LED OPERATING ERROR DESCRIPTIONS

● If the ESC detects an error during use, the Setup LEDs can be used to determine what the error is and what may cause it.

Setup LED Condition	Error	Possible Cause
Flashing Red, Blue & Green	No Signal	The Transmitter is turned OFF or the ESC is not plugged into receiver correctly.
Slowly Flashing Blue & Red	Abnormal Motor Rotation	Damaged motor and/or motor sensors. Also check sensor cable.
Slowly Flashing Red & Green	Low Battery	The battery voltage is below the Voltage Cut-Off limit or the battery could be damaged.
Flashes x 1 Red	Sensor Error	The sensor cable is unplugged or damaged, or the motor and/or motor sensors are damaged.
Flashes x 2 Red	Thermal Protection of FET	The ESC has overheated and the thermal protection feature has shut it down. Ensure Power Mode, gear ratio and Timing Advance are not too high. Ensure the number of turns of the motor is not too low.
Flashes x 3 Red	Thermal Protection of MOTOR	
Flashes x 4 Red	Thermal Protection of BEC	The BEC has been overloaded. Check cooling fan (install if necessary), servo(s) and other equipment.

SPECIFICATIONS

■Working Voltage: 3.7V - 7.4V
■Motor Type: For Brushless Motor (Sensor Type) Only
■Dimensions: 32.0 x 36.8 x 20.5mm
■Rated Current: 1332A/Phase (Transistor Rating at 25℃)
■Compatible Brushless Motor: 3.0T or greater (LiPo 1 cell)
4.5T or greater (LiPo 2 cell)
■Weight: 41.7g (w/o Power Capacitor)

WHAT'S INCLUDED

■Power Capacitor 2pc.
■Sensor Cable 1pc.
■Cooling Duct 1pc.
■Cooling Fan 1pc.
■Screw for installation of Cooling Fan 4pcs.
■12 AWG Power Wire 1m
■Heat-Shrink Tubing 5 colors
■User Manual 1pc.

TROUBLESHOOTING

Problem	Cause	Solution
Servo(s) work, but motor does not run	ESC is not connected properly.	Plug ESC into channel 2 and verify all connections and polarity
	Thermal protection Activated	Allow ESC to cool down sufficiently
	Wire or connector is disconnected	Verify that all connections are tight and secure
	Motor wires are connected incorrectly	Reconnect motor wires correctly per diagram on front page
	Motor is damaged	Replace or repair motor
	ESC is damaged	Repair ESC
Servo(s) do not work	Transmitter and receiver not paired	Pair (Bind) transmitter and reciever
	ESC not connected properly	Plug ESC into channel 2 and verify all connections and polarity
	ESC is damaged	Repair ESC
	Transmitter is damaged	Repair Transmitter
	Receiver is damaged	Repair Reciever
Motor runs backward even though holding throttle forward	Throttle reverse setting is changed after the setup	Set throttle reverse correctly
Motor runs slowly or has no acceleration	MODE 1 Cut-Off Voltage is active.	Check the setting of Mode1 or Replace and Charge Battery.
	Pinion gear is too large for motor	Use smaller pinion gear
	The setting of transmitter is changed after the setup	Reset the setup of ESC
	Battery is faulty or motor is damaged	Replace battery or repair or replace motor
	ESC is damaged	Repair ESC
ESC is overheating and going into thermal shutdown	The motor is not cmpatible with this ESC	Use motor compatible with ESC specifications
	Battery nominal voltage too high	Use recommend battery
	Incorrect gearing or binding in drive-train	Adjust gearing or repair drive-drain
	Inadequate cooling	Improve cooling for ESC or use optional cooling fan
	Values for Boost Rate, Boost Acceleration, Turbo set too high	Lower values for Boost Rate Boost Acceleration, Turbo or turn them OFF
Motor cannot stop, keeping slow rotation	The setting of transmitter is changed after the setup	Reset the setup of ESC
	ESC is watered	Turn off, remove battery and dry ESC
	ESC is damaged	Repair ESC
ESC works intermittently	Motor wire or Battery wire is too close to receiver or antenna	Keep motor wire or battery wire away from receiver or antenna
	Antenna of your car is too short	Keep antenna out of car and straight.
	Receiver is damaged	Repair reciever
	Loose connection	Check all connectors to ensure they're tight
Car do not run backward	ALB (antilock brake sysytem) of Transmitter is on. Or Reverse function of ESC is OFF.	Turn ALB of transmitter OFF. Turn Reverse of ESC ON.

