XRotor Pro H110A 14S BLDC

USER MANUAL

Thank you for purchasing this product! The brushless propulsion system is highly powerful, and improper use may lead to personal injury and equipment damage. Therefore, we strongly recommend that you carefully read this manual before using the equipment and strictly follow the specified operating procedures. Once you use the product, it is deemed that you have read and accepted all the contents of this manual. We shall not assume any liability arising from the use of this product or any unauthorized modification of the product, including but not limited to liability for incidental or consequential damages.

This ESC is an industrial-grade accessory for unmanned aircraft. If you have more professional application requirements, please contact us.

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01 Product Features

- Multi-rotor drone dedicated core program, with significantly improved throttle response speed.
- Built-in storage chip, real-time recording of ESC operating data, with black box function.
- This ESC features a nano-coating process with an ingress protection level of IP55, and can be customized to IP67.
- Equipped with both CAN digital throttle and PWM throttle modes, improving the operational reliability of the propulsion system.
- The microprocessor is powered by an independent voltage regulator IC, which has better anti-interference ability and significantly reduces the possibility of loss of control.
- Shielded cables are used to improve anti-interference capability, shielding both external and self-generated interference to ensure signal quality.
- BLDC square wave drive technology has good compatibility, and one program can be compatible with multiple types of motors.
- Using CAN communication, real-time monitoring of data such as throttle, RPM, bus current, bus voltage, capacitor temperature, MOS temperature, ESC status, etc. is achieved. Real-time communication can be obtained by contacting Hobbywing official.
- Automatically adjusts the advance angle, highly intelligent, and using the factory default settings can meet the requirements of most applications.
- Compatible with throttle signals with refresh frequencies ranging from 50 to 500 Hz, and compatible with multiple flight controllers.
- Using DSP (Digital Signal Processor) control technology, it has better throttle linearity and drive efficiency.
- You can use Hobbywing DataLink(kit G3 (optional) to upgrade the ESC program and adjust parameters. For details, refer to the DataLinkBox G3 User Manual or contact the manufacturer.
- Supports upgrading ESC firmware via flight controller (this function requires flight controller support).
- The throttle range of this ESC is solidified to 1100~1940μs and cannot be calibrated, but the range can be changed via DataLink software.

02 Precautions

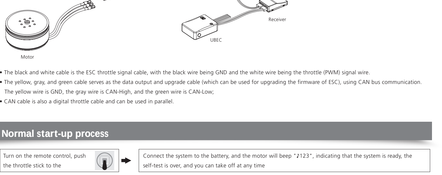
- When flying, please stay away from crowds, high-voltage lines, obstacles, etc., and be sure to comply with local laws, regulations, and safe flight regulations.
- Do not fly in extreme weather conditions such as strong winds, heavy rain, snow, heavy fog, thunder and lightning, sandstorms, icing, etc.
- Do not use when the ambient temperature exceeds 65℃ or is below -40℃. If used outside the ambient temperature operating range, the ESC may malfunction and cause the aircraft to crash.
- Before using this ESC, please carefully read the ESC and motor manuals to ensure that the propulsion system is properly matched and to avoid damage to the ESC caused by improper matching.
- Do not disassemble the ESC without permission to avoid damaging or affecting its protective capabilities.
- If you need to change or weld the input and output connectors of the ESC, please use a welding device with sufficient power and ensure that the welding is firm and reliable.
- Please make sure to carefully connect all components. If there is poor contact, you may not be able to control the aircraft properly, or other unpredictable situations such as equipment damage may occur.
- When connecting the ESC to related components, please ensure that all contact terminals are well insulated, as short circuits may damage the ESC.
- When installing and testing the product, please remove the propeller to prevent unknown risks. Before use, please check whether all components are in good condition. If any damage is found, please contact after-sales service in time for replacement.
- Please maintain a safe distance from the propeller that is rotating at high speed to prevent being cut by the blades. Do not install the propeller during ground testing to avoid unnecessary risks.
- If the motor rotation direction needs to be changed, you can swap the order of any two phase wires, or configure it via the Hobbywing DataLinkBox software.
- ESCs will generate heat during operation, and long-duration/heavy-loaded flights will produce high temperatures. Do not touch the ESCs immediately after landing to avoid burns.
- This ESC has CAN functions. The CAN digital throttle must be used in conjunction with a flight controller, i.e., the flight controller must has CAN throttle output functionality. If there are multiple ESCs on one aircraft, then Node IDs and Throttle IDs of different ESCs on one aircraft must not be the same. Otherwise, when using the CAN function, multiple ESCs with the same Node ID or Throttle ID will be recognized as one ESC. The factory default Node ID is 1 and the Throttle ID is 1. For related usage methods of flight controller, please contact the manufacturer of flight controller, no further explanations will be provided here.
- When using the CAN digital throttle as priority, it is recommended to set the flight controller's idle throttle value to 6%.
- The ESC does not come with a CAN termination resistor by default and needs to be uniformly matched according to the overall CAN topology.

