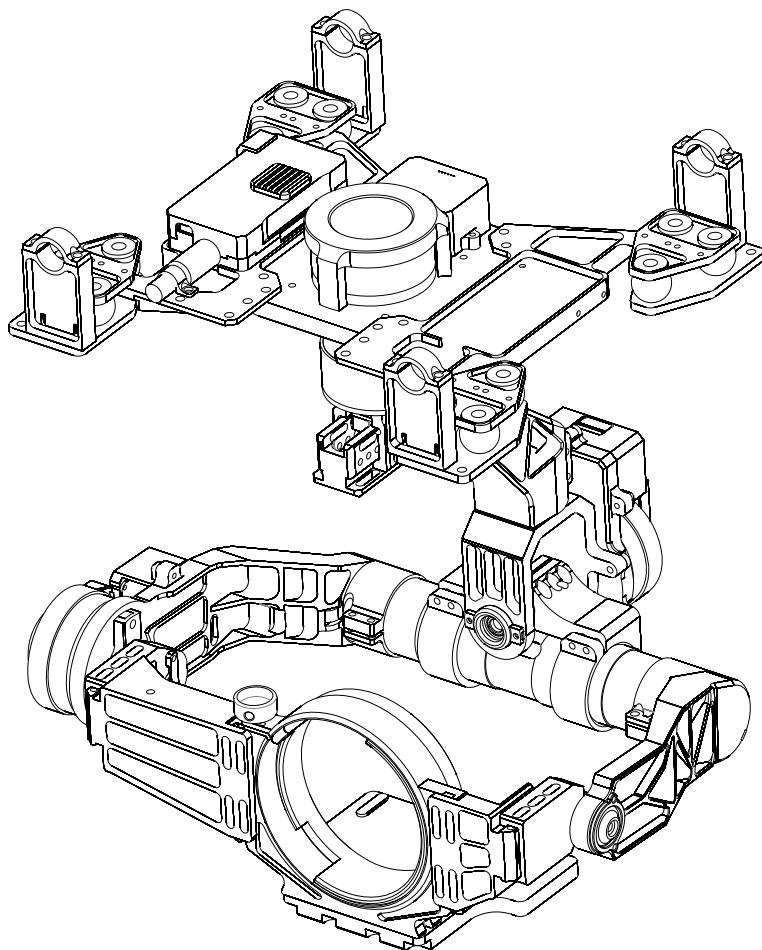


Zenmuse Z15-5D

User Manual

V1.02

December 26, 2013 Version



www.dji.com

Warning & Disclaimer

No further adjustment or changes are permitted to the Z15.

The Z15 is specifically adjusted to support the Camera and Lens before leaving the factory. Please mount your camera directly to the Z15 when installing as no further adjustment or changes are necessary or permitted. Do not modify or add any other component/device (such as a filter, lens hood, etc.) to the camera; make sure to use the original battery; Failure to follow these guidelines may result in decreased performance or internal malfunction.

The Z15 is only compatible with a flight control system specified by DJI Innovations (**A2/Ace One/Ace WayPoint/WooKong M**). To ensure highest stability and precision, download the corresponding assistant software and upgrade the flight control system MC firmware. Failure to do so may result in the Z15 working abnormally.

Make sure the flight control system is operated in the safest possible environment when the main power battery is connected. We strongly recommend users remove all propellers, DO NOT use power supply from R/C system or flight pack battery, and keep children away during gimbal calibration and parameter setup. Please follow the guidelines in order to correctly mount and connect gimbal to your aircraft, as well as to install the assistant software on your computer. Please respect the AMA’s National Model Aircraft Safety Code.

As DJI Innovations has no control over use, setup, final assembly, modification (including use of non-specified DJI parts i.e. motors, ESCs, propellers, etc.) or misuse, no liability shall be assumed nor accepted for any resulting damage or injury. By the act of use, setup or assembly, the user accepts all resulting liability. DJI assumes no liability for damage(s) or injuries incurred directly or indirectly from the use of this product.

DJI and Zenmuse are registered trademarks of DJI Innovations Names of product, brand, etc., appearing in this manual are trademarks or registered trademarks of their respective owner companies. This product and manual are copyrighted by DJI Innovations 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 DJI Innovations. No patent liability is assumed with respect to the use of the product or information contained herein.

Firmware versions of supported DJI Flight control systems

Flight control systems	Ace One	Ace WayPoint	WooKong M	A2
Firmware version of MC	V4.02	V4.02	V5.26	V2.0

Specified Camera and Lens Type

Z15-5D Mark II

Camera	Canon 5D Mark II
Lens	Canon EF 24mm f/2.8 IS USM

Z15-5D Mark III

Camera	Canon 5D Mark III
Lens	Canon EF 24mm f/2.8 IS USM

Product Profile

Z15 is an excellent gimbal designed for Aerial Photography. It has built-in slip rings within the mechanical structure, preventing the wire rod from entangling. The gimbal has an integrated independent IMU module, a special servos drive module, etc., which are dedicated to provide excellent performance in any working modes, including Orientation-locked control, Non orientation-locked control and FPV Mode (Reset).

