U.S. Department
of Transportation
**Federal Aviation
Administration**

800 Independence Ave., S.W.
Washington, D.C. 20591

July 20, 2015

Exemption No. 12081
Regulatory Docket No. FAA–2015–0195

Mr. Chris Rackley
Lewis Realty Associates, Inc.
320 North New River Drive
Surf City, NC 28445

Dear Mr. Rackley:

This letter is to inform you that we have granted your request for exemption. It transmits our decision, explains its basis, and gives you the conditions and limitations of the exemption, including the date it ends.

The Basis for Our Decision

By letter dated January 23, 2015, you petitioned the Federal Aviation Administration (FAA) on behalf of Lewis Realty Associates, Inc. (hereinafter petitioner or operator) for an exemption. The exemption would allow the petitioner to operate an unmanned aircraft system (UAS) to provide photos and videos of real estate listings offered for rental and sale, photos and videos used to promote tourism.

See Appendix A for the petition submitted to the FAA describing the proposed operations and the regulations that the petitioner seeks an exemption.

The FAA has determined that good cause exists for not publishing a summary of the petition in the Federal Register because the requested exemption would not set a precedent, and any delay in acting on this petition would be detrimental to the petitioner. However, the FAA received one comment in support of the petition made to the docket.

Airworthiness Certification

The UAS proposed by the petitioner is a Lewis Realty Associates Hexacopter 650.

The petitioner requested relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates*. In accordance with the statutory criteria provided in Section 333 of Public Law 112−95 in reference to 49 U.S.C. § 44704, and in consideration of the size, weight, speed, and limited operating area associated with the aircraft and its operation, the Secretary of Transportation has determined that this aircraft meets the conditions of Section 333. Therefore, the FAA finds that the requested relief from 14 CFR part 21, *Certification procedures for products and parts, Subpart H—Airworthiness Certificates*, and any associated noise certification and testing requirements of part 36, is not necessary.

The Basis for Our Decision

You have requested to use a UAS for aerial data collection[1]. The FAA has issued grants of exemption in circumstances similar in all material respects to those presented in your petition. In Grants of Exemption Nos. 11062 to Astraeus Aerial (*see* Docket No. FAA−2014−0352), 11109 to Clayco, Inc. (*see* Docket No. FAA−2014−0507), 11112 to VDOS Global, LLC (*see* Docket No. FAA−2014−0382), and 11213 to Aeryon Labs, Inc. (*see* Docket No. FAA−2014−0642), the FAA found that the enhanced safety achieved using an unmanned aircraft (UA) with the specifications described by the petitioner and carrying no passengers or crew, rather than a manned aircraft of significantly greater proportions, carrying crew in addition to flammable fuel, gives the FAA good cause to find that the UAS operation enabled by this exemption is in the public interest.

Having reviewed your reasons for requesting an exemption, I find that—

- They are similar in all material respects to relief previously requested in Grant of Exemption Nos. 11062, 11109, 11112, and 11213;
- The reasons stated by the FAA for granting Exemption Nos. 11062, 11109, 11112, and 11213 also apply to the situation you present; and
- A grant of exemption is in the public interest.

Our Decision

In consideration of the foregoing, I find that a grant of exemption is in the public interest. Therefore, pursuant to the authority contained in 49 U.S.C. 106(f), 40113, and 44701, delegated to me by the Administrator, Lewis Realty Associates, Inc. is granted an exemption from 14 CFR §§ 61.23(a) and (c), 61.101(e)(4) and (5), 61.113(a), 61.315(a), 91.7(a), 91.119(c), 91.121, 91.151(a)(1), 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a)

[1] Aerial data collection includes any remote sensing and measuring by an instrument(s) aboard the UA. Examples include imagery (photography, video, infrared, etc.), electronic measurement (precision surveying, RF analysis, etc.), chemical measurement (particulate measurement, etc.), or any other gathering of data by instruments aboard the UA.

and (b), to the extent necessary to allow the petitioner to operate a UAS to perform aerial data collection. This exemption is subject to the conditions and limitations listed below.

Conditions and Limitations

In this grant of exemption, Lewis Realty Associates, Inc. is hereafter referred to as the operator.

Failure to comply with any of the conditions and limitations of this grant of exemption will be grounds for the immediate suspension or rescission of this exemption.

1. Operations authorized by this grant of exemption are limited to the Lewis Realty Associates Hexacopter 650 when weighing less than 55 pounds including payload. Proposed operations of any other aircraft will require a new petition or a petition to amend this exemption.

2. Operations for the purpose of closed-set motion picture and television filming are not permitted.

3. The UA may not be operated at a speed exceeding 87 knots (100 miles per hour). The exemption holder may use either groundspeed or calibrated airspeed to determine compliance with the 87 knot speed restriction. In no case will the UA be operated at airspeeds greater than the maximum UA operating airspeed recommended by the aircraft manufacturer.

4. The UA must be operated at an altitude of no more than 400 feet above ground level (AGL). Altitude must be reported in feet AGL.

5. The UA must be operated within visual line of sight (VLOS) of the PIC at all times. This requires the PIC to be able to use human vision unaided by any device other than corrective lenses, as specified on the PIC's FAA-issued airman medical certificate or U.S. driver's license.

6. All operations must utilize a visual observer (VO). The UA must be operated within the visual line of sight (VLOS) of the PIC and VO at all times. The VO may be used to satisfy the VLOS requirement as long as the PIC always maintains VLOS capability. The VO and PIC must be able to communicate verbally at all times; electronic messaging or texting is not permitted during flight operations. The PIC must be designated before the flight and cannot transfer his or her designation for the duration of the flight. The PIC must ensure that the VO can perform the duties required of the VO.

7. This exemption and all documents needed to operate the UAS and conduct its operations in accordance with the conditions and limitations stated in this grant of

exemption, are hereinafter referred to as the operating documents. The operating documents must be accessible during UAS operations and made available to the Administrator upon request. If a discrepancy exists between the conditions and limitations in this exemption and the procedures outlined in the operating documents, the conditions and limitations herein take precedence and must be followed. Otherwise, the operator must follow the procedures as outlined in its operating documents. The operator may update or revise its operating documents. It is the operator's responsibility to track such revisions and present updated and revised documents to the Administrator or any law enforcement official upon request. The operator must also present updated and revised documents if it petitions for extension or amendment to this grant of exemption. If the operator determines that any update or revision would affect the basis upon which the FAA granted this exemption, then the operator must petition for an amendment to its grant of exemption. The FAA's UAS Integration Office (AFS−80) may be contacted if questions arise regarding updates or revisions to the operating documents.

8. Any UAS that has undergone maintenance or alterations that affect the UAS operation or flight characteristics, e.g. replacement of a flight critical component, must undergo a functional test flight prior to conducting further operations under this exemption. Functional test flights may only be conducted by a PIC with a VO and must remain at least 500 feet from other people. The functional test flight must be conducted in such a manner so as to not pose an undue hazard to persons and property.

9. The operator is responsible for maintaining and inspecting the UAS to ensure that it is in a condition for safe operation.

10. Prior to each flight, the PIC must conduct a pre-flight inspection and determine the UAS is in a condition for safe flight. The pre-flight inspection must account for all potential discrepancies, e.g. inoperable components, items, or equipment. If the inspection reveals a condition that affects the safe operation of the UAS, the aircraft is prohibited from operating until the necessary maintenance has been performed and the UAS is found to be in a condition for safe flight.

11. The operator must follow the UAS manufacturer's maintenance, overhaul, replacement, inspection, and life limit requirements for the aircraft and aircraft components.

12. Each UAS operated under this exemption must comply with all manufacturer safety bulletins.

13. Under this grant of exemption, a PIC must hold either an airline transport, commercial, private, recreational, or sport pilot certificate. The PIC must also hold a current FAA airman medical certificate or a valid U.S. driver's license issued by a state, the District of Columbia, Puerto Rico, a territory, a possession, or the Federal

government. The PIC must also meet the flight review requirements specified in 14 CFR § 61.56 in an aircraft in which the PIC is rated on his or her pilot certificate.

14. The operator may not permit any PIC to operate unless the PIC demonstrates the ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption, including evasive and emergency maneuvers and maintaining appropriate distances from persons, vessels, vehicles and structures. PIC qualification flight hours and currency must be logged in a manner consistent with 14 CFR § 61.51(b). Flights for the purposes of training the operator's PICs and VOs (training, proficiency, and experience-building) and determining the PIC's ability to safely operate the UAS in a manner consistent with how the UAS will be operated under this exemption are permitted under the terms of this exemption. However, training operations may only be conducted during dedicated training sessions. During training, proficiency, and experience-building flights, all persons not essential for flight operations are considered nonparticipants, and the PIC must operate the UA with appropriate distance from nonparticipants in accordance with 14 CFR § 91.119.

15. UAS operations may not be conducted during night, as defined in 14 CFR § 1.1. All operations must be conducted under visual meteorological conditions (VMC). Flights under special visual flight rules (SVFR) are not authorized.

16. The UA may not operate within 5 nautical miles of an airport reference point (ARP) as denoted in the current FAA Airport/Facility Directory (AFD) or for airports not denoted with an ARP, the center of the airport symbol as denoted on the current FAA-published aeronautical chart, unless a letter of agreement with that airport's management is obtained or otherwise permitted by a COA issued to the exemption holder. The letter of agreement with the airport management must be made available to the Administrator or any law enforcement official upon request.

17. The UA may not be operated less than 500 feet below or less than 2,000 feet horizontally from a cloud or when visibility is less than 3 statute miles from the PIC.

18. If the UAS loses communications or loses its GPS signal, the UA must return to a pre-determined location within the private or controlled-access property.

19. The PIC must abort the flight in the event of unpredicted obstacles or emergencies.

20. The PIC is prohibited from beginning a flight unless (considering wind and forecast weather conditions) there is enough available power for the UA to conduct the intended operation and to operate after that for at least five minutes or with the reserve power recommended by the manufacturer if greater.

21. Air Traffic Organization (ATO) Certificate of Waiver or Authorization (COA). All operations shall be conducted in accordance with an ATO-issued COA. The

exemption holder may apply for a new or amended COA if it intends to conduct operations that cannot be conducted under the terms of the attached COA.

22. All aircraft operated in accordance with this exemption must be identified by serial number, registered in accordance with 14 CFR part 47, and have identification (N−Number) markings in accordance with 14 CFR part 45, Subpart C. Markings must be as large as practicable.

23. Documents used by the operator to ensure the safe operation and flight of the UAS and any documents required under 14 CFR §§ 91.9 and 91.203 must be available to the PIC at the Ground Control Station of the UAS any time the aircraft is operating. These documents must be made available to the Administrator or any law enforcement official upon request.

24. The UA must remain clear and give way to all manned aviation operations and activities at all times.

25. The UAS may not be operated by the PIC from any moving device or vehicle.

26. All Flight operations must be conducted at least 500 feet from all nonparticipating persons, vessels, vehicles, and structures unless:
    a. Barriers or structures are present that sufficiently protect nonparticipating persons from the UA and/or debris in the event of an accident. The operator must ensure that nonparticipating persons remain under such protection. If a situation arises where nonparticipating persons leave such protection and are within 500 feet of the UA, flight operations must cease immediately in a manner ensuring the safety of nonparticipating persons; and
    b. The owner/controller of any vessels, vehicles or structures has granted permission for operating closer to those objects and the PIC has made a safety assessment of the risk of operating closer to those objects and determined that it does not present an undue hazard.

    The PIC, VO, operator trainees or essential persons are not considered nonparticipating persons under this exemption.

27. All operations shall be conducted over private or controlled-access property with permission from the property owner/controller or authorized representative. Permission from property owner/controller or authorized representative will be obtained for each flight to be conducted.

28. Any incident, accident, or flight operation that transgresses the lateral or vertical boundaries of the operational area as defined by the applicable COA must be reported to the FAA's UAS Integration Office (AFS−80) within 24 hours. Accidents must be

reported to the National Transportation Safety Board (NTSB) per instructions contained on the NTSB Web site: www.ntsb.gov.

If this exemption permits operations for the purpose of closed-set motion picture and television filming and production, the following additional conditions and limitations apply.

29. The operator must have a motion picture and television operations manual (MPTOM) as documented in this grant of exemption.

30. At least 3 days before aerial filming, the operator of the UAS affected by this exemption must submit a written Plan of Activities to the local Flight Standards District Office (FSDO) with jurisdiction over the area of proposed filming. The 3-day notification may be waived with the concurrence of the FSDO. The plan of activities must include at least the following:
    a. Dates and times for all flights;
    b. Name and phone number of the operator for the UAS aerial filming conducted under this grant of exemption;
    c. Name and phone number of the person responsible for the on-scene operation of the UAS;
    d. Make, model, and serial or N−Number of UAS to be used;
    e. Name and certificate number of UAS PICs involved in the aerial filming;
    f. A statement that the operator has obtained permission from property owners and/or local officials to conduct the filming production event; the list of those who gave permission must be made available to the inspector upon request;
    g. Signature of exemption holder or representative; and
    h. A description of the flight activity, including maps or diagrams of any area, city, town, county, and/or state over which filming will be conducted and the altitudes essential to accomplish the operation.

31. Flight operations may be conducted closer than 500 feet from participating persons consenting to be involved and necessary for the filming production, as specified in the exemption holder's MPTOM.

Unless otherwise specified in this grant of exemption, the UAS, the UAS PIC, and the UAS operations must comply with all applicable parts of 14 CFR including, but not limited to, parts 45, 47, 61, and 91.

This exemption terminates on July 31, 2017, unless sooner superseded or rescinded.

Sincerely,

/s/
John S. Duncan
Director, Flight Standards Service

Enclosures

Residential Sales
Commercial Sales

Lewis Realty Associates, Inc.

Vacation Rentals
Long Term Rentals
Property Management

January 23, 2015

U.S. Department of Transportation
Docket Management System
1200 New Jersey Avenue SE
Washington, DC 20590

Re: Exemption Request Section 333 of the FAA Reform Act & Part 11 of the Federal Aviation Regulations from 14 C.F.R.45.23(b); 14 CFR Part 21; 14 CFR 61.113(a) & (b); 91.7 (a); 91.9 (b); 91.103(b); 91.109; 91.119; 91.121; 91.151(a); 91.203(a) & (b); 91.405(a); 91.407(a) (1); 91.409; 91.417 (a) & (b)

To Whom It May Concern:

Pursuant to Section 333 of the FAA Modernization and Reform Act of 2012 (the Reform Act) and 14 C.F.R Part 11, Lewis Realty Associates, Inc, a real estate sales and vacation rental company and operator of a small 'hexacopter" (UAS) equipped for photos and videos of properties and the Topsail Island, NC area, hereby applies for an exemption from the listed Federal Aviation Regulations ("FARs") to allow commercial operation of its UASs, so long as such operations are conducted within and under the conditions outlined herein or as may be established by the FAA as required by Section 333.

Purpose of proposed flights will be to provide photos and videos of real estate listings offered for rental and sale, photos and videos used to promote tourism in the area resulting in potential tax receipts for Local, State and US Government.

The name and address of the applicant is:

Lewis Realty Associates, Inc.
Attn: Chris Rackley
PH: 910.328.5211 ext 801
Email: chris@topsailarea.com
Address: 320 N New River Drive Surf City NC 28445

The UAS & Flights

The UAS is a 3 lb 3 oz battery powered hexacopter (six motors, six blades), a handheld FrSky Taranis transmitter for control, associated control receivers on aircraft, 3 axis camera gimbal with GoPro 3+ camera and video transmitter to a small 11 inch screen for camera shot placement only (UAS is controlled ONLY by line of sight). The aircraft is equipped with one of two flight controllers (onboard UAS). Both Flight Controllers Offer:

1. GPS Assisted Flight - Allows Hexacopter to hover when no commands are being sent - This is a nice feature in case the PIC needs to "regroup" during a flight.
2. Non-GPS Modes - If GPS signals are lost, aircraft goes into a mode that monitors altitude and provide control assistance to help keep air craft stable and under total control of PIC.
3. Return to Home - Allows Hexacopter to return to home and land when battery power is low or a "failsafe" switch is flipped on transmitter. This is beneficial if pilot becomes disoriented or there are battery issues.
4. Both Flight Controllers Have "Geo-Fence" Capibilities. Ie. Not able to arm within 5 miles of an airport or a user inputed "geo-fence" for a "no-fly zone" outside the "geo-fence".
5. LED Status Lights on Aircraft - Gives User The Status of the aircraft through different sequences of blinking lights and/or alarms.

(both flight controller manuals are included for review in this packet)

The UAS also has two bright led modules on the front of the aircraft (white in color) and 2 on the rear of the aircraft (red in color). These LEDs are used for orientation and location of craft from line of site.

The transmitter is a Fr Sky Taranis X9D that offers full telemetry showing altitude (with pre set voice alarms of altitude and warning buzzers when approaching 400' AGL), 2 level battery voltage announcements/warnings, RSSI (signal) strength voice announcements, emergency return to home programmed failsafe & emergency return to home manual switch.

The video transmitter/receiver system operates at 5.8 MHZ at 600 mw. We understand it is legal to operate this without any additional licenses. If we are incorrect, we will immediately apply for all necessary licenses or change to a different frequency.

