

Ace One

User Manual

Revision 1.1

Date: 2010-12-13

<http://www.dji-innovations.com>

©2010 Dajiang Innovation Technology Co. Ltd. All Rights Reserved.

Product Documents List

The Ace One product package includes the following Guidance or Manual.

For correctly using Ace One system and safe flying, please read them carefully before power on.

Warranty Card

[Warranty Card] introduces the necessary conditions for using Ace One system and related safety issues. Please fill out the customer & helicopter information card and return to DJI for awarding your product warranty.

Quick Start Guide

[Quick Start Guide] For experienced users, the quick start guide provides a brief summary of the steps that can be found in details in this manual.

Ace One User Manual (in CD)












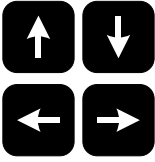



[Ace One User Manual] provides you the detailed guidance for Ace One basic setup, configuration, parameter settings, operation processes, and also maintenance for the product.

Reader's Guide for This Manual

Please read the manual, user guides and cautions in section "

Please strictly follow this guidance to mount and connect the Ace One system on your helicopter, as well as to install the Ace Assistant on your computer.

Icons seen in this document:

	FORBIDDEN		Mouse Left Click
	CAUTION		Mouse Right Click
	Correct		Ctrl Key
	Wrong		Alt Key
	Please refer to the page(s) mentioned		Enter Key
	Assembly & Mounting Tips		Directions Keys
	General Tips		
	Ace Assistant configuration required		
	R/C Transmitter configuration required		

Contents

Reader's Guide for This Manual	3
DJI Ace One Introduction	5
Package Contents	6
Step-by-Step Setup	7
1.1. Before you Begin	7
1.2. Hardware Installation	7
1.3. Connections	9
1.4. Find the Center of Gravity (C.G.)	11
1.5. Software Setup	11
Ace Assistant Software Basic Operation	12
Initial Configuration Flow	13
Functions Introduction & Configuration	14
3.1. GPS & IMU Mounting.....	14
3.2. Control Mode Switch.....	15
3.3. Main Function – Flybarless	16
3.4. Swashplate	17
3.5. Main Function - Tail Gyro.....	18
3.6. Main Function - Engine Governor	20
3.7. R/C Transmitter Calibration	21
3.8. SYSTEM CHECK.....	22
3.9. Main Function - Autopilot	23
Flight	24
4.1. Digital Compass Calibration.....	24
4.2. MANUAL MODE Test Flight.....	25
4.3. Enhanced Fail-Safe	26
4.4. AUTO MODE Test Flight	27
Maintains	28
Flight Log Reading	28
Firmware Upgrade	28
Product Info	28
Appendix	29
LED Indicator description.....	29
Product Specifications	30

DJI Ace One Introduction

DJI Ace One is an autopilot system for radio-controlled helicopters, which completely realized taking the stress out of flying RC helicopters for both professional and hobby applications. Ace One can be installed in a variety of models, from small electric helicopters to large gasoline and turbine helicopters.

Features of the product include:

- GPS-assisted position stabilization mode: simple position-oriented transmitter stick commands enabled
- Hands off position hold
- Attitude-only stabilization mode for skilled maneuvers
- Tilt and roll gimbal stabilization

Built-in functions include:

- Flybarless rotor head support
- Integrated engine governor for internal combustion engines
- Integrated tail gyro

Copyrights

This product and manual are copyrighted by Dajiang Innovation Technology Co. Ltd. with all rights reserved. No part of this product or manual shall be reproduced in any form without the prior written consent or authorization of Dajiang Innovation Technology Co. Ltd.

No patent liability is assumed with respect to the use of the product or information contained herein.

©2010 Dajiang Innovation Technology Co. Ltd. All Rights Reserved.

Disclaimer

Dajiang Innovation Technology Co. Ltd. assumes no liability for damage(s) incurred directly or indirectly from the use of this product.

Trademarks

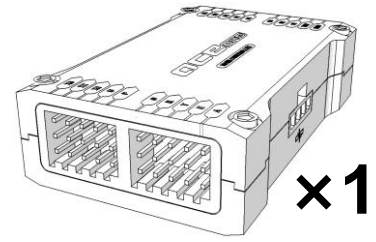
DJI is a registered trademark of Dajiang Innovation Technology Co. Ltd.

Names of products, brands, etc., appearing in this manual are trademarks or registered trademarks of their respective owner companies.

Package Contents

Main Controller

The Main Controller is the heart of Ace One. The Main Controller communicates with the IMU, GPS/Compass, engine governor, servos and RC transmitter to carry out autopilot functionality. The Main Controller provides a “black box” flight log, and also a USB interface to read flight logs, configure Ace One and update firmware from a PC.



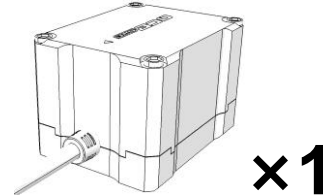
GPS & Compass module

The GPS/Compass module includes two status-indicating LEDs. It should be installed on the tail boom, where there is a clear view of the sky.



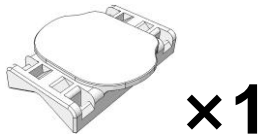
IMU

The Inertial Measurement Unit (IMU) consists of one 3-axis accelerometer, one 3-axis gyroscope and a barometer.



GPS Tail Boom Mount

The GPS Tail Boom Mount and double-sided foam tape enable secured installation for the GPS/Compass module on almost any helicopters.



3-PIN Servo Cable

Cables used to connect the Main Controller to the RC receiver.



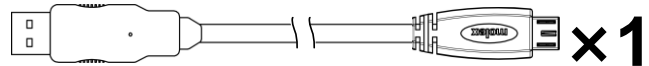
3M 5925 Double Sided Tape

(Only for GPS & Compass module)



Micro USB Cable

This cable is used to configure Ace One, update firmware and download flight logs.



Quick Start Manual

For experienced users, the quick start manual provides summary of the steps which can be found in detail in this manual.

Warranty Information Card

Ace One comes with a two-year warranty, as described on this card. Please keep this for your personal records.

Product CD

The CD contains a digital copy of this manual, some helpful videos, Ace Assistant and the driver to connect Ace One to your PC with the provided USB cable.

Step-by-Step Setup

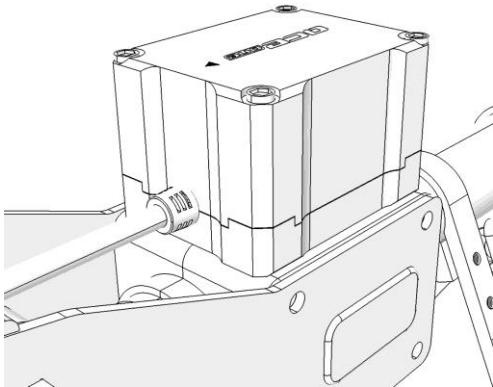
1.1. Before you Begin

Fly the helicopter without Ace One and make sure that the helicopter works properly without any autopilot assistance. To complete this step, you will need a tail gyro instead of Ace One system. This is a good time to isolate and resolve unwanted vibrations.

IT IS IMPORTANT THAT YOU DO NOT SKIP THIS STEP.

