

The instruction book of brushless ESC for aircraft

Dear user,

Thanks for using the brushless motor intelligent power electronic speed controller(ESC) which designed and manufactured by Shenzhen FLYCOLOR electronic Co.,Ltd..Because of big power when you switch on this product.Improper use or operation may cause personal injury and equipment damage.We strongly suggest customer read the user manual carefully before using it and operate it according to the manual strictly. We don't assume any liability arising from the use of this product,including but not limited to incidental damages or consequential damages liability.Meanwhile,we don't assume any responsibility of the use of unauthorized removable and modify any liability arising from this product and caused by third-party products.

We have the right to change the products without notice, including appearance, performance parameters,and use requirements;we do not make any guarantee, statement or promise for if the product is suitable for the user's particular purpose.

1. Features of brushless motor ESC

- Using powerful, high performance MCU processor, user can set up their own function according to their demand, Fully reflect the unique intelligence characteristics of our products.
- Have smooth and delicate feel of controlling speed, first-class speed control linear. Automatic correction of the throttle end and take the maximum of the throttle trip.
- Support unlimited highest speed of brushless motor.
- Support constant speed.
- Elaborate circuit design,super anti-jamming.
- Start way can be set up,throttle respond quickly,and has the very smooth speed control linear,compatible with fixed wing aircraft and helicopter.
- Low voltage protective value can be set.
- Built-in SBEC, big load power,small power consumption with steering gear
- With multiple self-protection function: input abnormal voltage ,battery low voltage,over thermal, throttle signal loss drop power
- Good performance of energization safety,when switching on the power, motor won't started immediately wherever the throttle levers of RC is in.
- Over-thermal protection: when ESC work temperature reached 100 °C,the output power will be half reduced , when lower than 100 °C, the output power recover automatically .
- Compatible with all the remote control operation setting and support program card settings
- Set alarm sound to judge the work situation after switching on.
- Our company has complete product intellectual property, the products upgrade and update sustainable. And customize according to customer's requirements .

2.Specifications of ESC

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specification	Continuous current(A)	the Max burst current (10s) A	BEC output (V/A)	BEC Mode	Cells of battery Li-XX	Cells of battery Ni-XX	Size (mm) (width*length*height)v	Weight (g)
FLY-10A	10A	12A	5V/3A-1A	SBEC/ UBEC	2-4Lipo	5-12NC	60*26*9	26
FLY-20A	20A	25A	5.5V/3A-1A	SBEC/ UBEC	2-4Lipo	5-12NC	54*26*11	30
FLY-30A	30A	40A	5.5V/3A-1A	SBEC/ UBEC	2-4Lipo	5-12NC	54*26*11	32
FLY-40A	40A	60A	5.5V/4A	SBEC	2-5Lipo	5-15NC	35*71*10.5	48
FLY-50A	50A	80A	5.5V/4A	SBEC	2-6Lipo	5-18NC	35*71*17	68
FLY-60A	60A	80A	5.5V/4A	SBEC	2-6Lipo	5-18NC	35*71*17	68
FLY-70A	70A	100 A	5.5V/4A	SBEC	2-6Lipo	5-18NC	35*71*17	69
FLY-80A	80A	100 A	5.5V/4A	SBEC	2-6Lipo	5-18NC	35*66*22	90
FLY-90A	90A	120 A	5.5V/4A	SBEC	2-6Lipo	5-18NC	35*66*22	95
FLY-100A	100A	140 A	5.5V/4A	SBEC	2-6Lipo	5-18NC	35*71*22	95
FLY-110A	110A	150 A	5.5V/4A	SBEC	2-6Lipo	5-18NC	35*71*22	95
FLY-120A	120A	150 A	5.5V/4A	SBEC	2-6Lipo	5-18NC	35*71*22	98

Attachment:

- 1) ESC with SBEC, supply power for steering gear is switching power supply mode, output voltage is 5.5 V, steering gear can take 4A load, the burst current in 2 second can reach 8A.
- 2) ESC with UBEC, supply power for steering gear is linear power supply mode, output voltage is 5.5 V, steering gear can take 1A load.
- 3) OPTO shows there is no built-in BEC, when working, steering gear and receiver should be supplied power
- 4) Can customize individualized BEC
- 5) Can customize individualized ESC according to customer's requirements.