03 Product Specifications

XRotor Pro H110A 14S BLDC	
Compatible lithium batteries: 14S (LiPo)	CAN communication protocol: Cyphal (UAVCAN): HWCAN (factory default) + DroneCAN
Voltage range: 18~63 V	CAN resistor: No termination resistor
Continuous current: 50 A (wind speed: 7 m/s; ambient temperature: 28℃)	CAN default baud rate: 500 kbps
Peak current: 110 A (wind speed: 7 m/s; ambient temperature: 28℃; maximum operating time: 15 s)	CAN sampling point: 83.3%
PWM pulse width: 1100~1940 μs	IPC Function: Not supported
PWM Throttle frequency: 50~500 Hz	Product weight (with cable): 155 g
PWM signal level: 5V/3.3V	Product Dimensions: 86.2*30.5*22.8 mm
Throttle range calibration: Solidified and cannot be calibrated (can be changed via DataLink software)	Product installation dimensions: 4*M2.5, thread hole depth: 5.0 mm
	Pinout of signal cable: Black—PWM GND, White—PWM, Yellow—CAN GND, Gray—CAN High, Green—CAN Low
Black box function: Fault Data + Log	Power cable specifications: 12AWG 145mm
Logging time: Default 2h (max 48h by changing Storage Interval)	Signal cable length: 410mm
Communication & digital throttle interface: CAN	
Throttle source: PWM+CAN	

04 User Guide

- **Warning! The throttle range of this ESC is solidified and cannot be calibrated, but the range can be changed via DataLink software.**
- **Warning! This ESC has two throttle modes, PWM and CAN. If one throttle mode is set as the priority, the other will serve as a backup. The factory default is the PWM throttle mode. If you need CAN throttle mode as the default, please contact us to obtain the configuration file.**
- Wiring method:



- The black and white cable is the ESC throttle signal cable, with the black wire being GND and the white wire being the throttle (PWM) signal wire.
- The yellow, gray, and green cable serves as the data output and upgrade cable (which can be used for upgrading the firmware of ESC), using CAN bus communication. The yellow wire is GND, the gray wire is CAN-High, and the green wire is CAN-Low;
- CAN cable is also a digital throttle cable and can be used in parallel.

05 Normal start-up process

Turn on the remote control, push the throttle stick to the ➡ Connect the system to the battery, and the motor will beep "2123", indicating that the system is ready, the self-test is over, and you can take off at any time

06 Protection and Alarm Function Description

The ESC included in the propulsion system is specifically designed for industrial drones, without low-voltage protection or over-temperature protection.

