

Quark Brushless Systems

Instruction Manual for Quark 22A/33A Universal Version 2

Precautions:

- **WARNING!** High-powered brushless systems can be very dangerous as high currents can heat and/or melt wires and batteries, causing fire, property damage, and serious bodily injury (including death). Follow the Instruction Manual carefully. Only operate in a sanctioned area. Quark ESC is equipped with a safety-arming feature, but users should still use caution when connecting the battery.
- The Quark Electronic Speed Controller complies with FCC and CE regulations. CE approval is your guarantee the unit meets all the relevant interference emission and rejection regulations when in operation.
- The battery wires must be connected with correct polarity. Quark ESC may be damaged if the polarity is incorrect and it will VOID the WARRANTY.
- Quark Electronic Speed Controllers (ESC) are designed for operation exclusively with R/C batteries. DO NOT use ESCs in conjunction with a power supply. Energy reversal may occur which can damage/destroy the power supply and/or ESC and will VOID WARRANTY.
- When Motor and Battery are connected to the ESC, handle the R/C with extreme care! Keep clear of moving/rotating parts when the battery pack is connected.
- Do not exceed the specified voltages as it may cause an overload, damage the ESC, and VOID WARRANTY.
- Do not use Schottky Diodes or Condensers with Brushless Motors.
- Ni-MH and Ni-CD may be used in place of each other, but never in place of Li-Poly
- Exercise Caution during and after use as the motor, battery, controller and all connecting wires may become hot. Contact with your skin may cause a burn or serious bodily injury.
- The power ON/OFF switch on the Quark ESC does not disconnect the battery from the ESC. A low residual current flows even if the Power switch is OFF and can cause deep under loading, especially with Li-Poly Cells. Connect the battery to the ESC shortly before operation and disconnect shortly after use.
- Never disconnect the battery pack while the motor is running, as this could cause damage on the speed controller and/or motor.
- Safeguard the Quark from excessive mechanical loads, vibration, dirt, or moisture. Should the ESC become wet, only reuse after air-drying for an extended period. If malfunction ensues, it may be sent to manufacturer for repair.
- Allowing water, lubricants, moisture or other foreign materials inside the ESC will VOID WARRANTY. Exposure to CA glue or its fumes can cause the ESC damage and it may malfunction; this will VOID WARRANTY.

- Speed controller needs to be completely checked after a model crash. **Never use a damaged ESC.**
- The heat sink on the ESC must be used for maximum cooling and performance – Never allow separate heat sinks to touch each other or any exposed conductive surface. This may cause a short circuit, damage ESC, and VOID WARRANTY.

1.0 Installation of Quark Controller

- Motor wires can be connected to the Quark ESC in any order. If the motor rotates in the opposite direction, swap any two of the three motor wires to reverse the motor rotation.
- Please connect the Servo Plug to the proper channel of the receiver.
- Use high quality connectors for Battery and Motor wires. Connectors with low conductivity may cause erratic motor rotations or other unexpected movements. For the battery, use connectors that cannot be plugged in backwards to prevent incorrect polarization. Comply with the allowed voltage capacity of the connectors. When possible, direct soldering is recommended for best conductivity.
- Do not mount the Motor in the R/C before all wires are properly soldered and/or connected. Mount the Motor only after everything has been connected and is working properly.
- When connecting the Quark to the battery pack, ensure that multiple touches of the connectors are not made.
- Check the motor manufacturer's instruction manual for screw mounting length. Mounting longer screws can damage motor and/or short-circuit the ESC and/or motor and VOID WARRANTY.
- Wires connecting the ESC to the motor and the battery should be kept as short as possible, preferably less than 20 cm.

2.0 Initial Setup

- Reset all the functions of the throttle channels of the transmitter.
- The Fail Safe systems of PCM transmitters/receivers must be turned off.
- Double check the polarity of the battery wires.
- **Warning!!**
 - The motor should not be connected to moving parts during programming because the vehicle may move and may result in property damage and/or personal injury.
 - The default battery settings are Li-Poly Normal. When using a Ni-MH or Ni-Cd battery, please change the settings to prevent damage to the battery.

3.0 Quark Programming Instructions

There are three steps to Quark ESC programming.