(Photos are included as Exhibit A)

The UAS will be flown with a Pilot in Command (PIC) and a ground based Visual Observer (VO) in accordance with FAA Policy N 8900.227 Section 14 "Operational Requirements for UAS" with the following additional restrictions:

- All operations will occur in Class G airspace at no more than 400' AGL. The vast majority of flights will be well below this limit at an average of 150' to 200' AGL to accomplish the best photographs and videos.
- Any required permits will be obtained from local and state governments before flights.
- The aircraft will not operate directly above human beings at any time or within 150 feet of human beings.
- Maximum Flight Time will be 12 minutes. Battery allows 18 minutes plus of flight time. Batteries are inspected and always fully charged before use.
- The aircraft will not operate within 5 miles of an airport/heliport without prior approval from said airport/heliport.
- All operations will be during the daytime and in ideal weather conditions of less than 15 mph winds and clear skies.
- Aircraft will remain in visual line of site at all times not to exceed ¼ mile from PIC.
- Visual Observer will serve as additional eyes on the aircraft and be within voice reach to communicate with the PIC.
- Aircraft will not fly in the area of any full scale aircraft and if a full scale aircraft comes into airspace during the aircraft's flight, it will be landed immediately to allow right of way to full scale aircraft.
- At any time aircraft is being flown, signs will be posted in at least three (3) locations, warning of UAS operations are being conducted and to stay at least 200' away at all times of landing and takeoff area. (marked with a large orange cone).
- The PIC (Chris Rackley) has flown different remote aircraft for over 10 years. The last three years has been exclusively multi-rotor types such has DJI Phantom (quadcopter), DJI F550 (hexacopter) and Custom 650 (hexacopter). There have been no incidents of injury or property damage.

- Our opinion is a private pilot's license is not applicable to flying a UAS for several reasons (flight controls are different than a traditional aircraft and PIC holds a United States Passport, holds a North Carolina Concealed Weapon Permit and is a native born American which should satisfy any suspicions of being linked to Terrorism). Although the PIC will obtain a private pilot's license with in 120 days of exemption being granted if the FAA deems it is indeed required. If the FAA rules that private pilot's license is not needed after granting the exemption and PIC has not obtained a pilot's license at that time then PIC would request permission to not obtain a private pilot's license.
- UAS will never be used as an invasion of privacy and only be used for the purposes listed above.
- Liability insurance will be maintained at all times.
- Our equipment is not inexpensive and we take public and property safety seriously. We have developed pre-flight plans, flight plans, emergency procedures, and maintenance procedures.

Exemptions

Exemption Request Section 333 of the FAA Reform Act & Part 11 of the Federal Aviation Regulations from 14 C.F.R.45.23(b); 14 CFR Part 21; 14 CFR 61.113(a) & (b); 91.7 (a); 91.9 (b); 91.103(b); 91.109; 91.119; 91.121; 91.151(a); 91.203(a) & (b); 91.405(a); 91.407(a) (1); 91.409; 91.417 (a) & (b)

14 C.F.R Part 21, 45.29, 45.23 :
The aircraft has no area to display numbers or letters that are at least 2" in size. To our knowledge there is no Registration System for UAS. We will place in the largest letters possible "Lewis Realty Experimental" on at least two "arms" of the craft.

14 C.F.R. 91.7:
To our knowledge there is no aircraft airworthiness certificates for UAS.

We will before each flight run through the enclosed pre-flight checklist to ensure airworthiness.

14 CFR 91.9 (b):

There is no cockpit to include said manual. Operating manual will be kept with PIC.

14 CFR 91.103:
Since there will not be a FAA approved hexacopter manual to be provided we will need to be exempt. We will again follow our enclosed pre-flight checklist to ensure safety and airworthiness.

14 CFR 91.109:
UAS are controlled by a transmitter and do not have the capability for dual controls. It is our understanding there have been other aircraft approved without dual controls.

14 CFR 91.119:
Since flights will never be above 400' AGL and usually 150' to 200' AGL, we requested an exemption as the altitudes cited in 14 CFR 91.119 would cause us to exceed said 400' AGL.

14 CFR 91.121:
UAS does not have a traditional altimeter. It does however have a barometric type which displays the altitude on the transmitter of which is monitored at all times to prevent exceeding 400' AGL. The transmitter has voice announcements of altitude a certain heights. There is also an alarm on the transmitter when reaching within 50' of 400' AGL.

14 CFR 91.151:
The UAS does not use traditional fuel but rather battery power. The battery provides for up to 18 minutes plus of flight time with a 20% reserve of battery power. If this level is reached the UAS returns to home and lands. However, no flights will last longer than 13 minutes as an extra safety net.

All batteries are only used if freshly charged. All batteries are visually inspected and volt tested before each flight.

14 CFR 91.203:
There is no cockpit to include said certificates or registration documents. Any certificates, exemptions or registration documents will be with the PIC on the ground level.

14 CFR 91.405, 91.407, 91.409, 91.417:
As there is no airworthiness inspections available therefore we request an exemption.

Again we will perform pre-flight checklists to ensure safety.

If our pre-flight checklist does not pass, we will abort flight.

Any items of concern will promptly be repaired using similar components and records will be kept through maintenance record.

We are prepared to modify or amend any part of this petition for exemption to meet or exceed concerns of safety. We do look forward to working with the FAA to provide a great service to our community and profession in a safe manner.

Sincerely,

Chris Rackley
President
Lewis Realty Associates, Inc.

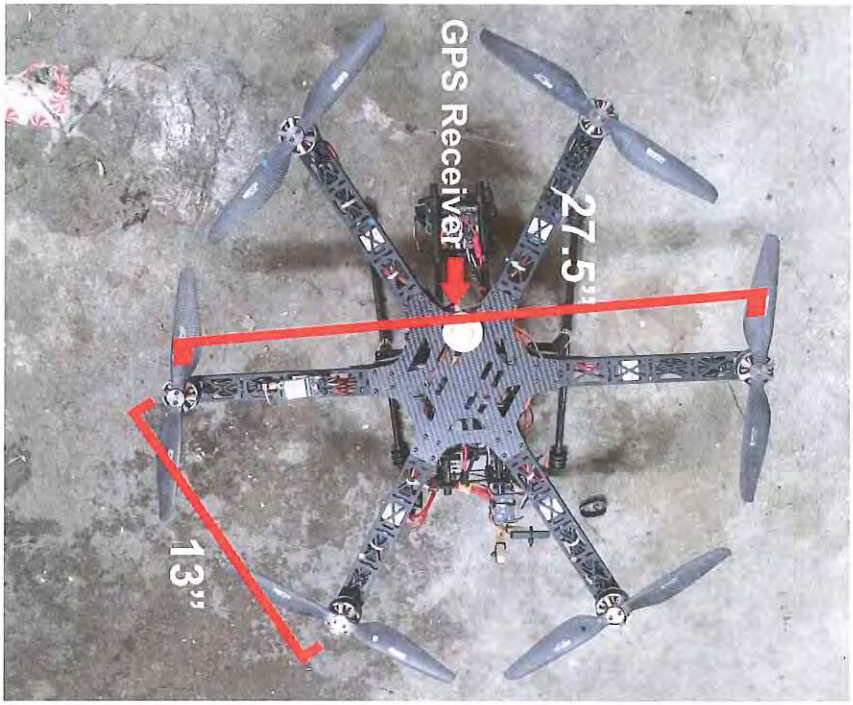
Enclosures:
Exhibit A - Photos
DJI Naza M Flight Controller Quick Start
Pixhawk Quick Start
Pre-Flight/Flight Plan Checklist
Maintenance Record

EXHIBIT A - Photos

Residential Sales
Commercial Sales

Lewis Realty
Associates, Inc.

Vacation Rentals
Long Term Rentals
Property Management



320 N. New River Drive Surf City, North Carolina 28445
(910) 328-5211, local (800) 233-5211, toll-free (910) 328-5277, fax

809 Roland Avenue Surf City, North Carolina 28445
(910) 328-2468, local (800) 326-2468, toll-free (910) 328-5111, fax

www.topsailarea.com

Residential Sales
Commercial Sales

Lewis Realty Associates, Inc.

Vacation Rentals
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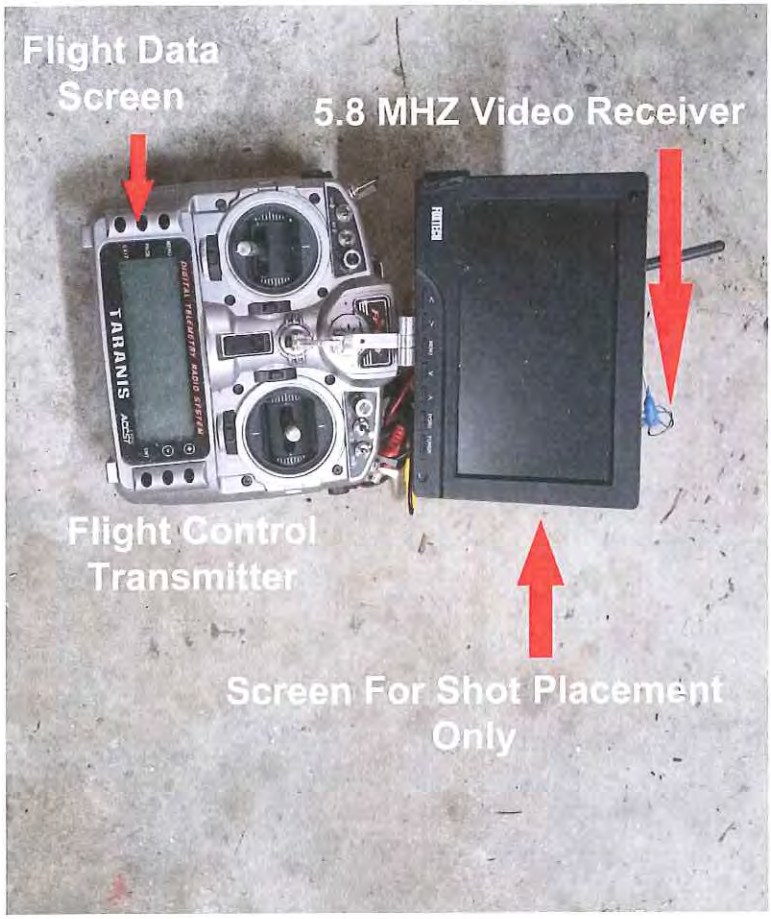
Property Management



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www.topsailarea.com

Lewis Realty Associates, Inc.

Hexacopter Pre-Flight/Flight Plan Checklist

_____(PIC) _____(Observer) Date: _____

Flight Location: _____

Weather Condition/Visibility/Wind Speed:

_____

BEFORE LOCATION

☐ Ensure Flight Location is Not Within 5 Miles of Airport/Heliport. If so, call airport/heliport for proper authority before flying. Record Contact Name, Phone & Airport if approval is received at bottom.
☐ Review Current Weather Conditions/Forecast As Reported By The NWS.
☐ Check All Battery Voltages/Condition - (If Not Charged, Must Charge Before Going to Location)
☐ Inspect all wires, plugs and solder connections.

AT LOCATION

☐ Check Battery Voltage and Visual Inspection of Battery
☐ Inspect Props on UAS For Cracks, Loose Securing Screws/Bolts, Proper Rotation.
☐ Visually Re-Check Current Weather Conditions
☐ Site Survey - Identify Any Possible Hazards Such As Telephone Poles, Flag Poles, Utility Wires, Flocks of Birds, Traffic, Large Groups of People.
☐ Identify Takeoff and Landing Location (Same Location)
☐ Identify Vantage Points for PIC and Observer.
☐ Place Orange Cone At Takeoff/Landing Location and Warning Notice Signs of Flight
☐ Ensure before motors are armed, no one is in a hazard area.

During Flight

- Remain Alert for Possible Aircraft, Bystanders or other hazards such as changing weather condition or birds.
- Fly only as high as needed for shot but never above 400' AGL.
- Every 1 minute view telemetry data showing battery level and flight time. (flights are limited to 13 minutes max)

Landing

- Ensure Landing Area is Clear from Hazards or Bystanders.
- View Wind Direction and Compensate Flight If Needed.
- Land Aircraft - Motors Are Shut Off Immediately After Landing.
- Until PIC or Observer Has Disconnected the Battery On The Aircraft All Bystanders Are Not Allowed To Approach the Aircraft.

Emergency Landing

- Land immediately at a safe and close location when:
    - other aircraft are spotted or heard (including other UAS)
    - bystanders have gathered or a bystander has enter the proximity
    - changes in weather or wind
    - birds entering area
    - anything happens to distract pilot
    - if PIC feels uncomfortable for any reason

Flight was performed to all flight plans and protocols contained herein.

Sign:_____(PIC)

Sign:_____(Observer)

Lewis Realty Associates, Inc.

Hexacopter Maintenance/Repair Report

Date: _____

Person Performing Maintenance:_____

Reason for Maintenance or Repair:

_____

Parts or Part Being Replaced/Repair (with any manufactoring information):

_____

After Maintenance/Repair:

Test Flight To Be Performed In Ultra Safe Zone:

Location: _____ Date: __/__/____

Tests to be Performed:
Low Hover, Low Flight Control Test (do this in all flight modes)

If Passed - 2nd Test Flight Will Be Of Nature of a Normal Flight Plan.

(failure in either test flight will result in grounding the aircraft until proper repair can be completed).

Sign:_____(PIC)

Sign:_____(Observer)

Naza - M V2

Quick Start Guide V 1.26

2014.05.12 Revision

For Firmware Version V4.02 or above

& Assistant Software Version V2.20 or above

Thank you for purchasing this DJI product. Please strictly follow these steps to mount and connect this system on your aircraft, as well as to install the Assistant Software on your computer.

Please regularly check the web page of corresponding product* at our website **www.dji.com**, which is updated regularly. Product information, technical updates and manual corrections will be available on this web page. Due to unforeseen changes or product upgrades, the information contained in this manual is subject to change without notice.

* **Important:** Naza-M, Naza-M V2 and PHANTOM control system are different in hardware parts, but their configurations and functions are the same when using the same Assistant Software and Firmware Version, so they use the same Guide. Unless stated, the following instruction is basic on Naza-M V2. If you use the Naza-M, please make sure to read the "Instruction of V1 (also known as Naza-M)" section; if you use the PHANTOM, download the other corresponding manuals on the PHANTOM web page.

This manual is only for basic assembly and configuration; you can obtain more details and advanced instructions when using the assistant software. To assure you have the latest information, please visit our website and download the latest manual and current software version.

If you have any problem that you cannot solve during usage, please contact your authorized dealer.

Index

Instruction

Disclaimer & Warning

Please read this disclaimer carefully before using the product. By using this product, you hereby agree to this disclaimer and signify that you have read them fully. THIS PRODUCT IS NOT SUITABLE FOR PEOPLE UNDER THE AGE OF 18.

This product is an autopilot system designed for serious multi-rotor enthusiasts providing excellent self-leveling and altitude holding, which completely takes the stress out of flying RC multi-rotors for both professional and hobby applications. Despite the system having a built-in autopilot system and our efforts in making the operation of the controller as safe as possible when the main power battery is connected, we strongly recommend users to remove all propellers when calibrating and setting parameters. Make sure all connections are good, and keep children and animals away during firmware upgrade, system calibration and parameter setup. DJI Innovations accepts no liability for damage(s) or injuries incurred directly or indirectly from the use of this product in the following conditions:

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2. Damage(s) or injuries caused by subjective intentional operations. Any mental damage compensation caused by accident.
3. Failure to follow the guidance of the manual to assemble or operate.
4. Malfunctions caused by refit or replacement with non-DJI accessories and parts.
5. Damage(s) or injuries caused by using third party products or fake DJI products.
6. Damage(s) or injuries caused by mis-operation or subjective mis-judgment.
7. Damage(s) or injuries caused by mechanical failures due to erosion, aging.
8. Damage(s) or injuries caused by continued flying after low voltage protection alarm is triggered.
9. Damage(s) or injuries caused by knowingly flying the aircraft in abnormal condition (such as water, oil, soil, sand and other unknown material ingress into the aircraft or the assembly is not completed, the main components have obvious faults, obvious defect or missing accessories).
10. Damage(s) or injuries caused by flying in the following situations such as the aircraft in magnetic interference area, radio interference area, government regulated no-fly zones or the pilot is in backlight, blocked, fuzzy sight, and poor eyesight is not suitable for operating and other conditions not suitable for operating.
11. Damage(s) or injuries caused by using in bad weather, such as a rainy day or windy (more than moderate breeze), snow, hail, lightning, tornadoes, hurricanes etc.
12. Damage(s) or injuries caused when the aircraft is in the following situations: collision, fire, explosion, floods, tsunamis, subsidence, ice trapped, avalanche, debris flow, landslide, earthquake, etc.
13. Damage(s) or injuries caused by infringement such as any data, audio or video material recorded by the use of aircraft.
14. Damage(s) or injuries caused by the misuse of the battery, protection circuit, RC model and battery chargers.
15. Other losses that are not covered by the scope of DJI Innovations liability.

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Certifications

This product is approved with quality standards such as CE, FCC and RoHS.

