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. \$3030 +T100

### **OPERATING INSTRUCTION**

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

# Graupner/SJ

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. f you have any difficulties while using your system, please consult the manual, our online requently 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

- 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
- Please feel free to contact "www.openhobbby.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 epair 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 Refer the WARRANTY CARD in a Package

OPENHOBBY A/S CENTER

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Customer Service E-mail: service@openhobby.com

TRANSMITTER THROTTLE ADJUSTMENT

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

2) How to access [ESC] DATA VIEW page

3. Set Warning setup with SMART BOX

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

2) Speed up typ. Start torque. Gov speed. Gov Response. Governor

3) Number-Pole, Gear Ratio, BEC Volt & Max-Reverse, Reverse funce

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

1 Air (Full throttle, Brake Start, Stop)

THE PROGRAMMING SETUP

2. Heli (Full throttle, Stop)

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### INTRODUCTION

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TELEMETRY

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MOUTING ESC.

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. BRUSH-LESS 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 documen are subject to change at the sole discretion of Graupner/SJ. For up-to-date product lite-rature, 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 WARNING the product before operating. Failure to operate the product correctly can result in damage to the product, personal property and cause serious injury.

### WARNING NOTES

- Always ensure the correct polarity in all connecting cables
- Never allow water, moisture, or other foreign materials to get inside speed controller, motor, or
- Ensure adequate air circulation around the speed controller and be careful to overheating of the
- . 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 control 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 circuit
- 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-contrtside 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.

Thermal cutoff

which can damage ESC.

- 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 rever
- Telemetry function with Graupner/SJ HoTT transmitte · 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

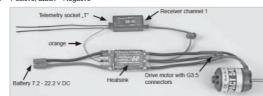
Telemetry function of BRUSHLESS CONTROL +T series speed controller can be used with Graupner/SJ HoTT transmitter only

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

· Alarm: You can program telemetry warning to

### • CONNECTIONS

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



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 ore efficient!

TRANSMITTER THROTTLE ADJUSTMENT

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

1) Connect ESC to motor but still not to drive battery

blink and motor sounds "Do, Re"

indicating that ESC is at full throttle.

at brake start position.

"Re~Do"

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

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 re

) Still hold transmitter throttle at full on position for about 10 seconds then motor sounds "Sol. Sol

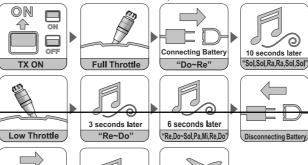
Ra, Ra, Sol, Sol" and the yellow status LED turns off and the red status LED turns solid red

Pull 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

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

- ) 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 re 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 vellow status LED turns solid vellow indicating that ESC is at Sto
- After 6 seconds, motor sounds "Re. Do~ Sol. Pa. Mi. Re Do" and the vellow 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 spee controller is ready to use.
- NOTICE: Brake function is not available in Helicopter mode.

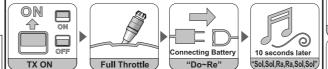


### 3. Car & Boat (Full throttle, Neutral, Reverse)

Connect battery

"Do~Do,Re,Mi"

- ) Connect ESC to motor, receiver but still not to drive batter 2) Turn on transmitter's power and push transmitter throttle to full on position and hold it
- Connect drive battery to speed controller with correct polarity. The status LEDs (yellow and red) blink and motor sounds "Do, Re".
- 1) 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. S) Put transmitter throttle at neutral and hold it there till motor sounds "Re. Do" and the re
- 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 een 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.



# "Re,Do~Sol,Pa,Mi,Re,D 1

### 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
ol"	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
- 11				

### THE PROGRAMMING SETUP

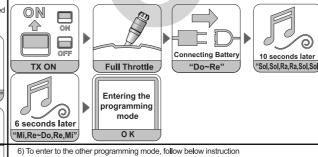
BRUSHLESS CONTROL +T series speed controllers can be programmed either directly using HoTT transmitter or Program box

### 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 vellow status LED turns off and the red status LED turns solid
- 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"



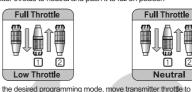
### Select AIR ESC Setting & DATA VIEW with ESC button and SERVO TEST page apperas for a while Press button to access (ESC) DATA VIEW page

1 Way setup for Airplane, Helicopter, Car and Boat

Move transmitter throttle to Stop position and push it to full on position.