1. **Start Protection**
   After the ESC is powered on, it enters power-on self-check mode. If the self-check is successful, it will emit a string of beeps before it can operate normally. If the self-check fails, the motor cannot be driven.
2. **Power-on voltage abnormal protection**
   When the power-on voltage is lower than 18 V or exceeds 63 V , it will warn of overvoltage or undervoltage through emitting beeps (refer to "Explanation of Motor Warning Beeps, and Fault Troubleshooting"), and cannot pass the power-on self-check to operate normally. During flight, there is no abnormal voltage protection. It is necessary to always monitor the power supply voltage. When the voltage drops below 18 V , some electronic components may malfunction, potentially leading to a crash. Please land the aircraft immediately.
3. **Stall protection**
   When the ESC detects that the motor is stalled, the motor will attempt to output for 1 s. If the stall continues during this period, the ESC will completely shut down the output. The motor can only be restarted after the throttle is returned to zero.
4. **Overcurrent protection**
   When the maximum current is abnormal and exceeds 400 A for about 1μs, the ESC will turn off the output and continuously attempt to restart the motor. If multiple restarts fail, the propulsion system must be repowered to restore normal operation.
5. **Throttle signal loss protection**
   When the ESC detects a loss of throttle signal for more than 0.3 s, it maintains the throttle output at the last moment and triggers the throttle signal lost alarm. And if the loss exceeds 1s, the output will immediately shut down to prevent greater losses caused by the continued high-speed rotation of the propeller. After the signal is restored, the ESC will restore power output accordingly.
6. **Over-temperature Warning**
   The motor & ESC have no temperature protection. When the MOSFET temperature exceeds 110℃ or the capacitor temperature exceeds 100℃, the ESC will send over-temperature fault information externally through the data interface, but the motor will not stop or reduce power. When the motor and ESC continue to overheat, there is a risk of burnout. Please land the aircraft in time or reduce throttle output.
7. **Back EMF (Back Electromotive Force) Protection**
   During the process of reducing throttle, the motor & ESC will generate back electromotive force (EMF), the ESC will perform corresponding logical processing to prevent high-voltage back EMF from damaging internal components. The back EMF voltage limit threshold is 66 V.

