GAIA 160HY-Hybrid Pixhawk 2.1

User Manual

V1.1 2019.04

FOXTECH

Contents

Product Profile

Introduction

GAIA 160HY-Hybrid Pixhawk 2.1 hexacopter is a long flight time hexacopter equipped with gasoline-electric hybrid power system and Pixhawk 2.1 flight controller which ensuring safe and stable operation at all times. With a maximum flight time of 3 hours, take off weight of 19.5kg, Gaia 160HY can meet specific needs across a range of industries. Its carbon fiber material and mechanical design, with quick-release arms make it easy to transport, store, and prepare for flight.

Highlighted Features

The heart of GAIA 160HY is the on board NOVA 2000 generator. With which the max take-off weight can reach 21kg (Default power system), and the max flight time is about 3 hours. This 2000W NOVA generator is the world record keeper by completing 100km sea bay flight in 175 minutes.

Triple redundancy IMU system makes the Pixhawk 2.1 flight more securer, greatly improved the reliability, IMU with built-in vibration dampening system which effectively filters high frequency vibration, reducing noise to IMU measurements. The Here 2 GNSS(M8N) GPS module features accurate positioning and faster response, colorful LED lights for visible indications of UAV status.

The GAIA 160HY is compatible with FH series zooming camera and gimbals, Seeker series camera and gimbals and DJI series camera and gimbals for professional aerial photography and industrial applications.

Assembled View
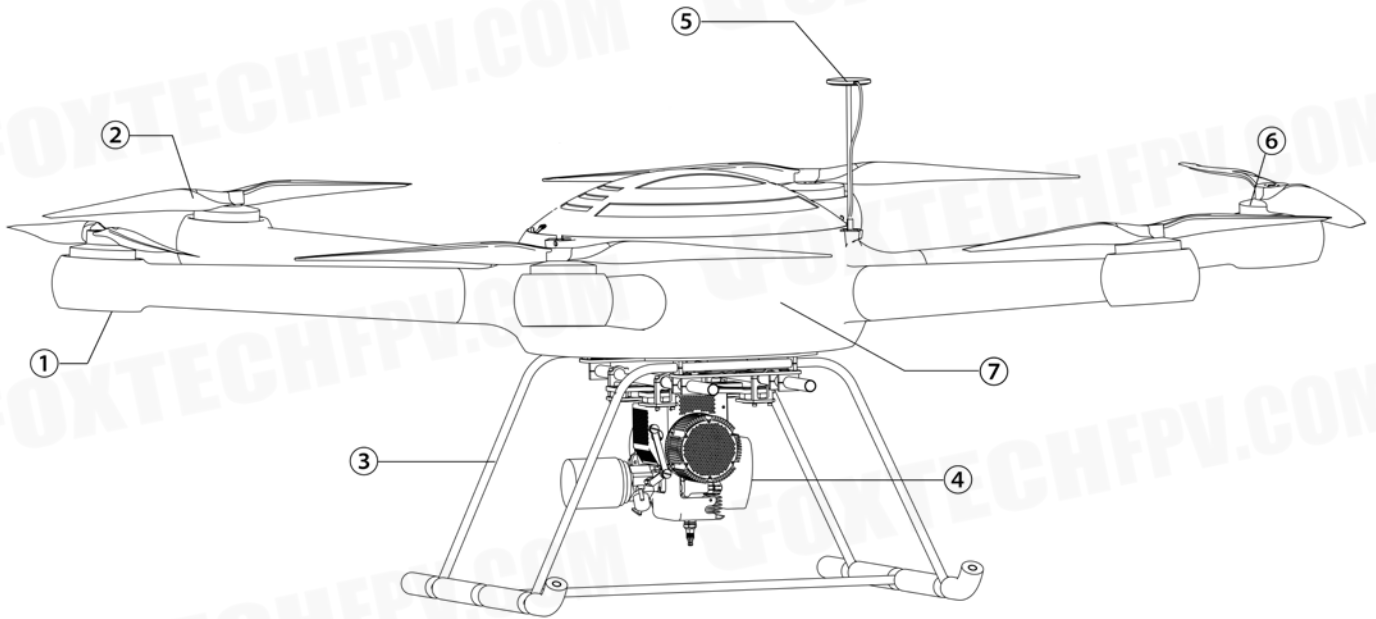
① T-MOTOR Flame 60A ESC

② Foxtech Supreme 3010T Propeller

③ Landing Gear

④ NOVA-2000 Generator

⑤ Here 2 GPS

⑥ T-MOTOR U8II KV85

⑦ GAIA 160HY-Hybrid

This content is subject to change.

Download the latest version from

https://www.foxtechfpv.com/gaia-160-hybrid-hexacopter-arf-combo.html

Specifications

Aircraft	
Structure	
Wheelbase	1600mm
UAV Dimension(Unfolding)	1600mmx1600mx680mm
UAV Body Dimension(Without Arms)	800mmx800mx500mm
Dimensions(NOVA-2000 Generator)	192mmx215mmx222mm
Shipping Dimension	8900mmx8800mmx6700mm
Shipping Weight	104kg(Throw Weight)
Weight(NOVA-2000 Generator)	4kg
No Payload Weight	15.5kg(No Fuel)
Max Take-off Weight	21kg
Propeller	Supreme 3010T Propeller
Motor	T-Motor U8II KV85
ESC	T-Motor Flame 60A ESC
Flight Controller	Pixhawk Flight Control
Radio	DA16+ Radio Controller 2+Remote Controller
Flight-time	3 Hours(4L Fuel)
Max Speed	15m/s
Max.Flight Height	≤2000m
Max.Ascending Speed	5m/s
Max.Descending Speed	4m/s
Working Temperature	-10℃ ~+45℃
Max Generator Output	2000W
Average Generator Output	1800W
Voltage	48V
Fuel Consumption	1.5L/H(Max)
Tank	4L(Customized tank are available. Max tank volume is 7L.)
Battery	6s 3300mAh x2

⚠ *NOVA-2000 generator is suitable for those multicopters whose power is still lower than 1800w even with 6kg generator system(including generator, fuel tank and 1L gasoline).