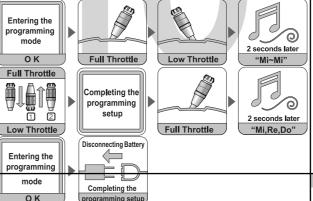
• 2 Way setup for Car and Boat

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 Re 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 paramete ) After the programming setup, push transmitter throttle to full on position and hold it there for 2 seconds till motor sounds "Mr, Re, Do" to indicate ESC gets back to the pro



LED indication and the programming mode/ parameter

OFF ON

Air Heli Boat Car -NO YES -

NOTICE: Since the programming mode 3 depends on mode 4, Model type, Model

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

he 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 SAMRT BOX. The ESC programming setu is carried out in the transmitter's "SETTING & DATA VIEW" menu and the ESC programm

ing 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 receive

If your transmitter doesn't have LCD screen, you may program ESC with the optional

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

SMART-BOX | mx-12 / mx-16 / mx-20 / mx32 HoTT | mc-19 / mc-22 / mc-24 / mx24 HoTT

scrol: ▼ value:

scrol: ▲ value: ▼

**ENTER** 

CLEAF

scroll: push Rotary + 🔾 value: Rotary

scroll: push Rotary + U value: Rotary

SMART BOX. SMART BOX provides an easy and comfortable environment for the

ERSE-FUNCTION ONEWAY TWOWAY

type should be programmed first

DIRECTION

ESC are transmitted by wireless.

ENTER

DEC

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 DATAVIEW page

2) How to access [ESC] DATA VIEW page

ESC DEC INC ENTER

->SETTING AND DATAVIEW

DEC INC

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

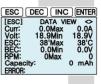
DEC



CURVE1 CH TYPE CURVE2 CH

### 3) [ESC] DATA VIWE

Follow chart for mz-12 transmitte



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			
Curr	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			
	The detected errors during flight			
ERROR	<ul> <li>OC : Over current protection</li> </ul>			
	T : Over temperature protection			
	<ul> <li>V : Low voltage protection</li> </ul>			
	R : No signal from receiver			

CONTROL +T, it consists of 6 pages

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

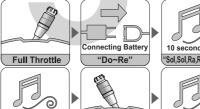


save the setup data, access to page 1 and move the cursor to E.S.C save line with DEC/INC buttons and then press DEC/INC buttons simultaneously to activate "NO" in black. Press INC button to switch to "YES" and press DEC/INC buttons simultaneously again to deactivate. All setup data is stored now





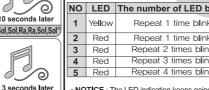
### ) Put transmitter throttle at Stop position and hold it there till motor sounds "Re. Do~ Sol. Pa. Mi 1) The explanation about the operation buttons of SMART BOX is introduced Re Do" and the yellow status LED turns solid red after the status LEDs (yellow and red) blink in 12~13P turn indicating ESC is at Stop position. Now, ESC setup has been completed. 13P Disconnect battery from speed controller. Put & hold transmitter throttle at Stop position and 14~16P connect battery to speed controller again then motor sounds "Do~ Do, Re, Mi" indicating spe 16~18P 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 ON . 20P 1 20~21P 1) Battery type, Cut-off type, Rotation, Motor timing (Helicopter, Airplane, Car. Boat) -- 22~23P · 24~25P 25~26F TX ON 26~27F 29P 20P

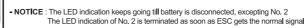


Low Throttle



"Re,Do~Sol,Pa,Mi,Re,Do"

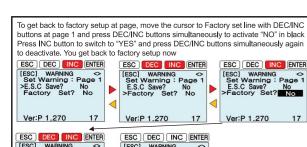




# 3. Set Warning setup with SMART BOX

# Set Warning is used to set alarm limit for telemetry function of BRUSHLESS

To access Set Warning page 1, press "ENTER" button at [ESC] DATA VIWE page.



