ASSEMBLING AND PARAMETERS SETUP FOR QUADCOPTER (DJI NAZA-F450)

USING TRANSMITTER (FUTABA T10 J) AND RECEIVER (R3008SB)

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UNIVERSITÄT BREMEN
Parallel Computing for Embedded Sensor Systems

Contents

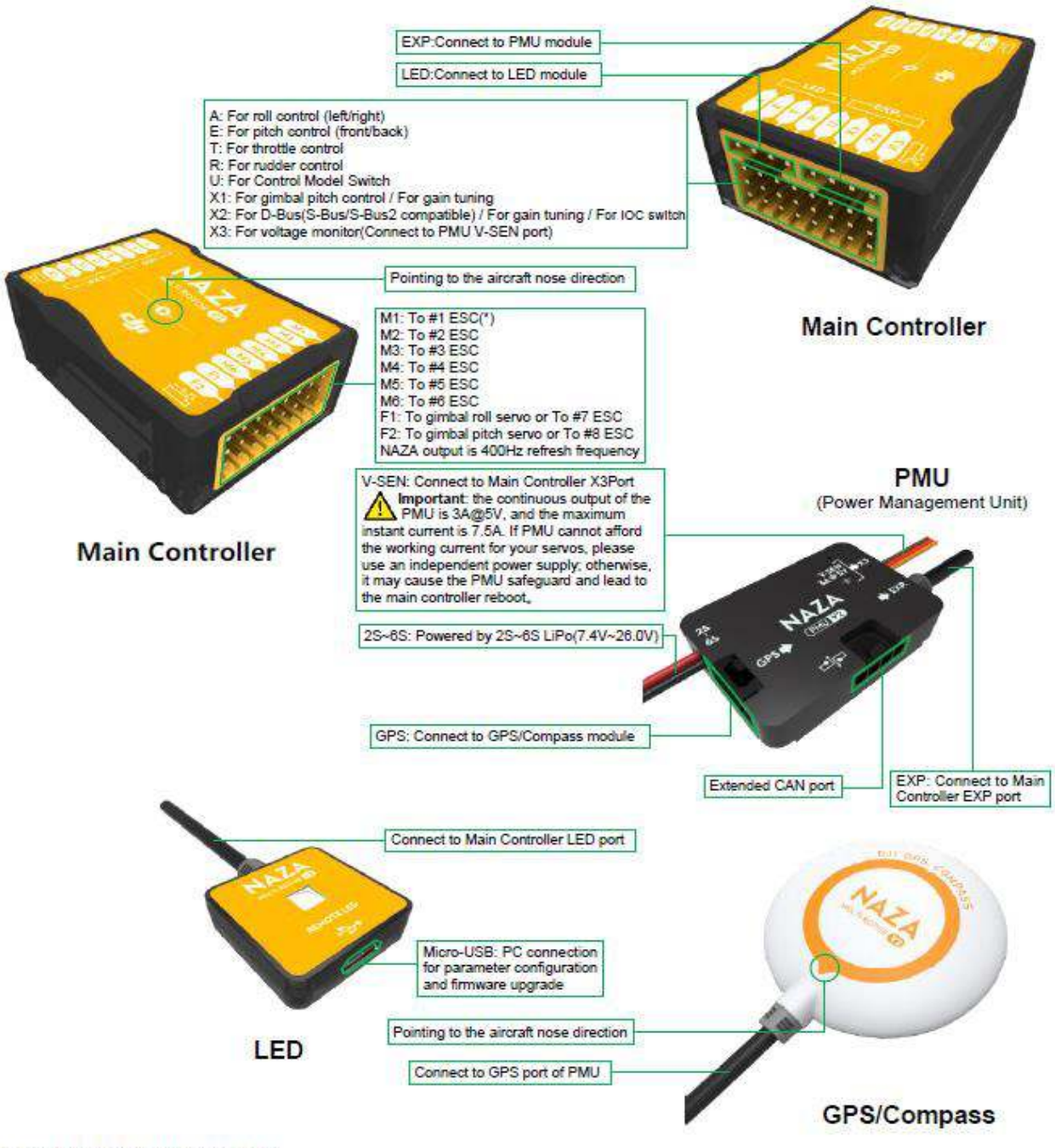
CHAPTER 1 2
ASSEMBLY & CONNECTIONS 2
PORT Description 2
Hardware Connections 3
Esc Configuration We Used 3
Main Controller(MC) Mount 3
Power Management Unit (PMU) Module Mount 3
GPS/Compass Mount (Optional) 3
Transmitter(TX) & Receiver(RX) Connections 4
CHAPTER 2 5
LINKING OF RECIEVER AND TRANSMITTER 5
10J Transmitter Specifications 5
R3008SB 2.4GHz T-FHSS 8-Channel Receiver 7
LINKING OF RECIEVER AND TRANSMITTER 7
TRANSMITTER CONFIGURATION SETTINGS 7
CHAPTER 3 11
ASSISTANT SOFTWARE INSTALLATION AND CONFIGURATION 11
SOFTWARE AND DRIVER INSTALLATION 11
CONFIGURATION BY ASSISTANT ON A PC 12
CHAPTER 4 13
BASIC FLYING 13
CONTROL MODE KNOWLEDGE 13
START & STOP MOTOR KNOWLEDGE 13
COMPASS CALIBRATION 14
ASSEMBLY CHECKING LIST 15
LED DESCRIPTION 16