*The specifications above is standard combo. For customized application solutions, please contact Foxtech sales.

Installation

Power System

1. Fix T-Motor U8II KV85 motors and Flame 60A ESC on arms.

T-MOTOR U8II KV85

T-MOTOR Flame 60A ESC

2. Install Pixhawk 2.1 and arrange cables.

Hardware connection:

Important notes on Safety Switch :

PIXHAWK2.1 does not have standalone port for safety switch.

1. For users applying **PIXHAWK2.1** GPS(8 pins), the safety switch is on the GPS.
2. Using other GPS modules(6 pins) or no GPS, simply connect the safety switch cable with the GPS 1 port.

❶ Telemetry

1. Telemetry provides a second method of controlling the UAV. It allows you to work with powerful GCS softwares (on a tablet or laptop PC) in real time.

2. The telemetry modules transmit 915MHz(USA) or 433MHz(Europe).

❷ Tablet

A tablet or laptop PC connects to PIXHAWK2.1 via telemetry radio allowing the operator to use powerful GCS softwares to control the UAV.

❸ Buzzer

Provides audio signals that indicate what the UAV is doing.

❹ PPM Sum Receiver

1. Translates PWM signals that PIXHAWK2.1 can not read into PPM signals.

2. An alternative is to use a PPM receiver, which outputs a PPM signal by default, or use other signals transmission system such as S.BUS and SPKT.

❺ Receiver

The receiver takes the 2.4GHz signals from the transmitter allowing the operator to low latency control over the UAV.
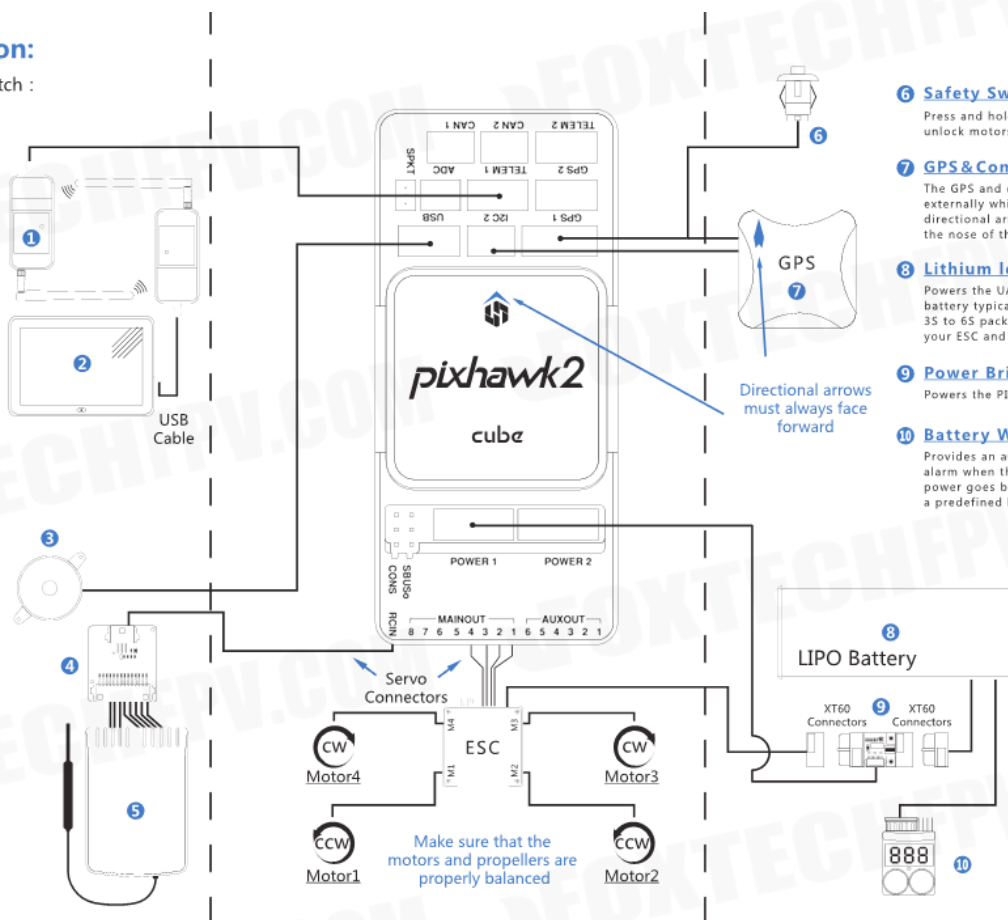
❻ Safety Switch

Press and hold to lock and unlock motors.

❼ GPS & Compass

The GPS and compass are housed externally which means that the directional arrow must point to the nose of the UAV.