Ver:P 1.270 17 Ver:P 1.270 17

To access other pages (page 1 to page 6), press DEC/INC buttons simultaneously when the cursor is in User setup line then the value, Page 1, is activated in black. Now press DEC/INC buttons to access the desired page.

ESC DEC INC ENTER ESC DEC INC ENTER

Set Warning: Page 1 E.S.C Save? No Factory Set? No	• <	Set Warning: Page 1 E.S.C Save? No Factory Set? No	<b>▶</b>	Set Warning: Page 2 Voltage : 6.0V Warning Time: Off Repeat Time: Always Singnal Tone: P
Ver:P 1.270 17		Ver:P 1.270 17		Min-Voltage: 18.9V
ESC DEC INC ENTER  [ESC] TEMPERATURE  >Set Warning: Page 3 Temperature: 60°C Warning Time: Off Repeat Time: Always Signal Tone: H  ESC. Temp.: 35°C	•	ESC DEC INC ENTER  [ESC] MAX.CURRENT > Set Warning: Parcel Maximum CUR: 100 A Warning Time: 5 sec Repeat Time: Aways Signal Tone: W  MAX.CURR: 0.0 A	•	ESC DEC INC ENTER  [ESC] MINIMUM RPM   Set Warning: Pages 1  Maximum RPM: 100  Warning Time: Off Repeat Time: Always Signal Tone:  RPM: 0

# 1) [ESC] VOLTAGE

ESC DEC INC ENTER
ESC] CAPACITY <

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

Access page 2 and select the category and then set the desire value to refer the setup method as explained above

NOTICE : All setup data can be utilized, only if they are saved to ESC in "E.S.C. Sav category at page 1



DEO LITTER	- 1	LOO DEC THE	1 1			
[ESC] VOLTAGE Set Warning: Page2 Voltage Warning Time: Off Repeat Time: Always Signal Tone: 18.8V		[ESC] VOLTAGE  Set Warning: Page2  >Voltage : 1357 Warning Time: Off Repeat Time: Always Signal Tone: P  Min−Volt: 18.8V	<b>&gt;</b>	[ESC] VOLTAGE ⇒ Set Warning : Page2 >Voltage : 18.5V Warning Time: Off Repeat Time: Always Signal Tone: P  Min-Volt: 18.8V		
SC DEC INC ENTER ESC DEC INC ENTER ESC DEC INC ENTER						

ESC DEC INC ENTER  [ESC] VOLTAGE  Set Warning Page2  Voltage : 18.5V  Warning Time: Off Repeat Time: Always Signal Tone: P  Min-Volt: 18.8V	<b>&gt;</b>	ESC DEC NO ENTER  [ESC] VOLTAGE SET Warming : Page2 18,5V  Voltage : 18,5V  Varning Time: Off Repeat Time: Always Signal Tone: P  Min-Volt: 18,8V	<b>&gt;</b>	ESC DEC ING ENTER  [ESC] VOLTAGE Set Warning : Page2 Voltage : 18,5V >Warning Time: 5 sec Repeat Time: Always Signal Tone: P  Min-Volt: 18,8V	ĺ
ESC DEC INC ENTER		ESC DEC INC ENTER		ESC DEC INC ENTER	)
feed were	F	[FOO] VOLTAGE 4		[FOO] VOLTAGE	ı

SC DEC INC ENTER	ESC DEC INC ENTER		ESC DEC INC ENTER	
[ESC] VOLTAGE  Set Warning: Page2 Voltage : 18.5V Warning Time: 5 sec Repeat Time: Always Signal Tone: P	[ESC] VOLTAGE Set Warning: Page2 Voltage: 18.5V Warning Time: 5 sec >Repeat Time: Always Signal Tone: P		[ESC] VOLTAGE  Set Warning: Page2 Voltage/Cell: 3.7V Warning Time: 5 sec >Rapeat Time: Always Signal Tone: P	
Min-Volt: 18.8V	Min-Volt: 18.8V		Min-Volt: 18.8V	
<b>←</b>		_		
ESC DEC INC ENTER	ESC DEC INC ENTER		ESC DEC INC ENTER	
ESC] VOLTAGE Set Warning: Page2 Voltage/Cell: 3.7V Warning Time: 5 sec	[ESC] VOLTAGE  Set Warning: Page2 Voltage: 18.5V Warning Time: 5 sec >Repeat Time: 1 min	•	[ESC] VOLTAGE  Set Warning: Page2 Voltage: 18.5V Warning Time: 5 sec Repeat Time: 1 min	