1. Neutral/Maximum Throttle Position Programming (section 3.1)
2. Basic Programming (section 3.2)
Includes:
 1. Mode Selection
 2. Brake Selection
 3. Battery Type Selection
 4. Manual Cut-off Voltage Selection
3. Advanced Programming (section 3.3)
Includes:
 1. Motor Type Selection
 2. Drag Brake On/Off Selection & Heli Mode Slow Start On/Off Selection
 3. Race/Safe Mode Selection
 4. Noise Cancel Selection
 5. Torque Selection
 6. Neutral Range Selection
 7. Drag Brake Amount Selection & Governor Response Selection

3.1 Neutral/Max Throttle Position Programming

This is the starting point for all programming. It allows the user to set Neutral and Maximum throttle positions. All transmitters emit their own transmitter signals and have varying Neutral and Maximum throttle positions and thus, it is the necessary first step in the overall programming of the Quark ESC.

- 1) Turn "ON" your Transmitter.
- 2) Press and hold the Program button and then turn "ON" the external power switch on Quark.
- 3) Release the Program button approximately after 2 - 3 seconds.
- 4) Move the throttle stick until you hear a recognition beep ("♪").
 - The red LED will blink once at this time.
- 5) Move the throttle stick to the desired Neutral throttle position and press the Program button and release. You will hear another recognition beep ("♪") signaling that the Neutral position has been saved.

- 6) Move the throttle stick until you will hear a recognition beep ("♪").
 - The red LED light will blink twice at this time.
- 7) Move the throttle stick to the desired Maximum/Full Throttle Position and press the Program button and release.
- 8) You will hear two recognition beeps ("♪♪") signaling that the Maximum/Full Throttle position has been saved.
- 9) Turn "Off" the external Quark power switch.
 - Note: If you have correctly followed the steps above and are unsuccessful at properly programming the Neutral and Full Throttle Settings, please reverse the Throttle Channel on the transmitter.

3.2 Basic Programming

Basic Programming includes 4 settings:

1. Mode Selection
2. Brake Selection
3. Battery Type Selection
4. Li-Poly Cut-off Voltage Selection

3.2.1 Entering Basic Programming

1. Turn "ON" your Transmitter.
2. Move the throttle stick to the Maximum/Full Position; Hold until step 4.
3. Turn "On" the Quark Power Switch ("♪♪")—transmitter recognition beep ("♪♪♪").
4. Press and hold the Program button and then move the throttle stick to the Minimum position ("♪♪♪♪").
5. Release the Program button after approximately 2 -3 seconds
6. Move the throttle stick until you hear recognition beep ("♪"). You have entered Basic Programming*.
 - * You will know that you have successfully entered basic programming when you notice the LED color changes when the throttle stick is moved up and down.

3.2.2 To choose any selection

1. Move the throttle stick to enter setting (or move to the next setting).
2. Move the throttle to the position that illuminates the desired LED pattern** and hold.
3. Press the Program button on the Quark.
4. Repeat step 1-3 until all settings 1 through 5 are completed*.
5. Power OFF the Quark to store selected settings.
 - *User may set desired selections, starting from Mode Selection until desired settings are stored. User may then Power "OFF" the Quark to avoid resetting remaining selections (Example: User may set selections of Air 3-D Mode and No Brakes, then Power "OFF" the Quark. Those two selections will be saved and the previous settings for selections 3-4 will remain saved.

****Use Tables 3.2-1 through 3.2-4 to set Basic Settings**

Note- Settings highlighted in blue are the Factory default settings

Table 3.2-1 Mode Selection

Mode	Red	Green	Yellow	Red	Description
Heli 3		●	●	●	Heli Mode with 2 adjustable governor rpm settings. *When using two governor rpms, non-collective pitch must be used.
Heli 2			●	●	Heli Mode with 1 Governor function.
Heli 1		●		●	Heli Mode with no Governor function.
Car-Reverse				●	Car Mode with reverse. Reverse is activated only when the throttle stick is at Full Brake, returned to Neutral, and then reverse is applied.
Car		●	●		Car Mode with Forward/Braking Only. No Reverse.
Air-3D			●		Forward and Reverse Air Mode.
Air		●			Forward Only Air Mode. No Reverse.

