

# FOXTECH GAIA 160MP

User Manual

V1.0

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**FOXTECH**

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# Product Profile

## Introduction

GAIA 160MP is a multipurpose heavy-lift platform. GAIA 160MP Heavy Lift hexacopter is sturdy and has very good stability. GAIA 160MP is made of carbon fiber material which features light weight and high strength, and only the cover is made of glass fiber. The arm of GAIA 160MP is pluggable, it can be locked with the quick locking hooks. This detachable design makes it easy to transport and quick to setup. GAIA 160MP heavy-lift drone is equipped with powerful motor and high efficiency 30 inch propeller to ensure long flight time, this heavy-lift drone is able to carry a lot more weight than your typical quadcopter, max thrust of one rotor can reach 13kg. GAIA 160MP is equipped with dual folding landing gear system, it has enough space between the center board and the ground. So this strong body can be equipped with many equipments, like searchlights and loading box, and can be applied in fields like reconnaissance mission, emergency rescue etc. Besides this, GAIA 160MP also can be used for professional filming and aerial photography, this GAIA 160MP can load with DJI Ronin 2 gimbal, which is compatible with many mainstream DSLR and professional cameras with cinema grade glass, like RED Dragon, Canon C300 and Sony FS7 etc. The motor and ESC adopt the water-resistant design, and can be applied in different weather conditions. Also the closed fuselage structure can protect GAIA 160-MP from the rain and dust, and also make it easy to care for.

## Specifications

### Aircraft

Structure

Item Name	GAIA 160MP
Wheelbase	1620mm
Frame Weight	5.8kg(with landing gear)
Take-off Weight	48kg
Flight Time	45min(4x6s 16000mah)
Max Effective Load	30kg
Max Flying Speed	10m/s
Battery	4x 6s 16000mah Lipo
Max Lifting Speed	5m/s
Max Descent Speed	4m/s
Suggested Flight Altitude Working	W500m
Temperature	-10 +55 °C
Hover Precision	Vertical Direction $\pm 0.5$ m, Horizontal Direction: $\pm 1.5$ m

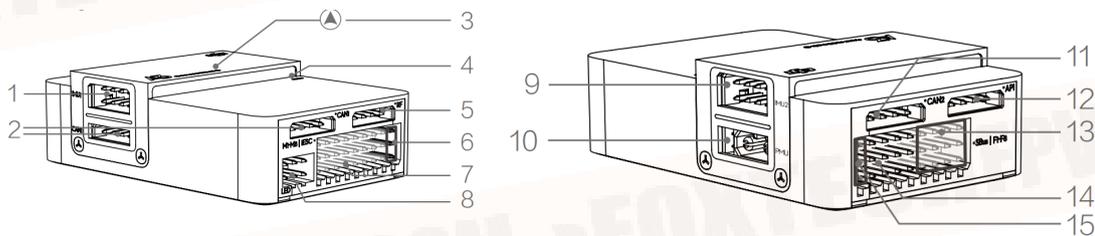
## System Components

### A3 and A3 Pro Parts

#### Flight Controller Feature Highlights

1. Independent CAN1 and CAN2 ports and API Serial port for the Onboard SDK. The CAN1 port is used to connect the GPS-Compass Pro and DJI devices (e.g. RTK GPS) while the CAN2 port is used to connect SDK devices.
2. Built-in inertial sensors for the measurement of aircraft attitude and built-in pressure sensor for the detection of aircraft altitude.
3. Support for multiple receiver types. If used with the DJI Lightbridge 2, the A3 has direct access to features in the DJI GO app such as Intelligent Flight Modes.
4. M1 to M8 are used to connect the ESCs of the aircraft and iESC for DJI Intelligent ESC communication.
5. 4 independent and configurable output ports and 4 I/O ports. These ports can be customized and connect other DJI devices (e.g. DJI Zenmuse Z15 gimbals, DJI Intelligent Landing Gear) or SDK devices.

### Port Diagram



#### 1.IMU1 Port

Communicates with the IMU Pro module.

#### 2.CAN1 Port

Dedicated DJI CAN-Bus port. Communicates with the A3 GPS-Compass Pro or other DJI devices (e.g. Real Time Kinematic (RTK) GPS system).

#### 3.Orientation Arrow

The FC module should be mounted with the arrow pointing in the specified direction (Orientation can be set in the DJI Assistant 2).

#### 4.Status Indicator

Indicates the status of the flight controller and triple modular redundancy system.

#### 5.RF Port

Communicates with the DJI Lightbridge 2 Air System.

#### 6.iESC Port

Communicates with the DJI Smart ESC.

#### 7.M1-M8 Pins

Connects to the corresponding ESC PWM port for each motor.

#### 8.LED Port

Communicates with the LED module.

#### 9.IMU2 Port

Communicates with the IMU Pro module.

#### 10.PMU Port

Derives power from the PMU.

#### 11.CAN2

Communicates with an SDK device.

#### 12.API Port

Communicates with an Onboard SDK device.

13.F5-F8 Pins

Multifunction PWM I / O ports.

14.F1-F4 Pins

Multifunction PWM output ports.

15.S-Bus Port

Communicates with a DJI DR16 or S-Bus receiver.

**GPS-Compass Pro Module**

The GPS-Compass Pro module has a built-in GPS and compass. The compass is used for geomagnetic field measurements. Compass calibration is required before use. DO NOT use or store the compass in environments with ferromagnetic materials.

Note that the GPS-Compass Pro module in the UPGRADE KIT is the same as the one in the A3 package.