1.2. Hardware Installation

IMU

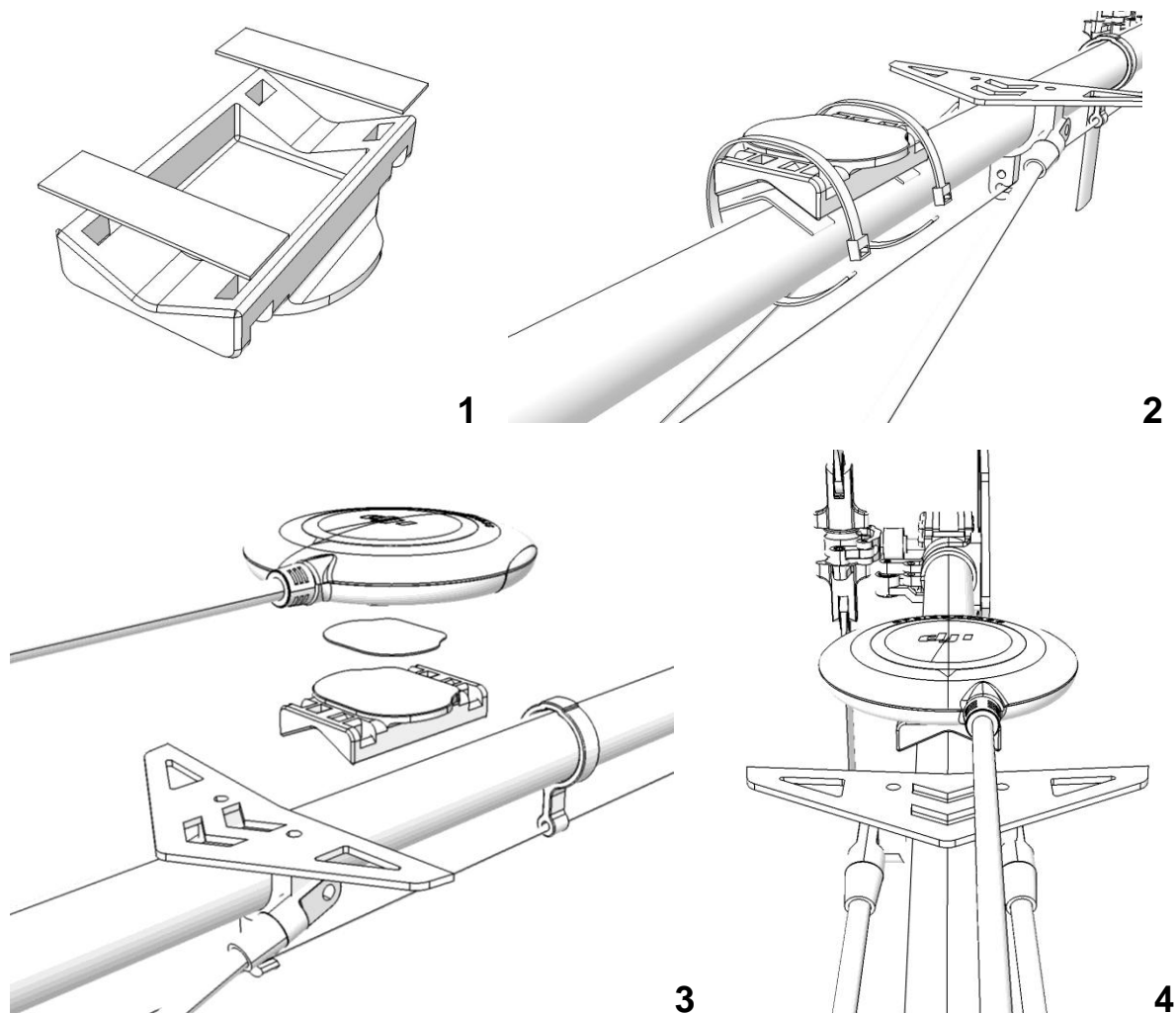


- **Where?** The IMU is best positioned near the helicopter's center of gravity, where vibration is relatively low.
- **What orientation?** Orient the IMU such that the arrow marked on the above surface of the IMU faces the sky and points directly forward, backward, left or right, whichever more convenient. The sides of the IMU should be precisely parallel to the helicopter body. **DO NOT MOUNT THE IMU UPSIDE-DOWN.**
- **How?** Use double-sided foam tape or Velcro for secured installation.



1. Check the double-sided foam tape or Velcro regularly to ensure that the IMU is securely positioned.
2. Please **DO NOT** cover the ventilation holes of IMU, keep them unobstructed and clean.
3. The IMU module is **NOT** water-proof or oil-proof.

GPS & Compass Module



- **Where?** Mount it on the tail boom, between the rotor-head and the tail-rotor. The compass is sensitive to magnetic interference, so position the module at least 20 cm from servos and 30 cm from electric motors or gasoline (petrol) engines. The GPS is sensitive to RF interference, so position the module at least 10 cm from the tail rotor. The GPS should not be close to the main rotor head because rotor blades can interfere with GPS satellite signal, the farther from the center of the rotor disk, the better.
- **What Orientation?** The DJI logo marked on the GPS should face the sky, with the orientation arrow pointing directly forward. The GPS/Compass is packaged with a special indication line for mounting for the first time. The LED status indicators should face the tail rotor.



1. If you are uncertain whether materials near the GPS/Compass module are magnetic or not, you can use a compass or magnet to check it.
2. GPS/Compass mounting-support hardware is included in the Ace One package. If however you prefer to use your own GPS/Compass mount, please make sure that the mount material is NOT magnetic.

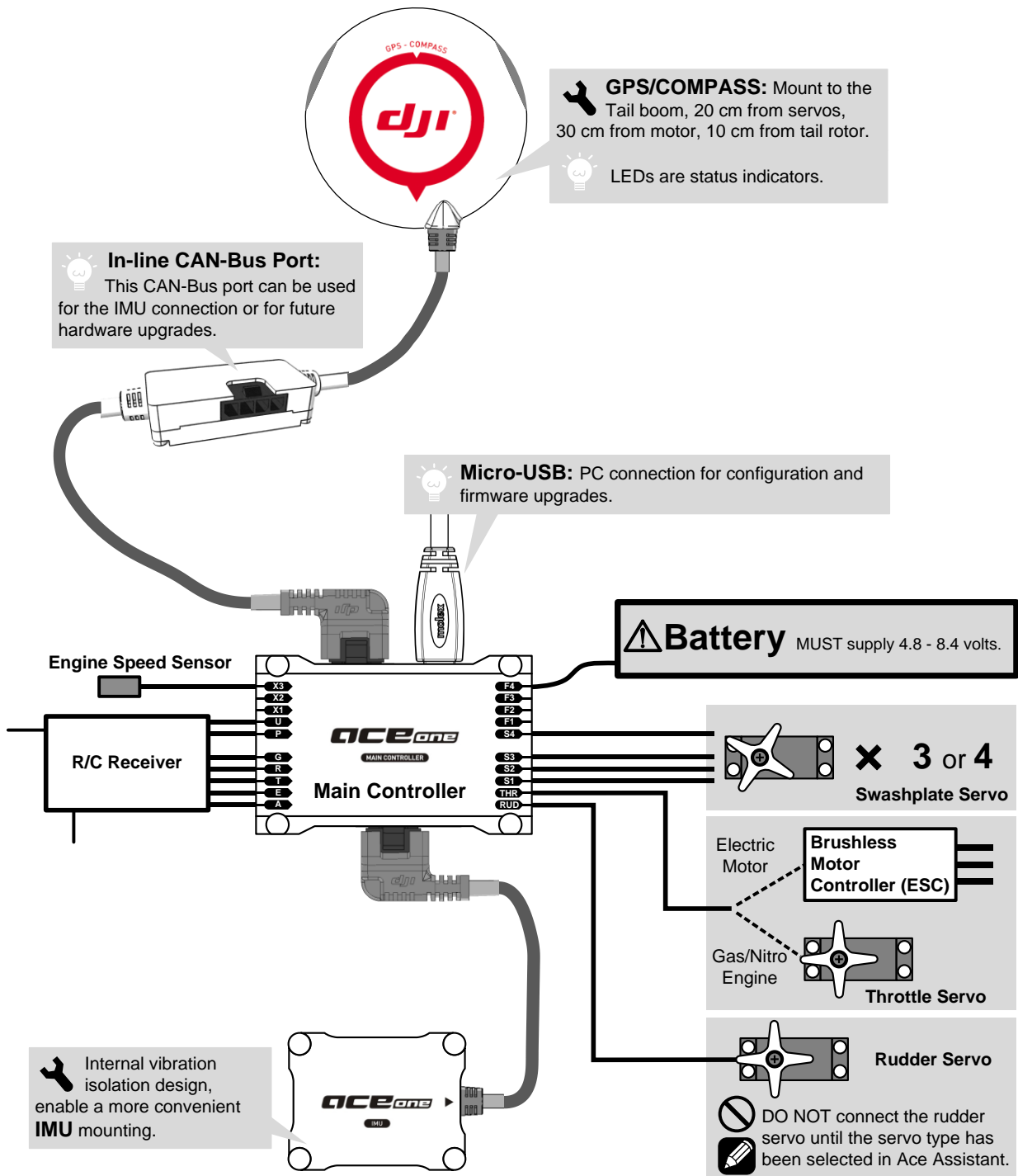
Main Controller

- **Where?** There is no orientation requirement for the Main Controller. Maintain at least a 20-centimeter-distance between the Main Controller and the engine or motor. Choose a mounting location where as shorter servo extension wires are needed as possible. This helps reduce the risks of electronic interference. Please also make sure that the USB port is accessible when installing the Main Controller so as to facilitate software configuration.



After choosing a location to mount the Main Controller, it is recommended that you DO NOT mount the Main Controller until all wirings and software configurations are completed.

1.3. Connections

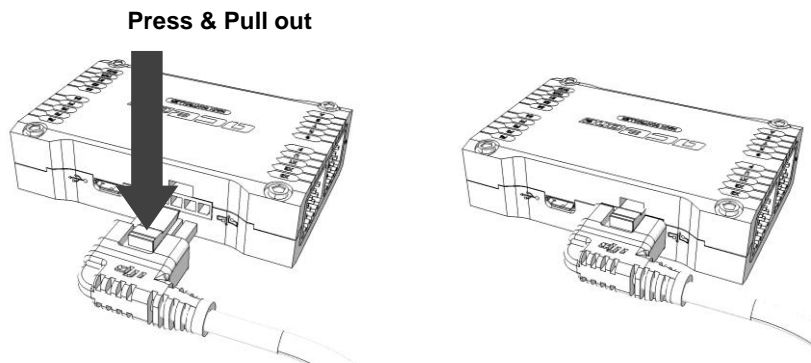


Ace One Modules

The Ace One Main Controller uses CAN-Bus to power and communicate with other Ace One modules. Three connection ports are provided: two on the Main Controller and one in-line connection on the GPS/Compass wire. Ace One identifies the connected devices automatically without configuration.