Table 3.2-2 Brake Selection

Brake	Red	Green	Yellow	Red	Description
100%		●	●	●	100% Braking at any throttle position below neutral
Double				●	Hard Proportional Braking.
Normal			●		Standard Proportional Braking.
Soft		●			Soft Proportional Braking.
0%	●				No Braking.

Table 3.2-3 Battery Selection

Brake	Red	Green	Yellow	Red	Description
Manual		●	●	●	User can manually set the cut-off voltage in Li-Poly Cut-off Selection in Table 3.2-5. Warning! — Damage to the battery may result if the cut-off voltage is set too low.
Li-Poly High			●	●	Select when the Battery is compatible with the voltage in use. Faster throttle response time and increased torque compared to when Li-Poly Normal is selected.
Li-Poly Normal			●		Select when the Battery capacity and discharge rate are lower than voltage in use. Slower throttle response and lower torque than when Li-Poly High is selected.
Ni-MH High	●	●			Select when the Battery is compatible with the voltage in use. Faster throttle response time and increased torque compared to when Ni-MH Normal is selected.
Ni-MH	●				Select when the Battery capacity and

Normal					discharge rate are lower than voltage in use. Slower throttle response and lower torque than when Ni-MH High is selected.
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Note: Li-Poly High, or Ni-MH High should be selected when using a very high capacity battery.

****Disregard Table 3.2-4 unless the "Manual" Battery Selection was made****
****To do so, Just Power "OFF" Quark ESC after completing Battery Selections****

Table 3.2-4 Li-Poly Cut-Off Voltage Selection

Cut-off Voltage	Red	Green	Yellow	Red	Description
3.0V	●	●	●	●	Cut-off voltage is set to 3.0V per cell.
2.9V		●	●	●	Cut-off voltage is set to 2.9V per cell.
2.8V	●		●	●	Cut-off voltage is set to 2.8V per cell.
2.7V			●	●	Cut-off voltage is set to 2.7V per cell.
2.6V		●	●		Cut-off voltage is set to 2.6V per cell.
2.5V	●	●			Cut-off voltage is set to 2.5V per cell.
2.4V		●			Cut-off voltage is set to 2.4V per cell.
2.2V	●				Cut-off voltage is set to 2.2V per cell.

- * Default battery setting is Ni-MH Normal. When using a Li-Poly battery, please change the settings to prevent any damage to the battery.
- * Selection of Li-Poly High or Ni-MH High should only be selected when the discharge capacity of the battery exceeds the actual current used in extreme running conditions by at least by 150% (When the discharge capacity is insufficient to handle the actual current usage in such instances, driving feel may be affected and/or battery damage may result).
- * Exercise Caution when setting the cut-off voltages. When the voltage per cell falls below a certain level, a Li-Poly battery may be permanently damaged making it un-rechargeable. In extreme cases, it may cause fire.
- * The "Manual" cut-off voltage applies to only Li-Poly batteries.
- * Once you have selected "Manual" from table 3.2-4 and set the cut-off voltage manually, switching the battery type to an automatic cut-off will not automatically change the cut-off voltage. (For example: If you have selected "Manual" and a cut-off voltage of 2.2V, any attempts to change the battery selection to "Li-Poly Normal" or "Li-Poly High" will maintain the cut-off voltage of 2.2V and thus, the cut-off voltage must be reprogrammed).

3.3 Advanced Programming

Advanced programming allows the user to choose from a wider variety of features for more control and performance:

1. Motor Type Selection
2. Drag Brake On/Off Selection & Heli Mode Slow Start On/Off Selection
3. Race/Safe Mode Selection
4. Noise Cancel On/Off Selection

5. Torque Selection
6. Neutral Range Selection
7. Drag Brake Amount Selection & Governor Response Selection

Note: Please select Out-runner type if an In-runner has 6 poles or above. Also, please select In-runner when using an out-runner with less than 600kv.

3.3.1 Enter Advanced Programming

1. Turn "ON" your Transmitter.
2. Move the throttle stick to the Minimum Position; Hold until step 4.
3. Turn "On" the Power Switch ("ON")—transmitter recognition beep ("beep") and ("beep") signaling the Quark is ready.
4. Press and hold the Program button and then move the throttle stick to the Maximum position ("beep").
5. Release the Program button after approximately 2 -3 seconds
6. Move the throttle stick until you hear a recognition beep ("beep"). You have entered Advanced Programming*.