❽ Lithium Ion Polymer Battery

Powers the UAV.This type of battery typically comes in 3S to 6S packs depending on your ESC and Motor combination.
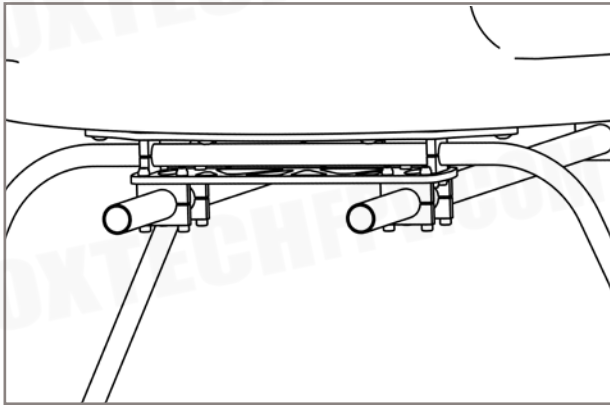
❾ Power Brick Mini

Powers the PIXHAWK2.1.

❿ Battery Warning

Provides an audio alarm when the battery power goes below a predefined level.
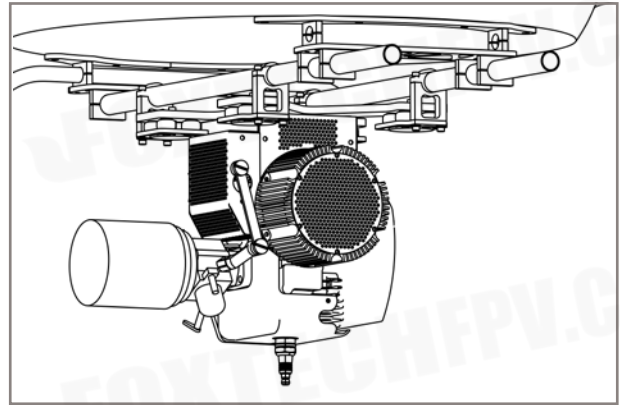
Generator System

1. Connect the fuel hose and the return hose. Mount the fuel tank.

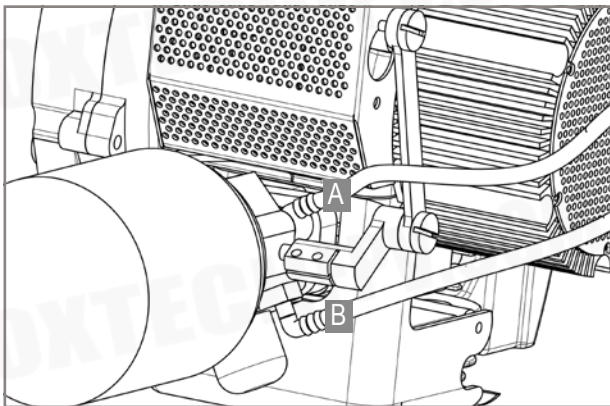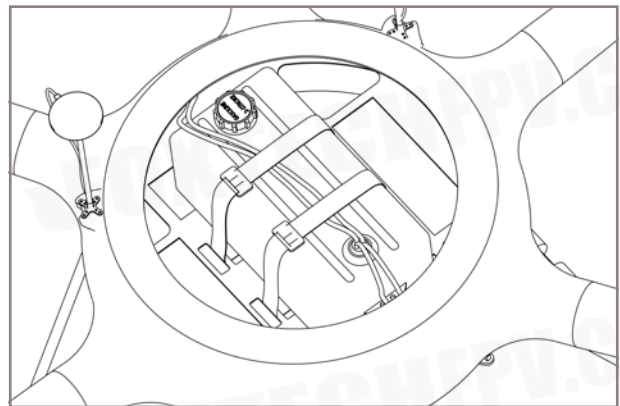   (For more information, download NOVA-2000 hybrid generator manual.

   https://www.foxtechfpv.com/foxtech-nova-2000-generator.html)