Symbol Instruction

 Forbidden(Important)

 Cautions

 Tip

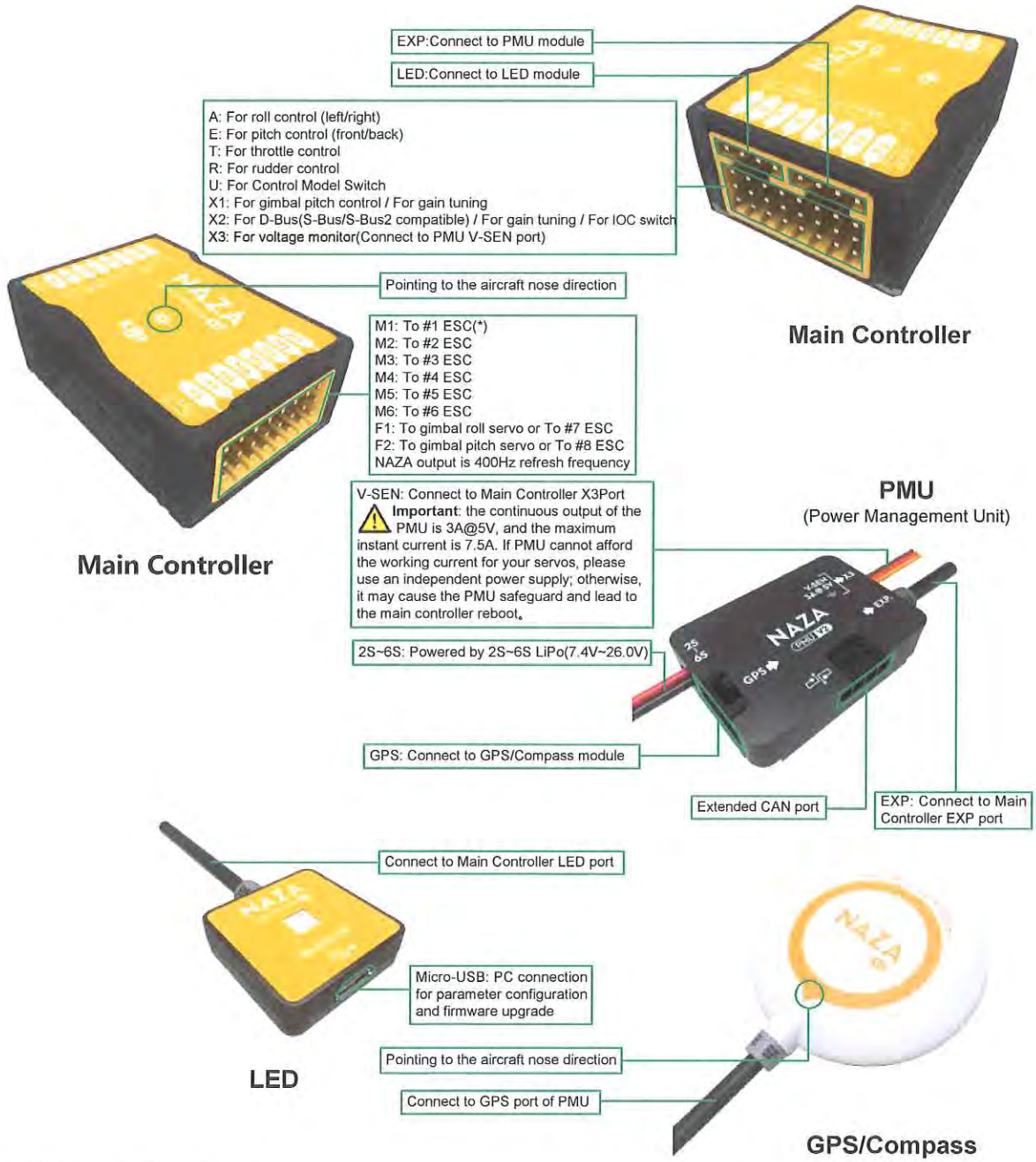
 Reference

Assembly & Connection

In the Box:

Main controller X1, PMU X1, GPS X1, GPS Bracket X1, LED X1, Servo Cable X8, Micro-USB Cable X1, 3M Adhesive Tape.

Step1 Port Description



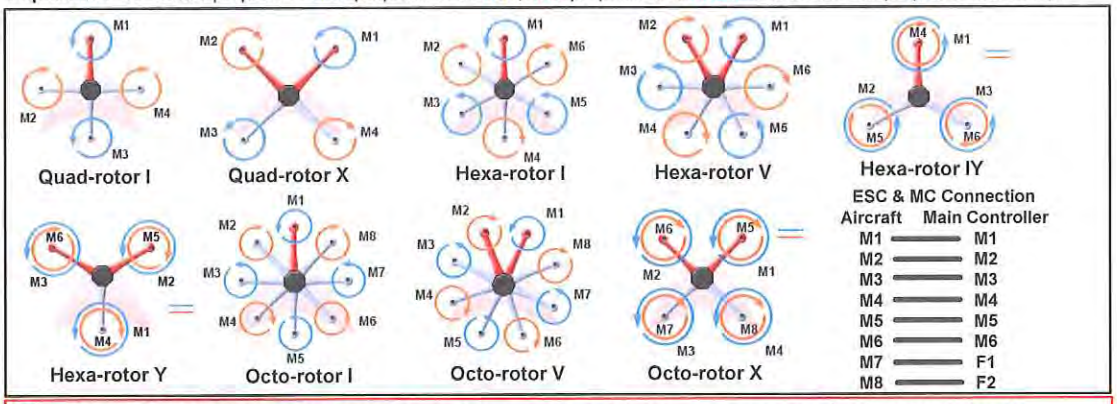
*ESC: Electronic Speed Controller

Step2 Assembly & Connection

Step1 Prepare an aircraft, supported the following **Mixed Types**.

The direction of the arrow in diagram indicates the rotation direction of the motor/propeller.

Important : To coaxial propellers: Blue propeller is at TOP; Red propeller is at Bottom. Otherwise all propellers are at top.



Note: The NAZA-M V2 flight control system doesn't support Gimbal function when used on the Octo-rotor aircraft. For big aircraft that is larger than 650 or with heavy load, WKM is recommended.

Step2 Assembly and Connection

Main Controller(MC)

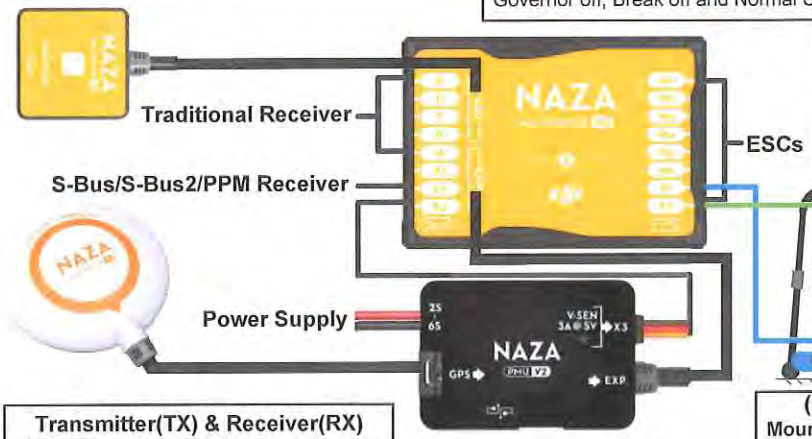
Mount : (1)The DJI logo should face the sky, DO NOT mount the MC upside-down. (2)The MC sides should be parallel to the aircraft body. (3)The arrow should point to the nose direction of aircraft. (4)he MC is best positioned near the aircraft's center of gravity. Make sure all ports are accessible.

Tip : It is recommended to fix the MC until all wirings and configurations are completed, using 3M gummed paper provided to fix the MC.

ESCs & Motors

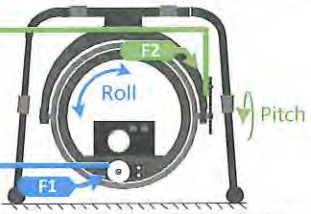
Please use the ESCs and motors recommended by the manufacturer of your aircraft. We recommend you use DJI motors and ESCs (Refer to its manual for details). Connect all ESCs to MC by the motor numbering method introduced in mixed types Supported .

Important : If you use 3rd party ESCs, make sure the ESCs travel midpoint is at 1520us. DO NOT use 700us travel midpoint ESC, as it may lead aircraft to fly away or cause injury and damage. After ESCs connection , calibrate ESCs one by one through the receiver directly before connect them to your MC, Make sure program all of them into Governor off, Break off and Normal Start up to get best experience.



Gimbal

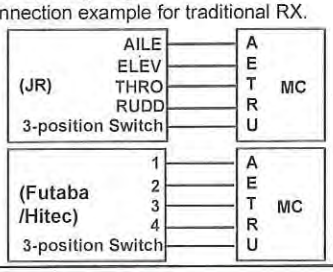
Connect the gimbal servos to the ports of F1 and F2 if a gimbal is used, and use the software for configurations.



Transmitter(TX) & Receiver(RX)

(1)Refer to you TX Manual, setup the Aileron, Elevator, Throttle, Rudder channels on your TX first, and choose a 3-position switch as control mode switch.

(2)Attach the matched RX to aircraft, then connect your RX to the right ports on MC. The following diagram shows the connection example for traditional RX.



PMU Module

Mount : DO NOT attach the PMU on other device. Sufficient air flow over the PMU is highly recommended.

Tip : If use with DJI multi-rotor, you can solder the power cable to power pads on frame bottom board. Please refer to DJI multi-rotor manual for details. If use with 3rd part aircraft, you can make a connecter by yourself to connect PMU and battery.

LED Module

Mount : Make sure You can see the light during the flight. Leave the USB interface to be accessible. Use the 3M gummed paper provided to fix.

(Optional)GPS/Compass

Mount : GPS/Compass is sensitive to magnetic interference, should be far away from any electronic devices. If you use your own mounting rod, make sure it is NOT magnetic!

Procedures :

(1)You should use epoxy resin AB glue to assemble the GPS bracket first. Mount the bracket on the center plate of craft. Position the bracket at least 10 cm from any propeller.

(2)The DJI logo marked on the GPS should face the sky, with the orientation arrow pointing directly forward. then fix the GPS on the plate of the bracket (by 3M glue provided).

Tip : The GPS/Compass is packaged with a special indication line for mounting for the first time.

Step3 Double Check

In this step, turn on the transmitter, connect the battery to the PMU, and then watch the LED, if you can see the LED blinks ( ), the system is working.

Assistant Software Installation and Configuration

Step1 Software and Driver Installation

Installing and running on Windows

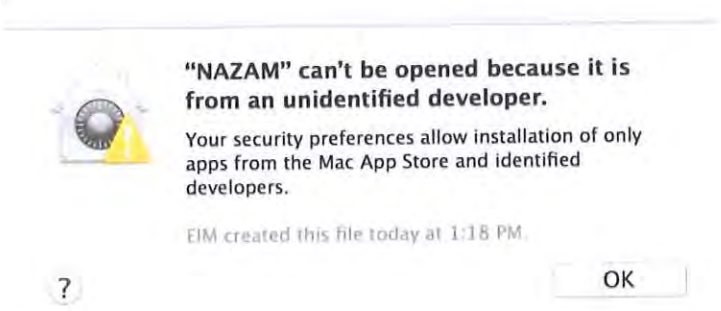
1. Please download the driver and the Assistant installation software in EXE format from www.dji.com.
2. Switch on the transmitter and then power on your autopilot system.
3. Connect your autopilot system and PC via a Micro-USB cable.
4. Open the driver installation software and follow the instructions to complete installation.
5. Run the Assistant installation software and follow the instructions to complete installation.

⚠ The installer in EXE format is supported on Win XP, Win7, Win8 (32 or 64 bit).

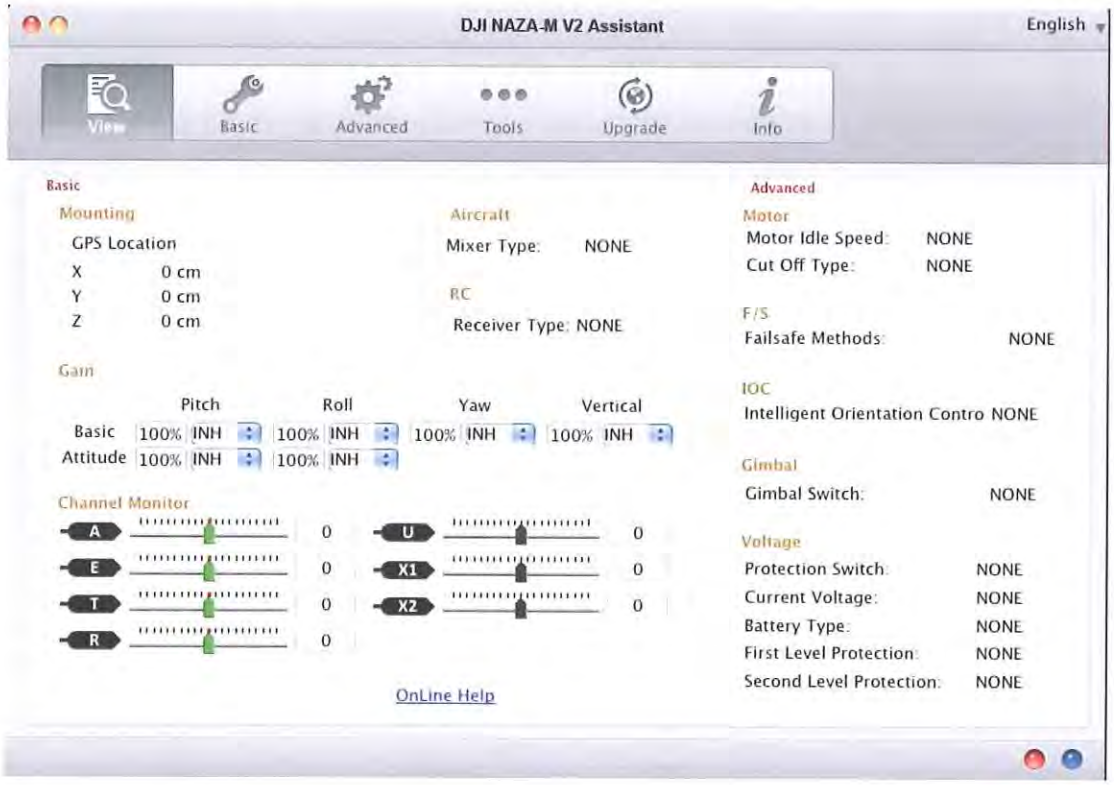
Installing and running on Mac OS X

1. Download the Assistant installer in DMG format from the download page of NAZA-M V2 on the DJI website.
2. Run the installation software and follow the prompts to finish installation.

3. When launching for the first time if use Launchpad to run the NAZA-M V2 Assistant Software, Launchpad won't allow access because the software has not been reviewed by Mac App Store.



4. Locate the NAZA-M V2 icon in the Finder and open the file by Control or right clicking the icon and selecting "Open" from the menu.
5. After the first successful launch, double-clicking the NAZA-M V2 icon in the Finder or using Launchpad will open the application.



Installer in DMG format is supported on Mac OS X 10.6 or above.

The NAZA-M V2 Assistant on Mac OS X and Windows are exactly the same. The Assistant appear in other places of this manual is based on Windows version.

Step2 Configuration by Assistant on a PC

1. Power on the PC. Make sure your computer is connected to the Internet for the first time you use.
2. Switch on the transmitter first, and then power on the autopilot system. Connect the autopilot system to the PC with a Micro-USB cable. DO NOT break the connection until setup is finished.
3. Run the Assistant Software.
4. Observe the indicators on the left bottom of the software. (They are the connection indicator and communication indicator in order.) If the communication indicator is blinking, that the software is ready, please go to next step.
5. Select the "Info" option. Check the software firmware version. If the upgrade is available, you may update the assistant software.

6. Select the "Upgrade" option. Check the Main Controller, GPS and IMU firmware version.
7. Select the "Basic" option. Please follow step-by-step for your first-time-configuration. Basic configuration is necessary, including Mixer Type, Mounting, RC, and Gain settings.
8. You can click the "Advanced" option for more parameter settings. Advanced setting is optional. There are settings of Motor, FailSafe, Intelligent Orientation Control (IOC), Gimbal, Low-Voltage Alert, and Flight Limits. Read the instruction in the assistant software to obtain more details.
9. Select the "Viewer" option to check all parameters.
10. Then break the Micro-USB cable, power off the aircraft. Finished.

(1) You may be required to fill register information for your first-time-usage.
(2) If the communication indicator is blue on, please double check the connections.
(3) Basic configuration is necessary before you go to the "Basic Flying Test".
(4) Users are required to install a Windows system, since the software can only run on Windows system .

(1) If the firmware upgrade is available, please upgrade it by referring to the Firmware Upgrade in the Appendix.
(2) This step is required to use together with the assistant software to obtain more details.

Recommended Parameters

Recommended Settings for using F330/F450/F550

	Configuration Information					Basic Gain				Attitude Gain	
	Motor	ESC	Propeller	Battery	Weight	Pitch	Roll	Yaw	Vertical	Pitch	Roll
F330	DJI-2212	DJI-18A	DJI-8 Inch	3S-2200	790 g	140	140	100	110	140	140
F450	DJI-2212	DJI-30A	DJI-8 Inch	3S-2200	890 g	150	150	100	105	150	150
F550	DJI-2212	DJI-30A	DJI-8 Inch	4S-3300	1530 g	170	170	150	140	170	170

Basic Flying

Control Mode Knowledge

Please read the Control Mode Knowledge clearly before usage, to know how to control the aircraft.

Different control modes will give you different flight performances. Please make sure you understand the features and differences of the three control modes.

<table>
<tr><th></th><th>GPS ATTI. Mode
(With GPS Module)</th><th>ATTI. Mode</th><th>Manual Mode</th></tr>
<tr><td>Rudder Angular Velocity</td><td colspan="3">Maximum rudder angular velocity is 150°/s</td></tr>
<tr><td>Command Linearity</td><td colspan="3">YES</td></tr>
<tr><td>Command Stick Meaning</td><td colspan="2">Multi attitude control; Stick center position for 0° attitude, its endpoint is 35°.</td><td>Max-angular velocity is 150°/s. No attitude angle limitation and vertical velocity locking.</td></tr>
<tr><td>Altitude Lock</td><td colspan="2">Maintain the altitude best above 1 meter from ground.</td><td>NO</td></tr>
<tr><td>Stick Released</td><td>Lock position if GPS signal is adequate.</td><td>Only attitude stabilizing.</td><td>NOT Recommend</td></tr>
<tr><td>GPS Lost</td><td>When GPS signal has been lost for 3s, system enters ATTI. Mode automatically.</td><td>Only performing attitude stabilizing without position lock.</td><td>---</td></tr>
<tr><td rowspan="3">Safety</td><td colspan="2">Attitude & speed mixture control ensures stability</td><td rowspan="2">Depends on experience.</td></tr>
<tr><td>Enhanced Fail-Safe(Position lock when hovering)</td><td>Auto Level Fail-Safe (Attitude stabilizing)</td></tr>
<tr><td colspan="3">With GPS/Compass module and the failsafe requirements are satisfied, in each Control Mode (including GPS Mode, ATTI. Mode, Manual Mode and IOC Mode), the aircraft will enter the failsafe Mode.</td></tr>
<tr><td>Applications</td><td>AP work</td><td>Sports flying.</td><td>---</td></tr>
</table>

Start & Stop Motor Knowledge

(1) Both Immediately Mode and Intelligent Mode are available in the Assistant Software: Advanced->Motor->Stop Type.