3.Introductions of ESC connection wire

To avoid short circuit and leakage, joints all use heat shrinkable tube to insulate

4.The functions of brushless motor ESC

1. Restore the factory default Settings
2. Battery type (LiPo or NiMH NicD) setting
3. Brake setting(brake or without brake)
4. Protective value of over low-voltage setting (set the low-voltage protective value)
5. The entrance angle setting(improve the service efficiency and stationarity of startup)

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6. Acceleration startup setting(apply in the precise gear box and helicopter specifically)
7. Helicopter mode(apply in helicopter specifically)
8. Steering of motor(clockwise or anticlockwise)
9. Working frequency setting
10. Over low-voltage mode(reduce power or stop immediately)

5. RC programming card set procedures of brushless motor ESC

Push the throttle lever to the highest ,ESC enter into the setting mode, then switch on the power of RC.

Note: Push the throttle lever to the highest ,ESC enter into the setting mode, Push the throttle lever to the lowest ,ESC enter into the working mode,

1) Battery pack connect with ESC, motor will sound BEEP one time after 2 s, shows ESC enter into setup mode, set menu is recycled mode .Each function is corresponding to the certain music tone. Each music tone plays 4 times continuously. Push the remote control throttle levers to the lowest position in the period of music played four times . Then the motor will sound BEEP 1 time, it shows corresponding parameters have stored ,ESC enter into work mode.

2) Repeat the processing as above , set the functions that you need.

Remark: also can set with program card(can choose parts) set process can see on the instruction book of program card.

1.Brake: ON OFF

ON-When throttle works in the lowest position, propeller will stop immediately.

OFF-When throttle works in the lowest position, propeller will stop slowly.

2.Battery type: LiPo or NiCd / NiMh

NiCad/NiMh—Set low-voltage protection point for NiCad/NiMh .

Lipo-- Set low-voltage protection point for Lipo and automatically detect battery cells within battery pack.

Remark: Choosing the low-voltage protection point for NiCad/NiMh, ESC will set 65% of the factory default as the suspended voltage point automatically. If need to change, you can change the suspension of the value through low voltage protection .When NiCad NiMh battery pack switched on, ESC will read the initial voltage, which can be used as the reference of the suspended voltage point.

3. Low-voltage protection: Low, Medium, High

1) For Ni-xx battery pack: Low, Medium, High, the suspended voltage is 50%/65%/65% of the battery pack's initial voltage.

2) For Li-xx battery pack: Low(2.8V) Medium(3.0V), High(3.2V): **Distinguish the battery cells automatically.**

It's no need to set except confirming battery type. ESC provide 3 low-voltage point protection points: Low(2.8V) Medium(3.0V), High(3.2V)

Eg: For 14.8V 4 cells Li-po battery pack:low-voltage suspended protection voltage : Low(11.2V) Medium(12.0V), High(12.8V)

4. Restore the factory default Settings

ESC factory default setting

- 1) Brake: OFF
- 2) Battery type: Lipo battery with automatically detect
- 3) Low-voltage suspended point: Medium(3.0V/65%)
- 4) Motor entrance angle: Automatic
- 5) Acceleration startup set: soft
- 6) Helicopter mode set: OFF

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- 7) Work frequency set: 8kHz
- 8) Low-voltage protection set: reduce power
5. Motor entrance angle: automatic, low,high
Automatic—ESC detect the optimum motor entrance angle automatically
Low(7-22 degree)—Set for the inner rotor motor
High(22-30degree)—Set for the outer rotor motor which are 6-pole or over 6-pole

In most cases, automatic entrance Angle is applicable to all types of motor, but to improve the efficiency, we propose to use low entrance angle set for the 2 pole motor (.general inner rotor) . 6-pole or over 6-pole motor use high entrance angle(general outer rotor). For higher speed motor can be set high entrance angle. Some motor need special entrance angle settings, if not sure, we suggest that use the entrance angle setting which motor manufacturers recommend or the automatic detection entrance angle setting .

Remark: After modifying entrance angle setting successfully, please test the motor on the ground first.