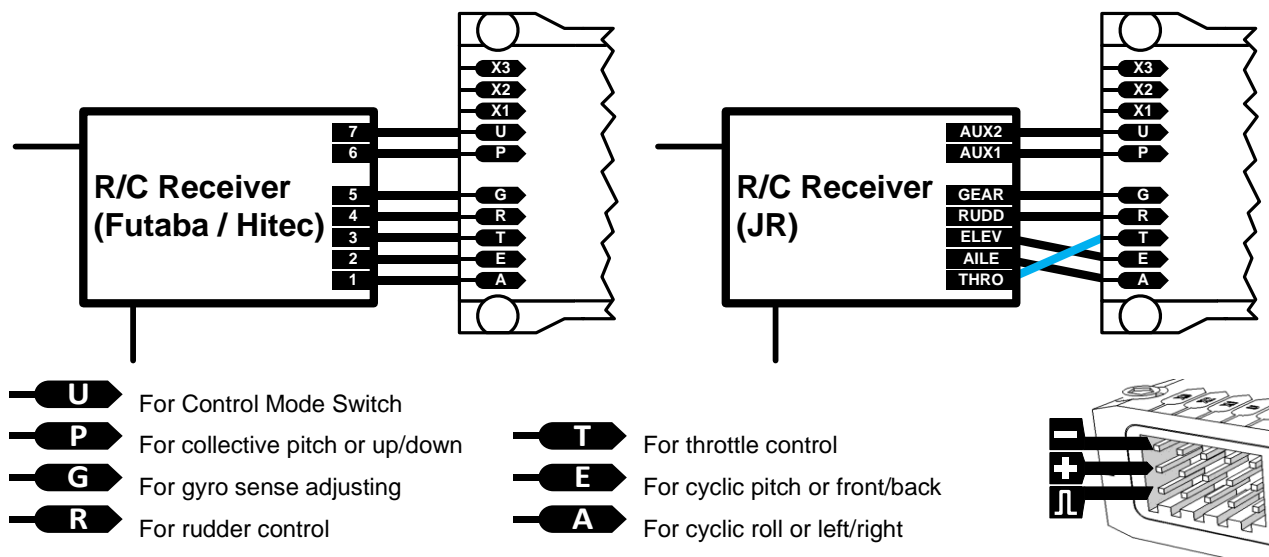
- GPS/Compass module can be connected to either port of Main Controller.
- IMU can be connected to the Main Controller or to the in-line port on the GPS/Compass wire.

Connect the GPS/Compass and IMU to the Main Controller.

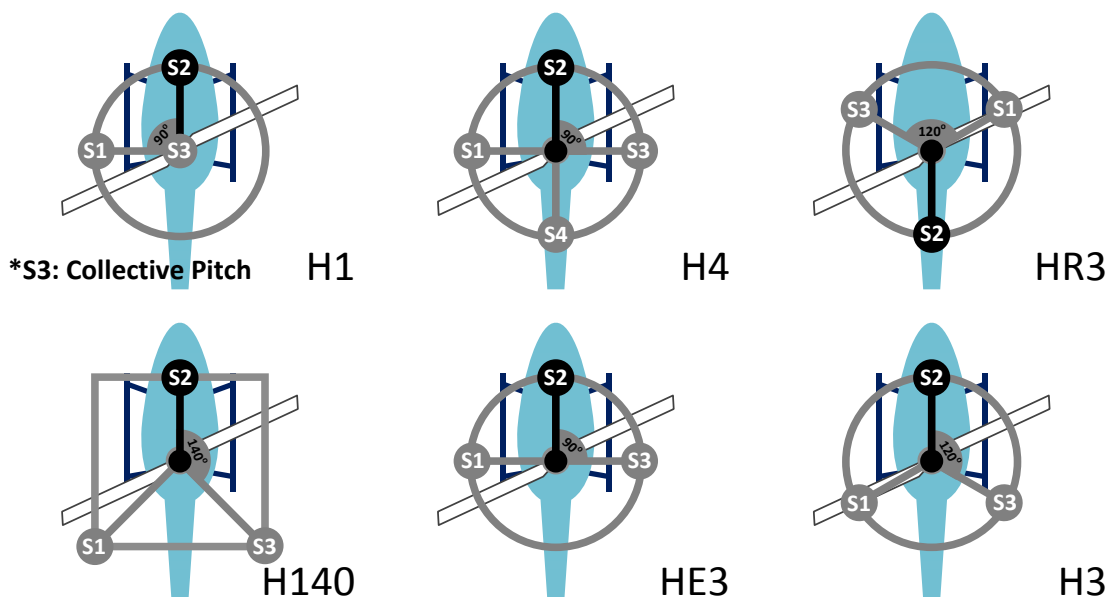
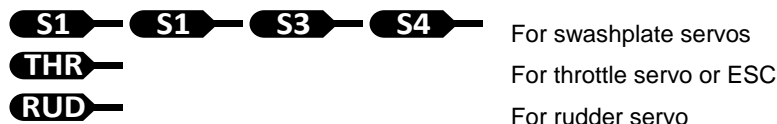


Receiver & Servos

Set the transmitter to single-servo CCPM (Futaba: H-1; JR/Spektrum: 1sNORM; Hitec: 1-Servo 90°). Connect the receiver to the Main Controller input servo ports.



Connect the cyclic servos and throttle servo or ESC (**NOT** the rudder servo) to the Ace One output servo ports using the diagram corresponding to your swash type.



Battery or BEC

Ace One uses the same power source as the servos and receiver; power to all electronics connected to the Main Controller can be supplied by either servo input or output ports on the Main Controller. Ace One operates with a power source between 4.8 to 8.4 volts DC. When choosing a power source, bear in mind that all servos and Ace One will use that same power source, thus please make sure the power source you use will also satisfy the servo requirements. A high capacity battery of 4000mAh or above is strongly advised, especially for an electric powered helicopter.



The power consumption for Ace One itself is 5W maximum (testing condition: 0.9A@5V).

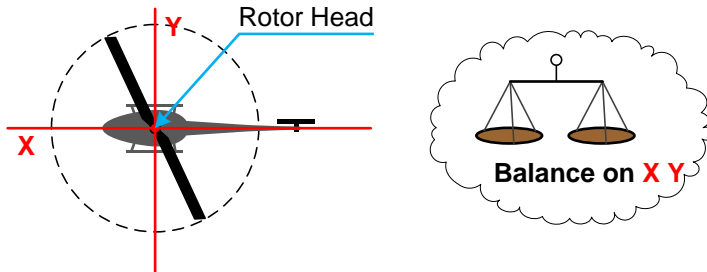
For some small scale helicopters, the BEC provided may not be able to supply enough overall power consumption, please replace with a higher performance BEC.

1.4. Find the Center of Gravity (C.G.)

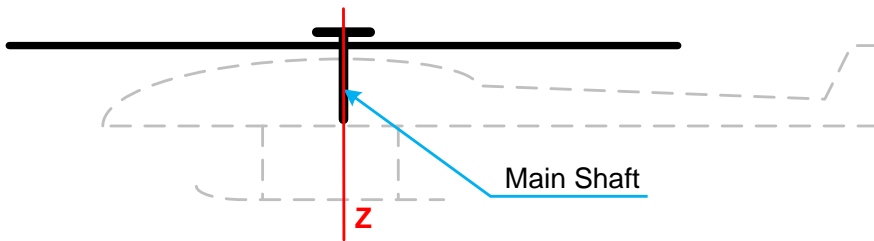
Install all payloads that will be used during the flight, including batteries, camera mount and camera. Balance the helicopter as you would normally, with the center of gravity directly on the main shaft.

You can use the following procedure to find C.G. for your helicopter.

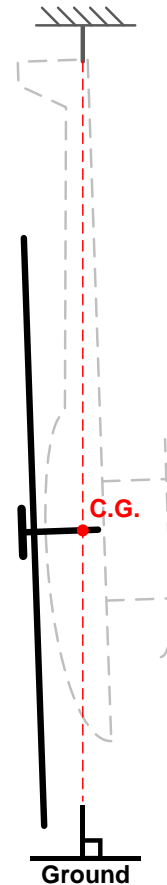
1 Adjust your helicopter, and make it balance on X and Y axle as shown below.



2 The C.G. should be on the extended line of helicopter main shaft.



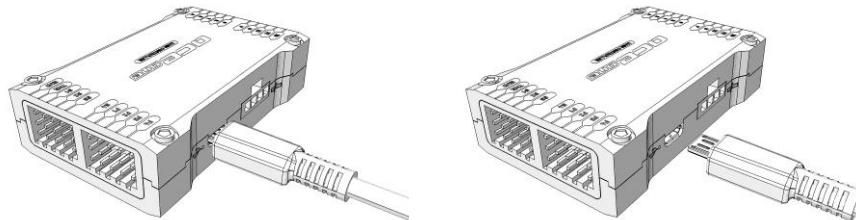
3 Hang the helicopter by the tail and use a plum line to find C.G. on Z axle.