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ESC Specialized for Brushless Motor

SUPER PRO VORTEX Gen2

670A02552A

USER MANUAL

Thank you for purchasing SUPER VORTEX Generation2 PRO.
Before you start to use your new ESC, please read these instructions carefully to enjoy optimum performance.
Keep this manual in a safe place for future reference.

PRECAUTIONS AND WARNINGS

■This ESC is designed for use with SANWA 2.4GHz radio systems. Functionality of this ESC with radio system bands other than SANWA may differ. Carefully check the function of the radio system when a brand other than SANWA is used.
■When soldering your battery connector and battery wires to the ESC, please observe correct polarity. Plugging the battery into ESC with reverse polarity will damage the ESC beyond repair!
■Be careful to solder silicone wire into your ESC or motor correctly. If battery wire is removed while driving, it'll lead to no control of reciever and it's very dagerous.
■This ESC is not waterproof. Do not run through water or allow the ESC to become wet with moisture or the ESC can be damaged.
■This ESC is not compatible with sensorless type brushless motor.
■Maintain your motor on a regular basis to ensure high performance. Degradation of motor performance can put undue stress on the ESC, resulting in damage to the ESC.
■This ESC is designed for use with 3.5T or greater (w/1S LiPo) and 4.5T or greater (w/2S LiPo) sensored brushless motor only.
■Do not hold full throttle under no-load operation of motor. Too much revolution may result in damage to your motor or ESC.
■When soldering the motor and battery wires to the ESC, be careful not to overheat the mounting posts or damage can result.
■The power capacitor installed on the ESC is mandatory for proper use. Do not remove the power capacitor.
■Always disconnect your battery from the ESC when not in use.
■Fix SUPER VORTEX Gen2 PRO in your car so securely that it will not be removed by impact.
■In case of using AUX CODE or CODE 5, please turn off CODE6 ~ CODE10 function on Telemetry & CODE ASSIGN by using PROGRAM BOX Gen2.

FEATURES AND SPECIFICATIONS

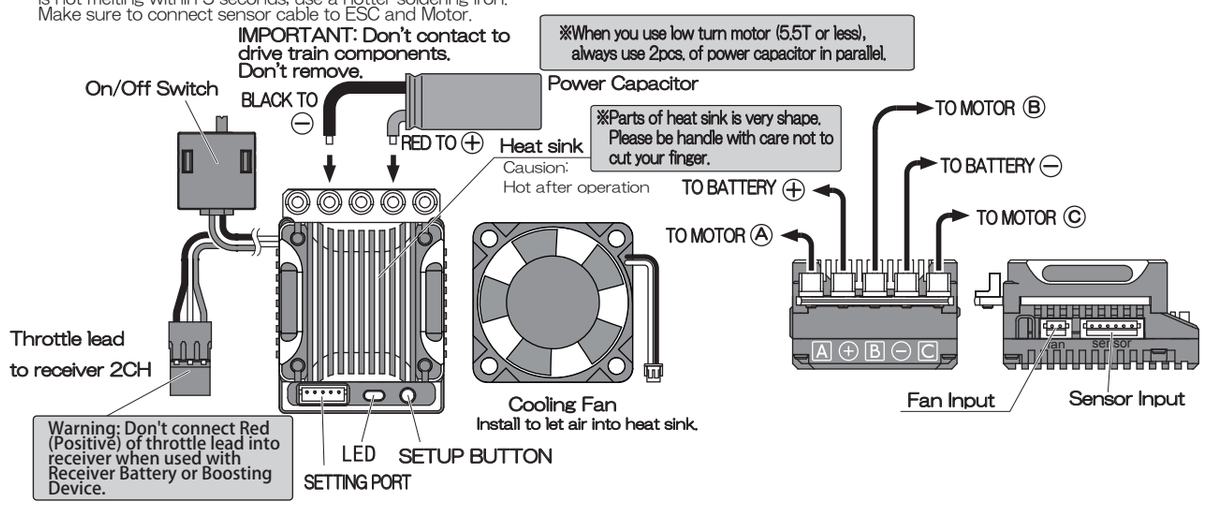
■SSR Mode-Compatible
■Installed 4 basic program + 10 program modes.
Other 4 programs can be added by using PROGRAM BOX Gen2. **(Required to update PROGRAM BOX Gen2 firmware (Ver.01.03R001)**
■New function compatible with CODE 10 for M12S & EXZES ZZ & MT-44.
■Developed Function is available only when used with SSL System/CODE 10.
(Boost Rate, Turbo, Boost Starting RPM, Boost Acceleration, Neutral Dead Band)
■Boost Function/Turbo Function
■High-performance regulator (6.0V-3.0A)
■Multi-Protect System
Prevent ESC from Overheat.
■Cut-off battery function allows you to use various batteries.
When the battery volatge reaches the selected cut-off voltage, motor slow down and then stop.
■SSL System-Compatible
When used with compatible transmitters and receivers (M12S/EXZES ZZ/ MT-44/MT-4S/MT-S and RX482/RX472/RX-47T), remote programming via transmitter is available. And telemetry data (RPM of motor, battery voltage, temperature of ESC and *motor) can be checked by transmitter without sensor.
*Only motor included temperature sensor.
*In case of using AUX CODE or CODE 5, please turn off CODE6 ~ CODE10 function on Telemetry & CODE ASSIGN by using PROGRAM BOX Gen2.
■Comaptible with Cooling Fan (30msize)