(2) Stop Motor method is defaulted to Immediately Mode.

Please get to know well about this section before flying.

1 **Start Motor:** Pushing throttle stick before takeoff will not start the motors. You have to execute any one of following four Combination Stick Commands (CSC) to start the motors:

2 **Stop Motor**: We provide two options to stop motors in the assistant software: Immediately and Intelligent.

(1) **Immediately Mode:** If you select this mode, in any control mode, once motors start and throttle stick is over 10%, motors will not stop immediately only when throttle stick is back under 10% the motors will stop. In this case, if you push the throttle stick over 10% within 5 seconds after motors stop, motors will re-start, CSC is not needed. If you don't push throttle stick after motors start in three seconds, motors will stop automatically.

(2) **Intelligent Mode:** By using this mode, different control mode has different way of stopping motors. In Manual Mode, only executing CSC can stop motors. In ATTI. Mode or GPS ATTI. Mode, any one of following four cases will stop motors:

a) You don't push throttle stick after motors start within three seconds;

b) Executing CSC;

c) Throttle stick under 10%, and after landing for more than 3 seconds.

d) If the angle of multi-rotor is over 70°, and throttle stick under 10%.

Notes of Intelligent Mode

(1) In ATTI. / GPS ATTI. Mode, it has landing judgment, which will stop motors.

(2) Start motors in ATTI. / GPS ATTI. Mode, you have to execute CSC and then push throttle stick over 10% in 3 seconds, otherwise motors will stop after 3 seconds.

(3) During normal flight, only pull throttle stick under 10% will not stop motors in any control mode.

(4) For safety reason, when the slope angle of multi-rotor is over 70° during the flight in ATTI. / GPS ATTI. Mode (may be caused by collision, motor and ESC error or propeller broken down), and throttle stick is under 10%, motors will stop automatically.

Notes of Intelligent Mode & Immediately Mode

(1) If you choose the Immediately Mode, you should not pull throttle stick under 10% during flight, because it will stop motors. If you do it accidentally, you should push the throttle stick over 10% in 5s to re-start motors.

(2) DO NOT execute the CSC during normal flight without any reason, or it will stop motors at once.

(1) If you choose the Intelligent mode, and the throttle stick is under 10%, this will trigger the landing Procedure, in any control mode. In this judgment, pitch, roll and yaw controls are denied except the throttle, but multi-rotor will still auto level.

(2) In any control mode, DO NOT pull throttle stick under 10% during normal flight without any reason.

(1) Any of these two cut off types will only work properly if TX calibration is correct done.

(2) In failed-safe, CSC is denied by the main controller, motors will hold their state.

Step1 Compass Calibration

Without GPS module, please skip this step. If you use with GPS module, follow step-by-step for calibration.

(1) DO NOT calibrate your compass where there is 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) Compass module CANNOT work in the polar circle.

(4) Compass Calibration is very important, otherwise the system will work abnormal.

Calibration Procedures

1. Switch on the transmitter, and then power on autopilot system!
2. Quickly switch the control mode switch from ***GPS Mode*** to ***Manual Mode*** and back to ***GPS Mode*** (or from ***GPS Mode*** to ***ATTI. Mode*** and back to ***GPS Mode***) for more than 5 times, The LED indicator will turn on constantly yellow so that the aircraft is ready for the calibration.
3. (Fig.1) Hold your Multi-rotor horizontal and rotate it around the gravitational force line (about 360°) until the LED changes to constant green, and then go to the next step.
4. (Fig.2)Hold your Multi-rotor vertically and rotate it (its nose is downward) around the gravitational force line (about 360°) until the LED turns off, meaning the calibration is finished.

Fig.1

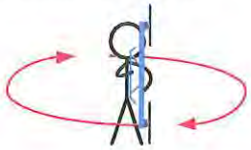


Fig.2

5. If the calibration was successful, calibration mode will exit automatically. If the LED keeps flashing quickly Red, the calibration has failed. Switch the control mode switch one time to cancel the calibration, and then re-start from step 2.

1. When the GPS is abnormal, the Main controller will tell you by the LED blinking Red and Yellow alternately (), disable the GPS Module, and automatically enter the aircraft into the ATTI. Mode.

2. You don't need to rotate your multi-rotor on a precise horizontal or vertical surface, but keep at least 45° difference between horizontal and vertical calibration.

3. If you keep having calibration failure, it might suggest that there is very strong magnetic interference around the GPS /Compass module, please avoid flying in this area.

4. When to do re-calibration

(1) The flight field is changed.

(2) When the multi-rotor mechanical setup has changed:

a) If the GPS/Compass module is re-positioned.

b) If electronic devices are added/removed/ re-positioned (Main Controller, servos, batteries, etc.).

c) When the mechanical structure of the multi-rotor is changed.

(3) If the flight direction appears to be shifting (meaning the multi-rotor doesn't "fly straight").

(4) The LED indicator often indicates abnormality blinking when the multi-rotor spins. (It is normal for this to happen only occasionally)

Step2 Assembly Checking List

Please check each item, to make sure for safety.

Any of the following mistakes will lead to a dangerous accident, double check all these items:

(1) Rotation direction of motor is opposite

(2) Infirm connection between the motor and the ESC

(3) Wrong or infirm installation of Main controller

(4) Wrong or infirm connection between the main controller and ESC.

(5) Propeller installation mistake

(6) Magnetization of the compass

Make sure the following items are correct.

(1) Make sure you have assembled your multi-rotor correctly.

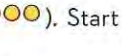
(2) Make sure you have done the configuration procedure correctly.

(3) Make sure all connections are in good condition.

(4) Make sure batteries are fully charged for your transmitter, autopilot system and all devices.

Step3 Before Flight

Carry out the following procedures (is based on Intelligent Mode of Motor Stop) to make sure all configurations are correct. Refer to the Appendix->LED Description for more LED details.

1. Always switch on the transmitter first, then power on multi-rotor!
2. Keep the aircraft stationary until the system start and self-check has finished (). After that, the LED may blink Yellow 4 times quickly (). Start motor is disable during LED blinking Yellow 4 times quickly (), as the system is warming up.
3. After the 4 times Yellow LED disappears, toggle the control mode switch on your transmitter to make sure it is working properly. For example, LED blinks (), which means the system is in ATTI. Mode and the GPS signal is worst Check it with LED indicator to specify the current working mode for MC. See following table for details about LED indicator;

   (1) There are Manual Mode and ATTI. Mode without a GPS/Compass module, no GPS signal status LED indicator.

   (2) After connecting to the GPS/Compass module, GPS ATTI. Mode is available, and GPS signal status LED indicator is available.

Control Mode LED Indicator	GPS Signal Status LED Indicator
Manual Mode: NO LED ATTI. Mode:  (indicates that is stick(s) not at center) GPS Mode:  (indicates that is stick(s) not at center)	Signal is best (GPS satellites > 6) : NO LED Signal is well (GPS satellites = 6) : Signal is bad(GPS satellites = 5) : Signal is worst (GPS satellites< 5) :

4. Keep the aircraft stationary, and then push both sticks to the left bottom or right bottom (shown as the following chart, defined as Combination Stick Commands (CSC)), to start the motors.

5. Release the yaw, roll and pitch sticks and keep them at the mid point, and the throttle stick under the mid point. Then check whether all propellers are rotating correctly.
6. Stop motors, power off the Multi-rotor.
7. Make sure all settings and configurations are correct and then you can take off you aircraft.

After power on, if abnormal LED Indicator occurs, please refer to the Abnormal LED instruction in the FAQ and aids troubleshooting.

Step4 Flying Test

1. Choose an open space without obstruction, tall buildings and crowds as flying filed. Place the aircraft 3 meters away from you and others, to avoid accidental injury.
2. If in GPS ATTI. Mode, place the aircraft in an open space without buildings or trees. Take off the aircraft after 6 or more GPS satellites are found (Red LED blinks once or no blinking). If in Manual Mode or ATTI. Mode, you can skip this step.
3. Start-up
   (1) Switch on the transmitter first, then power on multi-rotor! Keep the aircraft stationary until the system start and self-check has finished.
   (2) Please wait for the system to warm up gradually with the LED blinks Yellow 4 times quickly (🟡🟡🟡🟡). You should not start the motors until the blinking disappears.
   (3) Keep the aircraft stationary, and execute the CSC to start the motors.
   (4) Release the yaw, roll and pitch sticks and keep them at the mid point, at the same time raise the throttle stick from the bottom. The motors will stop if you do not push the throttle stick from the bottom within 3 sec and you will need to re-start the motors.
   (5) Keep raising the throttle stick until all the rotors are working, push the throttle stick to the mid point and then take-off your multi-rotor gently, pay attention not to push the stick excessively.
   (6) Pay attention to the aircraft movement at any time when flying, and use the sticks to adjust the aircraft 's position. Keep the yaw, roll, pitch and throttle sticks at the mid point to hover the aircraft at the desired height.
4. Lower the aircraft slowly. Pull the throttle stick to the bottom and then execute the CSC to stop the motors after landing.
5. Please always power off the Multi-rotor first, and then switch off the transmitter after landing.

FLYING NOTES(VERY IMPORTANT) !!!

(1) If the warm up waiting is longer than 2 minutes (the 4 times Yellow blink continues), please power off for 10 minutes, cold start, and then connect the assistant software, enter the "Tools" - > IMU calibration, carry out the Advanced calibration.

(2) If you enable the Immediately Mode of Motor Stop; you should not pull throttle stick under 10% during flight, because it will stop motors. If you do it accidentally, you should push the throttle stick over 10% in 5s to re-start motors.

(3) DO NOT execute the CSC during normal flight without any reason, or it will stop motors at once.

(4) Pay attention to the GPS satellite status LED indicator. Bad GPS signal may lead the aircraft to drift when hovering.

(5) DO NOT fly near to ferromagnetic substances, to avoid strong magnetic interference with the GPS.

(6) Please avoid using GPS ATTI. Mode in the areas, where GPS signal is most likely bad.

(7) If the LED flashes quickly Red then this indicates battery voltage is low, land ASAP.

(8) If the transmitter indicates low-battery alarm, please land ASAP. In this condition the transmitter may cause the aircraft to go out of control or even crash.

(9) In GPS ATTI. Mode, make sure that the home point is recorded when the GPS signal is well; otherwise the home point recording may be not so precise.

(1) In ATTI Mode, throttle stick center position is for 0m/s along the vertical direction. You should keep the position of throttle stick higher than 10% from cut-throttle during the flight! In any control mode, DO NOT pull throttle stick under 10% during normal flight without any reason.

(2) It is recommended to land the aircraft slowly, to prevent the aircraft from damage when landing.

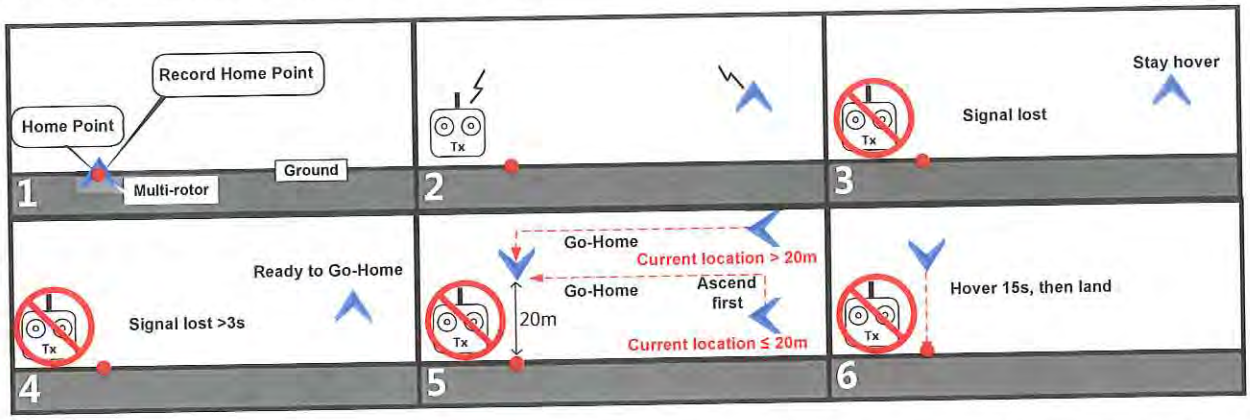
(3) If Low-Voltage Alarm is set, the aircraft will act according to the configuration of the Assistant Software once Low-Voltage Alarm is triggered. Make sure you remember what you have set before.

(4) If Fail-Safe function is set, the aircraft will act according to the configuration of the Assistant Software once Fail-Safe is triggered. Make sure you remember what you have set before.

Advanced Functions

A1 FailSafe

An introduction of Go-Home and Landing.



Home-point: Before takeoff, current position of multi-rotor will be saved as home-point by MC automatically when you start the motors for the first time after 6 or more GPS satellites are found (red light blinks once or no blinking) for 10 seconds.

> ⚠ Note
>
> 1. Please make sure to record the home-point before takeoff, and clearly know where it is.
> 2. During go-home the nose direction of the aircraft is facing toward the home-point, the aircraft is flying directly from the current position to the home-point.
> 3. You can regain the control during the aircraft is hovering 15 seconds.

The flowchart of failsafe and how to regain control

This section will demonstrate the working logic of failsafe and how to regain control. The following description is effective only when:
1. The aircraft is in flight.
2. The GPS works normally and signal is good (≥6 satellite, the LED blinks a single red light or no red light).

What triggered failsafe
The aircraft behavior after failsafe
How to regain control
Precautions

(1) The aircraft flies far away, TX is on but the signal is weak.

- Attitude Mode: (1) the aircraft will level its attitude immediately (2) 3 seconds later, failsafe is triggered and aircraft will start to go home. (3) If signal is regained during (1) or (2), it will resume normal flight immediately.
  - → Attitude Mode: In Attitude Mode as soon as you get signal you can regain control.
- GPS Mode: (1) the aircraft will slow down and hover. (2) if the signal is restored within 3 seconds (TX and receiver connected), the system will immediately return to normal operation; does not enter failsafe. (3) if not reconnected within 3sec, the system will enter failsafe, then even if the signal is restored, the system will not exit failsafe.
  - → GPS Mode: switch the TX mode switch to ATTI, if the receiver is connected, then you will regain control.

(2)Turn off the TX (we assume you want to trigger failsafe)

- In this case, the behavior of the aircraft is the same as in the above condition.
  If you want the aircraft to Return Home, please do not turn the TX back on within 3 seconds*, otherwise the aircraft will exit failsafe mode immediately.
  - → If you choose to turn off the TX, you must be pretty sure that you know how to regain control. Here we offer a method, please read carefully.

We strongly recommend you DO NOT try this, because there are three types of risk:
(1) You must be pretty clear whether the Home-point is OK for landing or not. (You have to understand the definition of Home-point well and the working process of failsafe)
(2) If there are tall buildings around, the aircraft may be obstructed on the way.
(3) When GPS signal is bad or GPS is not working, failsafe will not work.

When you turn off the TX, use the following method to regain control:
(1) Switch the TX switch to GPS.
(2) and then put throttle to the center position(greater than 3sec after switching off, important), you can now turn the TX back on.
(3) then you can switch the TX Control mode switch to ATTI to regain control.

Note: if you start the motors, but do not push the throttle to take-off the aircraft, in this case it is very dangerous to turn off the TX, because the aircraft will take off automatically, so do not try this.

* If signal lost for more than 3 seconds failsafe will be triggered, if signal regained within 3 seconds it will exit failsafe immediately.

A2 Low-Voltage Alert

In order to prevent your multi-rotor from a crash or other harmful consequences caused by low battery voltage, there are two levels of low voltage protection available to use. You can choose to use or not to use them; however we strongly recommend using the protections if available! Low-Voltage Alert is to indicate that the battery cannot provide enough power for the aircraft, in order to warn you to land the aircraft ASAP. You can configure this function in the assistant software, and please read the text in the software carefully before your flight. Make sure to carry out the Current Voltage Calibration.

There are both first level and second level protections. The first level protection has LED warning. During second level protection the aircraft will land automatically with LED warning. Meanwhile the center point of throttle stick will move up slowly to 90% of endpoint, you should land ASAP to prevent your aircraft from crashing!

It is not for fun, you should land your aircraft ASAP to prevent your aircraft from crashing or other harmful consequences!!!

(1) Configure the FailSafe function in the **assistant software -> "Advanced" -> "F/S"** and read the instruction thoroughly and carefully.

(2) Configure the Low-Voltage Alert function in the **assistant software -> "Advanced" -> "Voltage"** and read the instruction thoroughly and carefully.

A3 Intelligent Orientation Control (IOC) Flight (with GPS module)

Definition of Forward Direction:

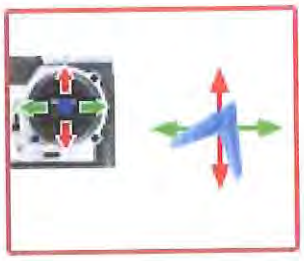
Multi -rotor will fly along this direction when you push the elevator stick ( ).

Step 1 Before You Start

Usually, the forward direction of a flying multi-rotor is the same as the nose direction. By using IOC, wherever the nose points, the forward direction has nothing to do with nose direction. The red and blue arrows on the transmitter are corresponding to pitch and roll operations in the following diagram.

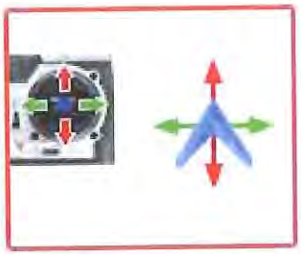
- In course lock flying, the forward direction is the same as a recorded nose direction. All the following requirements are met: the autopilot system is in ATTI. Mode or GPS ATTI. Mode.

Normal flying



Course Lock Flying

- In home lock flying, the forward direction is the same as the direction from home point to multi-rotor. All the following requirements are met: 6 or more GPS satellites are found, in GPS ATTI. Mode, and the aircraft is further than 10m away from the home point.