* You will know that you have successfully entered Advanced programming when the LED color sequence changes when the throttle is moved up and down.

3.3.2 To choose any selection:

1. Move the throttle stick to enter setting (or move to the next setting).
 2. Move the throttle to the position that illuminates the desired led pattern** and hold.
 3. Press the Program button on the Quark.
 4. Repeat step 1-3 until all settings 1 through 7 are completed*.
 5. Power OFF the Quark to store selected settings.
- *User may set desired selections, starting from Motor Type until desired settings are stored. User may then, Power "OFF" the Quark to avoid resetting remaining selections (Example: User may set selections of Inrunner Motor Type, Drag Brake ON, and Race Mode, then power "OFF" the Quark. Those three selections will be saved and the previous settings for selections 4-7 will remain saved.

****Use Tables 3.3-1 through 3.3-7 to set Basic Settings**

****Note. Settings highlighted in blue are the factory default settings****

Table 3.3-1 Motor Type Selection

Motor Type	Red	Green	Yellow	Red	Description
Outrunner	●			●	Select when using an outrunner type brushless motor.
Inrunner		●	●		Select when using a normal type brushless motor.

Table 3.3-2 Drag Brake On/Off & Heli Mode Start On/Off Selection

Mode		Red	Green	Yellow	Red	Description	
Drag Brake On	Heli Slow Start On	●	●		●	Drag Brake is applied in the neutral range at the amount set in table 3.3-7.	Slow start is applied in the Heli Mode
Drag Brake Off	Heli Slow Start Off	●	●			No brake is applied in the neutral range	Normal start is applied in the Heli Mode

*2 different settings are simultaneously programmed. However, drag brake is only applied when car mode is selected from 3.3-1. When Heli mode is selected from 3.3-1, then Heli slow start is programmed.

Table 3.3-3 Race/Safe Mode Selection

Mode	Red	Green	Yellow	Red	Description
Race Mode		●	●	●	Competition Mode.
Safe Mode		●			Transmitter recognizes only the User's TX. Fail-safe system is activated.

*When Safe Mode is selected, the fail-safe shut down function may cause shut downs in an environment when there are several interferences.

Table 3.3-4 Noise Cancel On/Off Selection

Mode	Red	Green	Yellow	Red	Description
Noise Cancel On		●	●		Filters out short interference noises. The Quark may not respond to very fine throttle adjustments.
Noise Cancel Off	●	●			The Quark responds to the slightest throttle adjustments.

*Noise Cancel On is recommended only for driving environments with heavy interference.

Table 3.3-5 Torque Selection

Torque	Red	Green	Yellow	Red	Description
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Dynamic	●	●	●	●	Dynamic initial torque
Normal 2	●	●	●		
Normal 1	●	●			
Soft	●				Smooth initial torque

*Proportional torque is applied regardless of torque selected (The torque corresponds with the amount of throttle applied).

Table 3.3-6 Neutral Range Selection

Neutral Range	Red	Green	Yellow	Red	Description
Wide	●			●	Widest Neutral range
Normal 2		●		●	
Normal 1		●	●		
Narrow		●			Very Narrow Neutral range

*Use the narrow selection if low speed control is needed. The wide selection should be used if cogging occurs.

Table 3.3-7 Delayed Brake Amount and Governor Response Selection

Mode		Description					
Amount of Drag Brake	Governor Response	Red	Green	Yellow	Red	Amount of Drag Brake	Governor Response
Hard	Fast	●	●	●	●	Hard Brake in the Neutral Range	Fast Governor Response
			●	●	●		
		●		●	●		
				●	●		
Soft	Slow	●	●			Soft Brake in the Neutral Range	Slow Governor Response
			●				
			●				
				●			

*2 different settings are simultaneously programmed. However, drag brake is only applied when Car Mode is selected. When Heli Mode 1, 2, or 3 is selected from 3.3-1, drag brake is not applied and the governor response selection is programmed.