6 .Acceleration startup setting: Provide quick acceleration startup with linear accelerator response

Super soft startup: after lagging 1.5 seconds from start to maximum speed throttle response, the set can prevent the transmission device of precision gears/from falling off in the transient load; Suggest use for the fixed wing model with gearbox or helicopter.

Soft startup: after lagging 1 second from start to maximum speed throttle response, Suggest use for the fixed wing model with gearbox or helicopter.

Acceleration startup: No lag from start to maximum speed throttle response, Suggest use for the fixed wing model with direct drive.

7. Helicopter mode(Apply in the helicopter specifically)

Switch off the helicopter

Helicopter 1: after lagging 5seconds from start to maximum speed throttle response, if switching off the throttle after startup, you can start again with common mode .

Helicopter 2: after lagging 15seconds from start to maximum speed throttle response, if switching off the throttle after startup, you can start again with common mode .

Remark: Once work in the helicopter mode, no matter what setting of ESC was, ESC brake will be reset as no brake mode and low-voltage protection will be reset as reduce power mode automatically.

8. Steering of motor: forward or reversal

In most cases, forward or reversal of motor can realize it by exchanging any 2pcs of 3pcs connecting lines which connect motor and ESC. When the motor connection lines have been soldered in the ESC, we can change the motor steering by changing the set value of ESC.

9. Work frequency: 8kHz /16kHz

8kHz—Set the work frequency for 2-pole motor, like inner rotor

16kHz-- Set the work frequency for over 2-pole motor, like outer rotor

Although working frequency 16 kHz can provides violent power for fixed wing or helicopter, 16 kHz generated high RF noise, so the default setting is 8 kHz

10. Low voltage protection mode: reduce power/stop immediately

Reduce power-when reaching the default low voltage protection value,ESC will reduce the output power of the motor (recommended)

Immediately stop- when reaching the default low voltage protection value,ESC will stop the output power immediately.

6. Sequence and explanation of the programming cycle Menu

●start the remote control→throttle hit the highest point→contact the battery to the ESC→wait for 2S→enter the programming

when entering the programming setting,you will hear the following tweet sounds,it will cycle tweet according to the following chart,after tweet a tone, hit the throttle to the minimum within four times chirping, then Confirm and save this set item.

Programmed Item Description			
Programming setting: (five kinds of warning tone code as follow)			
A=tick-		breve	
B=tick-tick-tick-		3 liaison	
C=~tick		Gradient sound+tick	
D=tick \		bass	
E=tick--		bosen	
music 1	accelerator		A-A-A-A
music 2	brake		B-B-B-B
music 3	Battery type	Ni-MH battery	C-C-C-C
music 4		lithium battery	D-D-D-D
music 5	Low-voltage protection threshold	Low	E-E-E-E
music 6		Medium	AA-AA-AA-AA
music 7		High	BB-BB-BB-BB
music 8	Restore the factory default		CC-CC-CC-CC
music 9	angle of entrance	automatic	DD-DD-DD-DD
music 10		Low	EE-EE-EE-EE
music 11		High	AAA-AAA-AAA-AAA
music 12	Motor start	Super-soft	BBB-BBB-BBB-BBB
music 13		soft	CCC-CCC-CCC-CCC
music 14		Accelerates Start	DDD-DDD-DDD-DDD
music 15	Helicopter mode	Turn off	EEE-EEE-EEE-EEE

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music 16		Helicopter mode 1	AAAA-AAAA-AAAA-AAAA
music 17		Helicopter mode 2	BBBB-BBBB-BBBB-BBBB
music 18	Motor positive and negative setting		CCCC-CCCC-CCCC-CCCC
music 19	PWM Motor frequency	8K	DDDD-DDDD-DDDD-DDDD
music 20		16K	EEEE-EEEE-EEEE-EEEE
music 21	Low voltage protection mode	Reduce the power protection	AD-AD-AD-AD
music 22		Shut off the output	AE-AE-AE-AE

● Alarm Sound: design the alert tone that the user can hear to judge the abnormal situation when power on.