OVERVIEW, CONNECTIONS AND MOUNTING

●Solder the included 12 AWG Power wire to connect ESC to battery and motor.

*IMPORTANT: When soldering your battery connector and battery wires to the ESC, please observe correct polarity - positive to positive and negative to negative. When soldering the motor wires to the ESC and your motor, make sure that the wiring matches - A,B and C from the ESC to A, B and C on yoru motor.

*WARNING: Do not leave the soldering iron on the mounting posts for any longer than is necessary to melt the solder. If the mounting posts overheat, it can damage the ESC. A suitably hot soldering should not be left on the mounting posts longer than about 5 seconds. If the solder is not melting within 5 seconds, use a hotter soldering iron.
Make sure to connect sensor cable to ESC and Motor.



TRANSMITTER SETUP AND CALIBRATING THROTTLE END POINTS

●Prior to setting up ESC, set up your transmitter as described in the right table.
●If EPA of your transmitter is set by variable resistance, adjsut the maximum value of EPA for throttle High side and Brake side.
※If your transmitter don't have EXP, ARC, etc., adjust the compatible function with the right table.

D/R-TH	THROTTLE・DUAL RATE	HIGH SIDE/BRAKE SIDE	TH 100% / BR 100%
EPA-TH	THROTTLE・END POINT ADJUST	HIGH SIDE	100% H
EPA/TH	THROTTLE・END POINT ADJUST	BRAKE SIDE	100% B/L
EXP-TH	THROTTLE EXPONENTIAL	HIGH SIDE/BRAKE SIDE	OFF / 0%
ARC-TH	THROTTLE・ADJUSTABLE RATE CONTROL	HIGH SIDE/BRAKE SIDE	OFF / 0%
THROTTLE TRIM			CENTER
SUB TRIM-TH	SUBTRIM・THROTTLE		0
THROTTLE REVERSE			NOR or REV It cannot be changed after setup.