Working Mode			
	Orientation-locked Mode	Non orientation-locked Mode	FPV Mode (Reset)
Gimbal Point	Gimbal point stays locked with aircraft nose direction	Gimbal point stays unchanged when aircraft nose direction changes.	Gimbal point stays the same as aircraft nose direction when powered up
Gimbal and Aircraft Nose Relative Angle	Gimbal point keeps the same relative angle with the aircraft nose direction	Relative angle between the gimbal point and aircraft nose direction may change	Zero relative angle between the gimbal point and aircraft nose
TX Control	Controlled	Controlled	Not controlled
Attitude stability	YES	YES	YES
Vibration Reduction	YES	YES	YES
Stick Meaning	Command stick stands for gimbal rotation velocity , Stick center position is for 0 , its endpoint is maximum velocity.	Command stick stands for gimbal rotation velocity , Stick center position is for 0 , its endpoint is maximum velocity.	---
Command Linearity	YES	YES	---

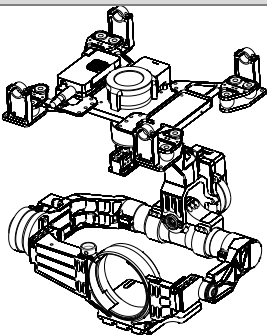

Note1: ‘Gimbal point’ refers to the *gimbal PAN rotation direction*.

Note2: ‘Attitude stability’ means the *gimbal’s ROLL/TILT will not follow the aircraft’s ROLL/PITCH*.

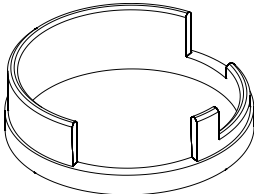

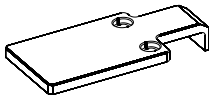

Note3: ‘Gimbal rotating maximum velocity’ is corresponding to the *TX 100% end-point*.

In Box

Gimbal & Gimbal Controller Unit (GCU)

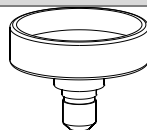
Gimbal × 1	
<p>The Z15 gimbal has built-in slip rings within the mechanical structure, which work to prevent the wire rod from entangling and enables rotational freedom for the 3 axes rotating rods.</p> <p>The gimbal has special built-in Z15 gimbal servo drive modules and independent IMU module.</p>	
Gimbal Controller Unit (GCU) × 1	
<p>Connect the gimbal controller unit to the flight control system with a CAN-Bus cable. The GCU will control the gimbal's PAN, ROLL and TILT axes rotation.</p>	

Main Parts Package

Lens Retaining Ring × 1	
<p>For fixing the camera lens.</p>	
Mounting Bracket × 4	
<p>For the gimbal and landing gear connection.</p>	
Mounting Board for Receiver × 1	
<p>For fixing the GCU and providing the mounting position for the receiver or other device.</p>	
Cable Clamp	
<p>For tidying the cables on gimbal.</p>	

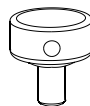
Camera Mount Screw × 1

For the camera mount.



Lens Retaining Ring Screw × 1

For fixing the lens retaining ring to the gimbal.



Screws and Cables Package

Screws Package

For mounting the gimbal to the aircraft (M2.5*8 Head-cup screw).



8-pin Cable

Connect the GCU and Gimbal use the 8-pin cable.



Gimbal Video Signal Cable × 1

For connecting the GCU and Wireless Video Transmission Unit, transmitting the AV signal.



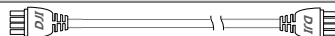
Micro-USB Cable × 1

For the parameter configurations and firmware upgrade via Assistant Software on PC.



CAN-Bus Cable × 1

The GCU communicates with the flight control unit via a CAN-Bus.



Spares Pack

Spares Pack × 1

Damping units, Spare Screw, and Mounting Bracket.