1. Unable to enter the working mode when power-on: have not set the throttle travel
2. The sustained sound of ticks:the throttle lever is not on the minimum position
a short pause after a tick: ESC can not detect the throttle normal signal from the receiver.
3. a tick then a second pause: the battery voltage is outside the acceptable range (once the battery is connected, the ESC will self-test and test battery voltage)

7. ESC Intelligent security protection features

Brushless motor electronic speed protection instructions	
Protect type	Protection description
Start protection	when start the push throttle, the ESC will shut down the motor within 2 seconds if failure to start the motor normally,the throttle needs to be reset before they can restart. Possible reasons: the ESC and motor wiring is disconnected or poor contact, propeller is blocking by other objects that makes the deceleration gear stuck.
Temperature protection	When the ESC operating temperature over 100 degrees, it will automatically reduces output power to protect, but won't power off all the output, at most reduced to 40% of full power to ensure that the motor still have a certain driving force, avoid to be crashed. When the temperature drops, the ESC will be restored to the maximum power gradually.
Throttle signal lost protection	When ESC detects a throttle signal lost after 2s,it will reduce the output power to the motor automatically, and then if the throttle signal is again lost more than 2s, the ESC will shut off the motor automatically. If the throttle signal recovery when the motor output power is reducing, the ESC can resumed the throttle control immediately.so when loss the signal transient(within 2s), the ESC won't do throttle protection; only when the remote control signal is indeed lost for a long time it will protect, but ESC won't turn off the output immediately, but a gradual process to reduce the output power,to leave the rescue time for player,taking into account the safety and practicality.

8. first time to use our ESC

● you need to set the throttle when first connected to ESC

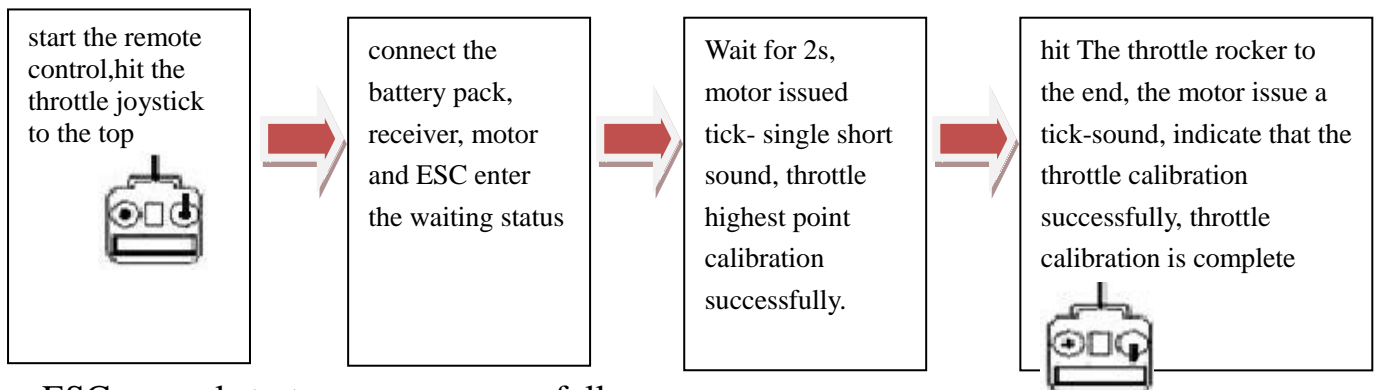
the characteristics Of flycolor is to set the best throttle depending on different transmitter, the ESC can get the smoothest throttle linear through the entire throttle range of the transmitter,in order to make the ESC access and memory the transmitter's throttle output signal, this operation only needs to do once, a replacement of transmitter need