07 Explanation of Motor Warning Beeps and Fault Troubleshooting

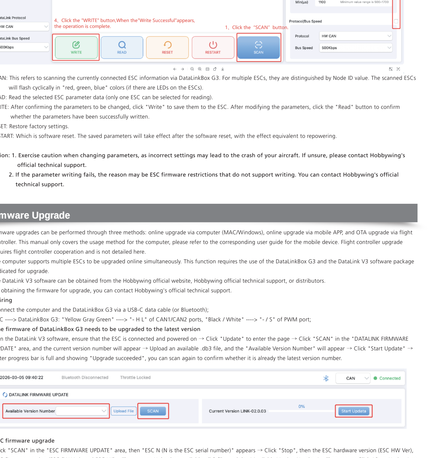
Operating Situation	Motor Beeping Sound	Meaning	Possible Reasons	Solution
Normal operation	Normal self-check beeping sound	Normal operation	\	\
Normal operation, but motor emitting a "buzzing" sound after the throttle is down to zero and motor stops spinning	\	Running normally, but there is no worry about it	It is normal for the ESC & motor to continue emitting some beeping noises, so there is no need to worry	\
Normal operation	\	Operating under full throttle	\	\
The motor fails to start after powered on	"Beep, beep~", "Beep, beep~" (each interval is approx. 1s)	Overvoltage	Battery voltage is too high, power-on voltage is higher than 63V	Replace with a fully charged battery with the appropriate voltage
The motor fails to start after powered on	"Beep, beep~", "Beep, beep~" (each interval is approx. 1s)	Undervoltage	Battery voltage is too low, power-on voltage is below 18V	Replace with a fully charged battery with the appropriate voltage
Motor stops in the air or restarts	\	Triggered overcurrent protection	Motor and propeller combination not match the ESC program If folding propellers are used, it is possible that the blades and propeller adapters are too loose and have lost their folding force, causing the blades to swing when the motor accelerates or decelerates. The propeller is damaged or the nut is not tight and has not trigger stall protection	Please use the motor and propeller combination that matches the ESC program, and do not modify or replace it without authorization If using folding propellers, please tighten the blade-mounting screws and replace the washer to restore the folding force between the blade and the propeller adapter Check whether the propeller has lost any foreign objects and whether there is any foreign object entangled on the propeller shaft. After resolving the issue, repowering the propulsion system to restart operation
The motor fails to start after powered-on	"Beep, beep, beep,..." (each interval is approx. 1s)	Throttle signal lost	No valid throttle signal input The throttle channel on receiver has no throttle signal output The ESC throttle signal cable is not plugged into the corresponding throttle signal control interface on the flight controller Wiring harness connections and soldering have issues, such as poor contact, loose connection, cold solder joint, detachment, etc. Flight controller not working, throttle lock engaged, flight controller output range does not match, flight controller output capacity insufficient, etc.	Check if the transmitter and receiver are working properly together Check if the ESC throttle signal cable is properly connected to the corresponding motor control interface on the flight controller Check if the hardware wiring is reliable Check if the ESC is receiving a throttle signal, flight controller throttle lock settings, check if throttle output range of the flight controller/transmitter match the PWM solidified throttle range of the ESC Check the resistance between the PWM solidified throttle range of the ESC and GND. If there is a short circuit, contact the seller for after-sales service
The motor fails to start after powered-on	The rapid single tone of "beep beep beep..."	Throttle not returned to zero point	Throttle is not at zero point when powering on	Check if the percentage of throttle is 0% Check whether the throttle output range of the flight controller/transmitter matches the PWM solidified throttle range of the ESC
Normal operation	\	MOSFET overtemperature (above 110℃)	The installation location of the ESC affects heat dissipation The ESC is directly overheated at room in summer or the temperature is too high Single-axis takeoff weight exceeds the maximum single-axis takeoff weight Motor and propeller combination not match the ESC program During bench testing, the thrust is greater than the maximum single-axis takeoff weight for an extended period of time	Check whether the throttle is in the normal throttle output to avoid burning out the motor/ESC Wait for the ESC to cool down before powering it on again to resume operation Please power the ESC in a well-ventilated area When exposed to high temperatures and direct sunlight at noon in summer, the flight load should be appropriately reduced Please use the motor and propeller combination that matches the ESC program, and do not modify or replace it without authorization Please calculate the maximum single-axis takeoff weight and make sure that the single-axis takeoff weight does not exceed the maximum single-axis takeoff weight Please use the motor and propeller combination that matches the ESC program, and do not modify or replace it without authorization During bench testing, please always monitor the thrust and throttle points; if MOS overheating occurs, the test should be stopped promptly and cooling measures should be taken
Normal operation	\	Capacitor overtemperature (above 100℃)	Parameters in flight controller are not properly set, resulting in excessive oscillation in throttle output The throttle response speed is too fast acceleration and deceleration during the test	Please land the aircraft in time or reduce throttle output to avoid burning out the motor/ESC Wait for the ESC to cool down before powering it on again to resume operation Please properly set the flight controller parameters Avoid too many times of rapid acceleration and deceleration during the test
Motor stops in the air or restarts	\	Trigger stall protection	Foreign objects entering the motor cause severe stuttering or jamming After the aircraft accidentally crashed, the propeller hit the ground, resulting in severe stuttering or jamming Motor and propeller combination not match the ESC firmware	Check whether the propeller has lost any foreign objects and whether there are foreign objects have entered the motor to cause the stall After resolving the issue, set the throttle to zero to restart operation Please use the motor and propeller combination that matches the ESC program, and do not modify or replace it without authorization
The motor fails to start after powered-on	No beeping sound during self-check	\	\	Please check if the motor wiring is in good condition If no issues are found, contact the seller for after-sales service
After powered-on, the motor fails to startup & emitting beeps accompanied by "clicking" jitters	No beeping sound during self-check	Motor phase loss/ open circuit	\	Check the connection of phase wires between the motor and ESC Check if the motor wires are damaged If no issues are found, contact the seller for after-sales service
The motor can rotate after powered-on	No beeping sound during self-check	Drive exception	\	Contact the seller for after-sales service
Motor stops in the air or restarts	\	\	The battery power is insufficient The propeller and propeller combination not match the ESC firmware If folding propellers are used, it is possible that the blades and propeller adapters are too loose and have lost their folding force, causing the blades to swing when the motor accelerates or decelerates. Power cables, motor wires, or signal cable have issues such as poor contact, loose connection, cold solder joint, detachment, short-circuit, etc., in connection or soldering Motor stall Throttle signal lost or interfered with Strong electromagnetic radiation interference (such as radar, high-power antennas, base stations, etc.)	Please use batteries with appropriate voltage and capacity During flight, please monitor the battery level and land in time to avoid a forced landing Please use the motor and propeller combination that matches the ESC program, and do not modify or replace it without authorization If using folding propellers, please tighten the blade-mounting screws or replace the washer to restore the folding force between the blade and the propeller adapter Check the wiring of the propulsion system Check whether the propeller has hit any foreign objects and whether any foreign objects have entered the motor to cause the stall Check for poor contact, cold solder joints, or short-circuits between the signal cables and the flight controller, check if the signal cables are too close to the power cables, use isolated wiring to route them, check the anti-interference of throttle, and check if the flight controller output is normal Before takeoff, please check the surrounding electromagnetic environment, and avoid flying near strong interference sources, and stay away from strong electromagnetic radiation sources. Contact the seller for after-sales service
During flight/testing the motor/ESC smokes/ burns out or capacitor explodes)	\	\	The positive and negative power cables are connected reversely Excessive high voltage input The power supply has no energy absorption capacity or insufficient energy absorption capacity When quickly decreasing the throttle, excessive high BACK EMF (Back Electromotive Force) will be generated and excessive high voltage will burn out the ESC Motor/ESC damage (wire insulation damage, exposed wires, water ingress, wiring wiring, aging of wires, mechanical scratching the coil, etc.) Single-axis takeoff weight exceeds the maximum single-axis takeoff weight Motor and propeller combination not match the ESC program During bench testing, the thrust is greater than the maximum single-axis takeoff weight for an extended period of time Parameters in flight controller are not properly set, resulting in excessive oscillation in throttle output Abnormally intense vibration caused damage to the ESC components The ESC overheats when the temperature is too low (-40℃ to -45℃) Other situations (corrosion, bumps, etc.)	Contact the seller for after-sales service