4.0 Instructions for Setting the Governor RPM in Heli Mode

Setting the Governor RPM can be done ONLY in Heli 2 and 3 Modes. Heli-2 Mode is recommended for intermediate/advanced users. Heli-3 Mode is recommended only for professional Users. Properly setting the Governor RPM requires practice and trial and error is expected during actual flight.

WARNING!! REMOVE ROTOR BLADES FROM MAIN ROTOR HEAD DURING GOVERNOR RPM PROGRAMMING!!! IT MAY CAUSE SERIOUS INJURY WITH THE ROTOR BLADES ATTACHED!!!

1. Heli-1 Mode is NOT equipped with the Governor RPM feature.
2. Heli-2 Mode is equipped with ONE RPM setting.
3. Heli-3 Mode is equipped with TWO RPM settings.

4.1 Heli-2 mode: Setting Governor One RPM:

1. Prepare tachometer.
2. **DO NOT ATTACH ROTOR BLADES OR PLEASE DETACH AT THIS TIME.**
3. Select Heli-2 mode. (Refer to Table 3.2-1)
4. Turn on your Transmitter. The throttle stick should be in the MINIMUM position. (“ㄟ ㄟ ㄟ ㄟ ㄟ ㄟ ㄟ ㄟ”)
5. Increase throttle slowly and the motor will start rotating.
6. At desired RPM. press the Program button on the Quark. (MOTOR will STOP)
7. At this time the RED LED will blink ONCE in one second intervals.
8. Lower throttle below the minimum position and gradually increase to start running the motor again.
9. Move the throttle stick to the desired RPM again, check Rotor Head RPM with tachometer.
10. Press the program button at the desired RPM. (Motor will STOP at this time)
11. Governor ONE RPM setting is complete.

4.2 Heli-3 mode: Setting Governor Two RPM:

1. Prepare tachometer.
2. **DO NOT ATTACH ROTOR BLADES OR PLEASE DETACH AT THIS TIME.**
3. Select Heli-3 mode. (Refer to Table 3.2-1)
4. Turn ON your transmitter. The throttle stick should be in the MINIMUM position. (“ㄟ ㄟ ㄟ ㄟ ㄟ ㄟ ㄟ ㄟ”)
5. Increase throttle slowly and the motor will start rotating.
6. At desired RPM, press the Program button on the Quark. (MOTOR will STOP)
7. At this time the RED LED will blink ONCE in one second intervals.
8. Lower throttle below the minimum position and gradually increase to start running the motor again.
9. Move the throttle stick to the desired RPM again, check Rotor Head RPM with tachometer.
10. Press the program button at the desired RPM. (Motor will STOP at this time)
➔ Governor One RPM setting finished.
11. Move the throttle stick up and down. (“ㄟ”)

12. At this time the RED LED will blink TWICE in one second intervals.
13. Increase throttle until the GREEN LED turns "ON"
(Quark's Green LED will automatically light up when the user sets the throttle position above the FIRST RPM setting.)
14. Press Program button. ("🎵🎵")
➔ Governor 2 throttle stick position setting finished.
15. Lower throttle stick below the minimum position and gradually increase to start running the motor again.
16. Check the Main Rotor Head RPM with tachometer, move the throttle to the desired 2nd RPM speed.
17. Press the Program button (Motor will stop) => RPM 2 setting is finished.

TIP: After programming there are two ways to start running the motor:

1. Turn power OFF on the Quark and turn it back ON.
2. Turn power OFF on the Transmitter and turn it back ON
(without powering OFF the Quark.)

5.0 Programming Tips

Please visit our website for more detailed programming tips.

www.sky-technology.net

a. Programming Sounds

The Quark generates a recognition sound in the following situations:

- Quark Power ON: 🎵🎵
- Transmitter ON: 🎵🎵
- Minimum Throttle Position: 🎵🎵🎵🎵
- Program Data Saved: 🎵

For example, when the transmitter is turned on and the throttle stick is at the minimum position the following successive sounds will be generated when the Quark's power switch is turned On: " 🎵 ~ 🎵 ~ 🎵🎵🎵🎵 "

b. Trouble Shooting

- When the "Quark Power ON" sound is not generated: Check the battery connection and if the power switch is "On".
- When the "Transmitter ON" sound is not generated: Check the transmitter and receiver crystals and that the Receiver wires are properly connected.
- When the "Minimum Throttle Position" sound is not generated: refer to section 3.1 and reprogram the neutral/maximum throttle position settings. You may also adjust the Transmitter's throttle EPAs and Trims.