Generator Loading Kit

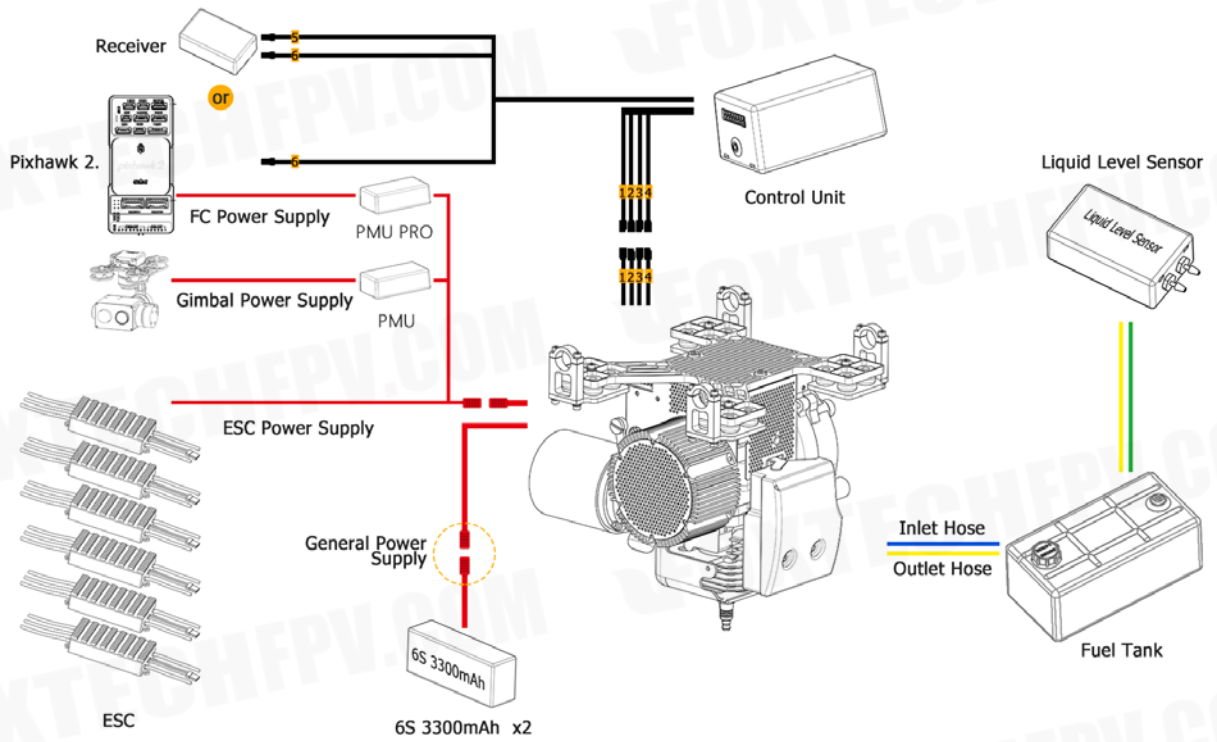Mount the NOVA-2000 Generator

A: Fuel Hose   B: Return Hose

Mount the Fuel Tank

Generator System Connection Illustrator

Compatible Gimbals

1.Foxtech Seeker Series Camera and Gimbals

Seeker-10   Seeker-18   Seeker-18 IR   Seeker-30   Seeker-30 TR

2.Foxtech FH Series Camera and Gimbals

FH310IR-TR   FH318/FH318Z   FH336-TR   FH325   FH230

3.DJI Series Camera and Gimbals

Zenmuse XT   Zenmuse X5   Zenmuse X3
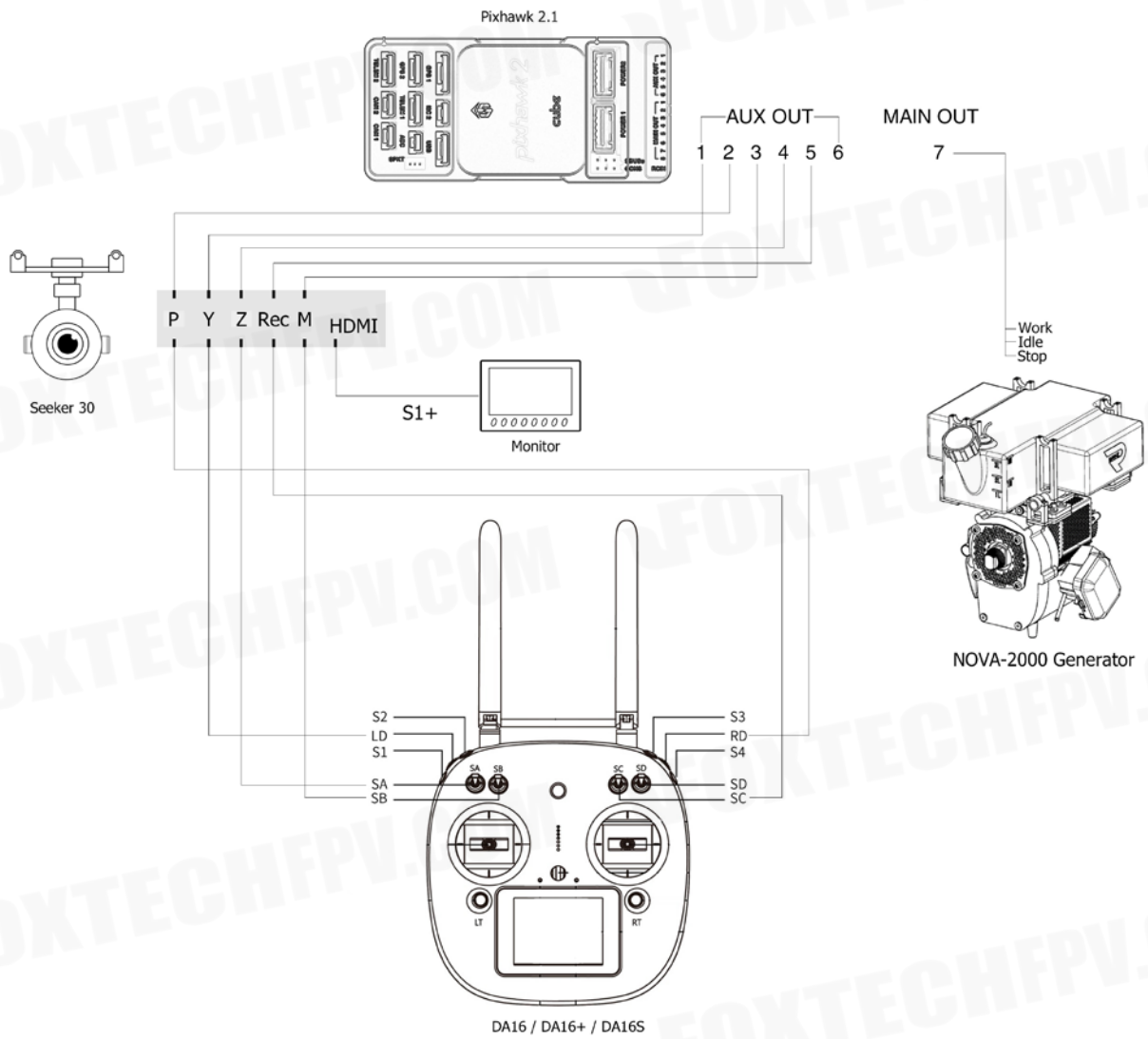
4.Foxtech Mapping Cameras

MAP 02   Zenmuse X3

Foxtech Seeker-30 Connection Illustrator

Flight

Flight Environment

1.Do not use the aircraft in adverse weather conditions including rain, snow, fog, and wind speeds exceeding 8 m/s.