Contents

WARNING & DISCLAIMER2

PRODUCT PROFILE.....3

IN BOX.....4

CONTENTS6

GIMBAL DESCRIPTION7

CAMERA SETUP9

MOUNT11

CAMERA WIRING/SHUTTER CONTROL13

VIDEO SIGNAL TRANSMISSION14

GCU CONNECTION15

WORKING MODES/AUX2/AUX3 SWITCH SETUP17

ASSISTANT SOFTWARE.....18

TEST18

APPENDIX.....20

IMPORTANT NOTES.....20

PORT DESCRIPTION.....21

GIMBAL LED INDICATOR.....21

TROUBLE SHOOTING22

SPECIFICATIONS.....23

The Gimbal Description

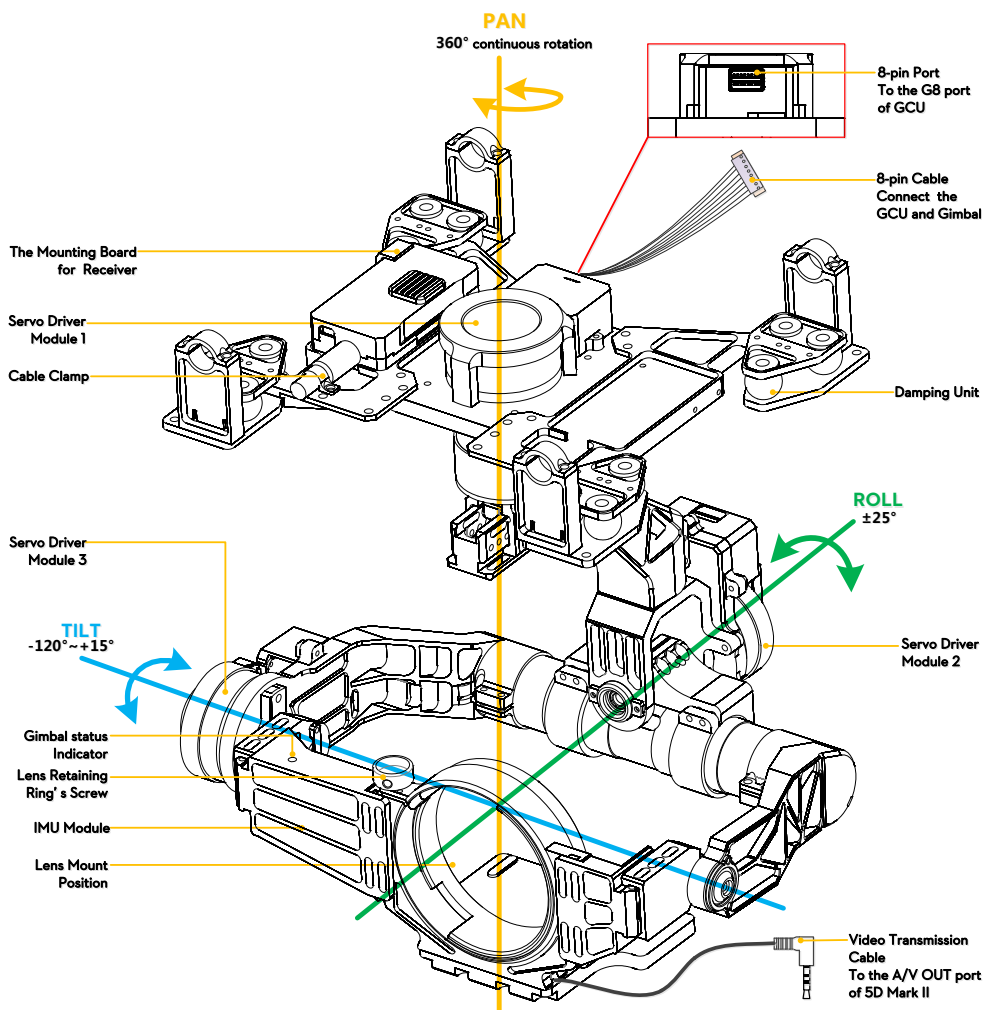
Notes:

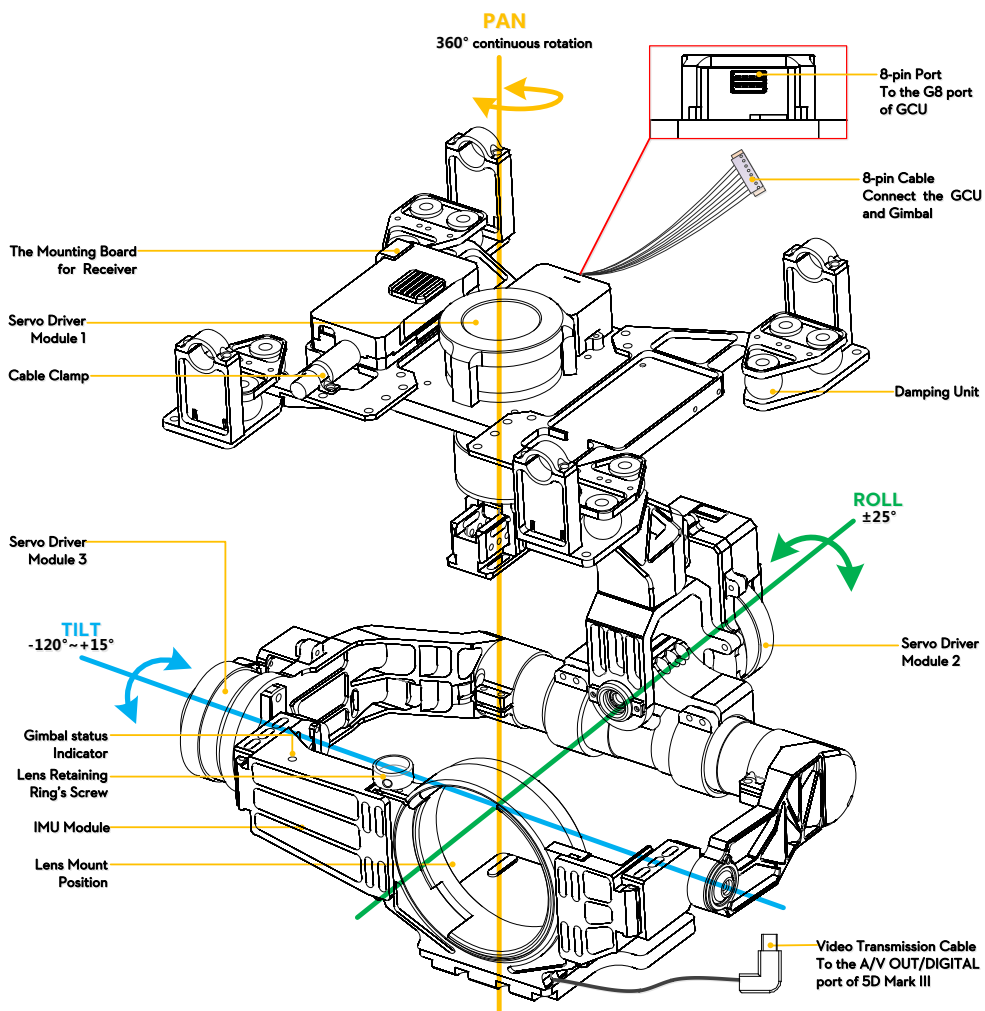
- Make sure nothing blocks the servo driver module rotation to avoid motor damage.
- Clear the obstacles at once if the rotating gimbal is blocked.
- No mechanical and electrical adjustment or change is permitted.