			_	
4	_			
ESC DEC INC ENTER		ESC DEC INC ENTER		ESC DEC INC ENTER
[ESC] VOLTAGE Set Warning: Page2 Voltage/Cell: 3.7V Warning Time: 5 sec >Rapeat Time: 1 min Signal Tone: P	<b>&gt;</b>	[ESC] VOLTAGE Set Warning: Page2 Voltage: 18.5V Warning Time: 5 sec >Repeat Time: 1 min Signal Tone: P	<b>•</b>	[ESC] VOLTAGE  Set Warning: Page2 Voltage : 18.5V Warning Time: 5 sec Repeat Time: 1 min >Signal Tone: P
Min-Volt: 18.8V		Min-Volt: 18.8V		Min-Volt: 18.8V
4				
ESC DEC INC ENTER		ESC DEC INC ENTER	ľ	ESC DEC INC ENTER
[ESC] VOLTAGE Set Warning: Page2 Voltage: 18.5V Warning Time: 5 sec Repeat Time: 1 min >Signal Tone:	<b>&gt;</b>	[ESC] VOLTAGE Set Warning: Page2 Voltage : 18.5V Warning Time: 5 sec Repeat Time: 1 min >Signal Tone: Q	<b>&gt;</b>	[ESC] VOLTAGE   >Set Warning: Page2 Voltage : 18.5V Warning Time: 5 sec Repeat Time: 1 min Signal Tone: Q

Min-Volt: 18.8V

Min-Volt: 18.6V		Min-Volt:	18.8V	
SC DEC INC ENTER		ESC DEC IN	IC ENTER	
[ESC] VOLTAGE Set Warning: Page 2 Voltage/Cell: 18.5V Warning Time: 5 sec Repeat Time: 1 min Signal Tone: Q	<b>&gt;</b>	[ESC] TEMPERAT >Set Warning Temperature: Warning Time: Repeat Time Signal Tone:	Page 3 60'C Off	
Min-Volt: 18.8V		ESC. Temp.	: 38'C	

Category	Description	Default
Voltage	Drive battery low voltage setup (6V~32.0V)	6V
Warning Time	Alarm operation time (Always, Off, 5, 10, 15, 20, 25, 30sec)	Off
Repeat Time	Alarm repeat (Always, 1, 2, 3, 4, 5min, One)	Always
Signal Tone	Warning tone (A~Z)	Р
Min -Volt	Drive battery min voltage in real time	-

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

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] TEMPERATURE   > Set Warning: Pacosi Temperature: 60°C Warning Time: Off Repeat Time: Always Signal Tone: H	value - NO to E
ESC Temp · 38'C	

Access page 3 and select the category and then set the desire value to refer to the setup method as explained above - NOTICE: All setup data can be utilized, only if they are saved to ESC in "E.S.C, Save" category at page 1

ESC.	Temp.	:	38'C	
•				

Category	Description	Default
Temperature	ESC temperature limit setup (10°C ~120°C)	100℃
Warning Time	Alarm operation time (Always, Off, 5, 10, 15, 20, 25, 30sec)	5sec
Repeat Time	Alarm repeat (Always, 1, 2, 3, 4, 5min, One)	Always
Signal Tone	Warning tone (A~Z)	Н
ESC. Temp.	ESC min voltage in real time	-

### 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.

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

Access page 4 and select the category and then set the desire value to refer to the setup method as explained above

NOTICE: All setup data can be utilized, only if they are saved to Con "E.S.C. Save" category at page 1