2.Only fly in open areas. Tall buildings and steel structures may affect the accuracy of the compass and the GPS signal.

3.Avoid flying near obstacles, crowds, high voltage power lines, trees and bodies of water.

4.Avoid flying in areas with high levels of electromagnetism, including mobile phone base stations and radio transmission towers.

5.Aircraft and battery performance is subject to environmental factors such as air density and temperature. Be very careful when flying over 8,202 feet(2,500 meters) above sea level as the battery and aircraft performance may be reduced.

Pre-Flight Checklist

Before each flight, make sure:

1.All firmware is up-to-date.

2.The remote controller, Batteries and your mobile device are fully charged.

3.The GPS-Compass is unfolded and the arrow on the GPS-Compass points toward the front of the aircraft.

4.All cables are connected correctly and firmly.

5.The QGC app is connected to the aircraft.

6.Motors start properly and are functioning as normal.

7.NOVA primer pump is filled with petrol.
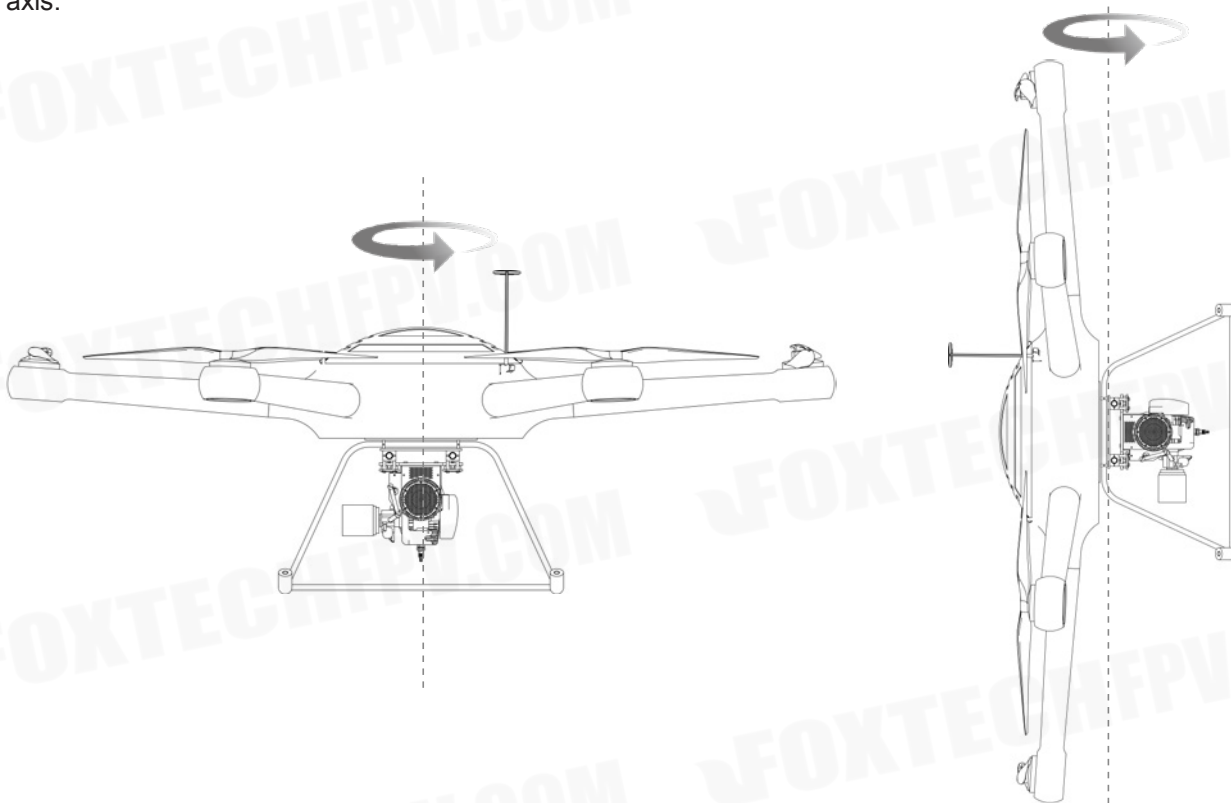
Calibrating the Compass

Be sure to calibrate the compass before your first flight, or else the aircraft cannot work properly. After that, calibrate the compass when the QGC app or the Aircraft Status Indicator prompts you to do so.

⊘   * DO NOT calibrate your compass where there is a chance of strong magnetic interference, such as magnetite quarries, parking structures, and underground steel reinforcements.

* DO NOT carry ferromagnetic objects such as cellular phones with you during calibration.

Calibration Procedures

Choose an open space to carry out: the following procedures.

1.Tap the System Status bar in the app and select Calibrate, then follow the on-screen instructions to calibrate the aircraft step-by-step.

2.Hold the aircraft horizontally, and rotate it 360 degrees along the central axis. The Aircraft Status Indicator will emit a solid green light.

3.Hold the aircraft vertically with its nose pointing downwards, and rotate it 360 degrees around its central axis.

4.Recalibrate the compass if the Aircraft Status Indicator blinks red.

⚲   • Calibrate the compass after you launch the QGC app if you are prompted to do so.

• After successful calibration, the compass may become abnormal and the QGC app will prompt you to recalibrate the compass when you place the aircraft on the ground. Move the aircraft to another location.

• The QGC app will prompt you to resolve the compass issue if the compass is affected by strong interference after calibration is complete. Follow the prompted instructions to resolve the compass issue.