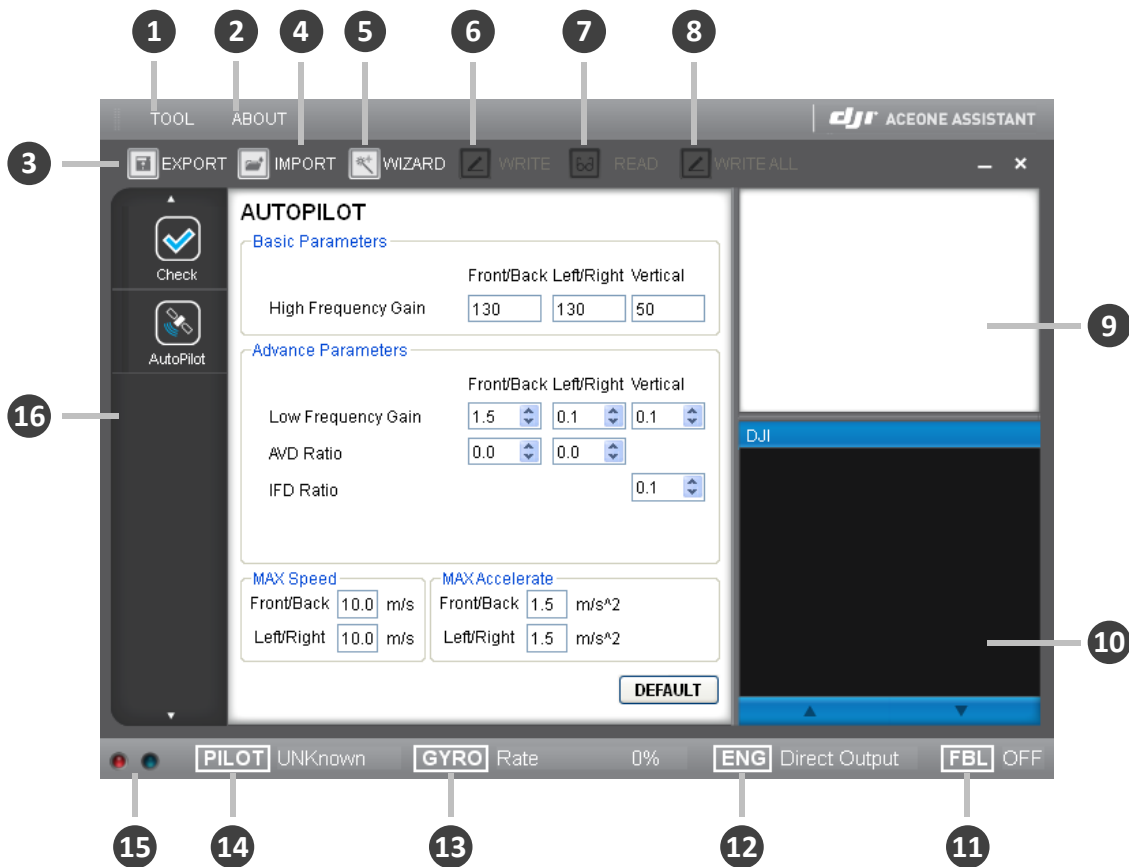
1.5. Software Setup

Please read Software & Driver Installation Guidance from product CD.

The micro-USB port is used to configure Ace One, read flight logs and update firmware.



Ace Assistant Software Basic Operation



1. TOOL

- Firmware upgrade: update your firmware from DJI server, keep your Ace One system up-to-date.
- Read flight log: Upon choosing this, Ace One main controller will become a mobile drive under **[My computer]** directory, and Ace Assistant will be closed automatically.

2. ABOUT

- Information regarding your Ace One

3. **Export:** export/save Ace One configurations in files.

4. **Import:** load previously saved Ace One configurations.

5. **Wizard:** a step-by-step guide for configuration procedures, please use the wizard for your first-time-configuration.

6. **Write:** write data of latest settings of the current page to your Ace One main controller. The parameter value or the title of which will appear as red and bold in font when modifications have been made, make sure you click the "Write" button to update your Ace One system.

7. **Read:** read parameters from Ace One main controller.

8. **Write all:** write latest settings and changes of all pages to your Ace One main controller.

9. **Graphic guidance**

10. **Text guidance**

11. **Flybarless function ON / OFF indication**

12. **Engine governor working mode indication**

13. **Tail gyro working mode & gyro sense indication**

14. **Autopilot working mode indication**

15. **Red light:** Ace One ↔ PC has been disconnected.

Green light: Ace One ↔ PC has been connected.

Blue light: Ace One ↔ PC communication.

16. Here you can find all the configuration pages the same as in the "Wizard".

Initial Configuration Flow

Helicopter Prepared.

Mounting, connection and wiring



Please read Hardware Installation and connection from **Page 7~10**

USE Ace One Assistant Software



Start Ace One Assistant. Click the Wizard button. You will find it in the **Product CD**.



Mounting Location Setup



You will be asked to check the center-of-gravity of the helicopter, Please refer to **Page 14** in this manual.



Ace Assistant → Wizard → STEP 1/8
or → Sensor Mounting



Control Mode Switch



You will be asked to adjust your transmitter for input port-U, and then you can switch the system working mode between **MANUAL / ATTITUDE / AUTO**. Please refer to **Page 15** in this manual.



Ace Assistant → Wizard → STEP 2/8
or → Tx Monitor



Flybarless

MANUAL MODE



Please select flybarless ON/OFF. You might need to adjust parameters during test flight. Please refer to **Page 16** in this manual.



Ace Assistant → Wizard → STEP 3/8
or → Flybarless



Swashplate setup

MANUAL MODE



Setup you swashplates, and check whether it is correctly responding to your transmitter commands (up/down, front/back, left/right), Please refer to **Page 16** in this manual.



Ace Assistant → Wizard → STEP 4/8
or → Swashplate



Tail Gyro setup

MANUAL MODE



To Check whether the rudder is correctly responding to your transmitter commands (rotating C.W. or rotating C.C.W.). You will need to make detailed settings later, before you fly the helicopter. Please refer to **Page 18** in this manual.



Ace Assistant → Wizard → STEP 5/8
or → Tail Gyro



Engine Supervisor setup

MANUAL MODE



Set the throttle servo working range if you are using gasoline/nitro engine. If you are using electric motor, select **<Direct Output>** Mode and ignore other settings. You will need to make detailed settings later, before you fly the helicopter. Please refer to **Page 20** in this manual.



Ace Assistant → Wizard → STEP 6/8
or → Engine



Tx Calibration



Four input channels: R, P, A, E settings are required in this step. Please refer to **Page 21** in this manual.



Ace Assistant → Wizard → STEP 7/8
or → Tx Monitor



SYSTEM CHECK

AUTO MODE



Check controller output and IMU mounting. Please refer to **Page 22** in this manual.



Ace Assistant → Wizard → STEP 8/8
or → SYSTEM CHECK



Digital Compass calibration



Slide the control mode switch on transmitter 10 times, and ACE ONE will enter the compass calibration mode. Please refer to **Page 24** in this manual.



Now, you are 3 more steps from ready to fly in **MANUAL MODE!!!**

- Adjust **Flybarless** parameters if you've enabled Flybarless, see **Page 16** for details.
- Adjust **Tail Gyro** sense, see **Page 19** for details.
- Adjust **Engine speed** if you are using Gasoline / Nitro engine, see **Page 21** for details.



For safety reasons, during configuration and system setup, please disconnect the power supply for Electric motor, or disconnect the ESC.

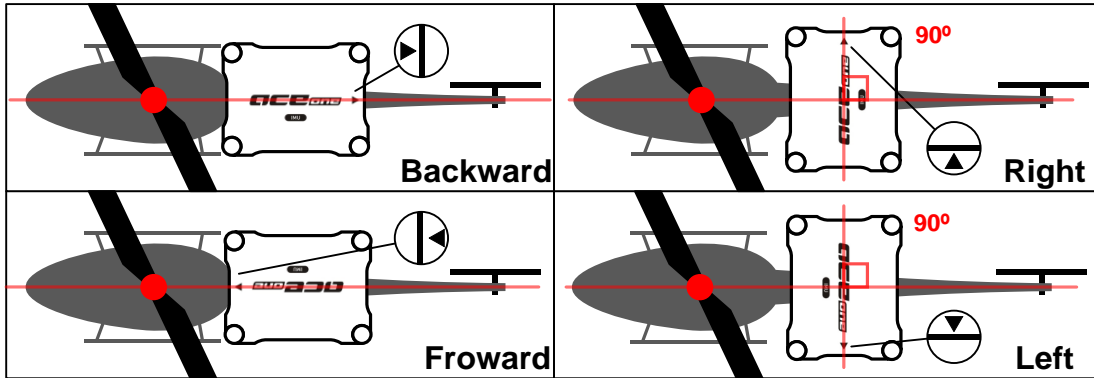
Functions Introduction & Configuration

3.1. GPS & IMU Mounting

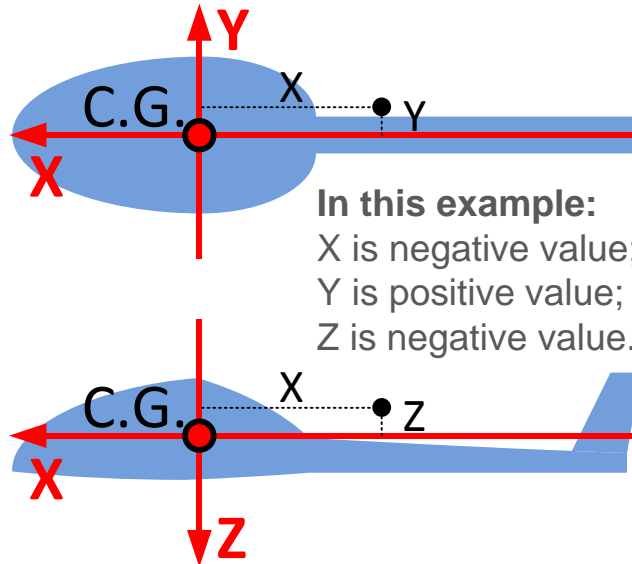


You have to fill in the following information in **Ace Assistant – SENSOR MOUNTING / Wizard STEP 2/9** for Ace One to work properly:

- **Select the IMU mounting direction**



- **Measure the distance between IMU and C.G. of helicopter in X, Y & Z axes:**
- **Measure the distance between GPS and C.G. of helicopter in X, Y & Z axes:**



In above diagram, X is negative value, Y is positive value and Z is negative value.