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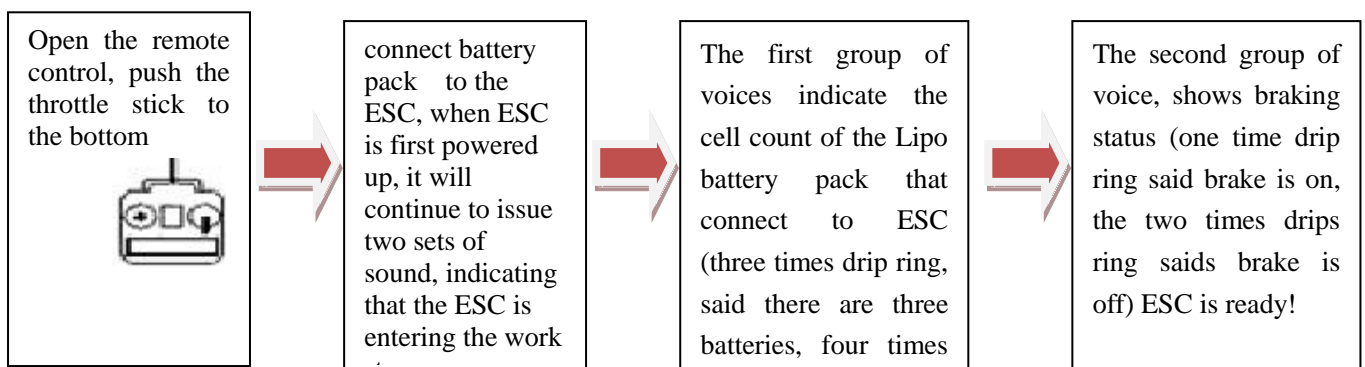
to repeat this procedure.

Note: when using the ESC, before connect the battery pack, be careful check all plugs to make sure the connect are with correct polarity, and is firmly installed, to prevent the ESC be damaged by wrong connection polarity or short circuit.

1. first time operate the ESC as shown in the figure below:



2. ESC normal start programs are as follow



Note: If the motor of your aircraft model suddenly stalled during the flight, please push throttle lever to the lowest position immediately, then pushed up the throttle lever so that the motor will restart, at this point control the throttle in a minor position, then landing the aircraft model immediately.

9. Safety common sense when using

3. Please do not remove any electronic components of the ESC secretly, otherwise it will cause permanent damage or information loss.
4. Test if the receiver device is setting correct, for the first time to test the ESC and motor, if not yet confirm the

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receiver device is set up correctly, please do not install the propeller or drive pinion on the motor.

5. Do not use cracked or punctured battery pack
6. Do not use the battery pack which is easy to overheat.
7. Do not use short-circuit battery.
8. Do not use non-standard cable insulation materials.
9. Do not use a non-standard cable connector.
10. The number of the battery or servo system should not exceed the provisions of the ESC.
11. The battery voltage should not exceed the operating voltage range of the ESC.
12. Do not use the unqualified battery pack.
13. Pay attention to the battery polarity, wrong battery polarity will damage the ESC.
14. Please ensure that the ESC will not be used for manned aircraft and manned machine.
15. Keep away from moisture and strong light.
16. Do not remove the battery when the motor is still running, this may burn the ESC for large peak current.
17. Do not pack anything outside the ESC, as far as possible keep the ESC in a ventilated and heat dissipation place.
18. Do not allow to use on a degaussed motor.
19. Keep away from chemicals or water.
20. If you do not use the ESC for a period of time, disconnect the battery pack.

10. Use of programming card for aircraft model

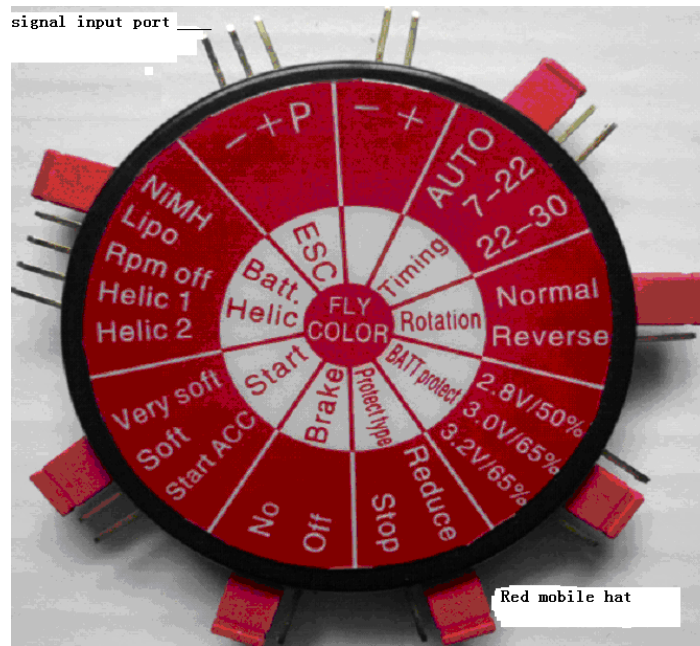
You can use our company-specific programming card for aircraft model.