1.Status Indicator

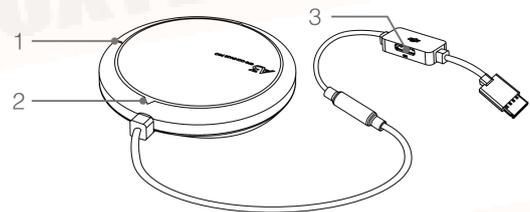
Indicates the status of the GPS-Compass Pro module and triple modular redundancy system.

2.Orientation Arrow

The GPS-Compass Pro module should be mounted with the arrow pointing to the aircraft's nose.

3.Extended CAN1 Port

Dedicated DJI CAN-Bus port. Communicates with DJI devices (e.g. Real Time Kinematic (RTK) GPS system).



**PMU Module**

Supported the LiPo batteries. with built-in PMU providing power for the whole Flight Control System and low voltage protection function.

1.Power Port (9V 3A)

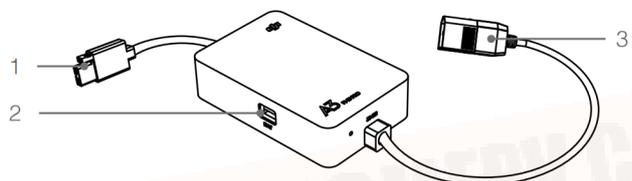
Connected to the Flight Controller for power supply.

2.iBAT

Reserved.

3. 3S-12S

Derives power from the LiPo batteries.



**LED Module**

The LED Module has an integrated LED Indicator and Micro USB port.

A.The LED is mainly for flight control system status indication during flight (e.g. Flight Mode).

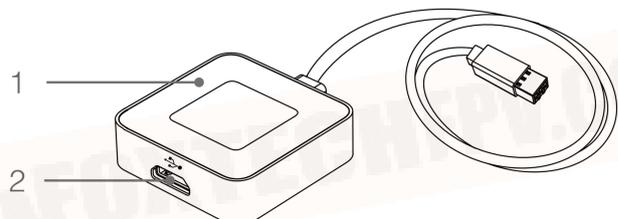
B.In addition, there is a Micro USB port for firmware upgrades via DJI Assistant 2.

1.Flight Status Indicator

Indicates the status of the flight control system.

2.Micro USB Port

Used to configure and upgrade the A3 or A3 Pro via DJI Assistant 2.



### IMU Pro Module

Includes built-in inertial sensors for the measurement of aircraft attitude and a built-in pressure sensor for detecting aircraft altitude. The IMU Pro has been calibrated before delivery and should be used under the specified temperature range. Using the IMU Pro outside the specified temperature range may have a negative effect on the IMU's performance.

#### 1.Orientation Arrow

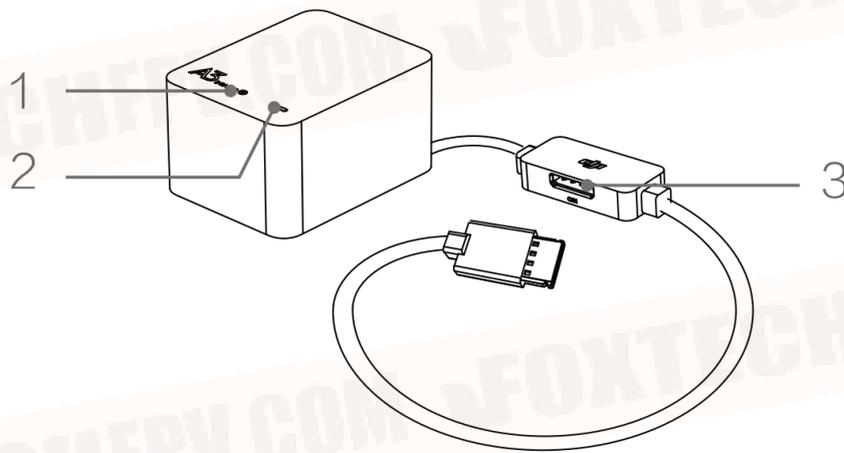
The IMU Pro module should be mounted with the arrow pointing to the specified orientation (Orientation can be set in the DJI Assistant 2).

#### 2.Status Indicator

Indicates the status of the IMU Pro module and triple 2 modular redundancy system.

#### 3.CAN1 GPS Port

Communicates with the GPS-Compass Pro module.

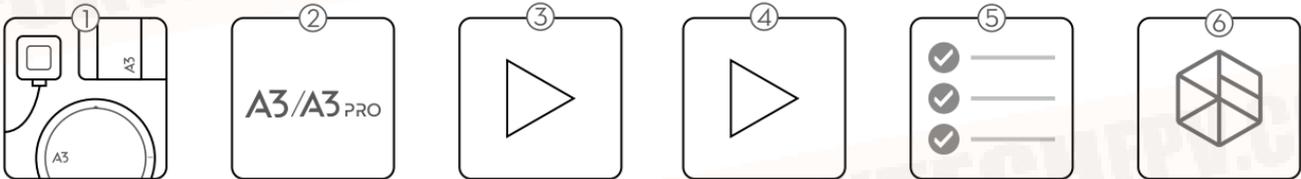


# Installation

## Overview

### Installation Procedure

Read this section carefully and follow the procedures below to install your flight control system, otherwise the flight control system may not normally work.



- ① Ensure all parts are in good condition.
- ② Select the A3 connection.
- ③ Mount the FC parts to GAIA 160MP and connect them properly.
- ④ Launch the DJI Assistant 2 and configure the parameters.
- ⑤ Ensure the motor, remote controller channels and Failsafe settings are correct.
- ⑥ Ensure the devices connected to the flight controller are working normally and correctly set in DJI Assistant 2.

## Start the Installation

💡 Strictly follow the provided guidelines. Failure to do so may lead to unexpected flight behavior or serious accidents.