3.2. Control Mode Switch



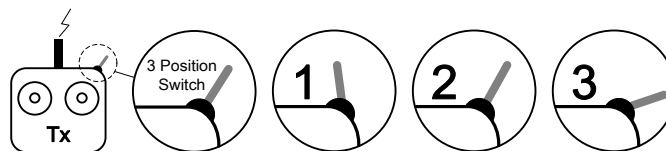
You have to adjust your transmitter and check it in **Ace Assistant – TX Monitor / Wizard STEP 3/9** for Ace One system to work properly:



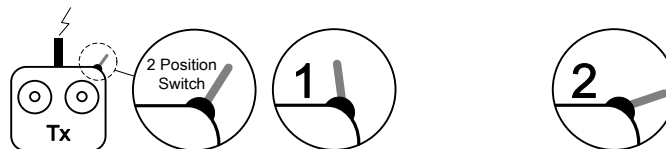
1. The transmitter you used must be Fail-Safe featured, which allows you to setup fixed outputs for all channels if the receiver loses signals from transmitter, otherwise Ace One will not enable the Enhanced Fail-Safe features. See **Page 26** for details.
2. Working mode for your transmitter should be HELICOPTER.
3. All the channels in your transmitter should be working independently: NO CCPM, NO channel MIX.
4. You need at least one 2 or 3-position switch on your transmitter to be set as the control mode switch.

Use sub-trim or end-point (+/-) fine tuning on your transmitter, move the slider of channel U to the specific range until Ace One Assistant indicates that it is in **AUTO** / **ATTITUDE** / **MANUAL** or **Fail-Safe** mode.

For 3 position switch: you can assign position 2 for **ATTITUDE MODE**, position 1 for **MANUAL MODE** and position 3 for **AUTO MODE**, or you can reverse the assignment for position 1 and position 3.



For 2 position switch: you can assign position 1 for **MANUAL MODE** & position 2 for **AUTO MODE**, or you can reverse the assignment for position 1 and position 2.



Set Fail-Safe output of receiver to input port-U, move the slider to the range which reads **Fail-Safe MODE**.
IMPORTANT. Ace One would not execute Fail-Safe protection if you don't set it properly. You can verify the Fail-Safe settings by shutting down your transmitter, and then you can use the following method to check whether Ace One was already in Fail-Safe mode.



You can check the current control mode of Ace One using either of the following methods:

- Check the Ace One Assistant status bar at the bottom side of the software interface.
- Check the LED indicators status on GPS/Compass module, see Appendix in this manual for details.

3.3. Main Function – Flybarless



DO NOT turn on the flybarless function for helicopters (two blades or above) with flybar, otherwise your helicopter will be out of control even in manual mode.



Once you changed the Flybarless to “ON”, the AILE and ELEV swash mix ratios in swashplate settings will be disabled, while [Direction Reverse] button will always be available for AILE and ELEV.
After you have set the Flybarless to “ON”, you have to adjust your swashplate parameters before setting your Flybarless control parameters.



1. You have to adjust flybarless function and test it in **MANUAL MODE** first.
 2. Don't try to use **ATTITUDE MODE** or **AUTO MODE** before you can fly your helicopter flybar-less without any problems.
- You might need to reduce the control gain of flybarless if you cannot make the helicopter stably hover or fly under **ATTITUDE MODE** or **AUTO MODE**.



Ace Assistant – Flybarless

Parameters/Buttons		Value	Description
Flybarless		ON / OFF	Select Flybarless ON if your helicopter has two blades and without fly-bar.
Gain	AILE (Cyclic Roll)	0 ~ 1000	<ul style="list-style-type: none"> ● Static Phenomenon First, Level your helicopter, adjust the rotor head and make the blades parallel with tail boom. Move your Pitch stick on TX to level the swashplate to 0° for collective pitch. Then, move your AILE stick on TX to its end position and measure the pitch angle, which should increase while the AILE gain increases. <hr/> <p>If you make the blades perpendicular with tail boom, and repeat the above procedures with ELEV stick pushed to its end position, you will find the pitch angle increasing with ELEV gain increasing.</p>
	ELEV (Cyclic Pitch)		<ul style="list-style-type: none"> ● Dynamic Phenomenon If these parameter values were set too large, you will find the helicopter oscillating in the corresponding direction. If the parameters values being too small, the helicopter will likely be out of control. ● How to adjust it? Adjust these two gain values according to static phenomenon. Adjust the maximum pitch angle to around 4°~6° for both AILE and ELEV direction as initial value. Fly your helicopter: <ol style="list-style-type: none"> 1. If it starts to vibrate even when hovering, reduce the parameter value. 2. If it starts to vibrate when you give a quick push on AILE and ELEV directions and then stop, reduce the parameter value. 3. If it doesn't vibrate in either the above two cases, you can try to increase the gain values until the helicopter tends to oscillate. This would give the best response performance for Ace One.
Reaction Rate	AILE (Cyclic Roll) ELEV (Cyclic Pitch)	0 ~ 1000	<ul style="list-style-type: none"> ● How to adjust it? Set the value depending on the hand feel you want. The helicopter response speed will be increasing as the value increases. It will also lead to helicopter vibration if the value is too large.

3.4. Swashplate



You have to set the transmitter to single-servo swash (Futaba: H-1; JR/Spektrum: 1sNORM; Hitec: 1-Servo 90°), and **Ace One** will do the CCPM instead. Please setup with **Ace Assistant – SWASHPLATE / Wizard STEP 4/9**, for Ace One system to work properly.

We provided the following options which are similar to most of the swashplate settings in transmitters:

- **Swash Type**



H1 / H3 / HR3 / H140 / HE3 / H4

Please make your selection according to your swashplate type.

- **Rotation**

The swashplate can be rotated in 360°, with 1° step increase or decrease. Once you have modified it, the graphic indicator for swashplate will also change.

- **Servo Direction, Trim and Current Output**



Click   button, you can reverse the working **Direction** of swashplate servos. Servo **Trim** is in range -100~100, with default value at 0. If the swashplate is not as level as you wish for, use it to fine-tuning them.

The **Current Output** can let you identify whether your swashplate servos are on their center position or not.



Please read your helicopter manual, and make sure the swashplate servo linkage and all the mechanical parts were correctly adjusted before you use the above electrical function for swashplate level adjusting.

- **Swash Mix**

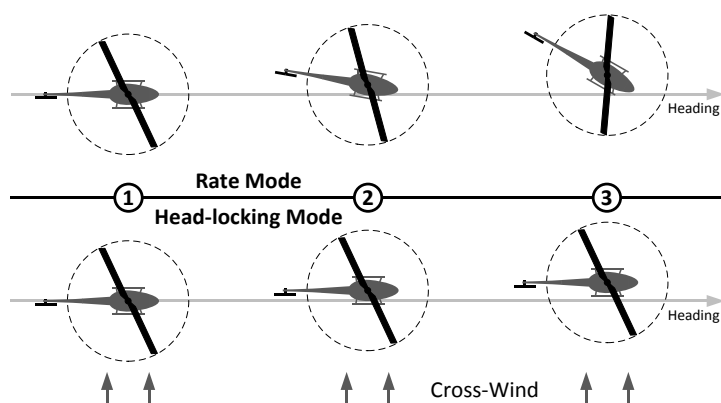
Click   button, you can reverse the moving direction for PITCH (Collective Pitch), AILE (Cyclic Roll) and ELEV (Cyclic Pitch). The Swash Mix ratio is 0~100%, which defines the maximum working range for PITCH (Collective Pitch), AILE (Cyclic Roll) and ELEV (Cyclic Pitch).



1. If you have enabled Flybarless function, then Swash Mix ratio settings for AILE (Cyclic Roll) and ELEV (Cyclic Pitch) will not be available, please read Flybarless setting for detail.
2. You should finish the setup for your swashplate in **MANUAL MODE**.

3.5. Main Function - Tail Gyro

The flying direction (YAW) of helicopter will be effect by cross wind. Ace One system can detect the drifting angle & Speed, and control the rudder servo to eliminate such influences. In the case of flying forward in cross-wind, Tail Gyro can work on two different modes as the example shown below.



This function requires configuration on (with) the following:



Ace Assistant – Tail Gyro

Parameters/Buttons	Value	Description
Rudder servo (RUD) direction	Reverse/Normal	
Servo Type	Analog (1520us@Receiver Speed) Digital-1520us (1520us@200Hz) Digital-760us (760us@500Hz)	<u>Digital-1520us Servo motor example:</u> Futaba S9253 / BLS254, JR 8900G / 3400G / 3500G, Align DS410 / DS510 / DS610 <u>Digital-760us Servo motor example:</u> Futaba S9251 / S9256
Servo Limit - A	-100 ~ 100	Mechanical travel range limit
Servo Limit - B	-100 ~ 100	



R/C Transmitter Setting – Tail Gyro

Related Input Channel	Operation Type	Description
R	Stick	Rudder command
G	Switch	1. Gyro working mode selection: Rate Mode / Head-Locking Mode 2. Gyro sensitivity setting, only on Head-Locking mode

1. Choose the rudder servo type

Please properly set your rudder servo type before you connect your tail-gyro servo to it, otherwise your servo might be damaged due to the incorrect servo type you chose.

2. Set servo working range limit

We have [**LimitA**] and [**LimitB**], which represent each side of the tail rotor pitch end point. The initial value for both is 70.

You can identify which side of the tail rotor pitch is represented by LimitA / LimitB like this:

1. Set one of them to 0, another to 50.
2. Move your rudder stick on your transmitter.
3. One side of the tail rotor pitch will not move.
4. This side should be related to the LimitA / LimitB whichever you are giving value 0 to.

Adjust these two limit value, make sure your rudder servo can work the full range for your tail rotor pitch, without any mechanical collisions. Otherwise, the performance of the tail-gyro could be affected.