	310 11.	
Category	Description	Default
Maximum CUR	ESC max current limit setup (25A ~200A)	100A
Warning Time	Alarm operation time (Always, Off, 5, 10, 15, 20, 25, 30sec)	5sec
Repeat Time	Alarm repeat (Always, 1, 2, 3, 4, 5min, One)	Always
Signal Tone	Warning tone (A~Z)	W
MAX CLIRR	ESC may current in real time	

### 4) [ESC] MINIMUM RPM

t is used to set the min RPM limit that ESC is detecting. An alarm will sound when the min RPM 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



Access page 5 and select the category and then set the desire value to refer to the setup method as explained above

NOTICE: All setup data can be utilized, only if they are saved to ESC in "E.S.C. Save" category at page 1

Category	Description	Default
Maximum CUR	The min RPM setup (10 ~ 100,000 RPM)	100
Waming Time	Alarm operation time (Always, Off, 5, 10, 15, 20, 25, 30sec)	Off
Repeat Time	Alarm repeat (Always, 1, 2, 3, 4, 5min, One)	Always
Signal Tone	Warning tone (A~Z)	Т
MAX.CURR	RPM in real time	-

### 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.

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

	PACITY		<
Set Warr			age 6
Capa.war	ning:		
Warning T			Off
Repeat	Time:	Alw	ays
Signal	Tone:		V
Capacity:		0	mAh

Access page 5 and select the category and then set the desire value to refer to the setup method as explained above

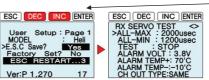
- NOTICE: All setup data can be utilized, only if they are saved to ESC in "E.S.C. Save" category at page 1

Category	Description	Default
Capa warning	The battery consumption amount limit (10 ~ 60,000mAh)	2,000mAh
Warning Time	Alarm operation time (Always, Off, 5, 10, 15, 20, 25, 30sec)	Off
Repeat Time	Alarm repeat (Always, 1, 2, 3, 4, 5min, One)	Always
Signal Tone	Warning tone (A~Z)	V
Capacity	Battery consumption amount in real time	-

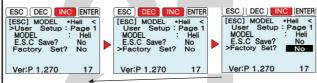
### 4. User setup with SMART BOX

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 at page 1 To save the setup value, access to page 1 and move the cursor to E.S.C save line with DEC/INC buttons and then 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 then motor sounds "Do ~ Do, Re, Mi" after countdown (3, 2, 1) to indicate all setup data is stored. The setup page is returned to RX SERVO TEST page automatically - NOTICE: You may utilize the setup data, only if they are saved to ESC.

			,			
	ENTER Heli < Page 1 Heli No No	[ESC] MODEL *HUSer Setup: MODEL : >E.S.C Save?	Heli <	•	[ESC] DEC INC [ESC] MODEL * User Setup: MODEL * >E.S.C Save? Factory Set?	Heli Page Heli No
Ver:P 1.270	17	Ver:P 1.270	17		Ver:P 1.270	17



To get back to factory setup at 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 then motor sounds "Do ~ Do, Re, Mi" after countdown (3, 2, 1) to indicate you get back to the factory setup. The setup page is returned to RX SERVO TEST page automatically



ESC DEC INC ENTER [ESC] MODEL *Heli < User Setup : Page 1 MODEL : Heli E.S.C Save? No >Factory Set? Yes ESC RESTART3	•	ESC DEC INC E  RX SERVO TEST >ALL-MAX : 2000us ALL-MIN : 1200us TEST : STOP ALARM YOLT : 3.8' ALARM TEMP-:-10' ALARM TEMP-:-10'
Ver:P 1.270 17		CH OUT TYPE:SAME

Ш	Category	Description	Default
Ш	Model	Model type setup (Air, Heli, Boat, Car)	Air
Ш	ESC Save ?	Storing the User setup data to ESC	-
Ш	Factory Set?	Getting back to factory setup	-

### 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. 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. Access page 2 and select the category and then set the desire value to refer the setup

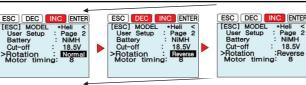
Access page 2 and select the category and then set the desire value to refer the setup method as explained above

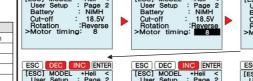
NOTICE: All setup data can be utilized, only if they are saved to ESC in "E.S.C. Save" category at page 1