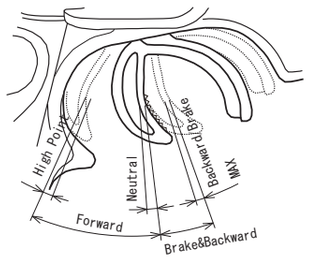
1	Verify that the ESC On/Off switch is turned OFF and the ESC is not plugged into your battery. Remove the pinion gear from motor to prevent any chance of a runaway model during the calibration process. While the throttle trigger in the neutral position, turn your transmitter ON.	
2	Plug the ESC into battery and while holding the Setup Button, turn the ESC On/Off switch ON. The Setup LED will turn solid green.	Turn the ESC On/Off switch ON while holding the Setup Button. ESC On/Off Switch → Setup Button Push → Solid Green LED
3	While the throttle trigger in the neutral position, press the Setup Button. The Setup LED will turn solid blue, indicating the throttle neutral position is stored.	Neutral → Setup Button Push → Solid Blue LED
4	While holding the throttle trigger in the full throttle position, press the Setup Button. The Setup LED will turn solid red, indicating the full throttle position is stored. Release the throttle trigger.	Full Throttle → Setup Button Push → Solid Red LED
5	While holding the throttle trigger in the full brake position, press the Setup Button. The Setup LEDs will turn solid red, blue, and green, indicating the full brake position is stored and the calibration process is complete. Release the throttle trigger.	Full Brake → Setup Button Push → Solid Red, Blue and Green LED

LED THROTTLE POSITION CONDITION INDICATORS

●You can confirm if Setup is correct by the LED indication while operating Throttle.
※It's no need to re-setup when changing response of transmitter after the setup for NOR/SHR or SSR is complete.

THROTTLE TRIGGER POSITION	LED	
NEUTRAL (BOOST OFF)	Flashing Blue	
NEUTRAL (BOOST ON)	Solid Blue	
NEUTRAL (CODE AUX INVALID)	Flashing Green	※Only in SSL
NEUTRAL (CODE AUX VALID)	Solid Green	※Only in SSL
ANY THROTTLE SETTING OTHER THAN FULL (SSR)	Flashing Blue Rapidly	
ANY THROTTLE SETTING OTHER THAN FULL (NOR/SHR)	Flashing Red Rapidly	
ANY THROTTLE SETTING OTHER THAN FULL (SSL/CODE AUX)	Flashing Green Rapidly	※Only in SSL
FULL THROTTLE	Solid Blue	
ANY BRAKE OR REVERSE SETTING OTHER THAN FULL	Flashing Red Rapidly	
FULL BRAKE OR FULL REVERSE	Solid Red	

SETUP LED OPERATION



■You can confirm throttle operation by LED

●Power on. Be careful to turn on transmitter prior to turning on ESC.
(When turning off, turn off ESC prior to turning off transmitter.)
●When throttle trigger is moved to backward or brake while driving, brake will work according to the operation.
When backward movement is valid, your car will move backward if throttle trigger stop at Neutral and move to Brake&Backward side.

Full brake rate (Max Brake) adjustment (Adjusted by PROGRAM BOX Gen2)

About full brake rate adjustment (Program Box Gen2 firmware Ver.01.03R001~999),
Using Program Box Gen2 can adjust full brake rate.
* Date 11 [D11 F-BR-R (22)] setting range [-100~0]: 0~100% [default: 0⇒100%]
Speed controller can adjust brake volume without transmitter EPA and D/R changes.
* Please update PROGRAM BOX GEN2 firmware (Ver.01.03R001).

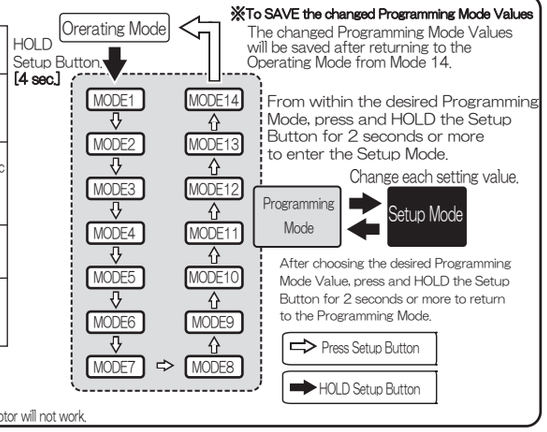
Turbo slope and delay adjustment (adjusted by PROGRAM BOX Gen2)