3. Check the Rudder Servo working direction

Move your rudder stick, and check whether the tail rotor pitch is working in your expected direction. If not, click **[Reverse]** button.



You must also finish the SYSTEM CHECK procedure in later steps, before you fly your helicopter.
 You might find the Controller Output Check for tail rudder result in opposite rudder moving directions, click Reverse button to make corrections. Please see **Page 22** for details.

4. Mechanical Center Adjusting

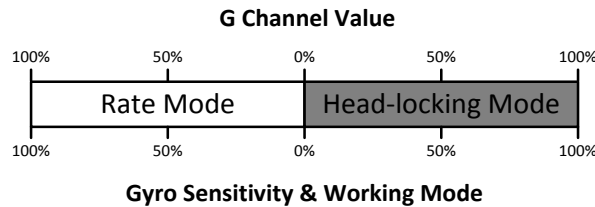
Switch your Tail-Gyro working mode to (Rate Mode), take-off your helicopter and hover. If your helicopter drifts obviously, then adjust your tail servo linkage until the helicopter stops drifting. Or you can use trim to fine-tune the rudder servo.



If you used trim during the Tail-Gyro working in Rate Mode, please power off the Ace One and re-start it before you wish to use Head-Locking Mode.

5. Gyro Sense setting

Set your gyro sense via transmitter, with the channel which you plug into input port-G on Ace One main controller. You can make a selection on Ace One Assistant, use either of the above ways for Tail Gyro Sense Setting.



You can identify the Tail-Gyro working mode on the status bar of Ace One Assistant.

We suggest that you set 70% at the beginning, and then slightly increase this value until the tail of helicopter starts vibration.

3.6. Main Function - Engine Governor



Before using governor control mode, adjust and fine tune your Gas/Nitro engine to a good working condition. Otherwise the performance of the system cannot be guaranteed.

This function requires configuration on (with) the following:

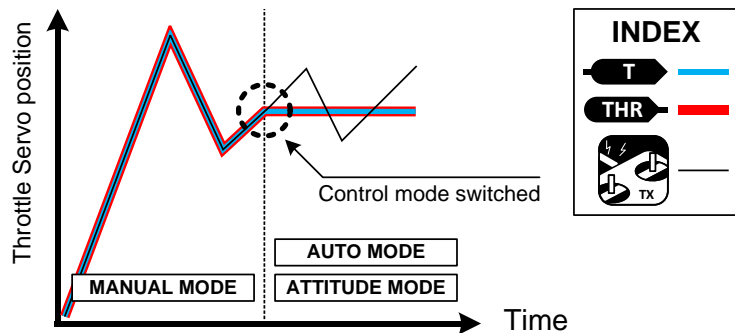


Ace Assistant – Engine

Parameters/Buttons		Value	Description
Operation mode		TX Control / Governor Control	<ul style="list-style-type: none"> Select [TX Control] for electric motor and ignore the rest of parameters. Select [Governor Control] for Gas/Nitro engine helicopter, perform the following setting procedure carefully.
SET-MAX	TEST	<single click>	
SET-IDEL	TEST	<single click>	
SET-STOP	TEST	<single click>	
Rotor RPM		800 ~ 2500	Main rotor RPM
Gear Ratio		1.0 ~ 20.0	Main Gear Ratio
Engine RPM		6000 ~ 25000	Read-only value, <i>Rotor RPM × Gear Ratio = Engine RPM</i>

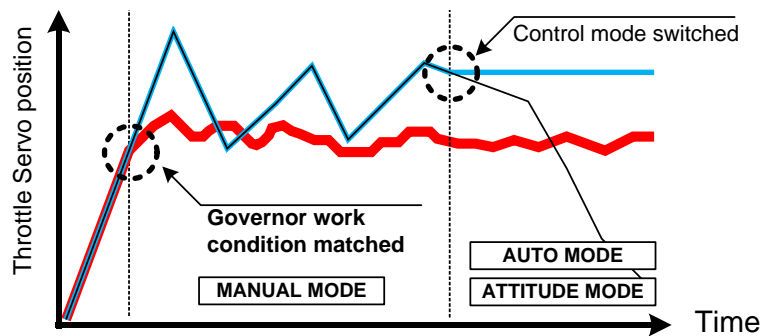
1. Operation mode

Tx control mode



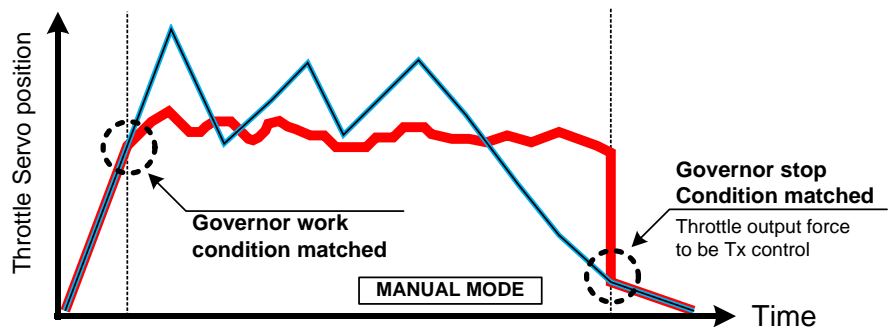
Governor Starts to work with **all** of the following conditions being satisfied:

- Throttle stick position was higher than 20% from cut-throttle position.
- Engine speed has been raised above 70% of the Engine RPM you set.
- Engine speed sensor works correctly.



Governor Stops working and forces the throttle to be under the Tx control with **any** of the following conditions being satisfied:

- Throttle stick position lower than 10% from cut-throttle position.
- Engine speed sensor lost or engine speed too low (< 3000 RPM)



2. Throttle working range SET & TEST

SET

- Move your throttle stick to maximum throttle open position, hold on and click **SET-MAX** button;
- Move your throttle stick to the throttle position when engine is working in idle, hold on and click **SET-IDLE** button;
- Move your throttle stick to cut throttle position, hold on and click **SET-STOP** button.

TEST

After three of the throttle positions being set, click **TEST** button above the **MAX / IDLE / STOP** buttons to review your throttle working range settings. Ace One system will force the throttle servo to stay on each respective position for about 2 seconds. Repeat the **SET** procedure if any of the positions were incorrect.



If you made logical mistake for this settings, e.g. **STOP** position being set between **MAX** and **IDEL**, you will be notified by **✘** (Wrong) or **○** (Correct). Engine governor will work in **[Tx Control]** mode automatically, if setting wrong.

3. Sensor mounting test

A third party engine speed sensor is required for the engine speed governor to function. We suggest using Futaba magnetic engine speed sensor. You have to adjust the sensor/magnet mounting, and leave a proper space between the sensor head and magnet. You can check this with the percentage bar at page "ENGINE", over 60% means the magnet is directly facing the sensor, and less than 2% means that the sensor is far from directly pointing at the magnet.



Only ONE magnet can be mounted on cooling fans of the engine.

4. Speed setting

Please read the user manual of your helicopter and engine, you will find the suitable main rotor speed (RPM) and also the main gear ratio. Write these two values into the software, and engine working speed will be calculated automatically.

3.7. R/C Transmitter Calibration



There are four command sticks that need calibrating:

- R** For rudder control
- P** For collective pitch or up/down
- E** For cyclic pitch or front/back
- A** For cyclic roll or left/right



- Click **[START]** button, and move all of the sticks throughout their complete range of motion several times.
- Click **[FINISH]** button when you finished above procedures.

3.8. SYSTEM CHECK

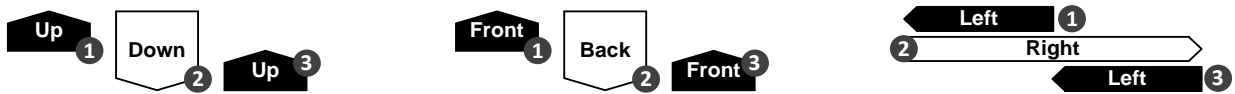
You have to run the system check in **Ace Assistant – SYSTEM CHECK / Wizard STEP 9/9** for Ace One system to work properly:

- **Controller Output Check**



Switch to **AUTO MODE** first.

1. Click **[START]** button, Ace One will drive the **swashplate** going up and down, representing helicopter’s movement during flight.
2. Click **[NEXT]** button, Ace One will drive the **swashplate** going front and back, representing helicopter’s movement during flight.
3. Click **[NEXT]** button, Ace One will drive the **swashplate** going left and right, representing helicopter’s movement during flight.



4. Click **[NEXT]** button, Ace One will drive the **rudder**, representing rotating C.C.W. and then C.W.



5. Click **[END]** button to finish the Controller Output Check.



If the swashplate or rudder moves in opposite sequence, you should click reverse button for correction.

- **IMU Feedback Check**



Switch to **AUTO MODE** first.

1. Click **[CHECK]** button.
2. Tilt the tail boom of the helicopter, the swashplate should respond to the opposite direction.
3. Tilt the helicopter body on its roll direction, the swashplate should also respond to the opposite direction.
4. Switch to **MANUAL MODE** and finish the IMU Feedback Check.



If your helicopter was not responding as described above, you may be placing you IMU in a wrong orientation, or you’ve select a wrong orientation direction for your IMU in Ace Assistant. Please check Sensor Mounting again.

- **Battery Performance Test**



- 1 Switch to **AUTO MODE** first.
- 2 Make sure that your battery has at least 80% capacity left from being fully charged.