### Flight Controller System Installation

#### Mounting the Flight Controller

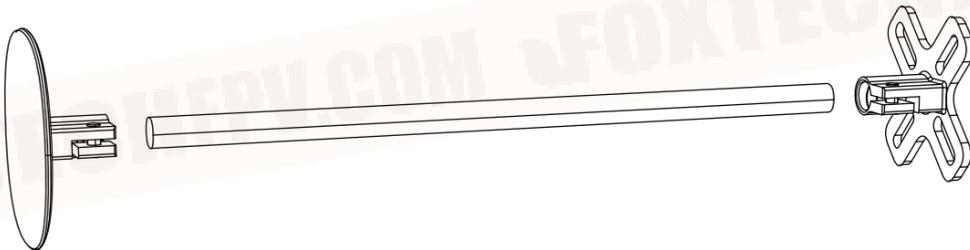
Mount the Flight Controller with the Orientation Arrow pointing to the front, back, left or right. Make sure the module is parallel to the aircraft and then fix it onto the aircraft with double-faced adhesive tape. Configure the parameters in DJI Assistant 2 and select the direction in which you mounted the Flight Controller. We recommend mounting the Flight Controller with the Orientation Arrow pointing forward.

- 💡
- The top side should be facing up. DO NOT mount upside-down.
  - Remember to warm up the battery if operating in cold weather.
  - Mount the flight controller at a low vibration position. The sides of the flight controller should be precisely parallel to the aircraft body. Based on our experience, there is less vibration near the aircraft's center of gravity.
  - The flight controller is NOT water-proof or oil-proof.
  - Check the double-faced adhesive tape regularly to ensure the IMU is fixed firmly in place.

#### Mounting the GPS-Compass Pro Module

Follow the procedures below to mount the GPS bracket and the GPS-Compass Pro module. The GPS-Compass Pro module included in the Upgrade kits is the same as the one in the A3 package.

1. Use the M2.0 4 screws to assemble the GPS bracket with the Ball End Hex Key assistant. The longest one is recommended.
2. With the M2.5 7 screws and M2.5 3.4 nuts, mount the bracket on the aircraft.
3. Ensure the GPS-Compass Pro arrow is pointing to the aircraft nose and then fix it onto the top of the GPS bracket. Try to keep it parallel to the aircraft.



#### Usage Requirements

1. The DJI logo should be facing the sky, with the orientation arrow pointing directly to the nose direction; otherwise you may experience take off failure.
2. Fly the aircraft in an open space without buildings or trees; otherwise the GPS may be affected.
3. The compass is sensitive to magnetic interference. Always keep the compass module away from magnetic fields. Otherwise, the compass module may become damaged and lead the aircraft to work abnormally or even lose control.

### Mounting the LED Module

Mount the LED module in a position to ensure it remains visible during flight. The LED bracket included can be used to fix the LED module onto the aircraft.

### Mounting the PUM Module

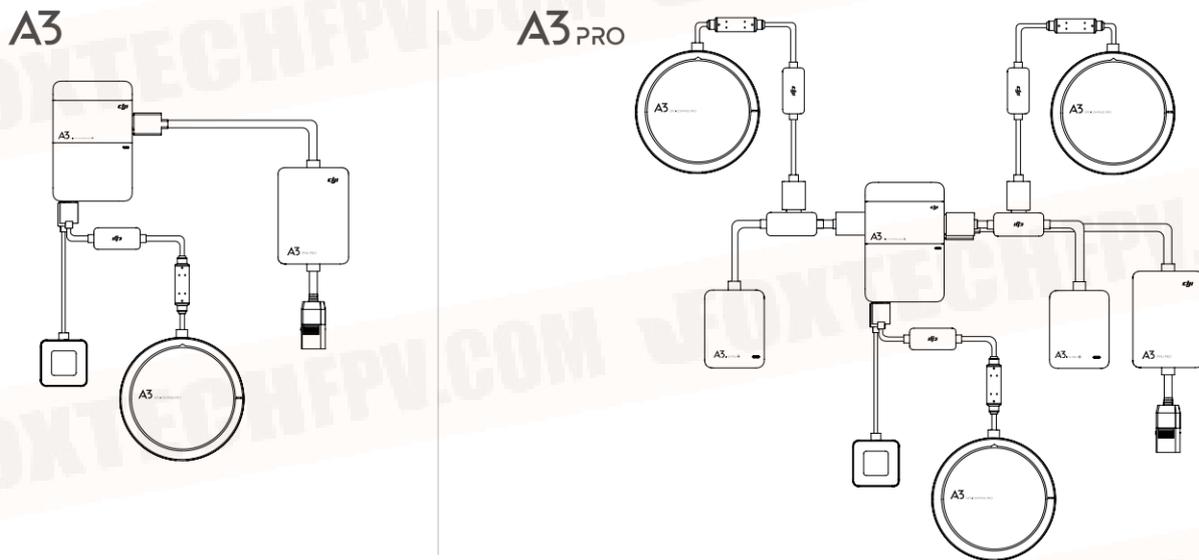
Mount the PMU module to an unobstructed position on the bottom of the aircraft's upper plate for heat dissipation.

### Mounting the IMU Pro Module

Mount the IMU Pro module with the Orientation Arrow pointing forward, backward, to the left or to the right. Make sure the module is parallel to the aircraft and then fix it onto the aircraft with double-faced adhesive tape. Configure the parameters in DJI Assistant 2 and select the direction in which you mounted the Flight Controller. We recommend mounting the Flight Controller with the Orientation Arrow pointing forward.