About turbo slope and delay adjustment (Program Box Gen2 firmware Ver.01.03R001~999),
Using Program Box Gen2 can adjust turbo slope and turbo delay.
* Date 12 (turbo slope) [D12 TB-REL (23)] setting range [0~100]. Value 0 is immediate. 1%~100%/0.1 sec [default: 0⇒ immediate]
Turbo slope: Set speed of increased advancement angle values when turbo starts. Speed of increased advancement angle is slow when the value sets low.
(In case of set as 0, the speed is immediately increased)
* Date 13 (turbo release slope) [D13 TB-REL (24)] setting range [0~100]. Value 0 is immediate. 1%~100%/0.1 sec [default: 0⇒ immediate]
Turbo slope: Set speed of decreased advancement angle values when turbo finish. Speed of decreased advancement angle is slow when the value sets low.
(In case of set as 0, the speed is immediately decreased)
* Date 14 (turbo delay) [D14 TB-REL (25)] setting range [0~100] 0~1.0 sec (0.01 sec each) [default: 0 ⇒ 0 sec]
Turbo delay: Set delay time when throttle is full.
* Turbo do not work in case of full-throttle time is shorter than setting value.
* In case of using function, please upload PROGRAM BOX GEN2 firmware (Ver.01.03R001).

PROGRAMMING MODE

●CHANGING MODE

Changing from Operating Mode to Programming Mode	Press and HOLD the Setup Button for 4 seconds or more in Operating Mode. The Setup LEDs will flash, indicating the ESC is in Programming Mode. Release the Setup Button.
Confirm the setting in Programming Mode	In Programmming Mode, Blue LED will flash a specific number of times, indicating the current Programming Mode and the Green LED will flash a specific number of times, indicating the current Programming Mode Value within the Programming Mode. (ex.) Mode3/Value#6: (Blue LED)Flashing three times/(Green LED)Flashing six times
Changing Programming Mode Values (Setup Mode)	From within the desired Programming Mode, press and HOLD the Setup Button for 2 seconds or more to enter the Setup Mode. The red and green LEDs will both flash a specific number of times, indicating the current Programming Mode Value. Press the Setup Button to choose the desired Programming Mode Value. The Red and green LEDs will flash a specific number of times, indicating the new current Programming Mode Value you chose.
Changing from Setup Mode to Programmming Mode	After choosing the desired Programming Mode Value, press and HOLD the Setup Button for 2 seconds or more to return to the Programming Mode.
Saving Programming Mode Values	From within the Programming Mode, press the Setup Button to cycle through the fourteen Programming Modes and return to the Operating Mode. All LEDs will flash indicating you returned to the Operating Mode. The changed Programming Mode Values are saved when returninng to the Operating Mode.



※To SAVE the changed Programming Mode Values
The changed Programming Mode Values will be saved after returning to the Operating Mode from Mode 14.

From within the desired Programming Mode, press and HOLD the Setup Button for 2 seconds or more to enter the Setup Mode.

Change each setting value.

After choosing the desired Programming Mode Value, press and HOLD the Setup Button for 2 seconds or more to return to the Programming Mode.

Note) While operating SSL/CODE AUX System, you cannot enter Programming Mode by Holding the Setup button.
It will change CODE AUX from Disabled to Enabled.
※If you use SSL/CODE AUX function, you can use extended functionality which allows Super Vortex GENERATION 2 to set more detiled values. (Refer to extended functionality of Programming Mode.) ※In Programming Mode or Setup Mode, motor will not work.

●Programming Modes and Programming Mode Values. *Default values are shown in gray.
Mode 1-4 is for basic setting of ESC and Mode 5-14 is for changing Motor function.

・MODE 1 (Cut-Off Voltage) *Ensure that the Cut-Off Voltage value you choose matches the battery type you're using.

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
flashes x 1 Blue	(OFF)	3.0v	3.3v	3.6v	4.0v	4.4v	4.8v	5.2v	5.6v	6.0v	6.4v

・MODE 2 (Reverse) Enable or Disable Reverse function. Reverse is 50% of speed of forward.

	#1	#2
flashes x 2 Blue	Disabled	Enabled

・MODE 3 (Thermal Protection) ESC and motor over-heat protection. Requires motor be equipped with temperature sensor.