08 General Basic Function Settings

- Basic function settings can be accessed via two methods: computer (MACWindows) and mobile APP. This manual only covers the usage on the computer, for the usage on the mobile, please refer to the corresponding user guide, which will not be detailed here.
- This software platform only supports parameter configuration for ESCs with CAN communication; if the ESC uses UART communication, please contact Hobbywing technical support.
- Basic function parameters include: **setting Node ID and Throttle ID, changing motor direction, modifying throttle priority, changing LED color and blinking frequency, modifying throttle range, modifying ESC protocol and bus speed (bus rate),** all of which can be set on this interface.
- This function requires the DataLinkBox G3 and DataLink V3 software. DataLink V3 software can be obtained from the Hobbywing official website, Hobbywing official technical support, or distributors.
- DataLinkBox G3 can be powered via USB-C or XT30, either method can be used. There is no need for duplicate power supply.
- If there are no other requirements, the ESC defaults to factory settings: Node ID is 1, Throttle ID is 1, CAN protocol is HW CAN, and bus rate is 500 Kbps;
- If there are multiple ESCs on one aircraft, then Node IDs and Throttle IDs of different ESCs on one aircraft must not be the same. Otherwise, when using the CAN function, multiple ESCs with the same Node ID or Throttle ID will be recognized as one ESC.

1) **Wiring**
   Connect the computer and the DataLinkBox G3 via a USB-C data cable (or Bluetooth);
   ESC ——> DataLinkBox G3: "Yellow Gray Green" ——> "- H L" of CAN1/CAN2 ports, "Black / White" ——> "- / 5" of PWM port;

2) **Operation**
   Run the DataLink V3 software, ensure that the ESC is connected and powered on → Click the "SCAN" button on the home page "CONFIGURE" → The ESC connected appears in the "DEVICE MANAGEMENT", indicating a successful scan → Select both the ESC and the parameters to be modified simultaneously → Click "WRITE", and a "Writing Completed" prompt pop-up window will appear → Power off all devices (power-off has no specific sequence and will not damage the devices).