Tips:

- Each servo driver module has two G8 ports, which are used to transmit servo and video signals.

Z15-5D MARK II

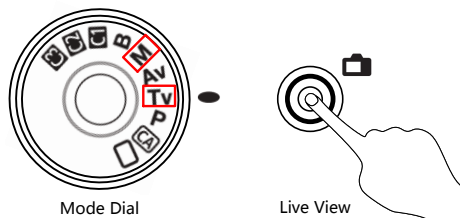




The Camera Setup

Configure your camera by the following settings to meet the requirements of Z15 and make sure to read the related content according to your camera.

Canon 5D Mark II

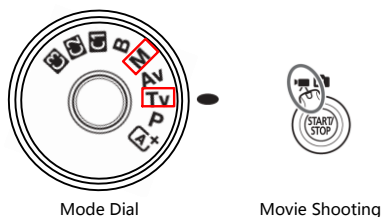


- Turn the Mode Dial to set the shooting mode to *Shutter-priority AE (Tv)* or *Manual exposure (M)*.
- Press down the *Live View/shooting/Print/Share* (camera icon / print icon) button.
- Press the **AF.DRIVE** button, select the drive mode as (10-sec.self-timer/Remote control) or (2-sec.self-timer/Remote control).
- Turn the Image Stabilizer switch, which is located on the lens, to *OFF*.
- It is recommended to adjust the shutter speed to within 1/100sec to 1/30sec. If shooting mode is set to Manual exposure, please adjust the aperture properly and set the ISO speed to **A** (Auto).

Tips:

- In the Menu settings, the values in red italic font are strongly recommended. Failure to follow the recommended settings may results in shaky or poor footage/image quality.

Canon 5D Mark III



- Turn the Mode Dial to set the shooting mode to *Shutter-priority AE (Tv)* or *Manual exposure (M)*.
- Turn the Live View shooting/Movie shooting switch (camera icon / movie icon) to the *Movie shooting* position.
- Press the **AF.DRIVE** button and select the drive mode as (10-sec.self-timer/Remote control) or (2-sec.self-timer/Remote control).
- Turn the Image Stabilizer switch, located on the lens, to *OFF*.
- It is recommended to adjust the shutter speed within 1/100sec to 1/30sec. If shooting mode is Manual

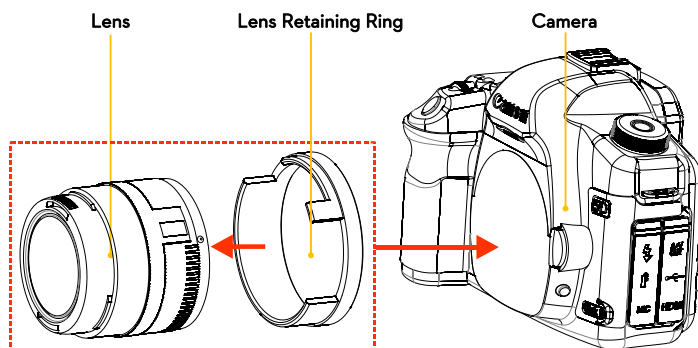
exposure, please adjust the aperture properly and set the ISO speed to **A** (Auto).

Tips:

- In the Menu settings, the values in red italic font are strongly recommended. Failure to follow the recommended settings may results in shakey or poor footage/image quality.
- The use of an SD card is preferred, as a CF card may effect the balance performance of the gimbal and lead to shakey or poor footage/image quality.

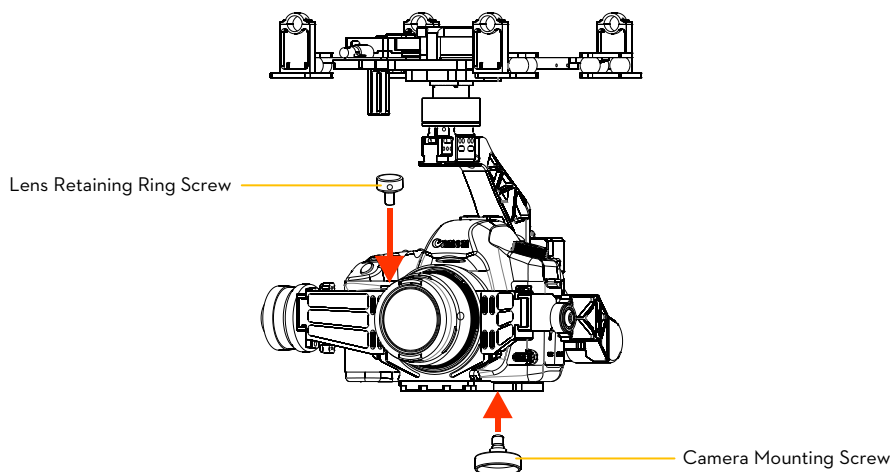
The Mounting

Mounting the Lens



Step 1: Mount the lens on the retaining ring first, before mounting the lens to the camera.