### Flight Controller System Connection

Follow the below diagram to connect the flight control system, and use the cable ties to tidy the cables.



 The flight control system's shell is connected to the whole system's ground.

### Connecting to the Airframe and its Equipment

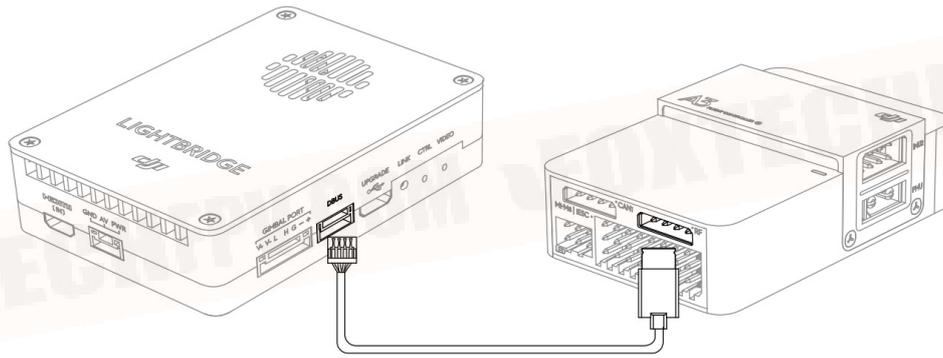
Strictly follow the provided guidelines. Failure to do so may lead to unexpected flight behavior or serious accidents.

### Connecting to a Receiver

Select the RF port or the S-Bus port for different types of receivers.

### DJI Lightbridge 2

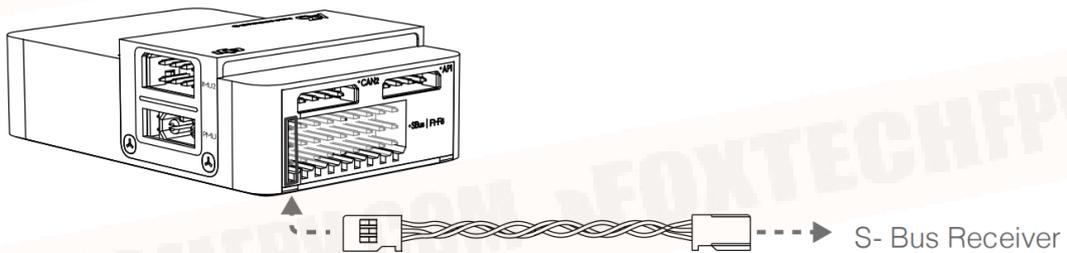
Connect the DJI Lightbridge 2 receiver DBUS port to the Flight Controller RF Port.



DBUS Cable II

### S-BUS Receiver

Connect the S-BUS receiver to the Flight Controller S-Bus Port with a servo cable.

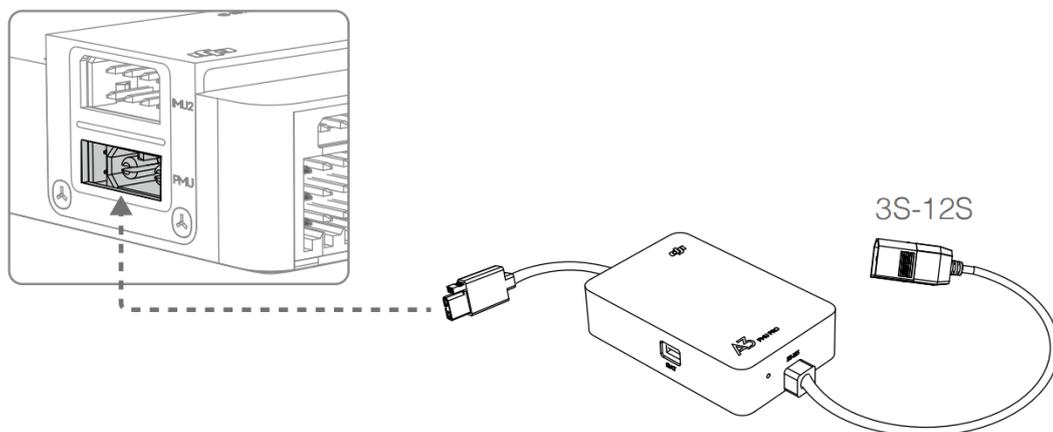


### Connecting to the ESCs

Connect the ESC ports to the ESC ports on the Flight Controller in order.