Normal flying

Home Lock Flying

Step 2 IOC Switch Setting

Before using the IOC function, you have to choose a 3-position switch on your transmitter as the IOC switch, which is also used for recording the orientation, home position in corresponding modes. Refer to the assistant software; click the "Advanced" to find the "IOC".

IOC Switch			
IOC Function	OFF	Course Lock	Home Lock

The above table is for example. The function of the switch position may be reversed since the normal/reversed setting of the switch channel. Toggle the switch and observe the slider position of channel X2 on the assistant software screen, the corresponding area should turn blue.

Step3 Method of Forward Direction and Home Point Recording

If you use the IOC function, **please be aware of the Forward Direction of Course Lock Flying, and the home point of Home Lock Flying.** There are two ways to record the forward direction and the home point: Manually and Automatically. You may choose any one record method. The LED will blink Green quickly if successfully recorded.

	Course Lock	Home Lock
Automatically	30 seconds after you power on the autopilot system.	Before takeoff, the current position of the aircraft will be saved as home point when you start the motors for the first time after 6 or more GPS satellites have been found for 10 seconds.
Manually	30 seconds after you power on the autopilot system. Toggle the IOC switch from Off to Course Lock, and back to Off quickly 3 to 5 times.	After 6 or more GPS satellites have been found. And the aircraft can be hovering. Toggle the IOC switch from Course Lock to Home Lock, and back to Course Lock quickly 3 to 5 times.

DO NOT toggle the switch between Off to Home Lock, since it may change the recording of the **Forward Direction of Course Lock.**

Step4 IOC Flying Test

Then you can do **Course Lock and Home Lock flying test.**

Carry out an IOC flight by the following procedure. The Control Mode LED will blink Yellow and Green alternatively ( ) to indicate the IOC mode only when the main controller is really to fly in Course Lock, Home Lock modes.

During the same flight	STEP1: Record	STEP2: ON	STEP3: OFF	STEP4: ON again
Course Lock				
Switch Setting	Record the Forward Direction	Set Control Mode switch at GPS or ATTI. position, Toggle IOC switch from OFF to Course Lock position	Toggle IOC switch to OFF position	Toggle IOC switch from OFF to Course Lock position
Home Lock				
Switch Setting	Record the Home Point	Set Control Mode switch at GPS position, Toggle IOC switch from OFF to Home Lock position	Toggle IOC switch to OFF position	Toggle IOC switch from OFF to Home Lock position

Aircraft moving direction when pull pitch stick Aircraft moving direction when pull roll stick

Home point Aircraft (the arrow is pointing to the direction of the aircraft nose)

IOC FLYING NOTES !!!

(1) When Multi-rotor is flying by home lock far away from you and the home point, please DO NOT toggle the IOC switch many times quickly so as to avoid the change of home point without your attention.

(1) Home lock flying requires that 6 or more GPS satellites are found and the aircraft is further than 10m away from the home point.

(2) If the IOC flying requirement is not satisfied, the autopilot system will quit IOC control mode. Please be aware of the LED indicator, to know the current control mode of the autopilot system.

(1) Blinking indications of IOC  are:

a) Before motors start:  **blink**, all sticks (except throttle stick) return to center;  **blink**, stick(s) (except throttle stick) not at center.

b) After motors start and throttle stick is over 10% in 3 seconds:  **blink**, all sticks return to center;  **blink**, stick(s) not at center.

(2) Before you do the home lock flight, you have to fly the aircraft out of the 10m range around home point, and then flip the IOC switch to Home Lock position to fly in home lock when all the requirements are met. If you have already toggled the IOC switch to Home Lock position when the aircraft is still in 10m range around home point, and this is the first time you are going to fly in home lock during the current flight, then if all the requirements are met, the main controller will change into home lock automatically when Multi-rotor flies out the 10m range around home point.

(1) When flying in Home Lock mode, if any of the following situations happen, then the system will quit Home Lock flying and automatically enter Course Lock flying. The aircraft will fly in Course Lock using the earlier forward direction.

a) The aircraft fly 's within 10m range of the home point.

b) You toggle the control mode switch to the ATTI. Mode.

c) The GPS signal becomes bad (The GPS signal LED is blinking Red twice or three times).

(2) We suggest that you should know clearly which flight lock method you are going to fly, and you know the locked forward direction or home point, before you switch on IOC mode during the flight.

A4 Receiver Advanced Protection Function

You are asked to enable this function by connecting to the Assistant Software, please set it at the section of Basic->R/C-> Receiver Advanced Protection.

If you choose enable it, the FailSafe will be triggered if the following situations occur during flight.

According to the difference of the aircraft height, there are two situations.

a) Lower than 100m, the A/E/R channel is not at the mid point.

b) Higher than 100m, the A/E/R channel is not at the mid point or the throttle stick is above the mid point.

In the GPS Mode or ATTI. Mode, if the requirement a) or b) is satisfied, and the output data of four channels A/E/R/T have not changed for 20 seconds, then the aircraft will hover automatically. After that, if the output data of four channels A/E/R/T still do not any changes and last for 10 seconds, the autopilot system will think that the data from receiver is abnormal, and then enter the FailSafe Mode.

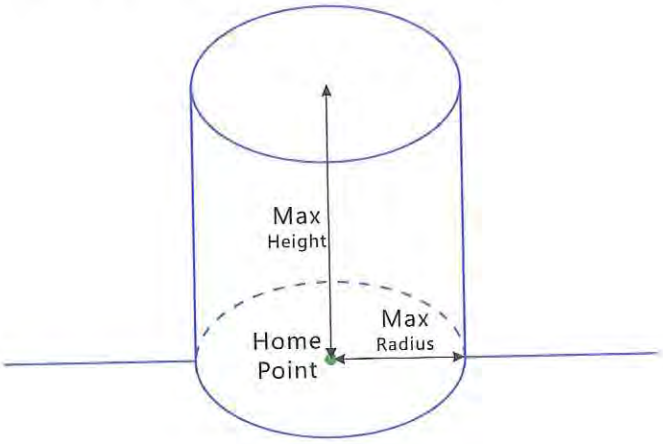
Brief introduction of how to quit the FailSafe Mode

If there is any command change from the receiver, the autopilot system thinks that the receiver is regained. In ATTI. Mode and Manual Mode, it will quit the FailSafe Mode automatically. In GPS Mode, please toggle the control mode switch to the ATTI. Mode and Manual Mode position to regain the control. Refer to the FailSafe section for more details.

A5 Flight Limits

The flight limits function is default enabled in the NAZA-M Flight control system, it's aimed to restrict the flying height and distance of the aircraft. The Max Height restricts the vertical distance between the aircraft and the Home point, the Max Radius restricts the horizontal distance between the aircraft and the Home point.

The default Max Height is 2000m and Max Radius is 2000m. Users can write the values of the Max Height and Max Radius in the Assistant software, the range of the Max Height is 10m-100000m, the range of the Max Radius is the same. So that the aircraft will fly in the entered range, which is a cylinder space above the Home point.



(1) Height Limit works when the control mode is GPS or ATTI. Mode. Radius Limit works when the control mode is GPS and the satellite number ≥6.

(2) If the aircraft flies out of the limits, it's still controllable except flying further away.

(3) If the control mode is changed to GPS when the aircraft is out of Max Radius, the aircraft will fly back within the entered range.

(4) The Failsafe and the Ground Station operations are not restricted to the Flight Limits.

Appendix

Specifications

General

Built-In Functions	(1) Three Modes of Autopilot	(4)S-Bus/S-Bus2 Receiver Support
	(2)Enhanced Fail Safe	(5)PPM Receiver Support
	(3)Low Voltage Protection	(6)2-axle Gimbal Support

Peripheral

Supported Multi-rotor	• Quad-rotor I4, X4; • Hexa-rotor I 6, X6, IY6, Y6. • Octo- rotor I8, V8, X8
Supported ESC output	400Hz refresh frequency.
Recommended Transmitter	PCM or 2.4GHz with a minimum 4 channels.
Assistant Software System Requirement	Windows XP SP3; Windows 7; Windows 8

Electrical & Mechanical

Working Voltage Range	• MC: 4.8V ~ 5.5 V • PMU Input: 7.4V ~ 26.0 V (recommend 2S ~ 6S LiPo) Output(V-SEN port red wire): 3A@5V Output(V-SEN port red wire)burst current:7.5A
Power Consumption	• MAX: 1.5W(0.3A@5V) • Normal: 0.6W(0.12A@5V)
Operating Temperature	-10°C ~ 50°C (14F ~122F)
Weight	• MC: 27g • GPS/Compass: 27g • PMU: 28g • LED: 13g
Dimensions	• MC: 45.5mm × 32.5mm × 18.5mm • GPS/Compass: 46mm (diameter) x 10mm • PMU : 39.5mm × 27.5mm × 10.0mm • LED : 25mm × 25mm × 7.0mm

Flight Performance (can be effected by mechanical performance and payloads)

Hovering Accuracy (GPS Mode)	• Vertical: ± 0.8m • Horizontal: ±2.5m
Max Yaw Angular Velocity	200°/s
Max Tilt Angle	35°
Max Ascent / Descent Speed	**Ascent** : 6m/s, **Descent:** 4.5 m/s

MC/PMU Firmware Upgrade

Please follow the procedure for software and firmware upgrade; otherwise the system might not work properly. For SAFETY REASONS, DO NOT use power battery during firmware upgrade.

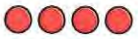
1. Make sure your computer is connected to the Internet.
2. Please close all the other applications during the firmware upgrade, including anti-virus software and firewall.
3. Make sure the power supply is securely connected. DO NOT un-plug the power supply until firmware upgrade has finished.
4. Connect system to PC with Micro-USB cable, DO NOT break connection until firmware upgrade is finished.
5. Run Software and wait for connection.
6. Select Upgrade option→Check the MC and PMU Firmware Version.
7. DJI server will check your current firmware version, and get the latest firmware prepared for the unit.
8. If there is a firmware version more up-to-date than your current version, you will be able to click to update them.
9. Wait until Assistant software shows "finished".
10. Click OK and power cycle the unit after at least 5 seconds.
11. Your unit is now up-to-date.

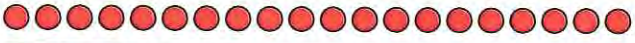
(1) After firmware upgrade, please re-configure the system using Assistant software.

(2) If firmware upgrade failed, the system will enter waiting for firmware upgrade status automatically, please try again with the above procedures.

(3) Select Upgrade option→Check the GPS Firmware Version, online upgrade is disable.

LED Description

System Status	LED Flashing
System start and self-check	
IMU abnormal data or need advanced calibration*	
Warm up after power on	
The aircraft is moved or bias of sensors too big	
Compass error too big, need recalibration.	
Transmitter (TX) signal lost, enter the FailSafe.	
TX stick(s) mid point error too big	
Low voltage alert or other abnormal alert* (e.g. Configuration error, TX data error, Enable low voltage protection without PMU, SN error or Compass abnormal work.)	
Record forward direction or home point	
Control Mode Indictor	Manual Mode: None ATTI. Mode:  (stick(s) not at center ) GPS Mode:  (stick(s) not at center ) IOC Mode:  (stick(s) not at center )
GPS Signal State Indicator (GPS/Compass Module is necessary)	GPS Signal is Best(GPS Satellite number > 6): None GPS Signal is Well(GPS Satellite number = 6):  GPS Signal is Bad (GPS Satellite number = 5) :  GPS Signal is Worst (GPS Satellite number < 5): 

Compass Calibration	LED Flashing
Begin horizontal calibration	
Begin vertical calibration	
Calibration or others error	

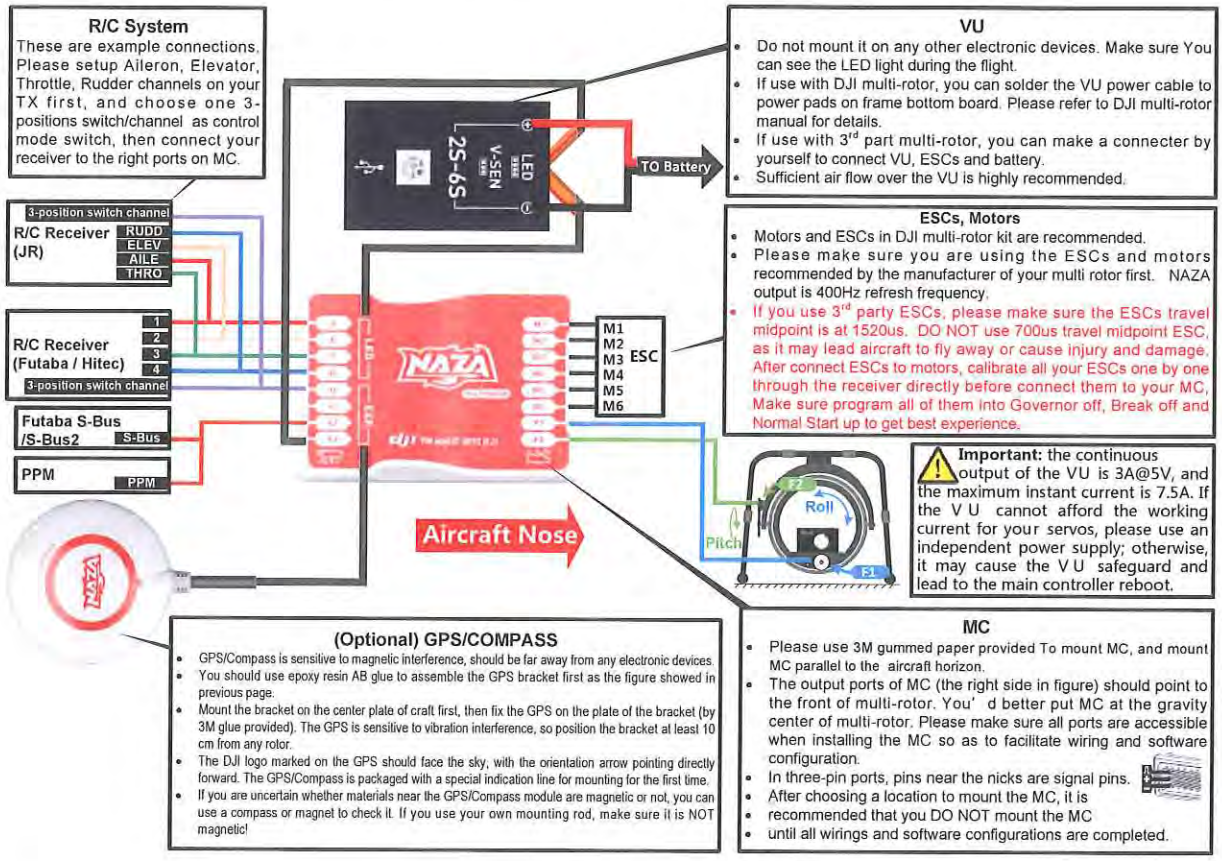
*You can figure out the error by connecting the autopilot system to the assistant software.

Instruction of V1 (also known as NAZA-M)

V1 (also known as NAZA-M) system is different from V2 system, if you are V1 system user, please read the following text carefully, and refer to the other text in this Guide for usage details (including **Assistant Software Configuration, Basic flying, Advanced Function Appendix and FAQ, etc.**) .

V1 Assembly and Connection

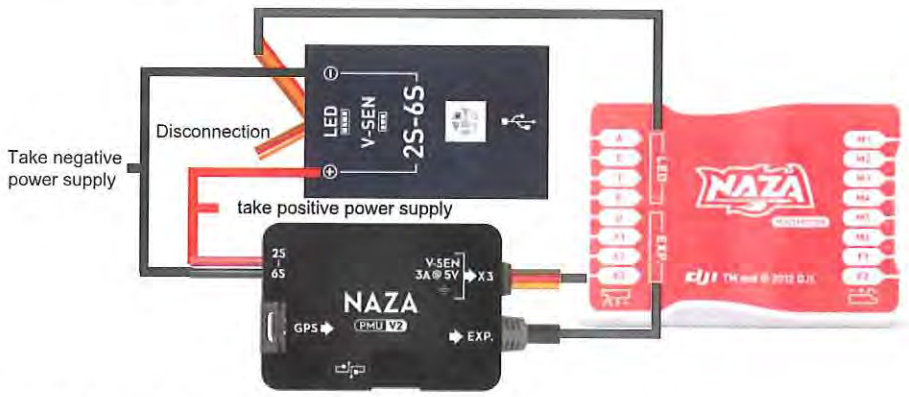
Connect the V1 system according to the following chart.



V1 is compatible with the PMU V2 (Accessory of Naza-M V2)

V1 system is compatible with the PMU V2 of V2 system; please carry out the following connection. The other modules connection is the same as before.

Important: You are asked to upgrade your Firmware version of V1 MC to V3.10 or above, as the PUM V2 can only work with the MC of version 3.10 or above.



V1 Port Description

Please remember the function of each port, which may help you to use the Naza-M efficiently.

Main Controller

A	For roll control (left/right)		
E	For pitch control (front/back)		
T	For throttle control		
R	For rudder control		
U	For Control Mode Switch		
X1	For gimbal pitch control	Or for gain tuning	
X2	For D-Bus (S-Bus/ S-Bus2 compatible)	Or for gain tuning	Or for IOC switch
X3	For voltage monitor (Connect with VU V-SEN port)		
M1	To #1 rotor		
M2	To #2 rotor		
M3	To #3 rotor		
M4	To #4 rotor		
M5	To #5 rotor		
M6	To #6 rotor		
F1	To gimbal roll servo	Or to #7 rotor (Upgrade the MC Firmware to V3.10 or above)	
F2	To gimbal pitch servo	Or to #8 rotor (Upgrade the MC Firmware to V3.10 or above)	
LED	LED port, for LED wire connection from Versatile Unit		
EXP.	GPS port, for GPS module wire connection.		
	(In three-pin ports, pins near the nicks are signal pins.)		