Mounting the Camera onto the Gimbal

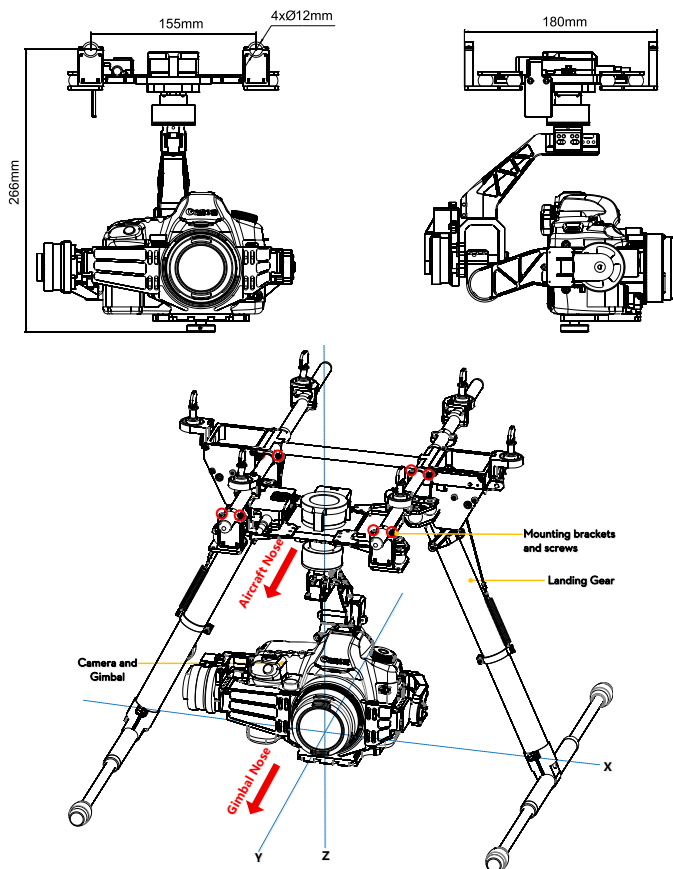


Step2: Mount the camera into the gimbal. Tighten the Camera Mounting Screw first then tighten the Lens Retaining Ring Screw.

Note: Take care when pushing the lens into the lens mount position; too much force may damage the lens.

Mounting the Gimbal to the Landing Gear

Please adhere to the dimensions of the gimbal shown below to mount the gimbal to a proper Landing Gear using the mounting brackets (4) and M2.5*8 screws (8).



Step3: Attach the gimbal to the landing gear then tighten the thread locking screws.

Notes:

- Ensure that the correct side of the servo driver module 1 faces the direction of the aircraft tail.
- Make sure the top and bottom plates of the dampening unit remain parallel when mounting in order to prevent the damping unit from being stretched or distorted.
- Keep overall balance when mounting, in order to ensure the center of gravity on the Z axis.
- The gimbal center of gravity has already been set, which directly determines the gimbal's performance. Please do not adjust the gimbal center of gravity by yourself.
- The gimbal is a high-precision controlled instrument. Do not remove any screws in the gimbal. Doing so may result in decreased performance or even damage.
- Do not unplug any cables which are attached to the gimbal ports, or attempt to change or customize the mechanical structure.
- Make sure the cable connections are correct and secure to ensure the gimbal works normally and is in full control.

The Camera Wiring/Shutter Control

The Camera Wiring



Z15-5D gimbal can transfer the signal from transmitter to infrared signal for shutter control, please make sure you connect the camera with the Z15-5D gimbal correctly and the camera settings are correct.

Step1: Connect the video transmission cable to the correct port on the camera.

Z15-5D MARK II: To the A/V OUT port of 5D MARK II.

Z15-5D MARK III: To the A/V OUT/DIGITAL port of 5D MARK III.

Note:

- Make sure to press the **AF.DRIVE** button and set the drive mode as  (10-sec.self-timer/Remote control) or  (2-sec.self-timer/Remote control).

The Shutter Control

Z15-5D gimbal can transfer the signal from transmitter to infrared for shutter control, please set one 2-position switch/channel for remote shutter control.

Make sure the shutter control module is correctly mounted and wired.

Whichever selection of the switch on your transmitter was set; wire the right channel of the receiver to the **SHUT** port. One switch toggle corresponds to one photo shot.

For example, toggle twice will result in two shot.

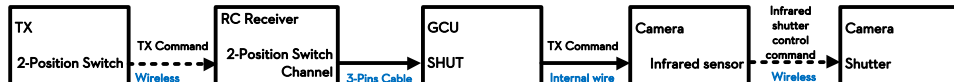
Position - 1 → Position - 2: First shot

Position - 2 → Position - 1: Second shot



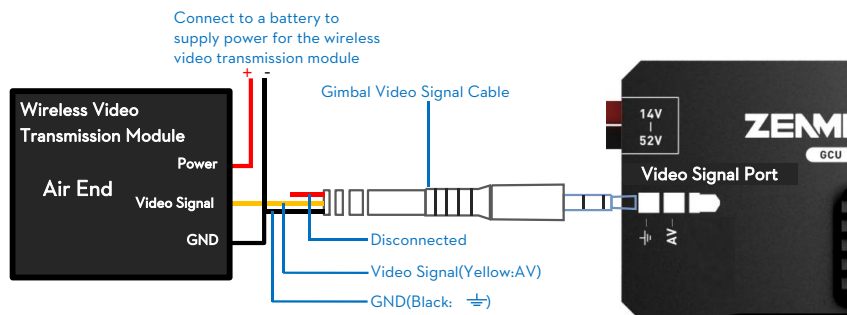
Tips:

- The following diagram shows how the shutter control works.
- If the shutter control works abnormally, please check each step.



The Video Signal Transmission

A wireless video transmission module is required for the video signal to access remotely.