- SCAN: This refers to scanning the currently connected ESC information via DataLinkBox G3. For multiple ESCs, they are distinguished by Node ID value. The scanned ESCs will flash cyclically in "red, green, blue" colors (if there are LEDs on the ESCs).
- READ: Read and display selected ESC parameter data (only one ESC can be selected for reading).
- WRITE: After confirming the parameters to be changed, click "Write" to save them to the ESC. After modifying the parameters, click the "Read" button to confirm whether the parameters have been successfully written.
- RESET: Restore factory settings.
- RESTART: Which is software reset. The saved parameters will take effect after the software reset, with the effect equivalent to repowering.

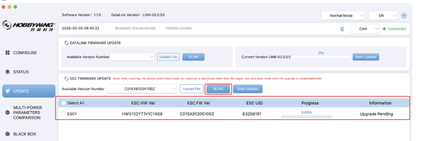
Caution: 1. Exercise caution when changing parameters, as incorrect settings may lead to the crash of your aircraft. If unsure, please contact Hobbywing's official technical support.
2. If the parameter writing fails, the reason may be ESC firmware restrictions that do not support writing. You can contact Hobbywing's official technical support.

09 Firmware Upgrade

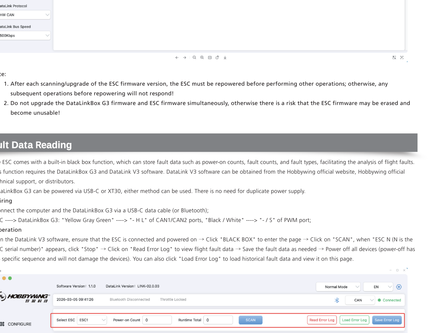
- Firmware upgrades can be performed through three methods: online upgrade via computer (MACWindows), online upgrade via mobile APP, and OTA upgrade via flight controller. This manual only covers the usage method for the computer, please refer to the corresponding user guide for the mobile device. Flight controller upgrade requires flight controller cooperation and is not detailed here.
- The computer supports multiple ESCs to be upgraded online simultaneously. This function requires the use of the DataLinkBox G3 and the DataLink V3 software package dedicated for upgrade.
- The DataLink V3 software can be obtained from the Hobbywing official website, Hobbywing official technical support, or distributors.
- For obtaining the firmware for upgrade, you can contact Hobbywing's official technical support.

1) **Wiring**
   Connect the computer and the DataLinkBox G3 via a USB-C data cable (or Bluetooth);
   ESC ——> DataLinkBox G3: "Yellow Gray Green" ——> "- H L" of CAN1/CAN2 ports, "Black / White" ——> "- / 5" of PWM port;

2) **The firmware of DataLinkBox G3 needs to be upgraded to the latest version**
   Run the DataLink V3 software, ensure that the ESC is connected and powered on → Click "Update" to enter the page → Click "SCAN" in the "DATALINK FIRMWARE UPDATES" area, and the current version number will appear → Upload an available .db3 file, and the "Available Version Number" will appear → Click "Start Update" → After progress bar is full and showing "Upgrade succeeded", you can scan again to confirm whether it is already the latest version number.



3) **ESC firmware upgrade**
   Click "SCAN" in the "ESC FIRMWARE UPDATE" area, then "ESC N (N is the ESC serial number)" appears → Click "Stop", then the ESC hardware version (ESC HW Ver), ESC firmware version (ESC FW Ver), and ESC UID will appear → Upload an available .db3 file, and the "Available Version Number" will appear → Click "Start Update" → After progress bar is full and showing "Upgrade succeeded", you can scan again to confirm whether the ESC FW Ver is already the latest version number → Power off all devices (power-off has no specific sequence and will not damage the devices).