	#1	#2	#3	#4	#5	#6
flashes x 3 Blue	120℃/80℃	120℃/90℃	120℃/100℃	120℃/110℃	120℃/120℃	OFF/OFF

・MODE 4 (Boost)

	#1	#2
flashes x 4 Blue	Disabled	Enabled

*Only when #2 boost enabled is set, Mode 10, 11, 12 & 13 are valid.

・MODE 5 (Throttle Punch) Adjust the punch when motor is started by throttle operation

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
flashes x 5 Blue	0%	4%	7%	11%	14%	16%	19%	22%	24%	26%	28%

・MODE 6 (Neutral Brake Rate/Drag Brake Rate) Change the braking effectiveness as the throttle trigger is returned to neutral.

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
flashes x 6 Blue	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%

・MODE 7 (Drive Feel) Higher values increase the smoothness of the throttle in the forward and return to the neutral directions.

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
flashes x 7 Blue	DF0	DF10	DF20	DF30	DF40	DF50	DF60	DF70	DF80	DF90	DF100

・MODE 8 (Neutral Brake Feel/Drag Brake Feel) Higher values increase the smoothness of the Neutral Brake function.

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
flashes x 8 Blue	NBF0	NBF10	NBF20	NBF30	NBF40	NBF50	NBF60	NBF70	NBF80	NBF90	NBF100

・MODE 9 (Brake Feel) Higher valuses increase the smoothness of throttle in the brake and return to neutral directions.

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
flashes x 9 Blue	BF0	BF10	BF20	BF30	BF40	BF50	BF60	BF70	BF80	BF90	BF100

・MODE 10 (Boost Rate/Timing Advance) Higher values increase motor performance throughout the entire throttle range.

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
flashes x 10 Blue	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%

・MODE 11 (Turbo) Increase the Timing Advance at only the full throttle postion by the percentage chosen.

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12
flashes x 11 Blue	0%	4%	8%	12%	16%	20%	25%	30%	35%	40%	45%	50%

・MODE 12 (Boost Starting RPM) Adjust the starting position of RPM at which the Boost Timing becomes active. If MODE 10 is #1, it doesn't work.

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
flashes x 12 Blue	23000rpm	21000rpm	19000rpm	17000rpm	15000rpm	13000rpm	11000rpm	9000rpm	7000rpm	5000rpm	3000rpm

・MODE 13 (Boost Acceleration) Increase the amount of boost rate per 1,000RPM. If MODE 10 is #1, boost doesn't work.

	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11
flashes x 13 Blue	0%	2%	4%	6%	8%	10%	12%	14%	16%	18%	20%

・MODE 14 (Neutral Dead Band) Adjust "Play"(Looseness) in Neutral range.

	#1	#2	#3	#4	#5	#6	#7	#8	#9
flashes x 14 Blue	10	15	20	25	30	35	40	45	50

IMPORTANT
●Advance Timing of Motor itself should be "Zero". If you use Advance Timing of motor itself, it will damage motor.
●MODE 1Cut-off voltage is the function to prevent your battery from over discharge. When your battery reached to the cut-off voltage you choose, motor will be stopped. When the motor be stopped, stop driving and replace or charge your battery.
●Set MODE 1-4 accroding to your use.
●Boost (Timing Advance) or Turbo will become active only when MODE 4 is #2 and MODE 10, MODE 13 is all but #1.
●If the value of Boost Rate or Boost Acceleration is too high, your Motor or ESC will heat up and may be broken. Adjust Boost Rate and Boost Acceleration by increasing the value from low step by step confirming temperature of ESC and Motor.
●Regarding MODE 12 Boost Starting Rate, adjust the values accroding to your motor and racing circuit. Preffered reference value of Boost Starting Rate is #2 for 4.5T Modified Motor etc., #3-5 for 13.5T Motor, and #6-8 for 17.5T Motor (1/10 EP Touring).
●When you change gear ratio, confirm the temperature of your motor and ESC. Inappropriate gear ratio will damage your motor or ESC.
●Don't hold throttle fully with motor no load. Too much revolution may break your motor or ESC.
●The Setting Data of Super Vortex Gen2 is stored when ESC is turned off. So turn off ESC by ON/OFF Switch after driving, instead of removing the battery connector.