Step1: Solder the Power/Video Signal/GND cables to a wireless video transmission module (Air End) respectively.

Step2: Plug the gimbal video signal cable head into the GCU Video Signal Port.

Notices:

- Make sure to connect the Wireless Video Transmission module to the GCU before powering on.
- The standard gimbal video signal cable is recommended.
- Make sure you solder the gimbal video signal cable to the wireless video transmission module correctly.

Ensure the cables are insulated, to prevent a short circuit.

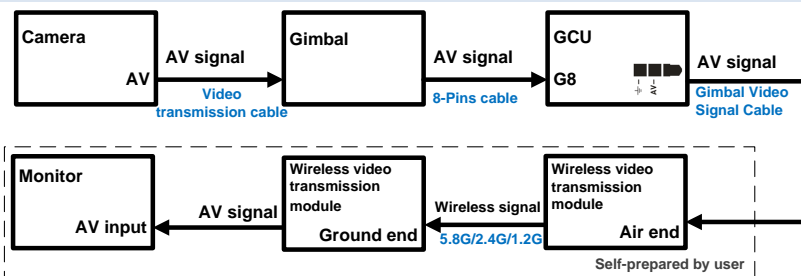
Video Signal Cable(AV)

GND Cable

- Please refer to the user manuals of the wireless transmitter module to supply power for it, since the GCU cannot provide power for it.

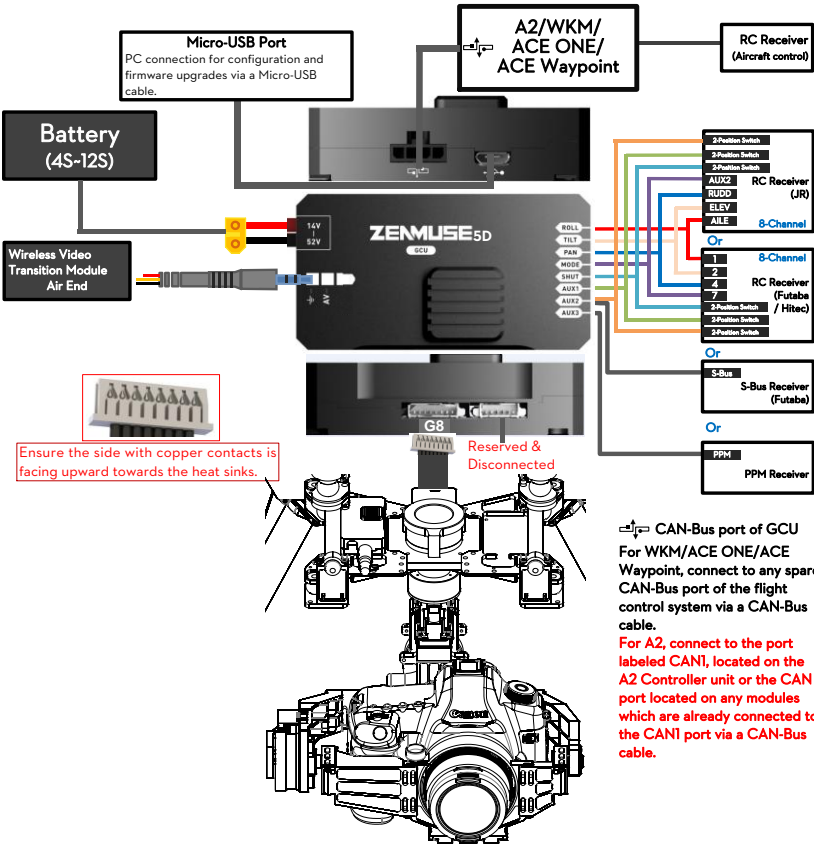
Tips:

- The following diagram shows how the video signal transmits with the gimbal working.
- If the video signal access fails, please check each step.



The GCU Connection

The GCU Connection



Battery

- Make sure the battery voltage is in the required range of both the aircraft and the gimbal if you use only one battery for power supply.

A2/WKM/ACE ONE/ACE Waypoint

Refer to the A2/ WKM/ACE ONE/ ACE Waypoint User Manual for more connection and configuration details.

Gimbal Controller (GCU)

- Make sure the ports are accessible when installing the GCU so as to facilitate wiring and software configuration.
- In 3-pin ports, pins near the nicks are the signal pins.
- DO NOT cover the heat sinks, keep them unobstructed.
- The GCU module is NOT water-proof or oil-proof.

Transmitter and Receiver

- Above are example connections, which require two transmitters and two receivers. One transmitter and receiver are used for gimbal control and the other are used for aircraft control. Users can also use a transmitter and a receiver to control both the gimbal and aircraft.
- Configure the Aileron, Elevator, Rudder channels on the transmitter for gimbal control. Command stick stands for the gimbal rotation velocity, the center position is for 0 and the endpoint for maximum velocity (both clockwise and counter clockwise directions). (End Point is 100%)
- Choose one 3-position switch/channel as the Z15 working modes switch.(MODE)
- Choose one 2- position switch/channel as the camera shutter control switch(SHUT), one for the camera lens orientation switch in Reset Mode (AUX2).
- Please refer to the A2/ WKM/ACE ONE/ACE Waypoint User Manual for aircraft control setting.
- Connect the receiver to GCU correctly.

The GCU Ports Description

The following table shows the GCU channels and the TX channels connection.