Notice:

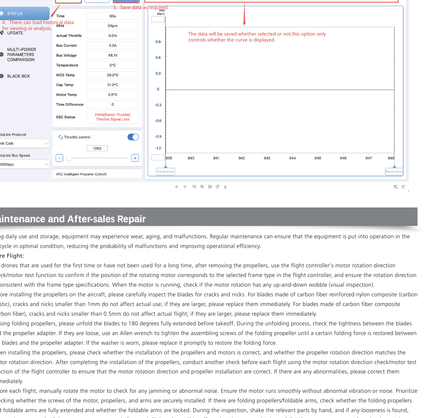
1. **After each scanning/upgrade of the ESC firmware version, the ESC must be repowered before performing other operations; otherwise, any subsequent operations before repowering will not respond!**
2. **Do not upgrade the DataLinkBox G3 firmware and ESC firmware simultaneously, otherwise there is a risk that the ESC firmware may be erased and become unusable!**

10 Fault Data Reading

- The ESC comes with a built-in black box function, which can store fault data such as power-on counts, fault counts, and fault types, facilitating the analysis of flight faults.
- This function requires the DataLinkBox G3 and DataLink V3 software. DataLink V3 software can be obtained from the Hobbywing official website, Hobbywing official technical support, or distributors.
- DataLinkBox G3 can be powered via USB-C or XT30, either method can be used. There is no need for duplicate power supply.

1) **Wiring**
   Connect the computer and the DataLinkBox G3 via a USB-C data cable (or Bluetooth);
   ESC ——> DataLinkBox G3: "Yellow Gray Green" ——> "- H L" of CAN1/CAN2 ports, "Black / White" ——> "- / 5" of PWM port;

2) **Operation**
   Run the DataLink V3 software, ensure that the ESC is connected and powered on → Click "BLACK BOX" to enter the page → Click on "SCAN", when "ESC N (N is the ESC serial number)" appears, click "Stop" → Click on "Read Error Log" to view flight fault data → Save the fault data as needed → Power off all devices (power-off has no specific sequence and will not damage the devices). You can also click "Load Data Log" to load historical fault data and view it on this page.

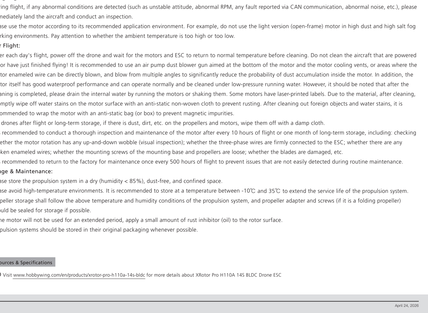


11 Log Reading

- The ESC comes with a built-in log function, which can record throttle, RPM, ESC temperature , ESC status, etc. during flight, facilitating the analysis of flight data.
- This function requires the DataLinkBox G3 and DataLink V3 software. DataLink V3 software can be obtained from the Hobbywing official website, Hobbywing official technical support, or distributors.
- DataLinkBox G3 can be powered via USB-C or XT30, either method can be used. There is no need for duplicate power supply.

1) **Wiring**
   Connect the computer and the DataLinkBox G3 via a USB-C data cable (or Bluetooth);
   ESC ——> DataLinkBox G3: "Yellow Gray Green" ——> "- H L" of CAN1/CAN2 ports, "Black / White" ——> "- / 5" of PWM port;

2) **Operation**
   Run the DataLink V3 software, ensure that the ESC is connected and powered on → Click "STATUS" to enter the page → Enter the number of minutes and click "reading" → The fluctuating data curve in the right graph indicates that reading is in progress → When the data curve stops fluctuating, it indicates that reading is completed. Save the data as needed → Power off all devices (power-off has no specific sequence and will not damage the devices). You can also click "Load Data" to load historical log data and view it on this page.



12 Maintenance and After-sales Repair

During daily use and storage, equipment may experience wear, aging, and malfunctions. Regular maintenance can ensure that the equipment is put into operation in the next cycle in optimal condition, reducing the probability of malfunctions and improving operational efficiency.