ESC DEC NO ENTER  [ESC   MODEL +Hell < > User Setup : Page 1   MODEL   Hell    E.S.C Save? No Factory Set? No Ver:P 1.070	•	ESC DEC INC ENTER [ESC] MODEL +Heil < > Vaer Setup: Pace 2 Battery : LIPo Cut-off Auto Rotation : Normal Motor timing: 8	•	ESC DEC INC ENTER  [ESC] MODEL *Heli < >User Setup : Page <2 Battlery : LIPo Cut-off : Auto Rotation : Normal Motor timing: 8
ESC DEC INC ENTER		ESC DEC INC ENTER	r	ESC DEC INC ENTER

Motor timing: 8	2 5	Motor timing: 8	Motor timing: 8
ESC DEC NO ENTER  [ESC] MODEL +Hell < User Setup : Page 2 Seattery : NiMH Cut-off : Auto Rotation : Normal Motor timing: 8 >User Setup : Page 1	<b>•</b>	ESC DEC INC ENTER  [ESC] MODEL +Hell < User Setup : Page 2 Battery : NiMH >Cut-off : Auto Rotation : Normal Motor timing: 8	ESC DEC INC ENTER  [ESC] MODEL +Heil < User Setup : Page 2: Battery : NiMH >CUT-off : Auto Rotation : Normal Motor timing: 8

ESC DEC INC ENTER [ESC] MODEL +Heli < User Setup : Page 2 Battery : NIMH >CUT-off : 18.5V Rotation : Normal Motor timing: 8	ESC DEC INC ENTER [ESC] MODEL +Hell < User Setup : Page 2 Battery : NIMH >Cut-off : 18.5V Rotation : Normal Motor timing: 8	ESC DEC INC ENTER  [ESC] MODEL *Hell < User Setup : Page 2 Battery : NIMH Cut-off : 18.5V >Rotation : Normal Motor timing: 8





ı		1			
	ESC DEC INC ENTER  [ESC] MODEL +Hell < User Setup : Page 2 Battery : NIMH Cut-off : 18.5V Rotation : Reverse >Motor timing: 8	•	ESC DEC INC ENTER  [ESC] MODEL +Heli < User Setup : Page 2 Battery : NIMH Cut-off : 18.5V Rotation : Reverse >Motor timing: 8	•	ESC DEC INC ENTER  [ESC] MODEL +Hell < User Setup : Page 2 Battery : NiMH Cut-off : 18.5V Rotation : Reverse >Motor timing: 15

	[ESC] User Batte		: P	eli < age 2 liMH
2	Cut-c Rota >Moto		:Re	8.5V everse 15
ш	Cat	naon		

Category	Description	Default	
Battery Drive battery select (LiPo, NiMH)		LiPo	
Cut-off	Cut-off voltage setup (6.0V ~ 32.0V)	Auto	
Rotation	The direction of motor rotation setup (Normal, Reverse)	Normal	1
Motor timing Motor timing setup (0 ~ 25 degree)		8 degree	

### 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

at page 3

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

### a. Helicopter

ESC DEC INC ENTER	Ŋ.
[ESC] MODEL *Heli <	1
>User Setup: Page 3	
Speed up typ: Normal	1
Start torque: Lowest	ш
Gov speed : Off	L
Gov Response:Slowest	
Governor : Off	L

Access page 3 and select the category and then set the desire value to refer the setup method as explained above - NOTICE: All setup data can be utilized, only if they are saved to ESC in "E.S.C. Save" category at page 1

Category Description				
ESC throttle operation speed setup (Lowest, Low, Normal, High, Highest)				
ESC Start torque setup (Lowes, Low, Normal, High, Highest)	Lowest			
Save governor speed to ESC (On, Off)				
The response speed setup in governor mode	Slowest			
( Slowest, Slow, Normal, Fast, Fastest)				
On/Off setup for governor mode	Off			
	ESC throttle operation speed setup (Lowest, Low, Normal, High, Highest) ESC Start torque setup (Lowes, Low, Normal, High, Highest) Save governor speed to ESC (On, Off) The response speed setup in governor mode ( Slowest, Slow, Normal, Fast, Fastest)			

### Governor Speed

Governor speed function allows ESC to memorize motor RPM that is operated by the programmed throttle curve in transmitter and allows that motor runs in that RPM regardless of motor load and battery voltage.