Takeoff and Landing

Takeoff

Follow the steps below to Takeoff:

1.Push the primer pump several times until fuel supply pipe is filled with gasoline(Fig.1).

2.Check the inlet filter if it is clogged(Fig.2).

3.Power on and switch the three-position switch to "idle". Make sure the status lamp on NOVA controller is "green".

4.Close the Choke Lever (Fig.3), a.Push hard the starter to NOVA, b.Push the start button for seconds. Disconnect starter from NOVA.(For a warm start, choking may not be necessary.)

5.Open the Choke(Fig.3). Push start button for 2~3seconds. Pull the starter until hearing running noise(Fig.4).

Fig.1

Fig.3

Fig.2

Fig.4
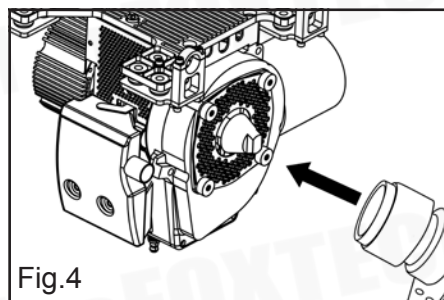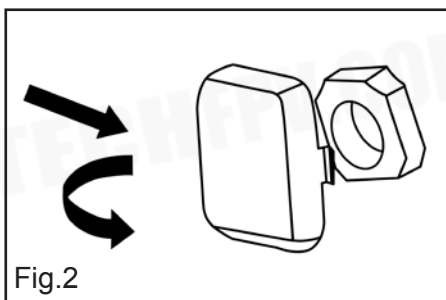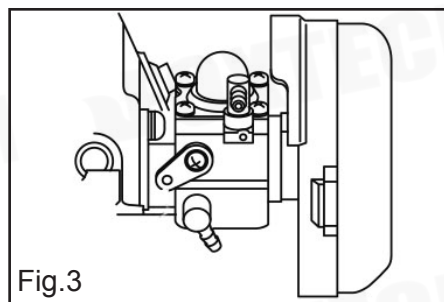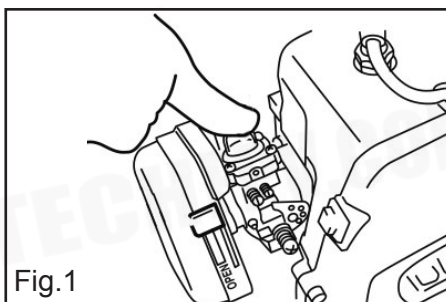
6.Switch the three-position switch to "run", and monitor the UAV input voltage. Voltage should be at 49±1V.

7.Run NOVA for 1 minute for warming up.

8.Launch the QGC app and enter the Camera View.

9.Ensure that the aircraft is in Q-loiter mode..

10.Go through the pre-flight checklist.

11.Turn on the safety switch.(Long Press the GPS safety switch until the red light keeps on).

12.Push the radio throttle stick to min. and the direction stick to the far right to start the motors. Once the motors have started spinning, release both sticks simultaneously.

OR
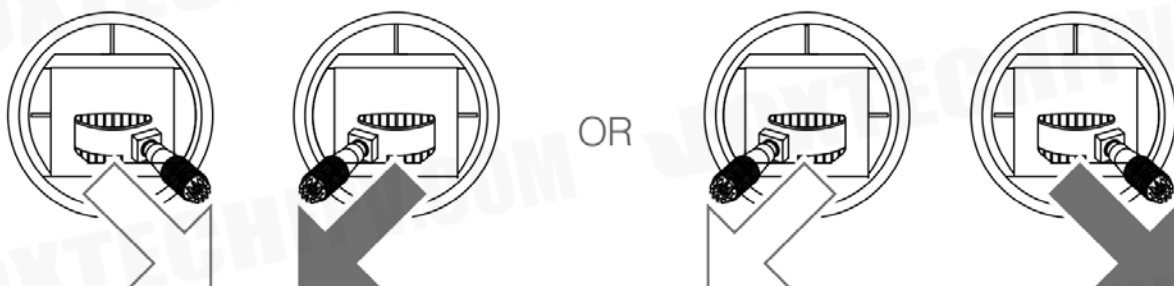
⛭ Voltage may drop 2~3 V when encounters air turbulence or Hard maneuver. If the voltage drops rapidly below 45 V, great attention should be given, and the drone should be landed and inspected when necessary.

⚠ Fuel depletion may damage NOVA. Monitor fuel level with given sensor and land before fuel ran out. To monitor fuel level, please purchase Liquid level display.

Landing

Follow the steps below to use Landing:

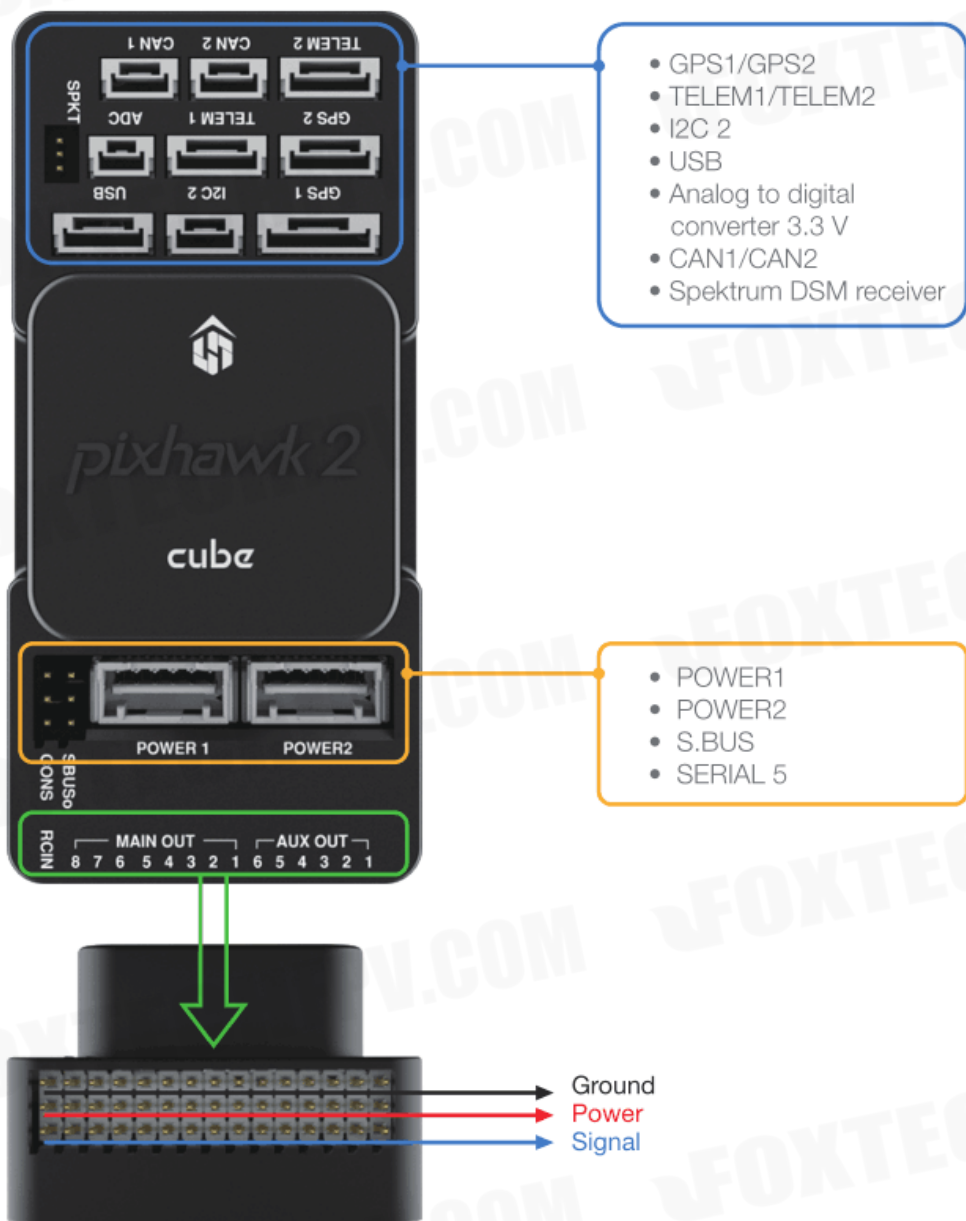1.push the throttle stick down, Release stick once the motors have stopped.

2.Switch the three-position switch to "idle", cooled down NOVA generator for about 30 seconds.

3.Switch the three-position switch to "stop". NOVA will stop.

4.Plug off.

Appendix

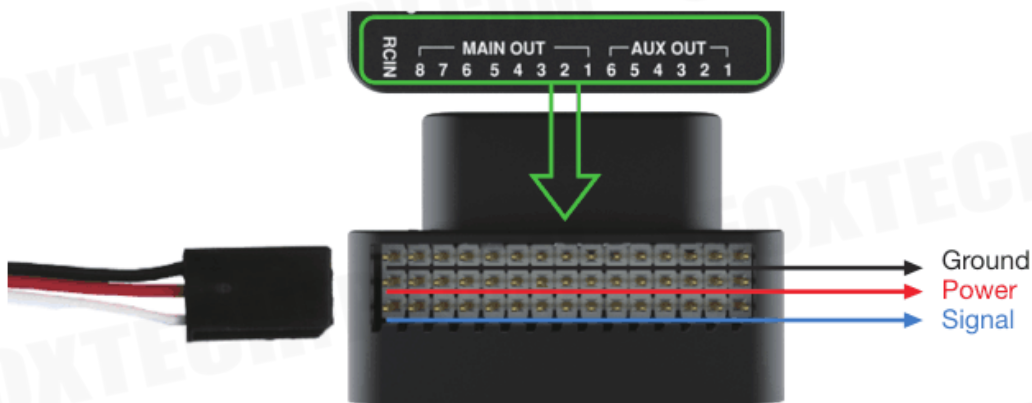## Pixhawk 2.1 Flight Control System Overview

Ports:

- GPS1/GPS2
- TELEM1/TELEM2
- I2C 2
- USB
- Analog to digital converter 3.3 V
- CAN1/CAN2
- Spektrum DSM receiver

- POWER1
- POWER2
- S.BUS
- SERIAL 5

Ground
Power
Signal

Edison Debug   Debug

ProfiCNC   HEX

Mirco-USB port

PX4 autopilot
ARDUPILOT

SD Card

CONNECT RADIO CONTROL

For PPM RC receivers and Futaba S.Bus receivers

RCIN   MAIN OUT   AUX OUT
8 7 6 5 4 3 2 1   6 5 4 3 2 1

Ground
Power
Signal

Connect the ground(-),power(+),and signal(S) wires
to the RC pins using the provided 3-wire servo cable.