5.0 OPTO Modification

* OPTO Modification must be applied when using batteries above Ni-MH 10cell Li-Poly 4 Cell. When done user must use a digital BEC or a Receiver battery.

Disconnect or remove the red wire from the middle pin of the socket.



6.0 Product Warranty

Sky & Technology Co., LTD warrants products to be free from defects in materials or workmanship for a period of 180 days from the original date of purchase (needs to be verified with a dated sales receipt). This warranty does not cover the following: incorrect or erroneous installation, any component parts damaged by use or modification, damage or tampering to case and/or any exposed circuit boards, overloading specified voltage, short circuiting from spliced or damaged wiring and/or motor (i.e. incorrect screw lengths), reverse battery polarization, overheating solder tabs, damage from improper installation of FET servo or receiver battery pack, using a Schottky diode, splices to wires (i.e. ON/OFF switch) causing a short circuit, damage from force when using Programming button, tampering with the internal circuit components and/or disassembling case, water, moisture or any other foreign objects to enter ESC or get onto the PC board, permitting exposed wiring or solder tabs to short-circuit, fitting connectors which are incapable of handling the specified current loads and/or connectors that provide poor electrical current and causes controller to function and operate defectively and/or inconsistently or any damage caused by a crash, or flooding.

Sky & Technology Co., LTD reserves the right to change or modify this warranty without notice.

Warranty Procedures

Prior to sending in your unit for service, please double check the instruction manual and system setup as the controller may not work due to a malfunction or failure in the system. If your unit develops a problem and/or needs repair, please return it to Sky & Technology Co., LTD or to the Importer. A detailed description of the problem or will help speed up time in replacing and/or repairing (Information should include: Battery voltage and capacity, motor manufacturer and type, radio system, servo, gears and programmed functions).

We recommend downloading and filling out the Product Service/Repair form on our website at www.sky-technology.net. If a form cannot be downloaded, please call or fax Sky & Technology Co., LTD or Importer.

For service and repairs under warranty, please send in dated Invoice/Sales receipt along with information on where (dealer, address, phone number and country) the unit was purchased. (Please keep a copy of Product Service/Repair form and original invoice)

Note: If you come across problems operating the Quark controller, please note that many problems are due to incompatible combinations of receiving system components or an incorrect installation of the model.

- Note: After testing and if the unit is operating correctly, even if the unit is under Warranty, a Labor Charge will be charged.
- Note: Damages caused by the users own negligence is not covered under the warranty and any replacement and shipping costs will be borne by the requesting party.

Limitation of Liability

Sky & Technology Co., LTD has no control over the proper installation and operation, as well as the Speed Controller's usage and maintenance. Due to this reason, no liability for loss, damage or costs resulting from the use of the product and any other means should be assumed or accepted. Any claims arising from the operation, failure, malfunctions or etc., will be disclaimed. Every Quark controller is carefully tested before leaving facility and is, therefore, deemed operational. By the act of connecting and/or operating speed controller, user accepts all resulting liability. Sky & Technology Co., LTD assumes no liability for personal injury, property damage or consequential damages resulting from our delivery or our workmanship. In no case shall our liability exceed the products original invoice value. Sky & Technology Co., LTD reserves the right to change or modify this warranty without notice.

7.0 Contact Information

For any questions, technical support, or any kind of information, please contact us at:

Sky & Technology USA
500 E. Carson Plaza Drive, Suite 222
Carson, CA 90746
Tel: 310-527-0002
Fax: 310-527-0004
e-mail: info@sky-technology.net
website: www.sky-technology.net

Sky & Technology Co., LTD
10th Floor Trapalace #1059, Soo-Nae Dong
Bun Dang Gu, Kyung Ki Do, 463-825 Korea
Tel: 82-31-716-6851 / 2
Fax: 82-31-716-6875
e-mail: info@sky-technology.co.kr
website: www.sky-technology.co.kr