TX Channels		GCU Channels	Descriptions
JR	Futaba/Hitec		
AILE	1	ROLL	For roll axis control (left/right). The velocity is zero if disconnected.
ELEV	2	TILT	For tilt axis control. The velocity is zero if disconnected.
RUDD	4	PAN	For pan axis control. The v is zero if disconnected.
AUX2	7	MODE	For Working Mode switch.
2-position switch channel		SHUT	For camera shutter control (both taking picture and recording video are available). It is off when non-connection and disconnected.
2-position switch channel Or Futaba S-Bus channel		AUX2	When the AUX2 is connected to a 2-position switch channel, it is used for camera orientation (downward or forward) switch in FPV Mode (Reset). The camera orientation is set to forward while non-connection or disconnected. If a S-Bus receiver is used, it should be connected to the AUX2 port.
PPM channel		AUX3	When the AUX3 port is connected to a 2-position switch channel, it is used for the Z15-5D video recording control. If a PPM receiver is used, it should be connected to the AUX3 port.

The following table shows the corresponding relationship between the GCU and the S-Bus/PPM channels.

S-Bus/PPM Channels	GCU Channel
1	ROLL
2	TILT
4	PAN
7	MODE
5	SHUT
8	AUX1
9	AUX2
6	AUX3

The Working Modes/AUX2/AUX3 Switch Setup

Setting the Gimbal Working Mode Switch

Whichever 3-position switch you select as the working mode switch, wire the right channel of receiver to **MODE** port. At each switch position, use end-point fine tuning to set the AUX2 channel of JR/7 channel of Futaba/Hitec for the three Working modes.

Orientation-locked Mode **MODE** channel end-point 60%-90%

FPV Mode (Reset) **Back to center**

Non orientation-locked Mode **MODE** channel end-point 60%-90%

Notes:

- The gimbal will work in **Orientation-locked Mode**, if there is no connection to the **MODE** port.
- Gimbal default works in **FPV Mode** after power on.
- The gimbal will maintain the Working Mode from the last moment if the cable between the **MODE** port and the Receiver is disconnected while powered on.

Tips:

- For the 3-position switch, you may assign:

Position-1 to **Non orientation-locked**

Position-2 to **FPV Mode (Reset)**

Position-3 to **Orientation-locked**

Position-1 and Position-3 can be reverse assigned.

- One 2-position switch can be assigned for any two of the working modes as you like.



Setting the AUX2 Switch

The Z15 supports controlling the camera lens downward or forward in Reset Mode. Please wire the right channel of receiver to the **AUX2** port. You may assign: Position-1 to **DOWNWARD**; Position-2 to **FORWARD**; or reverse the assignment.



Notices:

- This function can only work in FPV Mode (Reset).
- When this function is enabled, if the working mode switches from the other modes to the FPV Mode (Reset), the gimbal will force the camera lens to face forward or downward depending on AUX2 Switch.
- The camera orientation is forward while non-connection or disconnected.

Tips:

When the AUX2 port is connected to the **Futaba** S-Bus channel it is used as the S-Bus channel input.

Setting the AUX3 Switch

The Z15-5D supports camera video recording. Please wire the right channel of receiver to **AUX3** port. Every toggle is set for start/stop recording.

The Assistant Software

Installation and Usage

Step1: Make sure the driver is installed correctly and has been installed beforehand if you use A2, WKM, ACE ONE or ACE WAYPOINT.

Step2: Please download the assistant software installer from the DJI Innovations website.

Step3: Double click the assistant software installer file and follow the steps to finish installation.

Step4: Run the assistant software.

Step5: Please upgrade the firmware and configure the parameters according to the assistant software indications if necessary.

Test

Check List Before Flight

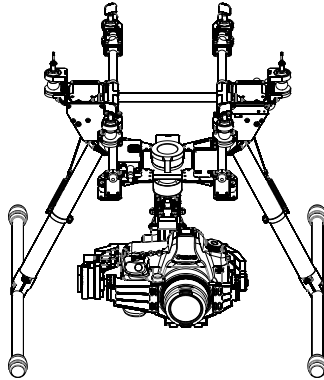
Notes:

- The gimbal is installed firmly to the landing gear, and the camera is mounted correctly and stably.
- All cables are correctly connected, without any connected back to front.
- The gimbal video signal cable is in good soldered condition if wireless video transmission module used.
- Correct connection between the GCU and RC receiver.
- Normal connection between the GCU and flight control system.
- Correct camera setup.
- Correct Transmitter settings.
- The firmware of flight control system has been upgraded to the latest version.

Tips:

- Please turn to the Trouble Shooting section in Appendix if an abnormal situation occurs.

Flight Test



- Step1:** Ensure the batteries are fully charged for the transmitter, GCU and all the other devices on your aircraft.
- Step2:** Make sure all connections and wirings are in good condition.
- Step3:** Toggle on the switch.
- Step4:** Make sure to adjust the Roll axis of the gimbal to be level.
- Step5:** Power on the gimbal and wait for self-testing to begin. The Roll axis will rotate first, and then the yaw and pitch axes will rotate quickly at the same time.
- Step6:** After self-testing, the camera lens will point to the aircraft nose direction and the three axes of the gimbal should be in the condition as the above diagram shows.
- Step7:** The gimbal will enter initialization, at this time the three axes will rotate very slowly.
- Step8:** The gimbal is at a standstill after initialization and ready for use.
- Step9:** Toggle the Working Modes switch on your transmitter, making sure it is working properly.
- Step10:** Toggle the Working Modes to the Non orientation-locked, FPV Mode (Reset), Orientation-locked respectively, and then try to push your sticks lightly in Roll, Tilt and Pan modes to see if your gimbal moves to the corresponding direction. If not, return to the 'Setting the Working Mode Switch' section to correct your settings.