1. Click **[START]** button, Ace one will force all the servos you connected and LEDs working at maximum payload, which will behave as shaking swashplate and rudder. This will continue for 20 seconds and then stop automatically, you can force the stop by clicking **[STOP]** button, or switch to **MANUAL MODE**.
2. Ace Assistant will inform you the test result (LEDs on GPS will also blinking in yellow if failed condition was matched):



Test failed, which means voltage drop below 3.5 volts, the battery might not be able to provide necessary current for

your helicopter and Ace One, please change it. Test passed.

3.9. Main Function - Autopilot

This function requires configuration on (with) the following:








Ace Assistant – Autopilot

Parameters/Buttons		Value	Description
High Frequency Gain	Front/Back	1 ~ 1000	High frequency Gain (Basic) If these parameter values were set too large, you will find the helicopter oscillating (attitude) in the corresponding direction. If the parameters values being too small, the helicopter will likely be out of control.
	Left/Right	1 ~ 1000	
	Vertical	1 ~ 100	
Low Frequency Gain	Front/Back	0.1 ~ 2.0	Low frequency Gain (Advance) If these parameter values were set too large, you will find the helicopter shaking slowly in the corresponding direction.
	Left/Right	0.1 ~ 2.0	
	Vertical	0.1 ~ 5.0	
AVD - Ratio	Front/Back	0.0 ~ 1000.0	Angular velocity dumping ratio (Advance)
	Left/Right	0.0 ~ 1000.0	
IFD - Ratio	Vertical	0.1 ~ 50.0	Interference dumping ratio (Advance)
MAX Speed (m/s)	Front/Back	1.0 ~ 20.0	The maximum speed
	Left/Right	1.0 ~ 20.0	
MAX Acc (m/s ²)	Front/Back	0.5 ~ 3.0	The maximum acceleration
	Left/Right	0.5 ~ 3.0	



R/C Transmitter Setting –Autopilot

Related Channel	Operation Type	Description	
 U	Switch	Control Mode Switch (Three positions): MANUAL / ATTITUDE / AUTO Mode.	
 P	Stick	Vertical (Up/Down) command from Tx	They are all speed commands once you switched to ATTITUDE / AUTO . When all sticks released or staying at center position, speed commands for all directions are zero, and the helicopter will stay hovering.
 E	Stick	Front/Back command from Tx	
 A	Stick	Left/Right command from Tx	
 R	Stick	Rudder command from Tx	

Flight

4.1. Digital Compass Calibration

Why calibrate the compass?

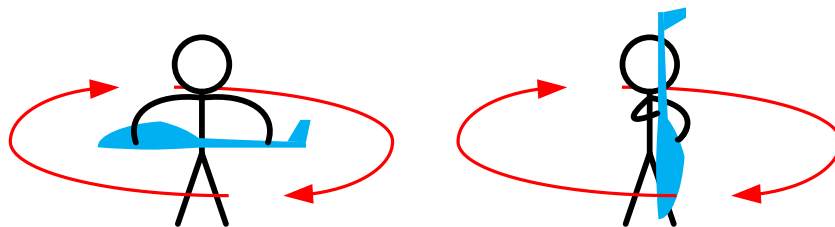
Ferromagnetic substances placed on helicopter or around its working environment will affect the reading of earth magnetic for digital compass, and in turn reduce the accuracy for the helicopter control, or even give errors. Calibration technology can eliminate such influences, and ensure that the Ace One system performs well in a non-ideal magnetic environment.

When to do it?

1. The first time you install Ace One on your helicopter.
 2. When the helicopter mechanical setup is changed:
 - a) When the GPS/Compass module is re-positioned.
 - b) When electronics are added/removed/re-positioned (Main Controller, servos, batteries, etc).
 - c) When the mechanical structure of the helicopter is changed.
 3. If the flight direction appears to be shifting (meaning the helicopter doesn't "fly straight").
 4. The LED indicator often indicates attitude error when the helicopter yaws. (It is normal for this to happen only occasionally.)
-

Calibration procedure:

1. Enter calibration mode: quickly slide the control mode switch from auto mode to manual mode for 10 times, and LED indicator will be constantly on in blue;
2. Calibration in horizontal: rotate you helicopter along with the horizontal surface until the green light is constantly on, then go to the next step;
3. Calibration in vertical: while green light is constantly on, hold your helicopter vertically and rotate it along with its vertical surface, keep rotating until the green light is off, meaning the calibration is finished.



4. After you finished the calibration, LED indicator will show whether the calibration was successful or not:
 - If white light turns on for 3 seconds, calibration succeeds;
 - If red light keeps blinking quickly, the calibration has failed. Slide the control mode switch one time to cancel current calibration, and then re-start from step 1 for re-calibration.



If you keep having calibration failure, it might suggest that there is very strong magnetic interference around the GPS & Compass module, please check.



1. Don't calibrate your compass where there is strong magnetic interference, such as magnetite, car park, and steel reinforcement under the ground.
2. DO NOT carry ferromagnetic materials with you during calibration, such as keys or cell phones.
3. You don't need to rotate your helicopter on a precise horizontal or vertical surface, but keep at least 45° difference between horizontal and vertical calibration.
4. Ace One system cannot be work in the polar circle.

4.2. MANUAL MODE Test Flight



When the system is powered on, DO NOT move your helicopter or sticks on transmitter until the system initialization is finished (about 5 seconds).

1. Check all the connection and wiring, and make sure they are in good condition.
2. Make sure your batteries are fully charged, for your transmitter, Ace One and all the devices on your helicopter.
3. Turn on the transmitter first,
4. Power on the Ace One and all the rest of electric device on helicopter, except brushless motor controller.
5. Check the LED indicator on GPS/Compass module, if red LED sparks quickly, then system start-up has failed. You have to place you helicopter horizontally and power on again. See Appendix for details about LED indicator.
6. Slide the control mode switch on your transmitter to make sure it is working properly. Check with LED indicator to specify the current working mode for Ace One. See Appendix for details about LED indicator.
7. Others system failure and error will also be displayed by LED indicator on GPS/Compass module, See Appendix for details.
8. If everything checked, and without any problems, switch the system to **MANUAL MODE**, and start the engine or power on the brushless motor controller.
9. Take-off and fly your helicopter in **MANUAL MODE**.



1. Fly the helicopter. Trim transmitter such that the helicopter hovers stably.
2. You have to adjust the following parameters to achieve the best performance of your helicopter.
 - **Flybarless** parameters if you've enabled Flybarless, see **Page 16** for details.
 - **Tail Gyro** sense, see **Page 19** for details.
 - **Engine speed** if you are using Gasoline / Nitro engine, see **Page 21** for details.
3. Adjust Pitch curve on transmitter, so that the helicopter hovers at about mid-stick.
4. Set correct fail safe output on all channels of your R/C Transmitter/Receiver.
5. Verify Fail safe settings on status bar in Ace One Assistant. IMPORTANT!



Don't switch to **AUTO MODE** during **MANUAL MODE Test Flight**.
Go through this section first, and read about how to do **AUTO MODE Test Flight** on **Page 27**.



The Enhanced Fail-Safe (Auto Hovering and Auto Go-Home) has not been activated yet,
Go through this section first and read about how to activate it on **Page 26**.

4.3. Enhanced Fail-Safe



This function will be activated by on-line firmware upgrade on JAN-FEB 2011.



The Enhanced Fail-Safe (Auto Hovering and Auto Go-Home) will not be activated, until you've correctly Pre-set Transmitter Command Stick Center Position.



The Enhanced Fail-Safe functions will not be working correctly if you have not been finished the **AUTO MODE Test Flight**. Please see **AUTO MODE Test Flight** on **Page 27** for details.