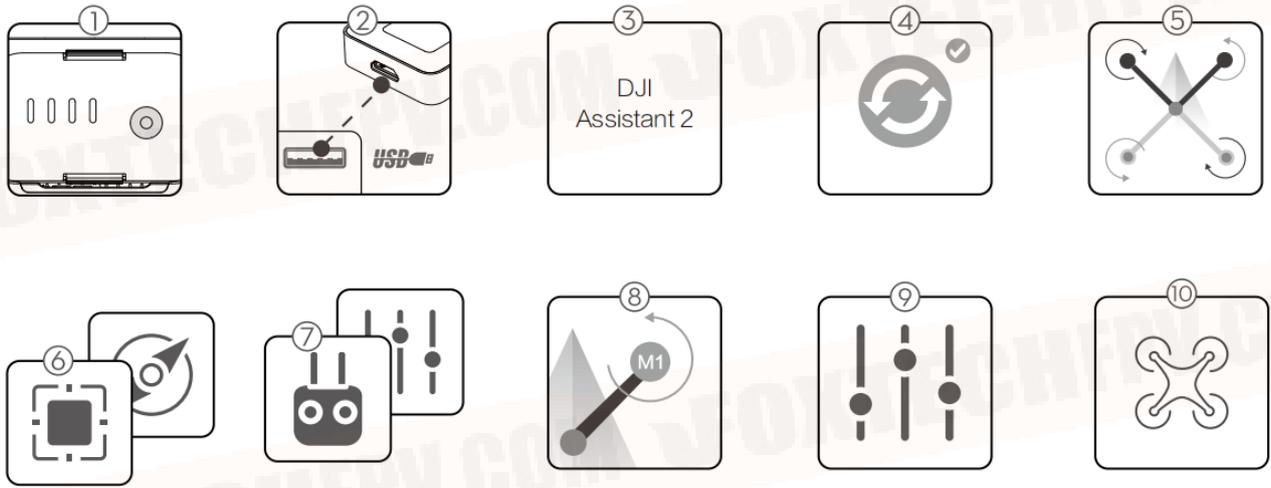
### Connecting to a Battery

Connect the PMU to the Flight Controller PMU port, and then connect the battery to the PMU.



## Parameter Configuration

Launch DJI Assistant 2 and follow the prompts to complete configuration.



1. Ensure the flight control system is properly powered on.
2. Connect A3 to a PC.
3. Run DJI Assistant 2. Note that you may be asked to register for first time use.
4. Follow the prompts to upgrade the firmware to the latest version\*.
5. Select the airframe type.
6. Configure the IMU and GPS mounting parameters.
7. Select the receiver type and configure the channel mapping.
8. Make sure the motors are rotating in correct direction. If not, change the rotating direction.
9. Configure the function channels.
10. Fly in the simulator to check that all functions is working normally.

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 Please note that firmware update may reset various Main Controller Settings, such as the RTH Altitude and Maximum Flight Distance, to factory defaults. Before the update, take note of your preferred settings, and readjust them after the update to suit your preference.

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# A3 Functions

## Compass Calibration

Ensure the compass is calibrated before every flight. Failure to calibrate may lead to poor flight performance or a crash.

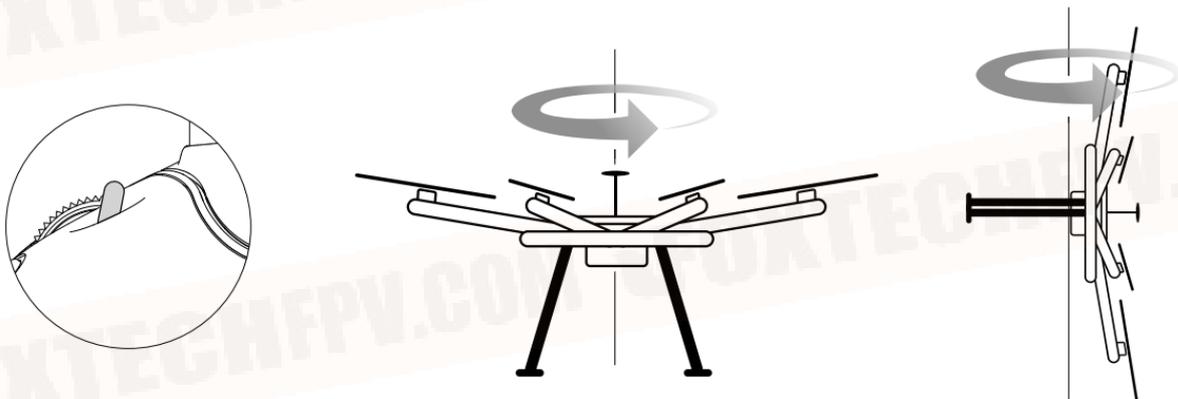
1. DO NOT attempt to calibrate your compass where there is a chance of strong magnetic interference. This includes areas where there are massive metal objects, parking structures, steel reinforcements underground, or under bridges.
2. DO NOT carry ferromagnetic materials with you during calibration, such as keys or mobile phones.
3. The compass should always be calibrated when moving from indoor spaces to outdoor spaces.
4. After successful calibration, the compass may become abnormal when you place the aircraft on the ground. This may be because of underground magnetic interference. Move the aircraft to another location and try again.

### Calibration Procedures

Choose an open space to carry out the following procedures.

Using the remote controller (Lightbridge 2 is used here as an example):

1. Quickly flip the control mode switch from P mode to A mode, and then back to P mode three times, and the Aircraft Status Indicator will display a solid yellow light. Flip the control mode switch between position-1 and position-3 when using the third party remote controllers.
2. Hold and rotate the aircraft horizontally 360 degrees, and the Aircraft Status Indicator will display a solid green light.
3. Hold the aircraft vertically with nose pointing downward, and rotate it 360 degrees around the center axis. Recalibrate the compass if the Aircraft Status Indicator is solid red.



Using DJI GO (Lightbridge 2 is required):

Tap the Aircraft Status Indicator bar in the DJI GO app and select "Calibrate", then follow the on-screen instructions.



- If the Aircraft Status Indicator blinks red and yellow after the calibration, move your aircraft to a different location to carry out compass calibration.
- Calibrate the compass before each flight. Launch DJI GO App, follow the on-screen instructions to calibrate the compass.

### When to Recalibrate

1. When compass data is abnormal, and the Aircraft Status Indicator is blinking red and yellow.
2. When flying in a new location, or a location that is different from your last flight.
3. When the mechanical structure of the A3/A3 Pro has changed, i.e. the mounting position of the compass has changed.

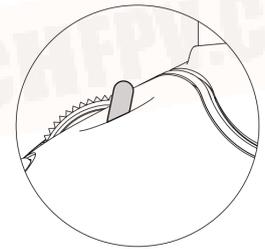
When severe drifting occurs in flight, i.e. the A3/A3 Pro does not fly in a straight line.