From the input signal line as a starting point, clockwise, are as follows:

- 》 a " - + ": without BEC output, please join a 5VDC voltage at " - + ".
 - 》 b entrance angle setting: Auto, 7-22, 22-30
 - 》 c steering setting: positive and negative
 - 》 d low-voltage protection point: 2.8V/50%, 3.0V/65%, 3.2V/65%
 - 》 e Low-voltage protection type: Reduce the power, stop immediately
 - 》 f brake choose: On, Off
 - 》 g startup options: accelerated, soft, super-soft
 - 》 h helicopter mode: helicopter 1, helicopter 2, helicopter off
- Battery option: Lipo, NiMH

When using a programming card, you just need to set the function you want. Move the "red mobile cap" on the programming card and then insert it to the corresponding function interface, and then connect the signal line (red, white, black) into the programming card signal line input port which is corresponding with the (ESC) interface. (Note: if without BEC output, please add a 5VDC at " - + ") and then power-on, when you hear the motor "beep" means that it's done successfully. It is very convenient to operate.

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11. Processing method for common problems.

problems	reason	solution
when power on, motor does not work, no music, the servo system not connected	Battery pack is poor contact with the ESC, the power can not switch on	Re-clean the plug or replace the plug, check and confirm the wiring polarity
	ESC signal line is wrong connected with the receiver polarity	Check the signal line, to ensure the correct polarity
	weak Welding , easy to cause poor contact	Welding cable again
	wrong battery wiring polarity	Check the battery pack,replace the battery pack with specifications and fully charged.
	ESC have other quality problems.	Replace ESC
when power on,the ESC issue the sounds of automatically detect the battery count, but the motor can not start	The throttle travel of ESC did not set	Reset the throttle travel
ESC is working, but motor do not work ,no music. When ESC is powered on,motor can not work,issue an alert tone.a couple of "beep" then a short pause.	Poor contact between the ESC and motor, or welding is not strong	Check the connector terminals or replace the connector or re-welding the motor wiring
	Motor rejects	Replace the motor
	ESC low voltage protection, battery voltage is not within an acceptable range	Check the battery voltage, then replace is a fully charged battery pack
when powered on, motor does not	Receiver throttle signal no output	Check to make sure the throttle

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work, but issued a sound of the alarm tone (a sound of "beep" then a short pause)		channel of the receiver and the signal line is connected correctly Check the transmitter and receiver to confirm the signal output
when powered on, motor does not work, issue a continuous alarm tone.	The throttle lever isn't placed on the minimum position	Move the throttle lever to the minimum position, reset the throttle travel
when powered on, motor does not work, the ESC issued two long ring, then two short drop rings.	Throttle channel pros and cons are misplaced, leading the ESC to enter the programming mode	Reference the remote control manual, adjust the throttle channel pros and cons setting.
Motor reverse operation	line sequence error between motor and ESC.	<ul style="list-style-type: none"> ① replace any two of the three cable between the ESC and the motor. ② use the remote control or programming card to change the direction of the motor directly.
the motor stalled during flight.	The battery voltage is below low voltage protection setting Threshold voltage and low voltage protection mode is shutdown	<ul style="list-style-type: none"> ① set up the low-voltage protection voltage threshold correctly; when flight the battery should be full charged; set the low voltage protection mode to reduce power mode (default mode). when Power reducing in flight, landing you aircraft model in time. ② control your aircraft model flying within the range of remote control. ③ pay attention to the battery voltage of remote control, if the voltage drops more, then you need to landing aircraft model in time.
	Throttle signal loss	<ul style="list-style-type: none"> ① Check whether the remote control is operate properly ② Check if the remote control and receiver match correctly. ③ If strong electromagnetic interference when using, try to re-power on <p>Start to resume normal work, if the problem is recurring, it indicate the external interference is too strong, you</p>

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		should replace the flying field
	wiring Poor contact	Check to confirm if the plug of battery pack output cable is connected reliably with motor cable