Versatile Unit

V-SEN V-SEN port: To the X3 port of the main controller, for monitoring battery voltage and supplying power

- Orange wire (signal wire) output: ±3.3V
- Red wire (power wire) output: 3A@5V

LED LED wire, to LED port of the main controller.

USB port: PC connection for configuration and firmware upgrades.

GPS & Compass

Connect to the EXP. port.

V1 Specification

General	
Built-In Functions	• Three Modes of Autopilot • Enhanced Fail Safe • Low Voltage Protection • S-Bus/ S-Bus2 Receiver Support • PPM Receiver Support • 2-axle Gimbal Support
Peripheral	
Supported Multi-rotor	• Quad-rotor I4, X4; • Hexa-rotor I 6, X6, IY6, Y6. • Octo-rotor I8, V8, X8 (Upgrade the MC Firmware to V3.10 or above)
Supported ESC output	400Hz refresh frequency.
Recommended Transmitter	PCM or 2.4GHz with a minimum 4 channels.
Assistant Software System Requirement	Windows XP SP3; Windows 7
Electrical & Mechanical	
Working Voltage Range	• MC: 4.8V ~ 5.5 V • VU Input: 7.2V ~ 26.0 V (recommend 2S ~ 6S LiPo) Output(V-SEN port red wire): 3A@5V Output(V-SEN port red wire)burst current:7.5A
Power Consumption	• MAX: 1.5W(0.3A@5V) • Normal: 0.6W(0.12A@5V)
Operating Temperature	-10°C ~ 50°C(14F ~122F)
Weight	• MC: 25g • GPS: 21.3g • VU: 20g
Dimensions	• MC: 45.5mm × 31.5mm × 18.5mm • GPS & Compass: 46mm (diameter) x 9mm • VU: 32.2mm × 21.1mm × 7.7mm
Flight Performance (can be effected by mechanical performance and payloads)	
Hovering Accuracy (GPS Mode)	• Vertical: ± 0.8m • Horizontal: ± 2.5m
Max Yaw Angular Velocity	200°/s
Max Tilt Angle	45°
Max Ascent / Descent Speed	6m/s

FAQ

Abnormal LED Indication List

During the Checking Procedure, if abnormal LED Indicator occurs or even the system cannot work normally, please refer to the following list and aids troubleshooting.

(1) "System initializing and self-checking LED flashes" are not correct ( Red LED appears in the last four green flashes). The autopilot system works abnormally. Please contact your dealer.

(2) LED blinks Yellow 4 times quickly (). The system is warming up. You cannot start the motors until the 4 rapid yellow flashes disappear. If the warm up waiting is longer than 2 minutes, please power off for 5 minutes, cold start, and then connect the assistant software, enter the "Tools" - > IMU calibration, carry out the Advanced calibration.

(3) After the system start and self-checking has finished, if the LED blinks Red, Green and Yellow () continually. Sensor error is too big. Please connect the assistant software, enter the "Tools" - > IMU calibration, carry out calibration.

(4) At the first motors start, the system will check the sensors Bias and you are asked to keep the aircraft stationary (no need of horizontal level). If you cannot start the motors and the LED blinks Green 6 times quickly (), it means that the sensor error is too big. Please connect the assistant software, enter the "Tools" - > IMU calibration, carry out basic calibration.

Note: after the first successful motors start, this checking will be disabled and it is no need any more to keep the aircraft stationary during starting motors.

(5) The system blinks Red LED quickly during flying. Low-voltage protection is triggered. Please land the aircraft ASAP.

(6) The system blinks Yellow LED quickly during flying. FailSafe Mode is triggered. Pay attention that there is no tall buildings and trees to block your aircraft during go-home.

(7) The LED blinks Red and Yellow alternately (). Compass error is too big.

a) There may be a ferromagnetic substance close to the Phantom. Lift the aircraft up about 1m from the ground, if there is no Red and Yellow flashing, then it will not affect the flight.

b) Otherwise, re-calibrate the compass.

c) If re-calibration does not work, please connect to the Assistant Software, select the "Tools" and follow the tips to carry out the required operation.

Fix the TBE (Toilet Bowl Effect) Problem

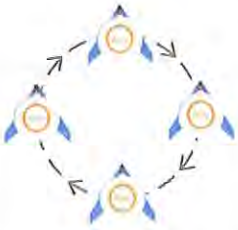
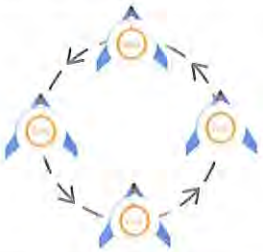
When flying in GPS ATTI. Mode and the compass calibration has been done correctly, should you find the aircraft rotating (Toilet bowl effect), or drifting when hovering. Please check the GPS module mounting orientation and then

re-do the compass calibration. Carry out the following procedure to re-mount the GPS module.

In the following diagram (view from the top), the aircraft can appear to be rotating in both clockwise and counter-clockwise direction, please re-mount the GPS module correspondingly.

is the rotating direction of aircraft, is the nose direction of aircraft,

is the arrow direction on the GPS module, θ is the offset angle for GPS re-mounting(about 10~30°)

Clockwise rotating	GPS re-mounting	Counter Clockwise rotating	GPS re-mounting
			

Should you find the multi-rotor does not track straight in forward flight.

Please carry out several more courses, the system will fix it automatically.

Motors Start failure caused by TX stick(s) mid point error too big

If the TX stick(s) mid point error is too big, Motors Start will fail when you execute the Combination Stick Commands (CSC) and lead to the aircraft will not takeoff.. And the LED will blink Red four times per second continually to warn you.

TX stick(s) mid point error too big can be caused by the following reasons:

(1) There is TX stick (except the throttle stick) not at center when power on the autopilot system.

(2) The TX sticks has been trimmed, which leads to the large deviation of mid point. For example, the SUB-TRIM has been adjusted for Futaba transmitter.

(3) The TX stick(s) travel has larger asymmetry.

For the reason (1), please put all TX sticks at the mid point, and then power cycle the autopilot system to re-record the mid point. If the problem continues, that can be caused by the reason (2) or reason (3), yo u need to adjust the output range of your TX, and then use the Assistant Software to redo the TX cali bration. Please carry out the following procedures.

(1) Connect to the Assistant software, click Basic-> R/C-> Command Sticks Calibration, and push all TX sticks throughout their complete travel range to see if any stick cannot reach its largest position.

(2) Adjust the largest travel of TX stick until the cursor on the Assistant software can reach both end positions, according to your TX manual.

(3) Power cycle the autopilot system, note that power cycle is required.

(4) Redo the TX calibration according to the Assistant software.

Attitude Controllable When One Motor Output is Failed

For Hexa-rotor, including Hexa-rotor I, Hexa-rotor V, Hexa-rotor IY and Hexa-rotor Y, aircraft is attitude controllable when one motor output is failed.

The NAZA-M can still control the attitude of the Hexa-rotor for a safe landing when one motor output of the Hexa-rotor has failed, for example, one motor is stopped or one propeller is broken, etc.

The control mode of NAZA-M should be in Atti. Mode or GPS Atti. Mode. The aircraft will rotate, due to an imbalance of torque; however, it can still be controlled by the Transmitter.

Select Course lock or home lock mode for flying the aircraft into a safe area to land when the aircraft is far away or the attitude can't be recognized. Even when the multi rotor is rotating, using Course lock or home lock mode will allow you to move the multi rotor in the corresponding Transmitter stick direction.

When used with other DJI products

The NAZA-M system communicates with other DJI products (e.g. H3-2D gimbal, BTU module, iOSD mini and iOSD Mark II) via the CAN-Bus port ( ) of the NAZA PMU V2. You can plug new DJI products into any spare CAN-Bus port, since CAN-Bus ports on NAZA-M, CAN HUB, GCU, iOSD mini, iOSD Mark II and 2.4G Bluetooth Datalink are the same for the communications.

When there are not enough CAN-Bus ports for additional DJI products, then a DJI CAN HUB module is recommended. The following diagram is for your connection reference.

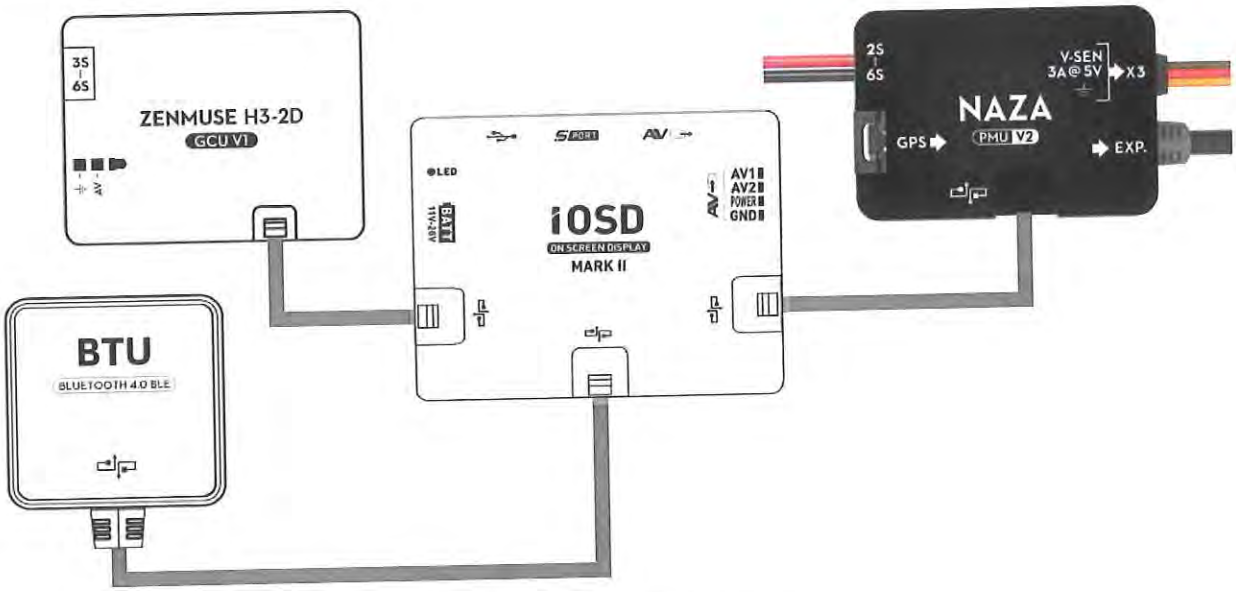


Fig.1 Used with iOSD Mark II

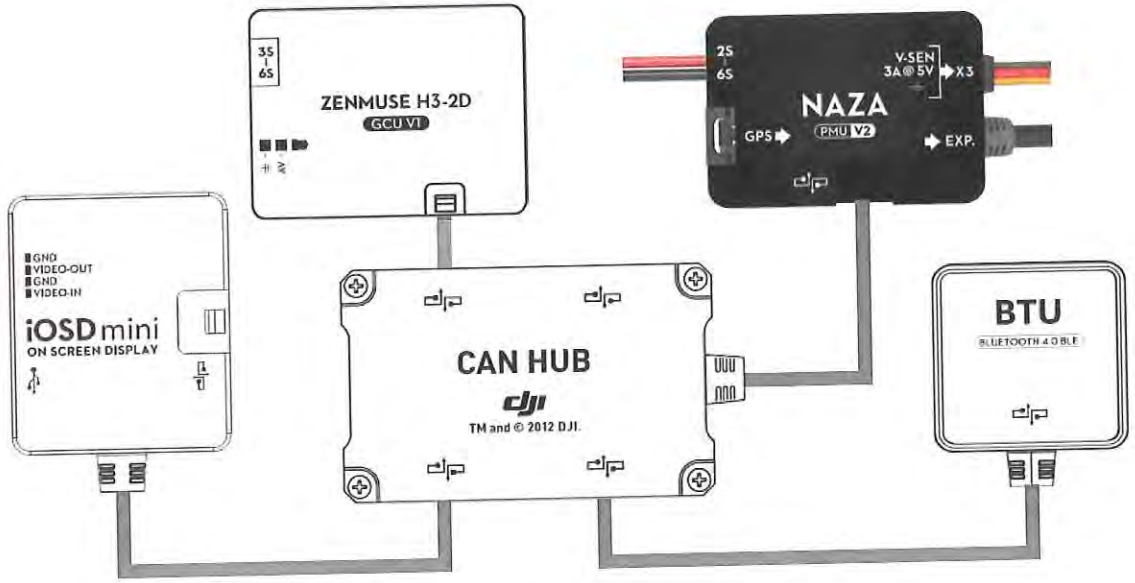


Fig.2 Used with CAN HUB

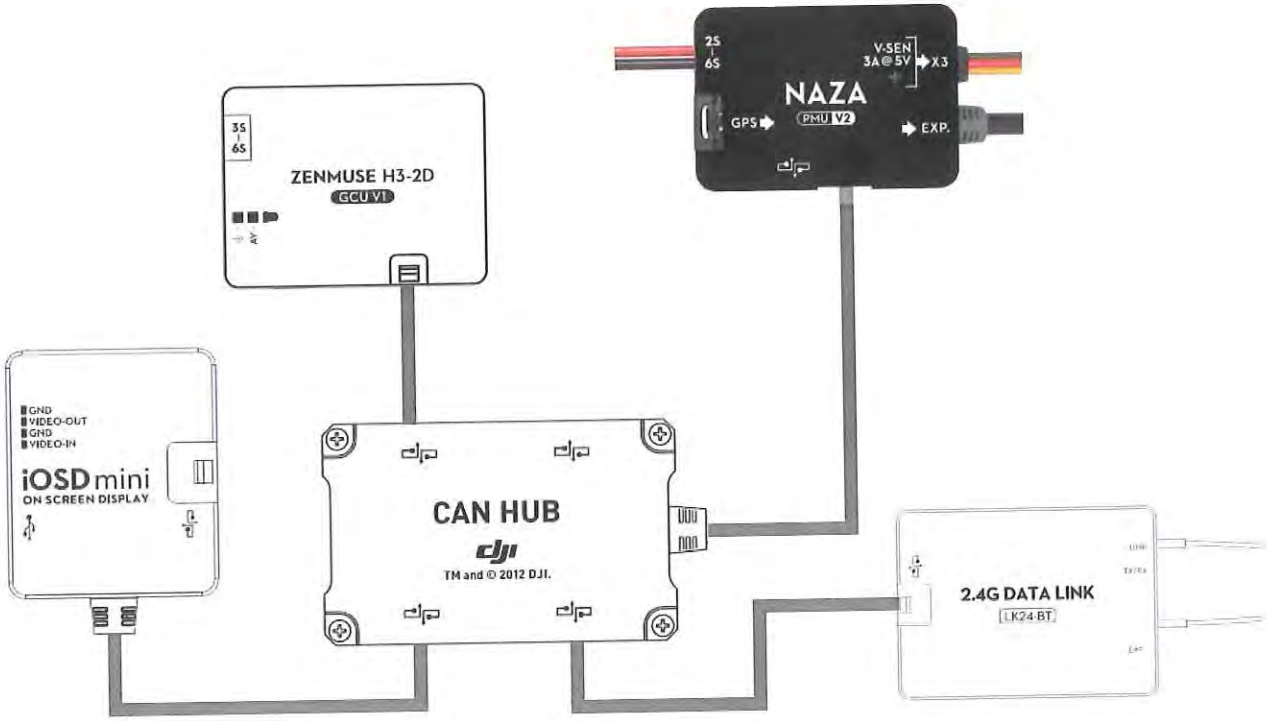


Fig.3 Use a CAN HUB to connect the 2.4G Bluetooth Datalink

(1) Users can use the NM Assistant on the mobile device when a BTU module is connecting with the Ground end of the2.4G Bluetooth Datalink (No need to connect another BTU module to the Flight control system).

pixhawk

AUTOPILOT

QUICK START GUIDE

3D Robotics

PARTS

1 Pixhawk
2 Buzzer
3 Safety switch
4 Micro-SD card and adapter
5 Micro-USB cable
6 Six-wire cable x2
7 Power module
8 I²C splitter module
9 Four-position I²C splitter cable
10 Three-wire servo cable
11 Mounting foam

GETTING STARTED

With the help of APM firmware, Pixhawk turns any RC plane, copter, or rover into a full-featured personal drone. Once you have a fully-assembled frame, follow this guide to install Pixhawk.

1 Mount
2 Connect
3 Load firmware
4 Calibrate

1 MOUNT

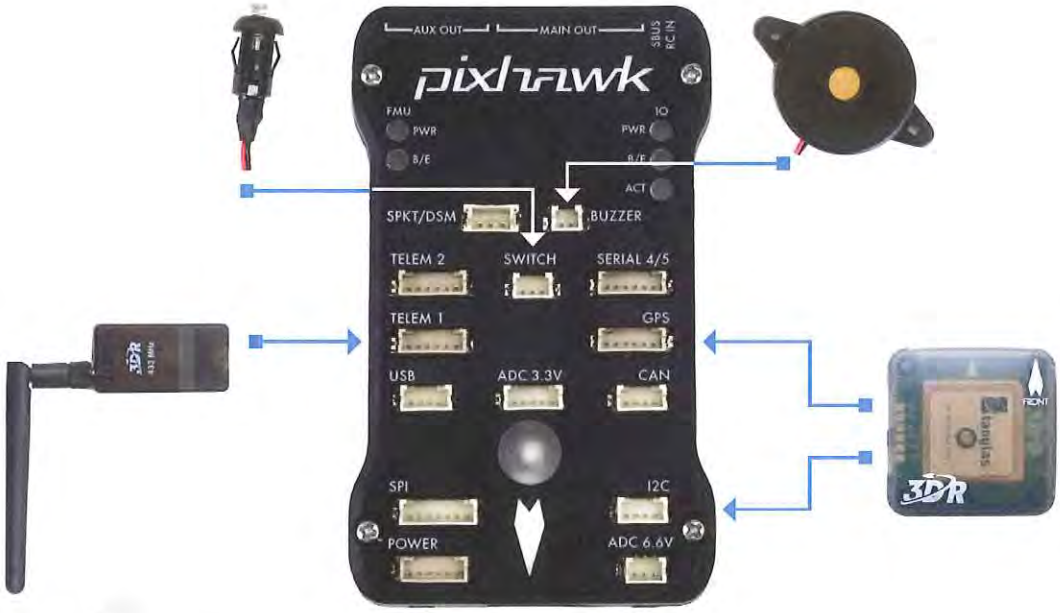
Use the provided foam to mount Pixhawk as close as possible to your vehicle's center of gravity. Make sure to orient the board with the arrow pointing forward.