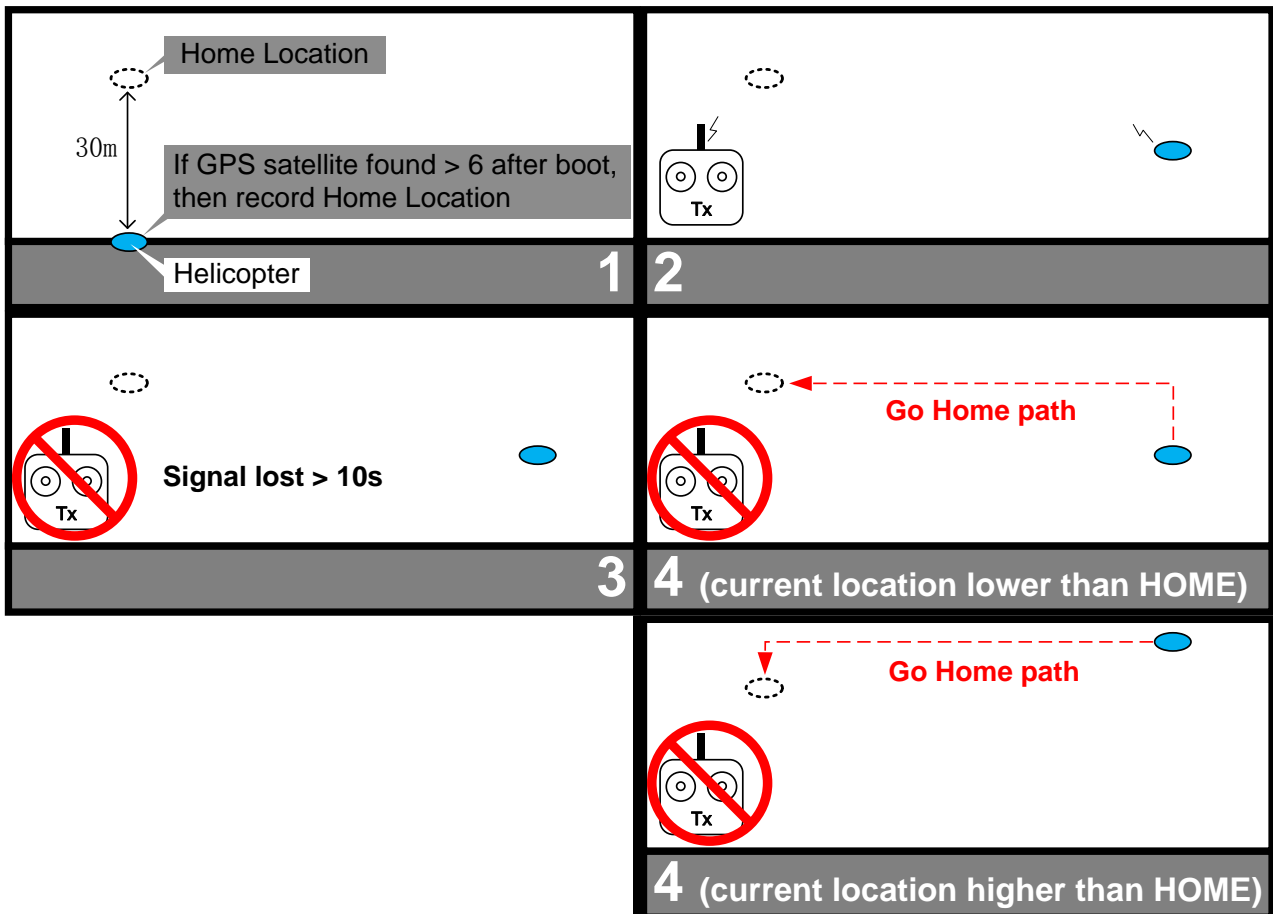
Ace One can detect the fail safe output from your receiver, if you have pre-set fail safe output to input port-U correctly. Once your helicopter lost control from the transmitter, Enhanced Fail-Safe function will control the helicopter automatically and save it in most of the conditions.

Automatic Hovering /Go-Home

Go Home feature is only available if you've correctly finished the transmitter center position Pre-set.

You can select Auto Hovering or Auto Go-Home as Enhanced Fail-Safe protection.

The auto Go-Home procedure is described in the following diagrams.



If GPS signal reception is bad, Auto Go-Home function will not be working, even it was activated in Ace Assistant, during which case the Auto hovering function will be force to activate instead.

4.4. AUTO MODE Test Flight



When system is powered on, you must not move your helicopter or sticks on transmitter until the system initialization is finished (about 5 second).



Please read this section before you switched to **AUTO MODE** & **ATTITUDE MODE**

1. Make sure you have already adjust
2. Make sure the GPS signal is good, without red LED blinking.
Please avoid using Ace One system in the following areas, where will GPS signal is most likely blocked:
 - Urban area with crowded buildings
 - Tunnels
 - Under bridges
3. Make sure the attitude of helicopter is in good condition, without white LED blinking.

1. Check all connections and wirings, and make sure they are in good condition.
2. Make sure your batteries are fully charged, for your transmitter, Ace One and all the devices on your helicopter.
3. Turn on the transmitter first.
4. Power on the Ace One and all the rest of electric device on helicopter, except brushless motor controller.
5. Check the LED indicator on GPS/Compass module, if red LED sparks quickly, the system start-up has failed.
You will need to place you helicopter horizontally and power on again. See Appendix for details about LED indicator.
6. You may find red LED blinking, indicating that Ace One is getting GPS satellite signal, please wait until red LED is off, meaning Ace One have found more than 7 GPS satellites, and that it can work in its best condition. See Appendix for details about LED indicator.
7. Slide the control mode switch on your transmitter to make sure it is working properly. Check it with LED indicator to specify the current working mode for Ace One. See Appendix for details about LED indicator.
8. Switch the system to **AUTO MODE**, if the swashplate is not horizontal, please go back to 3rd step, and restart the system.
9. Switch the system to **MANUAL MODE**, move all the sticks on your transmitter to check whether the helicopter is correctly responding to your commands.
10. Others system failures and errors will also be display by LED indicator on GPS/Compass module, See Appendix for details.
11. If everything checked, and without any problems, switch the system to **MANUAL MODE** and start the engine or power on the brushless motor controller.
12. Take-off and fly your helicopter in **MANUAL MODE**.
13. Hover your helicopter, and switch to **AUTO MODE**.

Maintains

Flight Log Reading

Notice: You may be asked to provide your Ace One Flight Log for customer support.

1. Click **[TOOL]** → **[Read Flight Log]**.
2. Click **[OK]**.
3. Ace One Assistant Software will be closed automatically and Ace One Main controller will be working as a mobile drive named **[ACEONE LOG]**, you can find it in **[My Computer]** directory.
4. Open it and you can find your flight log files there. Copy or delete as you do normal PC operations.
5. Please power cycle Ace One for exit from Flight Log reading mode.



You have 4GB memory space for Ace One flight log recording.

If the memory is out of space, Ace One will stop flight log recording and format all the information after power cycle the main controller.

Firmware Upgrade

Please strictly follow the operation procedure for firmware upgrade, otherwise Ace One might not work properly:

1. Make sure your computer is connected to the Internet.
2. Please close all the other applications during the firmware upgrade, including Anti-virus software and firewall.
3. Make sure the power supply is securely connected with Ace One. DO NOT un-plug the power supply until firmware upgrade has finished.
4. Connect Ace One main controller to PC with micro-USB cable, DO NOT break connection until firmware upgrade is finished.
5. Open Ace Assistant Software and wait for connection.
6. Select **[TOOL]** → **[Firmware Upgrade]**.
7. DJI server will check your current firmware version, and get the latest firmware prepared for Ace Assistant.
8. If there is a firmware version more up-to-date than your current version, you will be able to click the upgrade button.
9. Wait until Ace Assistant reads "Finished".
10. Please power cycle Ace One after at least 5 seconds.
11. Your Ace One is up-to-date now.



- If it is notified that the network or DJI server is busy, please try again later with above procedures.
- If firmware upgrade failed, the Ace One will enter **<waiting for firmware upgrade status>** automatically, please try again with the above procedures.

Product Info

You can check the Ace One product version via **[ABOUT]** → **[Info]**.

- Software version
- Firmware version
- IMU version
- Hardware ID

[S/N] is a 32 digits authorization code for Ace One function activations. We had already filled in the authorization code for your Ace One after manufacture. You might be asking to fill in the new **[S/N]** in the future if you brought new function upgrades.

Fill-in the **[S/N]** and then click **[Write]** button,



If you filled in the invalid S/N over 30 times, your Ace One will be locked and you have to contact our customer support.

Appendix

LED Indicator description

Flight Status: Manual Mode	
GPS satellites found < 5	
GPS satellites found < 6	
GPS satellites found < 7	
Attitude & GPS good	*All OFF
Attitude status fair	
Attitude status bad	
Flight Status: Attitude Mode	
GPS satellites found < 5	
GPS satellites found < 6	
GPS satellites found < 7	
Attitude & GPS good	
Attitude status fair	
Attitude status bad	
Flight Status Auto Mode	
GPS satellites found < 5	
GPS satellites found < 6	
GPS satellites found < 7	
Attitude & GPS good	
Attitude status fair	
Attitude status bad	
	0 — 1 — 2 — 3 → sec
Compass Calibration Status	
Begin horizontal calibration	
Begin vertical calibration	
Calibration finished	*3s only
Calibration error	
	0 — 1 — 2 — 3 → sec
System Checking Mode	
Right-LED	
Left-LED	
Low Voltage Warning	
< 4.4V	
Start-up Errors	
	0 — 1 — 2 — 3 → sec



1. The circle symbols above represent one blink each.
2. The rectangular symbols above represent an LED being solid on.
3. Both LEDs operate simultaneously except when the system is powered on, as indicated by .

Product Specifications

Electromechanical

Built-In Functions:	Autopilot Tail Gyro Engine Governor Fly barless Return-to-Home Fail Safe
Helicopter Types:	Electric and internal combustion powered
Supported Swashplate Types:	Normal, Three Servo 120°/140°/90°, Four Servo 90°
Supported Servo output:	500Hz (760us) /200Hz (1520us) for Rudder Channel; (Others follow on your receiver output)
Recommended Transmitter:	PCM or 2.4GHz with minimum 7 channels and Failsafe function available on all channels
Recommended Power Supply:	DC 4.5~8.4V (Not to exceed MAX operating voltage of servo motor) > 4000 mAh capacity, Discharge current more than 5C
Power Consumption:	MAX 5W (0.9A@5V, 0.7A@5.8V, 0.5A@7.4V, 0.4A@8V)
Operating Temperature:	-20°C to +70°C
Memory:	4GB Flash Memory for flight information recording

Flight Performance (can be effect by mechanical performance)

Hovering Accuracy:	Vertical : ± 0.5m Horizontal : ± 1m
Suitable Wind Condition:	< 8m/s (17.7mph)
Forward / Backward Speed:	± 72 Km/h (44.74mph)
Left / Right Speed:	± 56.7 Km/h (35.77mph)

Packaging & Shapes

Total Weight:	<= 150g
Dimensions:	Main Controller: 61mm x 39.6mm x 15.8mm IMU: 40mm x 31mm x 26mm GPS & Compass: 50mm (diameter) x 9mm