Before Flight:

- For drones that are used for the first time or have not been used for a long time, after removing the propellers, use the flight controller's motor rotation direction check/motor test function to confirm if the position of the rotating motor corresponds to the selected frame type in the flight controller, and ensure the rotation direction is consistent with the frame type specifications. When the motor is running, check if the motor rotation has any up-and-down wobble (visual inspection).
- Before installing the propellers on the aircraft, please carefully inspect the blades for cracks and nicks. For blades made of carbon fiber reinforced nylon composite (carbon plastic), cracks and nicks are relatively easy to form, but do not affect actual use; if they are larger, please replace them immediately. For blades made of carbon fiber composite (carbon fiber), cracks and nicks smaller than 0.5mm do not affect actual flight, if they are larger, please replace them immediately.
- If using folding propellers, please unfold the blades to 180 degrees fully extended before takeoff. During the unfolding process, check the tightness between the blades and the propeller adapter. If they are loose, use an Allen wrench to tighten the assembling screws of the folding propeller until a certain folding force is restored between the blades and the propeller adapter. If the washer is worn, please replace it promptly to restore the folding force.
- When installing the propellers, please check whether the installation of the propellers and motors is correct, and whether the propeller rotation direction matches the motor rotation direction. After completing the installation of the propellers, conduct another check before each flight using the motor rotation direction check/motor test function of the flight controller to ensure that the motor rotation direction and propeller installation are correct. If there are any abnormalities, please correct them immediately.
- Before each flight, manually rotate the motor to check for any jamming or abnormal noise. Ensure the motor runs smoothly without abnormal vibration or noise. Prioritize checking whether the screws of the motor, propellers, and arms are securely installed. If there are folding propellers/foldable arms, check whether the folding propellers and foldable arms are fully extended and whether the foldable arms are locked. During the inspection, shake the relevant parts by hand, and if any looseness is found, tighten them promptly. If these parts are not securely fastened, flight safety will be affected, so be sure to check carefully! If any components are found to be aged or damaged, replace them promptly.

During Flight:

- During flight, if any abnormal conditions are detected (such as unstable attitude, abnormal RPM, any fault reported via CAN communication, abnormal noise, etc.), please immediately land the aircraft and conduct an inspection.
- Please use the motor according to its recommended application environment. For example, do not use the light version (open-frame) motor in high dust and high salt fog working environments. Pay attention to whether the ambient temperature is too high or too low.

After Flight:

- After each day's flight, power off the drone and wait for the motors and ESC to return to normal temperature before cleaning. Do not clean the aircraft that are powered on or have just finished flying! It is recommended to use an air pump dust blower gun aimed at the bottom of the motor and the motor cooling vents, or areas where the motor enamel wire can be directly blown, and blow from multiple angles to significantly reduce the probability of dust accumulation inside the motor. In addition, the motor itself has good waterproof performance and can operate normally and be cleaned under low-pressure running water. However, it should be noted that after the cleaning is completed, please drain the internal water by running the motors or shaking them. Some motors have laser-printed labels. Due to the material, after cleaning, promptly wipe off water stains on the motor shells with an anti-static non-woven cloth to prevent rusting. After cleaning out foreign objects and water stains, it is recommended to wrap the motor with an anti-static bag (or box) to prevent magnetic impurities.
- For drones after flight or long-term storage, if there is dust, dirt, etc. on the propellers and motors, wipe them off with a damp cloth.
- It is recommended to conduct a thorough inspection and maintenance of the motor after every 10 hours of flight or one month of long-term storage, including: checking whether the motor bearings have any up-and-down wobble (visual inspection); whether the three-phase wires are firmly connected to the ESC; whether there are any broken enamelled wires; whether the mounting screws of the mounting base and propellers are loose; whether the blades are damaged, etc.
- It is recommended to return to the factory for maintenance once every 500 hours of flight to prevent issues that are not easily detected during routine maintenance.

Storage & Maintenance:

- Please store the propulsion system in a dry (humidity < 85%), dust-free, and confined space.
- Please avoid high-temperature environments. It is recommended to store at a temperature between -10℃ and 35℃ to extend the service life of the propulsion system.
- Propeller storage shall follow the above temperature and humidity conditions of the propulsion system, and propeller adapter and screws (if it is a folding propeller) should be sealed for storage if possible.
- If the motor will not be used for an extended period, apply a small amount of rust inhibitor (oil) to the rotor surface.
- Propulsion systems should be stored in their original packaging whenever possible.

Resources & Specifications

Visit www.hobbywing.com/en/products/xrotor-pro-h110a-14s-bldc for more details about XRotor Pro H110A 14S BLDC Drone ESC