Attach the foam squares to the corners of the board.

Vehicle front

2 CONNECT

(Required) Connect the buzzer and safety switch.



(Optional) Connect a 3DR Radio to Pixhawk's Telem port using the 6-wire cable provided with your 3DR Radio Kit to receive data and communicate with the autopilot in flight.

(GPS or GPS+Compass required) Connect a 3DR GPS+Compass to provide the autopilot with positioning data during flight. This kit includes a 6-wire cable to connect the GPS ports. Connect the MAG to the I²C port using the 4-wire cable provided with the 3DR GPS+Compass.

(Required) Connect the 3DR Power Module to the Power port using the 6-wire cable to direct power from your lithium polymer (LiPo) battery to the autopilot.

(Optional) The I²C splitter expands the I²C port to allow up to four additional peripherals to connect to Pixhawk. Use the 4-wire cable to connect the I²C splitter and add a compass module, external LED, digital airspeed sensor, or other peripherals to your vehicle.

LOAD SD CARD INTO PIXHAWK

If the SD card is not preloaded into Pixhawk, insert the micro-SD card into the slot at the bottom end of the board.

CONNECT RADIO CONTROL

FOR PPM RC RECEIVERS AND FUTABA S.BUS RECEIVERS

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

FOR SPEKTRUM SATELLITE RECEIVERS

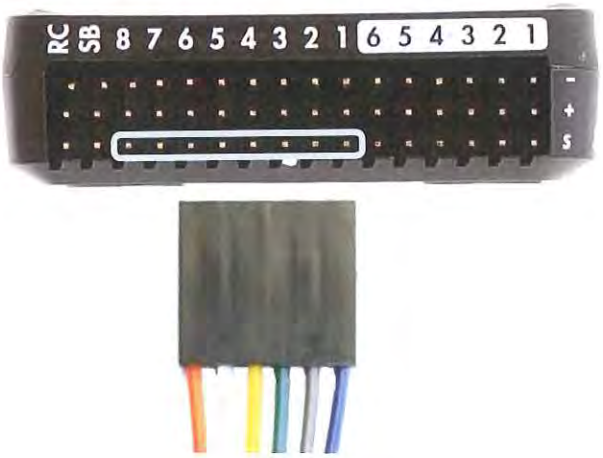
For a Spektrum DSM, DSM2, or DSM-X Satellite RC receiver, connect to the SPKT/DSM port.

For a complete list of RC systems compatible with Pixhawk, visit the APM wiki page here.

FOR PWM RECEIVERS

Purchase a PPM Encoder module to connect a PWM RC receiver to Pixhawk at store.3dr.com.

CONNECT OUTPUTS



FOR COPTERS

Connect each signal wire from the PDB to the main output signal (S) pins by motor number. Connect one wire for each motor to the corresponding pin.

Pin 1 = Motor 1
Pin 2 = Motor 2
Pin 3 = Motor 3
Pin 4 = Motor 4
Pin 5 = Motor 5
Pin 6 = Motor 6
Pin 7 = Motor 7
Pin 8 = Motor 8

FOR PLANES

For planes, connect the control channel wires to the main output signal pins.

Pin 1 = Aileron
Pin 2 = Elevator
Pin 3 = Throttle
Pin 4 = Rudder

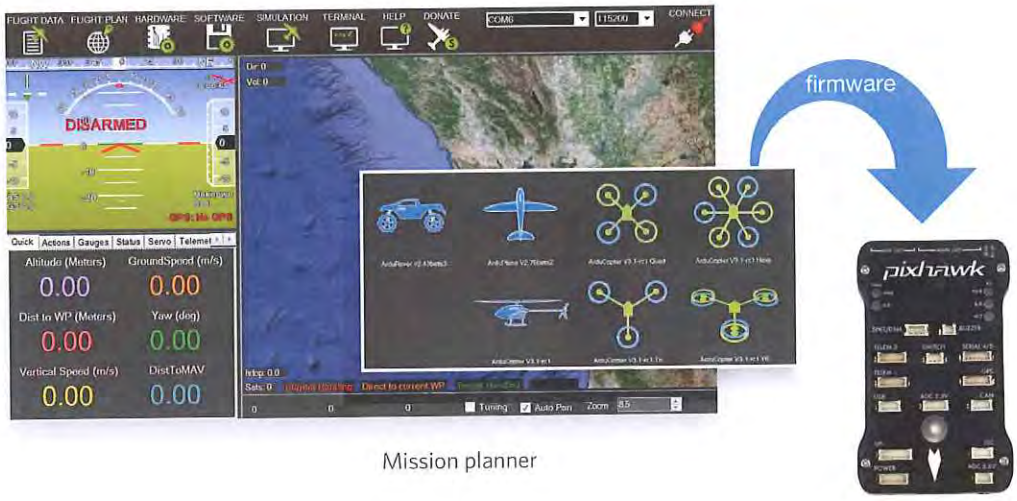
FOR ROVERS

For rovers, connect the throttle and steering wires to the main output signal pins.

Pin 3 = Throttle
Pin 4 = Steering

3 LOAD FIRMWARE

APM firmware is the brains of your autopilot operation and must be installed before using Pixhawk.
To load firmware onto Pixhawk, install a mission planner application on your ground station computer. Choose either Mission Planner (Windows) or APM Planner for (Windows, OS X, and Linux).
Both applications are available for free download from ardupilot.com.



Mission planner

Download Mission Planner (Windows)

Ardupilot.com → Downloads → Mission Planner

Download APM Planner (Windows, OS X, and Linux)

Ardupilot.com → Downloads → APM Planner 2.0

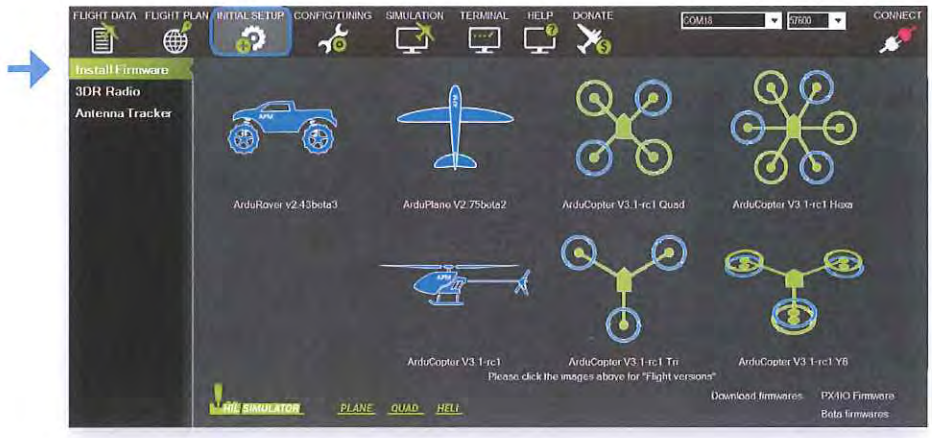
INSTALL PLANNER

After selecting the correct file, read the safety information and select Download.

Open the file to run the setup wizard. Proceed through any security warnings, and install all suggested drivers. When the installation is complete, open the application, and connect Pixhawk to your computer using the micro-USB cable.

Your computer will automatically install the correct drivers. Do not select Connect at this time; Pixhawk can only load firmware while unconnected to Mavlink.

Select Initial Setup, Install Firmware, and select your vehicle.



When prompted, follow the directions to load the firmware. Once the status bar shows that the download is complete, power cycle the board by disconnecting and reconnecting the USB.

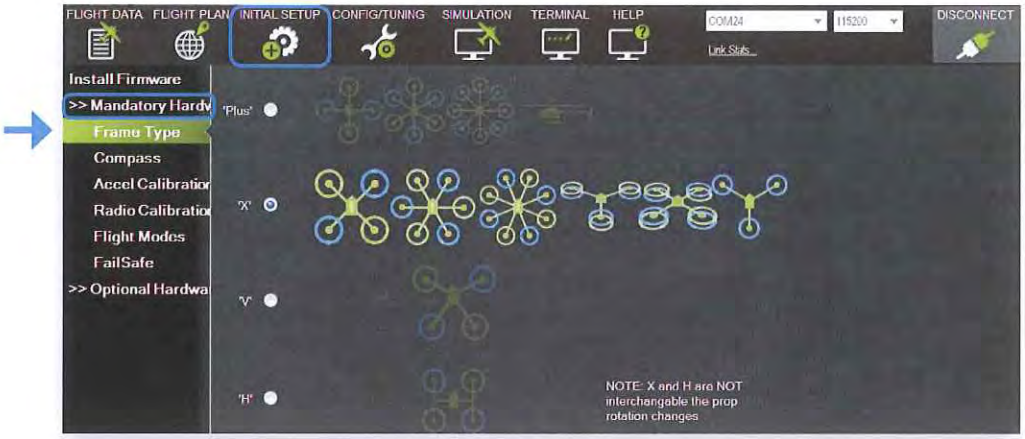
If you hear a musical tone, your firmware installation is complete. If you hear a series of tones followed by three beeps, disconnect the USB and reconnect while holding down the safety button. Upon restart, listen for a series of tones followed by two beeps indicating that your firmware has loaded successfully.

4 CALIBRATE

With Pixhawk connected to your computer, select the communication option from the drop-down menu for PX4 FMU, set the rate to 115200, and select the Connect icon. Select Initial Setup and Mandatory Hardware to access the calibration wizards.

Remove propellers before performing calibration.

SELECT FRAME TYPE (COPTERS ONLY)



For copter, select your frame orientation.

CALIBRATE COMPASS

Select the options to enable the compass; to allow automatic declination calculation; and to specify Pixhawk. Select Live Calibration to launch the wizard, and follow the prompts.

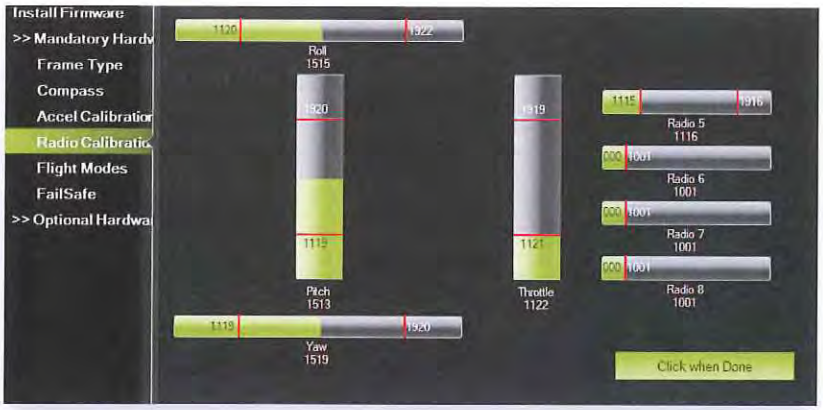
Show Me

videos demonstrating live calibration techniques at 3dr.com/learn.

CALIBRATE ACCELEROMETER

Select Accel Calibration, check the box for AC 3.0+, select Calibrate, and follow the prompts to calibrate Pixhawk's accelerometer. Make sure to wait a couple of seconds before and after changing the positions of the vehicle.

RC CALIBRATION

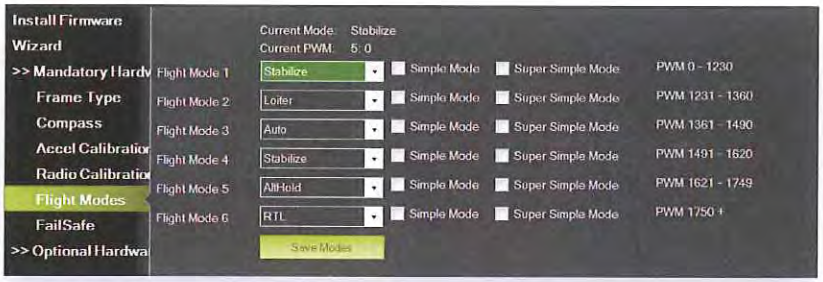


left stick

right stick

Select Radio Calibration to teach Pixhawk to work with your RC transmitter. Turn on your transmitter, select Calibrate Radio, and move all sticks and switches to their extreme positions. Select Click when Done once the red bars are set for all available channels.

SELECT FLIGHT MODES



Move each switch on your transmitter to its available positions. The mission planner will indicate the currently selected position with green highlighting. Select a mode for each switch position, and select Save Modes to assign.

LED MEANINGS

Flashing red and blue: initializing. Please wait.

Double flashing yellow: error. System refuses to arm.

Flashing blue: disarmed, searching for GPS. Autonomous, loiter, and return-to-launch modes require GPS lock.

Flashing green: disarmed, GPS lock acquired. Ready to arm. Quick double tone when disarming from the armed state.

Solid green plus single long tone: armed and ready to fly!

Flashing yellow: RC failsafe activated.

Flashing yellow plus quick repeating tone: battery failsafe activated.

Flashing yellow and blue plus high-high-high-low tone: GPS glitch or GPS failsafe activated.

SAFETY SWITCH MEANINGS

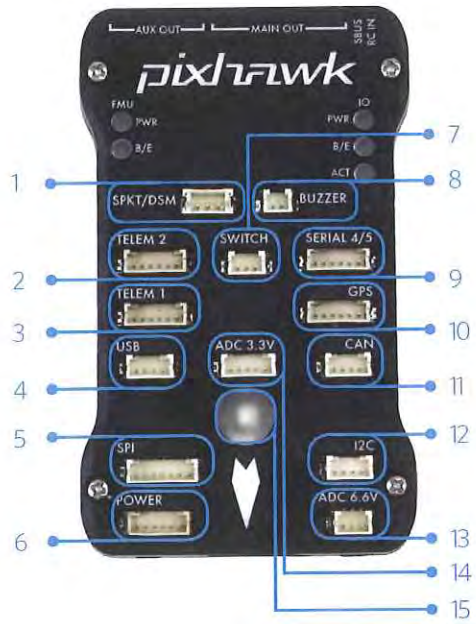
Quick, constant blinking: performing system check. Please wait.

Intermittent blinking: system ready. Press the safety button to activate.

Solid: ready to arm. Proceed to the arming procedure.

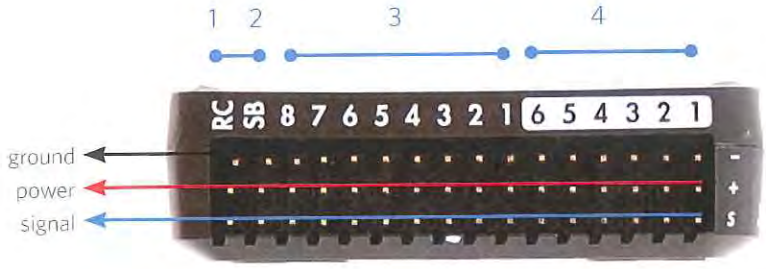
Learn more
about LED meanings and buzzer tones at 3dr.com/learn.

PORTS



1 Spektrum DSM receiver
2 Telemetry (radio telemetry)
3 Telemetry (on-screen display)
4 USB
5 SPI (serial peripheral interface) bus
6 Power module
7 Safety switch button
8 Buzzer
9 Serial
10 GPS module
11 CAN (controller area network) bus
12 I²C splitter or compass module
13 Analog to digital converter 6.6 V
14 Analog to digital converter 3.3 V
15 LED indicator

1 Input/output reset button
2 SD card
3 Flight management reset button
4 Micro-USB port



1 Radio control receiver input
2 S.Bus output
3 Main outputs
4 Auxiliary outputs

IMPORTANT NOTE

Please note that these instructions describe basic setup for Pixhawk and do not represent the complete set of configuration procedures required to build a copter, plane, or rover.

For more information on ESC calibration, battery monitoring, failsafes, mode descriptions, and more, visit ardupilot.com. Do not operate your vehicle without a complete understanding of the online instructions.

SPECIFICATIONS

Processor

32-bit ARM Cortex M4 core with FPU
168 Mhz/256 KB RAM/2 MB Flash
32-bit failsafe co-processor

Sensors

ST Micro 16-bit gyroscope
ST Micro 14-bit accelerometer/magnetometer
MEAS barometer
MPU6000 accelerometer/magnetometer

Power

Ideal diode controller with automatic failover
Servo rail high-power (7 V) and high-current ready
All peripheral outputs over-current protected, all inputs ESC protected

Interfaces

5x UART serial ports, 1 high-power capable, 2x with HW flow control
Spektrum DSM/DSM2/DSM-X Satellite input
Futaba S.BUS input and output
PPM sum signal
RSSI (PWM or voltage) input
I²C, SPI, 2x CAN, USB
3.3 and 6.6 ADC inputs

Dimensions

Weight 38 g (1.3 oz)
Width 50 mm (2.0")
Height 15.5 mm (.6")
Length 81.5 mm (3.2")

SUPPORT

For more information about Pixhawk and other documentation, visit 3dr.com/learn. For more instruction on using APM firmware and planner software, visit ardupilot.com.

For customer support, contact us at help@3dr.com or call our support line at +1 (858) 225-1414 Monday through Friday, 8 am to 5 pm, PST.

SAFETY

Operating a powered vehicle of any kind can be a lot of fun, but it carries certain inherent risks. Regulations governing the use of powered vehicles, including aircraft, vary from locale to locale, even within the same country or district. It is your responsibility to ensure that you understand and comply with all local laws and regulations.