## Flight Functions

### Flight Modes

Below flight modes are available. Use the Flight Controller mode switch to change the flight mode of the aircraft. The details of each flight mode are found in the section below.

Lightbridge 2 is used here as an example.



**P mode (Positioning):** P mode works best when GPS signal is strong. There are three different states of P mode, which will be automatically selected by the A3/A3 Pro depending on GPS signal strength and Vision Positioning sensors:

**P-GPS:** GPS and Vision Positioning both are available, and the aircraft is using GPS for positioning.

**P-OPTI:** Vision Positioning is available but the GPS signal is not. Aircraft is using only Vision Positioning for hovering

**P-ATTI:** Neither GPS or Vision Positioning available, aircraft is using only its barometer for positioning, so only altitude is controlled.

**A mode (Attitude):** The GPS and Vision Positioning System is not used for holding position. The aircraft only uses its barometer to maintain altitude. If it is still receiving a GPS signal, the aircraft can automatically return home if the Remote Controller signal is lost and if the Home Point has been recorded successfully.

**F mode (Function):** Intelligent Flight Mode is activated in this mode.

**M mode (Manual):** The GPS and Vision Positioning System is not used for holding position. No barometer is used to maintain altitude. Only use M mode in case of an emergency.



- P-OPTI mode is only available when a DJI Vision Positioning System is used.
- Once the GPS signal is recovered, or the Vision Positioning System available, the Flight Control System can re-enter P-GPS mode or P-OPTI mode.
- M mode (Manual) should be enabled in DJI Assistant.

### Aircraft Status Indicator Description

#### Normal



Green Flashes Slowly Safe to Fly (P-mode with GPS and Vision Positioning)



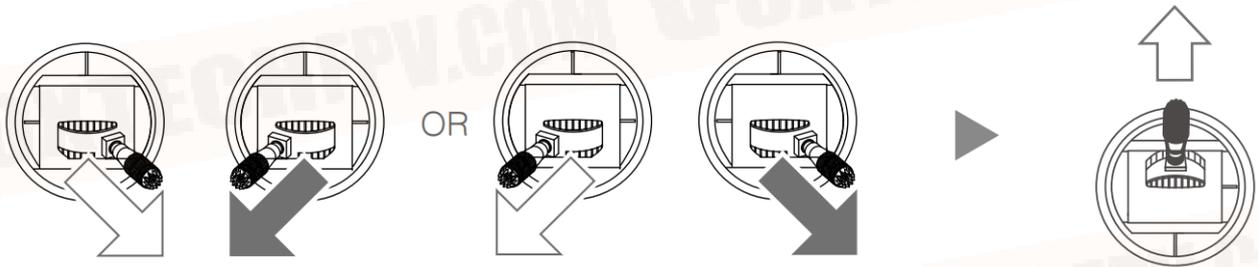
Green Flashes Twice Safe to Fly (P-mode with Vision Positioning but without GPS)



Yellow Flashes Slowly Safe to Fly (A mode but No GPS and Vision Positioning)

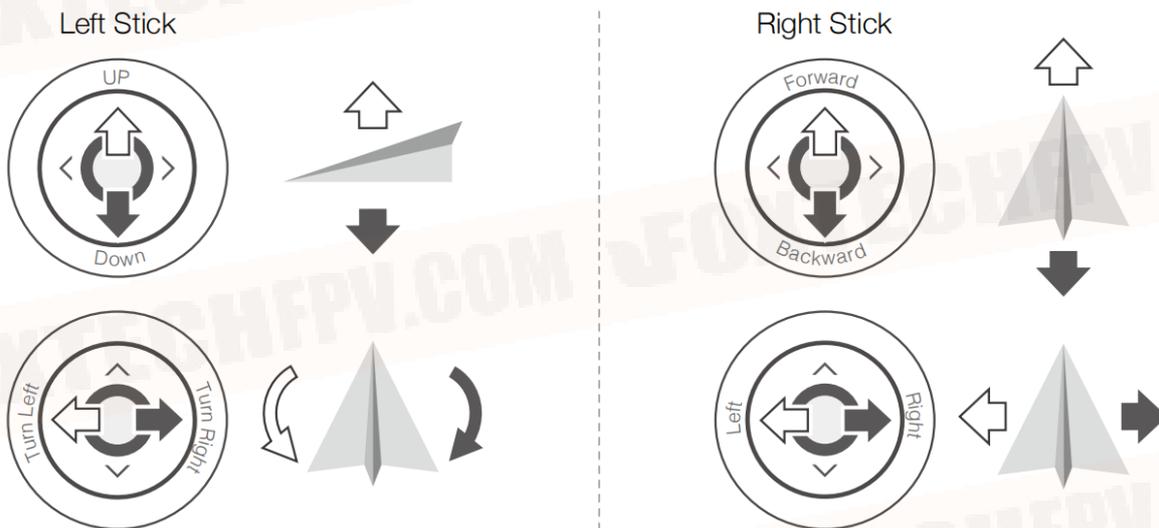
Flight Control  
Manual Take-off

Start the motors by pulling both control sticks to the bottom inside (or outside) corners. Release the sticks once the motors start. Slowly push the left stick (throttle stick) up to takeoff.



Remote Controller Operation

Here are the default flight controls (Mode 2). The left stick controls altitude and rotation, while the right stick controls the forward, backward, left or right movements. The gimbal dial controls the camera's tilt.



💡 You can customize or change these controls through the DJI GO app.