• How to set

Switch "Off" to "On" in both of Gov Response and Governor categories and save this setup at page 1. Move transmitter throttle and program throttle curve till motor reaches to the desirec RPM. If motor runs stably at this RPM, yellow LED on ESC blinks briefly to indicate ESC has detected motor RPM. We recommend to set 70 ~80% Gov speed

MARNING If the different batteries are used to fly, it is very important to program Gov speed function with battery in lower voltage. i.e. if 4S and 5S batteries are used to fly, the setup should be performed with 4S battery.

To store the detected motor RPM to ESC, you need to land a helicopter and move transmitter throttle to idle position and hold it there for about 3 sec then motor RPM is stored to ESC

## b. Airplane, Car, Boat



Access page 3 and select the category and then set the desire value to refer the setup method as explained above

- NOTICE: All setup data can be utilized, only if they are saved to ESC in "E.S.C. Save" category at page 1

Category	Description		
Speed up typ	ESC throttle operation speed setup (Lowest, Low, Normal, High, Highest)		
Start torque	ESC Start torque setup (Lowes, Low, Normal, High, Highest)		
A-Brake	Auto brake which is operated from 2nd throttle position setup (0 ~ 100%)		
Min-Brake	Brake setup when brake is operated at first (0 ~ 50%)		
Max-Brake	The maximum brake setup (50 ~ 100%)		
Brake Type	The time from Min-Brake to Max-Brake (softest, soft, normal, hard)		

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

### 3) Number-Pole, Gear Ratio, BEC Volt & Max-Reverse, Reverse funce

It is used to set Number-Pole, Gear Ratio, BEC Voltage & Max-Reverse, Reverse function at page 4
+ Helicopter and Airplane: Number-Pole, Gear Ratio, BEC Voltage
• Car and Boat: Max-Reverse, Reverse function, Number-Pole, Gear Ratio, BEC Voltage
To perform the programming setup, you need to select the category first with DEC/INC buttons

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

### a. Helicopter, Airplane

_	ar moneopion, mpiamo
ER	ESC DEC INC ENTER
2 l / al	[ESC] MODEL *Heli < >User Setup: Page 4 Number-Pole: 2 Gear Ratio: 1,0:1 BEC Volt: 5.6V

# Category Description Default Number-Pole The number of motor magnet connected to ESC (2 ~ 36 Poles) 2 Gear Ratio Gear ratio (1.0:1 ~ 25.0:1) 1.0:1 BEC Volt BEC voltage setup (5.0 ~ 8.0V) 5.6V

### b. Car, Boat



Access page 4 and select the category and then set the desire value to refer the setup method as explained above

NOTICE: All setup data can be utilized, only if they are saved to ESC in "E.S.C. Save" category at page 1

•	Ш	Category	Default	
_	ч	Max-Reverse	The operation rage setup in Reverse (20 ~ 100%)	100%
	ı	Reverse funce	Reverse type setup (One way, Two way)	Car:2 way, Boat:1 way
R	Number-Pole The number of motor		The number of motor magnet connected to ESC (2 ~ 36 Poles)	2
7	П	Gear Ratio	Gear ratio (1.0:1 ~ 25.0:1)	1.0:1
2	П	BEC Volt	BEC voltage setup (5.0 ~ 8.0V)	5.6V
П	П			

### 5. Graphic display for telemetry data

Please refer to the section entitled "Telemetry" in the operating instruction of HoTT transmitter or SAMRT BOX.

## mx-16, mz-12 transmitter SMART BOX



ESC DEC INC
SETTING AND DATAVIEW MODEL SELECT
->EXTERNAL MONITOR

1		0(	0,0
	10.0V /	9.8V	0mAh
Ц	0	0.0A	0 <u>.</u> 0A
	ļ	Orpm	
	<del> </del>	- Urpili	X
_			

+ 31( +52)°C

If mx-16 transmitter's power is turned on, SMART BOX is also turned on and the start up page appears. You may select EXTERNAL MONITOR category with DEC/INC buttons and access telemetry data page with ENTER button.