FOR PWM RECEIVERS

Purchase a PPM Encoder module to connect a PWM RC receiver to PIXHAWK2.1 at
hex.aero or proficnc.com

Ground
Power
Signal
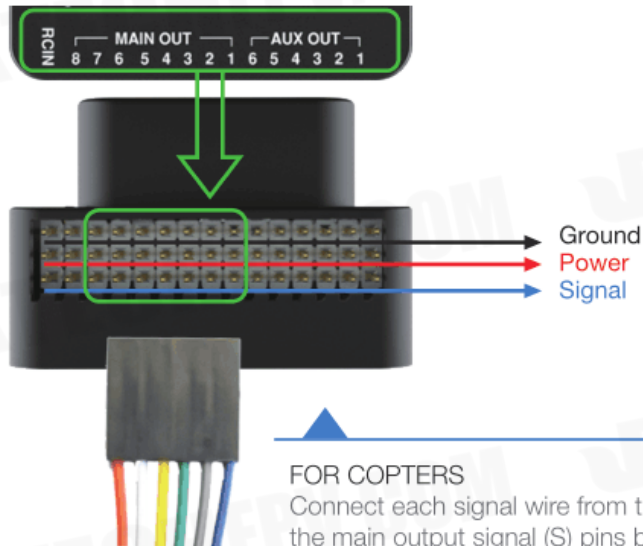
FOR COPTERS
Connect each signal wire from the PDB to the main output signal (S) pins by motor number. Connect one wire for each motor to the corresponding pin.
Pin 1 = Motor 1 Pin 5 = Motor 5
Pin 2 = Motor 2 Pin 6 = Motor 6
Pin 3 = Motor 3 Pin 7 = Motor 7
Pin 4 = Motor 4 Pin 8 = Motor 8

FOR PLANES
For planes, connect the control channel wires to the main output signal pins.
Pin 1 = Aileron
Pin 2 = Elevator
Pin 3 = Throttle
Pin 4 = Rudder

FOR ROVERS
For rovers, connect the throttle and steering wires to the main output signal pins.
Pin 3 = Throttle
Pin 4 = Steering

DA16 Remote Controller

DA16+ is 16-channel radio controller which has both datalink and radiolink built inside, and both the datalink and radiolink can reach a range of 5km. You also could equip the DA16+ with range booster to extend the RC range and data transmission distance to 15km-20km.
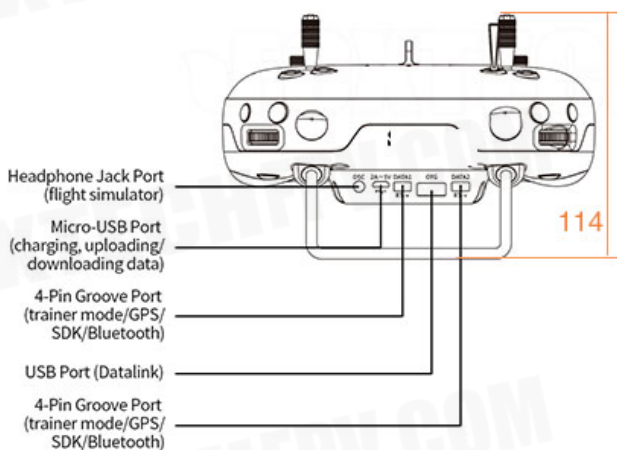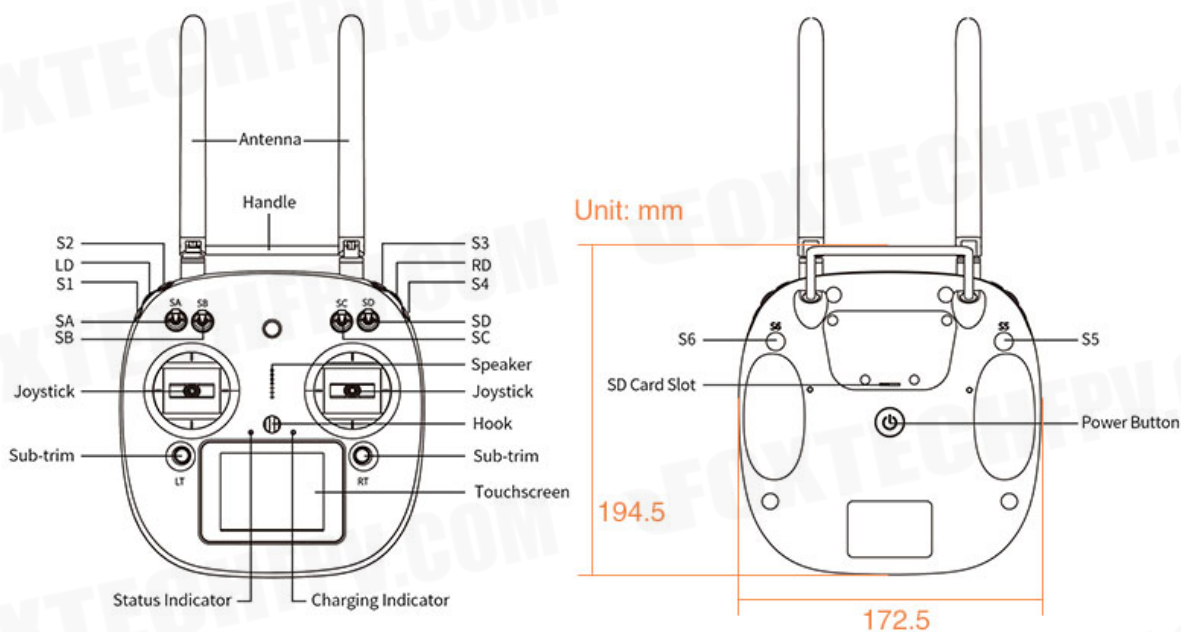
Extensible Ports
By supports extenal hardware devices and SDK, the remote controller's appli- cabion potential is ultimately developable.

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