Safety basics:

- Never operate the vehicle or software in a way that could be dangerous to you, other people, or property.
- Always keep propeller arcs free of objects and body parts while the vehicle is live.
- Keep in mind that software and hardware failures happen. Although we design our products to minimize such issues, you should always operate with the understanding that a failure could occur at any time and without warning. Accordingly, you should take the appropriate precautions to minimize danger in case of product failure.
- Never use the software or hardware for manned vehicles.
- Always operate within local laws and regulations.
- Do not operate the aircraft if you are under the age of 18.

Additional safety information:

- Be sure to maintain safe distances between people and your aircraft.
- Never operate your aircraft if your ability to do so with the utmost attention to safety is impaired in any way. Do not operate your aircraft while tired, under the influence of drugs or alcohol, or otherwise unable to operate it with the highest attention to safety.
- Environment conditions can change rapidly and can make operation difficult. If this occurs, land your aircraft and discontinue use immediately. Do not operate your aircraft if operating conditions are not ideal. This includes, but is not limited to, rain, snow or excessive wind.
- Always ensure the battery cable is disconnected from the aircraft until you are ready to fly, and ensure that your batteries are fully charged prior to use.
- Always turn on the transmitter and ensure the throttle stick is all the way down before connecting the battery.
- After landing, disarm your vehicle immediately and disconnect the battery cable.
- Do not turn off the transmitter until after you have disconnected the battery.
- Always remove the propellers while testing the motors.
- When the battery is connected, always assume the vehicle is live and the motors are armed.
- Do not attempt to fly longer than the battery's safe capacity.
- Do not operate the vehicle with excess weight attached.
- Ensure that all vehicle components are well maintained before each flight. Ensure that components are firmly attached and operating properly.
- Replace any worn or damaged components before each flight. Never operate with any damaged or worn components.
- SAFETY IS THE FIRST PRIORITY. Take all precautions necessary to ensure your own safety as well as the safety of other people and property.

DISCLAIMER

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FrSky 2.4GHz ACCST Taranis X9D Manual

Introduction

Thank you for purchasing the FrSky 2.4GHz ACCST TARANIS X9D digital telemetry radio system. In order for you to make the best use of your system and to fly safely, please read this manual carefully. If you have any difficulties while using your system,please consult the manual , your hobby dealer, or FrSky technical support.

Due to unforeseen changes in production procedures, the information contained in this manual is subject to change without notice.

Meanings of Special Markings

Pay special attention to safety where indicated by the following marks:

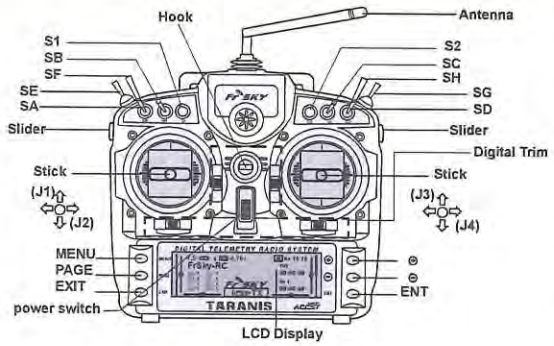
⚠ DANGER- Procedures which may lead to dangerous conditions and cause death/serious injury if not carried out properly.

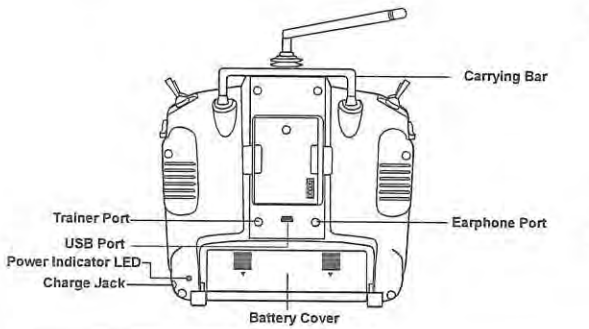
⚠ WARNING- Procedures which may lead to a dangerous condition or cause death or serious injury to the user if not carried out properly or procedures where the probability of superficial injury or physical damage is high.

⚠ CAUTION- Procedures where the possibility of serious injury to the user is small, but there is a danger of injury, or physical damage, if not carried out properly.

ⓘ = Mandatory ⃠ = Prohibited

⚠ Warning: Always keep electrical components away from small children.





Overview

(Switch Default Settings)

- SA: 3 positions, Alternate; Short Lever
- SB: 3 positions, Alternate; Long Lever
- SC: 3 positions, Alternate; Long Lever
- SD: 3 positions, Alternate; Short Lever
- SE: 3 positions, Alternate; Short Lever
- SF: 2 positions, Alternate; Long Lever
- SG: 3 positions; Alternate; Short lever
- SH: 2 positions, Momentary; Long Lever

You can choose the Switch and the ON/OFF position in the menu of Mixer.

use earphones with volume control when applied.

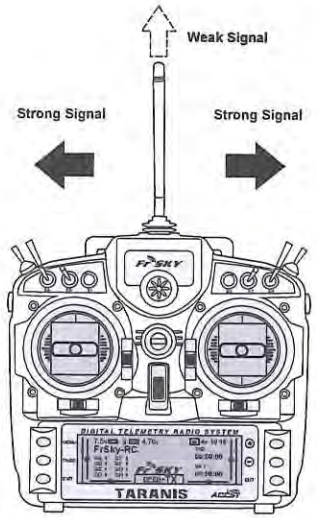
www.frsky-rc.com

⚠ Cautions on handling antenna

⃠ Do not touch the antenna during operation.There is the danger of erroneous operation causing a crash.

⃠ Do not carry the transmitter by the antenna.There is the danger that the antenna wire will break and operation will become impossible.

⃠ Do not pull the antenna forcefully.There is the danger that the antenna wire will break and operation will become impossible.



Rotating Antenna

The antenna can be rotated 180 degrees and angled 90 degrees. Forcing the antenna further than this can cause damage to the antenna. The antenna is not removable.

Angle adjustment of the antenna

The antenna rotation and angle can be adjusted. The antenna features week radio signal in the forward direction and strong radio signal directions. Adjust the antenna angle to match your flying style.

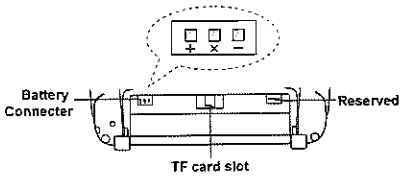
Specifications

Model Name: Taranis X9D
Number of Channels: Up to 16 channels
Operating Voltage Range:6~15V (2S, 3S Lipos are acceptable)
Operating Current: 260mA maximum (both RF module and backlit are on)
Operating Temperature: -10~60℃
Backlight LCD Screen: 212*64, monochrome
Model Memories: 60 (extendible by SD card)
Compatibility: FrSky X series, D series and V8-II series receivers

Features

- Quad Ball Bearing Gimbals
- Receiver Match
- Audio Speech Outputs (values, alarms, settings, etc.)
- Antenna Status Detection and Alters
- Real-time Flight Data Logging
- Reception Signal Strength Alerts
- Super Low Latency
- Smart Port Supported

Website:www.frsky-rc.com FrSky Electronic Co., Ltd E-mail: frsky@frsky-rc.com Technical Support: sales4tech@gmail.com



Battery Connector Polarity

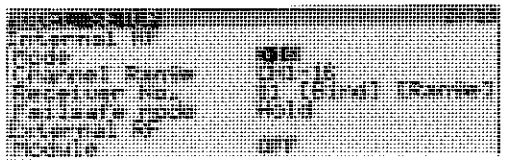
Pay attention to the battery connector polarity when connecting other batteries than the provided 6cell NiMH battery into the battery compartment, otherwise the Taranis X9D could not be powered on.

⚠ Notes and Warnings for Battery & Charger

- Please connect the provided battery in the battery compartment before use.
- The NiMH battery is for your TARANIS X9D use only.
- Be sure to use the provided battery charger to charge the battery.
- Be careful not to drop the battery.
- Don't pull the battery wirings.When it short-circuits, there may be danger of explosion ignition.
- Never take out the battery from the TARANIS X9D transmitter while the voltage warning is blinking.Internal settings and memories can be destroyed.
- Do not use the transmitter if a "Backup Error" warning occurs.
- Be sure to turn off the Taranis X9D before power charging.
- The Power Indicator LED will be on during charging, and be off after the charging is finished.

Model Setup for Taranis X9D Internal RF Module

The internal RF module of FrSky Taranis X9D is newly developed by FrSky under the name of XJT.
Enter the MODEL SETUP menu (refer to the guide from the SD card for details, or download it from FrSky website).



Step 1: Set the Mode for Taranis X9D Internal RF
Refer to the table below and set the Taranis X9D to corresponding mode (D8, D16 or LR12 mode) for your receiver.

Mode of Taranis X9D	Compatible Receivers	Number of Output Channels
D8	V8-II series in D mode (V8FR-II, V8R7-II,V8R4-II,VD5M,etc.) D series (D8R-II plus, D8R-XP, D6FR,D4R-II,etc.)	8 channels
D16	X series (X8R, etc.)	Up to 16 channels
LR12	L series (L9R, etc.)	12 channels

If you want to make full use of old V8 receivers, just plug DJT or V8JT to the external module slot.

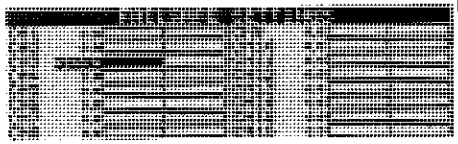
Step 2: Set the Channel Range
The internal RF module of Taranis X9D supports up to 16 channels. The channel range is configurable, and needs double check before use.

Step 3: Set the Receiver No.
When you create a new model, the system will assign you a receiver No. automatically. The range of the receiver No. is 00-63. 01 is the default receiver No. and 00 is not recommended here. Once the receiver is set to your required receiver number and finishes the binding procedure with Taranis X9D, the binding procedure will not need to be repeated next time, unless the receiver number is changed to another different number. In this case, you need to either set the receiver number to the previous one, or do the binding procedure again.

Step 4: Bind
Bind refers to Taranis X9D binding mode. Move the cursor to "Bind", press ENTER button, the cursor will flash and the speaker will beep to remind you that the RF module has entered the bind mode. Then put your receiver into binding mode and finish the bind procedure(refer to the receiver's manual for details).Press Enter or EXIT to exit.

Step 5: Set Failsafe mode
There are 3 failsafe modes: No Pulse, Hold, Custom.

- No Pulse: no pulses output on lost signal, just choose, wait 9 seconds before the failsafe takes effect, and you are done.
- Hold: hold the last positions before signal is lost, just choose, wait 9 seconds before the failsafe takes effect, and you are done.
- Custom: pre-set to required positions on lost signal. Move the cursor to "Set" and press ENTER, you will see FAILSAFE SETTING screen below. Move the cursor to the channel you want to set failsafe on, and press ENTER .When moving the corresponding sticks or switches, you will see the channel bar moving. Move the channel bar to the place you want for failsafe and long press ENTER to finish the setting. Wait 9 seconds before the failsafe takes effect.

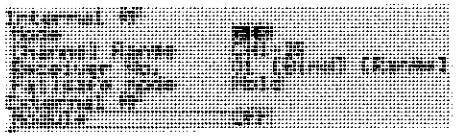


Notice:

- SBUS port always outputs, No Pulse could not perform properly on it. Set "Hold" or"Custom" for SBUS port.
- When the internal RF module of Taranis X9D is in D8 mode, failsafe could only be set on the receiver side.

Step 6: Range
Range refers to Taranis X9D range check mode. A pre-flight range check should be done before each flying session. Move the cursor to "Range" and press ENTER. In range check mode, the effective distance will be decreased to 1/30. Press Enter or EXIT to exit.

Model Setup for Taranis X9D External RF Module



The external RF module could be powered on or off by software. The setup is the same as that for the internal RF. If you use other brand RF module than FrSky, please choose PPM mode.

FCC Statement

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: **This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.**

This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

Make sure you set the country code to your corresponding country to match the regulations.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

RF warning statement:
The device has been evaluated to meet general RF exposure requirement.The device can be used in portable exposure condition without restriction.

CE

The product may be used freely in these countries:Germany, UK, Italy, Spain, France, Belgium, Netherlands, Portugal, Greece, Ireland, Denmark, Luxembourg, Austria, Finland, Sweden, Norway and Iceland.

FLYING SAFETY

⚠ **Warning:**
To ensure the safety of yourself and others, please observe the following precautions:
① **Have regular maintenance performed.** Although your TARANIS X9D protects the model memories with non-volatile EEPROM memory (which does not require periodic replacement) and not a battery, it still should have regular check-ups for wear and tear. We recommend sending your system to the FrSky Service annually during your non-flying-season for a complete check-up and service.

Battery
① **Charge the batteries!** Always recharge the transmitter and receiver batteries for at least 8 hours before each flying session.A low battery will soon die, causing loss of control and a crash. When you begin your flying session, reset your transmitter's built-in timer, and during the session pay attention to the duration of usage.

① **Stop flying long before your batteries become low on charge. Do not rely on your radio's low battery warning systems, intended only as a precaution, to tell you when to recharge. Always check your transmitter and receiver batteries prior to each flight.**

Nickel-metal hydride Battery Safety and Handling instructions

IMPORTANT! The Nickel-metal hydride battery (NiMH) batteries included in the TARANIS X9D transmitter are not to be confused with Lithium-Polymer (LiPo) batteries, or any other type of rechargeable battery (including NiCd's and LiFe's). NiMH batteries require special charging criteria different than other rechargeable batteries. Use only the FrSky transmitter charger included with this set for, or other chargers approved by FrSky to charge the NiMH batteries in the TARANIS X9D transmitter.

It's important to understand the operating characteristics of Nickel–metal hydride battery (NiMH). Read the specifications printed on the label of your NiMH battery and charger prior to use. Failure to follow the proceeding precautions can quickly result in severe, permanent damage to the battery and its surroundings and possibly result in a FIRE!

IMPORTANT PRECAUTIONS

- Do not attempt to disassemble NiMH packs or cells.
- Do not allow NiMH cells to come in contact with moisture or water at any time.
- Always provide adequate ventilation around NiMH batteries during charge, discharge, while in use, and during storage.
- Do not leave a NiMH battery unattended at any time while being charged or discharged.
- Do not attempt to charge NiMH batteries with a charger that is NOT designed for NiMH batteries, as permanent damage to the battery and charger could result.
- Always charge NiMH batteries in a fireproof location. Do not charge or discharge NiMH batteries on carpet, a cluttered workbench, near paper, plastic, vinyl, leather or wood, or inside an R/C model or full-sized automobile! Monitor the charge area with a smoke or fire alarm.
- Do not charge NiMH batteries at currents greater than the "1C" rating of the battery ("C" equals the rated capacity of the battery).
- Do not allow NiMH cells to overheat at any time! Cells which reach greater than 140 degrees Fahrenheit(60°C) should be placed in a fireproof location.
- NiMH cells will not charge fully when too cold or show full charge.
- It is normal for the batteries to become warm during charging, but if the charger or battery becomes excessively hot disconnect the battery from the charger immediately!! Always inspect a battery which has previously overheated for potential damage, and do not re-use if you suspect it has been damaged in any way.
- Do not use a NiMH battery if you suspect physical damage has occurred to the pack. Carefully inspect the battery for even the smallest of dents, cracks, splits, punctures or damage to the wiring and connectors. DO NOT allow the battery's internal electrolyte to get into eyes or on skin—wash affected areas immediately if they come in contact with the electrolyte. If in doubt, place the battery in a fire-proof location for at least 30 minutes.

MicroSD Card

The MicroSD card (TF Card) can store various files, such as model data, music, sound files and pictures. The card is locked when it is pushed in all the way in. To remove the card, push in on the card again, it will pop up allowing you to remove it.

⚠ Warning

- Be sure to turn off the power to the transmitter before inserting or removing the SD card.
- As the SD card is a precision device, do not use excessive force when inserting.
- If model data generated by a new software version transmitter is copied to an old software version transmitter, the transmitter may operate erroneously. Copy the model data after updating the copy destination transmitter to the new software version.
- Do not expose the SD card to dirt, moisture,water or fluids of any kind.
- Never remove the SD card or turn off power while entering data.
- Never store the SD card where it may be subject to strong static electricity or magnetic fields.
- Do not expose the SD card to direct sunlight, excessive humidity or corrosive environments.
- Be certain to insert the SD card in the correct direction.

Read data from a PC

Saving music and image files edited by a PC into the MicroSD card, you can use those files on your TARANIS X9D transmitter. Equipment for reading and writing MicroSD cards are available at most electronics stores.

Stored data

The life of the MicroSD card is limited due to the use of Flash memory. If you have a problem saving or reading data such as picture data after a long period of use you may need to purchase a new MicroSD card.

- We are not responsible for, and cannot compensate for any failure to the data stored in the memory card for any reason.Be sure to keep a backup of your models and data in your MicroSD card.
- No necessity for backup; TARANIS X9D transmitters and MicroSD cards are using non- volatile memory devices so that the data stored in those will not be destroyed even without a backup battery. The clock for the transmitter depends on the Lithium battery.

SD Card References

You could find videos, artworks for icons, voice files, detailed user guide, etc. from the pre-installed SD card in Taranis battery compartment.

Updates

FrSky is continuously adding features and improvements to our radio systems. The update (via mini-USB port on the back of Taranis X9D) is easy and free. To get the most from your new transmitter, please pay attention to FrSky website www.frsky-rc.com , download section for the latest update firmware and how-to guide.

FrSky Taranis X9D radio system has open source firmware, and abides by GPL license. The source code for Taranis cen be found on FrSky website www.frsky-rc.com, download section, source code.

All FrSky radio systems will have open source firmware. Do not hesitate to contact FrSky if you have any ideas and suggestions for the current and future radio systems, or you are willing to join FrSky developing union to be part of the projects.

* The currently pre-installed firmware of FrSky Taranis X9D is derived from openTX firmware, modified, improved and well tested by FrSky and the developing union.
* More information about openTX can be found on: http:/openrcforums.com.