Note:

If the gimbal is abnormal after initialization, please refer to the *Trouble Shooting* in *Appendix*.




Appendix

Important Notes





For safety reasons, please pay serious attention to all following items:

- Ensure nothing blocks the servo driver module rotation, to avoid motor damage.
- Before powering on, spin the gimbal by hand through the complete rotational axes to ensure nothing is blocking the mechanical movement of the gimbal.
- Ensure that the side of the servo driver module 1 with ports correctly points towards the aircraft tail direction.
- The gimbal center of gravity has been set, which directly determines the gimbal's performance. Please do not adjust the gimbal center of gravity by yourself.
- The gimbal is a high-precision controlled instrument. Do not remove any screws in the gimbal. Doing so may result in decreased performance or even damage.
- Do not unplug any cables which are attached to the gimbal ports, or attempt to change or customize the mechanical structure.
- Make sure the cable connections are correct and secure to ensure the gimbal works normally and is in full control.
- Make sure to connect the Wireless Video Transmission module to the gimbal controller before powering on the system.
- The factory gimbal video signal cable is recommended. Make sure you solder the gimbal video signal cable to the wireless video transmission module correctly. And ensure the cables are insulated, to prevent a short circuit.
- Make sure the current consumption of wireless video transmission module does not exceed 1A, to prevent the GCU from damage.
- Keep the gimbal away from any power cables; otherwise it may lead to a short circuit of the gimbal.
- Make sure to adjust the Roll axis of the gimbal to be level before powering on.

The Port Description

The GCU	
ROLL	For roll axis control
TITL	For tilt axis control
PAN	For pan axis control
MODE	For Working Mode select
SHUT	For camera shutter control
AUX2	For gimbal orientation (downward or forward) switch in FPV Mode; S-Bus Receiver
AUX3	For the video recording control; PPM Receiver
	To the wireless video transmission module, transmitting the AV signal
XT60	To the battery
G8	To the gimbal, transmitting video signal
	Micro-USB port: PC connection for configuration and firmware upgrades
	CAN-Bus port: Use CAN-Bus to connect the GCU to the flight control system
The Gimbal	
Video Transmission cable port	To the AV port of Camera
8-Pin Cable Port	To the G8 port of GCU

The Gimbal LED Indicator

LED Indicator	Description
	The gimbal works normally
	Some servo is recovering from overcurrent protection
	The gimbal is performing a self-check
	The GCU is disconnected from the Flight control system

Trouble Shooting

NO.	What	Why	How to
1	The gimbal keeps drifting after initializing	(1) Too much TX trim (2) The GCU and flight control system is disconnected (3) The Z15 mounting direction is not aligned to the aircraft nose	(1) Adjust the TX trims (2) Connect the GCU and flight control system (3) Ensure the Z15 mounting direction is aligned with the aircraft nose
2	The gimbal is abnormal after initializing	Abnormal calibration after manufacture	Please contact the local dealer or DJI Innovations customer service
3	Cannot distinguish the gimbal direction when in use	BVR flight	Switch to the FPV Mode first, then to another Working Mode needed
4	The gimbal green LED is on but without video display	(1) The wireless video transmission unit has been disconnected (2) Wrong power supply for wireless video transmission unit	(1) Check the wireless video transmission unit connection

Specifications

General	
Built-In Functions	<ul style="list-style-type: none"> ● Three Working Modes <ul style="list-style-type: none"> ✧ Orientation-locked control ✧ Non orientation-locked control ✧ FPV mode (Reset) ● Built-in independent IMU module ● DJI gimbal special servos drive module ● Wireless video transmission supported ● Camera shutter control supported ● Wide range voltage input supported ● S-Bus/PPM Receiver supported
Peripheral	
Supported Camera	CANON EOS 5D MARK II; CANON EOS 5D MARK III
Current Supported Lens	CANON EF 24mm f/2.8 IS USM
GCU Input Power	4S-12S LiPo Battery
Control Requirement	Four spare receiver channels at least
Assistant Software System Requirement	Windows XP SP3; Windows 7; Windows 8 (32 or 64 bit)
Mechanical& Electrical Characteristics	
Working Current	<ul style="list-style-type: none"> ● Static current: 200mA (@25V) ● Dynamic current: 400mA (@25V) ● Locked-rotor current: 4A (@25V)
Operating Temperature	-10°C - 50°C
Weight	1.42Kg
Dimensions	204mm × 242mm × 264mm
GCU Weight	63g
GCU Dimensions	64.2 mm × 34.1mm × 19.5mm
Working Performance	
Load Weight (Reference Value)	2615g(5D MARK II with SD Card & Battery & CANON EF 24mm f/2.8 IS USM Lens) 2664g(5D MARK III with SD Card & Battery & CANON EF 24mm f/2.8 IS USM Lens)
Controlled Angle Accuracy	±0.02°
Maximum Controlled Rotation Speed	Pan axis: ±90°/s

	Tilt axis: $\pm 130^{\circ}/s$ Roll axis: $\pm 30^{\circ}/s$
Controlled Rotation Range	Pan axis control: 360° continuous rotation Tilt axis control: From -120° to $+15^{\circ}$ Roll axis control: $\pm 25^{\circ}$