Manual Landing

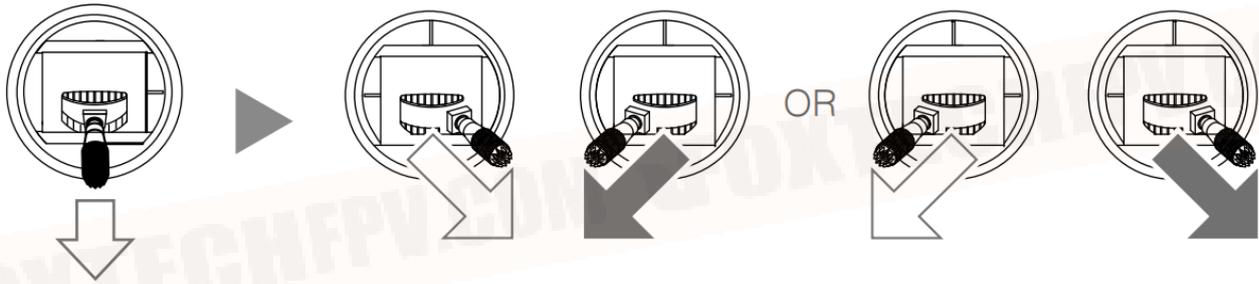
Use the below method to stop the motors:

When the aircraft has landed, push the throttle down and hold. The motors will stop after 3 seconds.



You can use the below method to stop the motors in the event of an emergency.

When the aircraft has landed, push the throttle down, then perform the CSC (Control Stick Combination). The motors will stop immediately. Release both sticks once the motors have stopped.



### Intelligent Flight Modes (using the Remote Controller)

Intelligent Flight Modes make it easier to operate the aircraft. If you are not using a Lightbridge 2 remote controller, you will need to configure a 3-position switch on the remote controller as the Intelligent Flight Modes Switch, with each switch position corresponding to one of the following modes: Off, Course Lock, or Home Lock.

#### Course Lock

Use Course Lock to lock the current nose direction as the aircraft's forward direction. The aircraft will move in the locked direction regardless of its orientation (yaw angle).

Requirements: Compass must be working properly.

How to operate: 1. Fly the aircraft in the direction you wish to lock; 2. Toggle the Intelligent Flight Modes Switch to the Course Lock position to lock the current nose direction as the aircraft's forward direction.

How to reset the parameters: Aircraft nose orientation cannot be reset during flight.

How to stop or exit the flight mode: Toggle the Intelligent Flight Modes Switch to the Off position.

#### Home Lock

Pull the pitch stick backward to move the aircraft toward its recorded Home Point.

Requirements: Home point recorded; P-GPS mode enabled; distance between the aircraft and Home Point is greater than 5 meters.

How to operate:

1. Fly the aircraft to the target position;
2. Toggle the Intelligent Flight Modes Switch from the Off position to the Home Lock position for more than three times to record the Home Point (Note: the Intelligent Flight Modes Switch should stop at the Off position);
3. Flip the Intelligent Flight Modes Switch to the Home Lock position to start the flight. How to reset the parameter: Parameters cannot be reset during flight.

How to stop or exit the flight mode: Toggle the Intelligent Flight Modes Switch to the Off position.

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💡 Lightbridge 2 not only allows you use the DJI GO app to operate the aircraft, but also use Intelligent Flight Modes, such as Course Lock, Home Lock, Point of Interest (POI) and Waypoints, to capture professional shots during flight.

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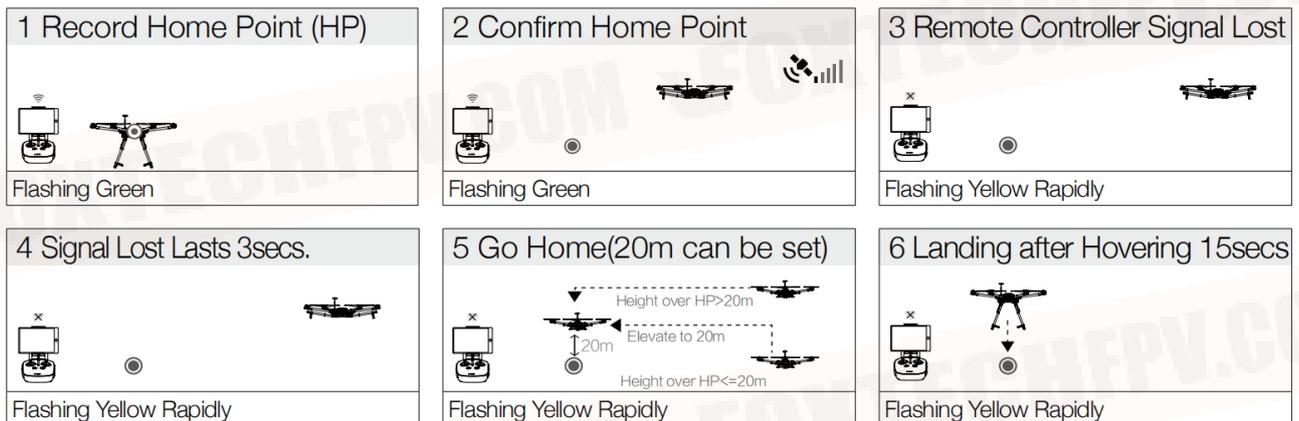
## Protection Functions

### Return to Home

Return to Home (RTH) brings the aircraft back to the last recorded Home Point. There are three cases that will trigger the RTH procedure; they are Failsafe RTH, Smart RTH and Low Voltage RTH with a LiPo battery.

### Failsafe RTH

Failsafe RTH is activated automatically if the remote controller signal (including video relay signal if DJI Lightbridge 2 used) is lost for more than 3 seconds, provided that the Home Point has been successfully recorded and the compass is working normally. The RTH process may be interrupted and the operator can regain control over the aircraft if a remote controller signal is resumed.