# Oppn/0 The current voltage of battery / The max voltage of battery since ESC is turned on the current temperature of ESC(The max temperature since ESC is turned on the current temperature of motor/The max temperature of motor since ESC is turned on the current temperature of motor/The max temperature of motor since ESC is turned on the current temperature of motor since ESC is turned on the current since ESC is turned on the current PM/ The maximum current since ESC is turned on the current RPM/ The maximum RPM since ESC is turn



RPM display
 The current RPM of motor is displayed, which is connected to ESC

0.0A 0mAh

Current, Battery capacity display
It shows the actual current consumption, the
maximum current and the battery consumption
amount since ESC is turned on

10 .0V 0 .0A 0rpm 0 °C + 28 °C

 Voltage, Current, RPM, Motor temperature, ESC temperature
 It shows Voltage, Current, RPM, Motor temperature
ESC temperature since ESC is turned on

### SPECIFICATION

ea	BRUSHLESS CONTROL						
		+T 18 #33718	+T 35 #33735	+T 45 #33745	+T 60 #33760	+T 70 #33770	+T 100 #S3030
	Cell count (LiPo)	2-4	2-6	2-6	2-6	2-6	2-6
	Operating Voltage	6-15V DC	6-25V DC	6-25V DC	6-25V DC	6-25V DC	6-25V DC
r	Continuous current (2.4 Ah)	18A	35A	45A	60A	70A	100A
	max. current 10s	22A	45A	55A	70A	80A	110A
	Over current. Protection	-	50A	70A	80A	90A	120A
	PWM frequency	32kHz	32kHz	32kHz	32kHz	32kHz	32kHz
1	BEC continuous current	2A	2A	3A	3A	3A	3A
	BEC current max	3A	3A	10A	10A	10A	10A
٦	BEC voltage	5.6V	5.6V *	5.6V *	5.6V *	5.6V *	5.6V *
1	BEC short circuit protection	Yes	Yes	Yes	Yes	Yes	Yes
$\parallel$	False start protection	Yes	Yes	Yes	Yes	Yes	Yes
$\exists$	Overtemp. Protection	Yes	Yes	Yes	Yes	Yes	Yes
	Low voltage cutoff	Yes	Yes	Yes	Yes	Yes	Yes
	updatable firmware	Yes	Yes	Yes	Yes	Yes	Yes
	Power wires	0.48mm <sup>2</sup>	2.0mm <sup>2</sup>	2.5mm²	3.5mm²	3.5mm²	6mm²
4	Motor Wires	0.48mm²	2.0mm <sup>2</sup>	2.5mm²	3.5mm²	3.5mm <sup>2</sup>	4mm²
	Dimensions(mm) length (with out capacitor)	31x22x8	39.5x25x9.5	55x30x10	55x30x10	55x30x10	55x30x10
s	Weight(with cable)	16g	43g	66g	69g	73g	75g

### MODEL FINDER

This function is specially designed for Airplane and Helicopter only and it may help to find the downed model location. The installed motor in a model beeps in 30sec since the preset throttle cut is operated and also beeps when ESC don't take any signal from transmitter for 30 sec

### • FIRMWARE UPDATE

For more information on the latest firmware and the related software, please refer to the download menu on our website www.openhobby.com, www.graupner-sj.com

### 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. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your

environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or where you purchased the produce

### SAFETY APPROVAL

• EG DECLARATION OF CONFORMITY We hereby declare that the flowing product

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

Confirms with the essential protective requirements as laid down in the directive for harmonizing the statutory directives of the member states concerning electro-magnetic interference The applicant may issue a DECLARATION of CONFIRMITY and apply the CE marking in accordance with European Union Rules

### KC Information

Product: Graupner/SJ BRUSHLESS CONTROL ESC BRUSHLESS CONTROL +T18, +T35, +T45, +T60, +T70, +T100 ESC 국립전파 연구원의 전자파 적합등록을 획득하였습니다.