- 💡 - The aircraft automatically descends and lands if RTH is triggered when the aircraft flies within a 65-foot (20-meter) radius of the Home Point.
- The aircraft cannot return to home if the LED is slowly blinking yellow or the GPS does not work.
- The aircraft cannot avoid obstacles during Failsafe RTH. Therefore it is important to set a reasonable Failsafe altitude before each flight. Launch the DJI GO app and enter "Camera" view and select "MODE" to set the Failsafe altitude.
- The aircraft will stop ascending and immediately return to the Home Point if you move the throttle stick when the aircraft reaches an altitude of 20 m or above during Failsafe.

### Smart RTH

Use the RTH button on the remote controller when GPS is available to enable Smart RTH. During the Smart RTH procedure, the aircraft returns to the last recorded Home Point but you may control the aircraft's orientation to avoid collisions. Press the Smart RTH button once to start the process. Press the Smart RTH button again to exit Smart RTH and regain the control.

- 💡 If using the DJI Lightbridge 2, no additional settings are required for the RTH button. If using another type of remote controller, you must configure the RTH button in DJI Assistant 2.

### Low Battery RTH with LiPo battery

The low voltage failsafe is triggered when the DJI LiPo Battery is depleted to a point that may affect the safe return of the aircraft. Users are advised to return home or land the aircraft immediately when these warnings are shown. Aircraft will automatically return to the Home Point if no action is taken after 10 seconds countdown. Cancel the RTH procedure by pressing once on the RTH button. The thresholds for these warnings are automatically determined based on the current aircraft altitude and its distance from the Home Point.

Aircraft will land automatically only if the current voltage can support the aircraft in landing on the ground from the current altitude. Use the remote controller to control the aircraft's orientation during the landing process.



When the critical battery level warning activates and the aircraft is descending to land automatically, you may push the throttle upward to hover the aircraft and navigate it to a more appropriate location for landing.

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### Attitude Control When One Motor Output Fails

For multirotor aircraft, the A3/A3 Pro flight control system can control the aircraft's attitude when one motor fails:

1. During flight, the aircraft with A3/A3 Pro flight control system is attitude controllable when one motor output fails
2. The motor will not start before take-off. (DJI Intelligent ESCs are required for communication.) Select Course Lock or Home Lock mode to fly the aircraft to a safe area to land when the aircraft is far away, or the attitude can't be recognized.

### Propulsion System Protection

Low voltage and overweight aircraft warnings are provided in the DJI GO app.

# Flight Control System Checklist

## Hardware Checklist

Mounting and components checklist

- 1.Ensure all parts are mounted correctly and firmly.
- 2.Ensure the ESCs and receiver are connected correctly and firmly.

LED Status checklist

- 1.Ensure the mode switch corresponds to the flight status LED.
- 2.System status LED on the GPS-Compass Pro and IMU Pro are normal.
- 3.Ensure all the sensor parameters are correct and the IMUs are calibrated correctly.

## DJI Assistant 2 Checklist

DJI Assistant 2 checklist

- 1.Ensure the aircraft mounting parameters are correct.
  - 2.Ensure the flight controller parameters are correct.
- Low voltage protection and Failsafe protection are set correctly.

# Appendix

## LED Indicators

### Flight Status LED Indicator

LED	Description
 .....Blinking Red, Green and Yellow	The system is running a diagnostic test.
 x4..... Blinking Yellow	Four Times The system is warming up.
 .....Blinking Green Slowly	Safe to fly, GPS working
 .....Blinking Yellow Slowly	P-ATTI or ATTI mode
 x2.....Blinking Green Quickly Twice	VPS working, no GPS
 .....Blinking Purple Twice	Manual mode
 .....Blinking Blue (Alternates with flight mode patterns)	Positioning with D-RTK
 .....Blinking Blue Rapidly for 1.5 seconds	Switching devices (IMU or GPS modules) for the modular redundancy system
 .....Blinking Green Rapidly for 1.5 seconds	Home Point/POI/Course Orientation is set successfully
 .....Blinking Yellow (Alternates with other flight mode and D-RTK patterns)	Intelligent Flight Modes
 .....Blinking Yellow Rapidly	Remote controller signal lost
 .....Blinking Red Slowly	Low voltage warning
 .....Blinking Red Rapidly	Critically low voltage warning
 .....Blinking Red Rapidly for 0.6 second when performing CSC	Large IMU bias or IMU initialization
 —— Solid Red	Critical error
 .....Blinking Red and Yellow Alternatively	Compass calibration required

### GPS-Compass Pro/IMU Pro/Flight Controller LED Indicator

LED Indicator	Status
 Green	The module is functioning normally and working as a part of the system When the LED is blinking green.
 Red	The module is functioning abnormally When the LED is blinking red.
 Blue	The module is functioning normally but not working as a part of the system When the LED is blinking blue.

## Troubleshooting

### 1.LED Status checklist

Ensure the mode switch corresponds to the flight status LED.

Ensure the system status LEDs on the GPS-Compass Pro and IMU Pro are normal. Ensure all the sensor parameters are correct and the IMUs are calibrated correctly.

### 2.IMU calibration failure.

Ensure the aircraft is not moved during calibration. Ensure the aircraft is placed level during calibration.

### 3.Voltage detection error.

Connect to DJI Assistant 2 to ensure the battery type is correct.

### 4.Compass calibration failure.

Restart the battery if compass calibration failed.

Connect to DJI Assistant 2 to ensure the channel mapping of the flight mode switch is correct. Connect to DJI Assistant 2 to ensure the compass Mod value is normal.

5.Failed to exit the SD card read mode after reading the SD card successfully. Restart the battery of the aircraft.

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