CHAPTER 1

ASSEMBLY & CONNECTIONS

PORT Description

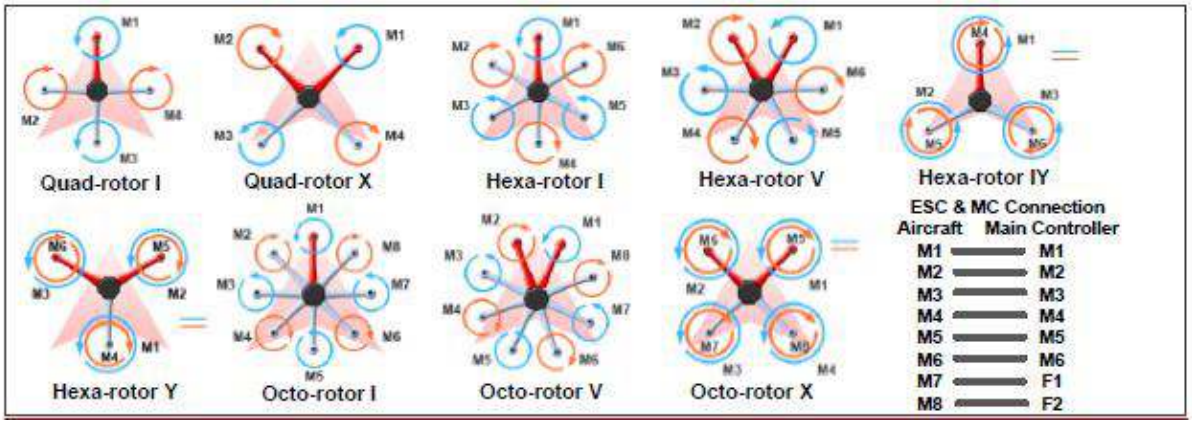
Following is the brief description about the Main controller, Power Management Unit, GPS Module, LED Module, Servo Cable, Micro-USB Cable



*ESC: Electronic Speed Controller

Hardware Connections

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



Esc Configuration We Used

We used Quad Rotor X Configuration in our case that is on 2nd place in the above picture. And Motor1 (M1) is Connected to M1 input on the controller and same procedure is followed for the rest of three Motors.

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) The 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.

Power Management Unit (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.

GPS/Compass Mount (Optional)

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：

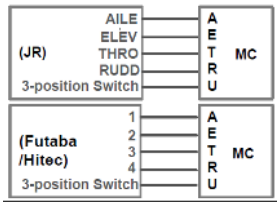
(1) You should use epoxy resin AB glue to assemble the GPS bracket first. Mount the bracket on the center plate of craft. Position the bracket at least 10 cm from any propeller.
(2) The DJI logo marked on the GPS should face the sky, with the orientation arrow pointing directly forward. then fix the 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.

Transmitter(TX) & Receiver(RX) Connections

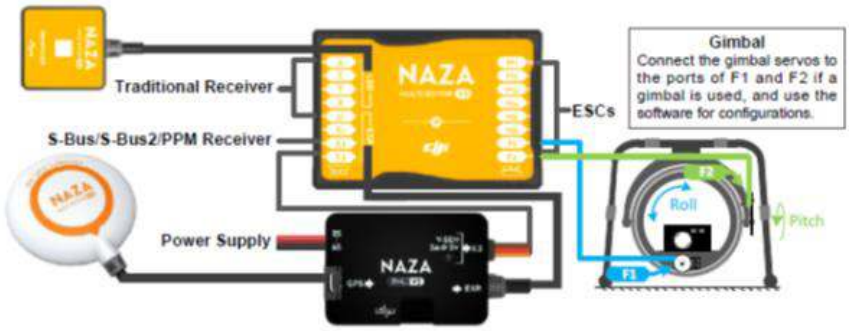
(1) Refer to you TX Manual, setup the Aileron, Elevator, Throttle, Rudder channels on your TX first, and choose a 3- position switch as control mode switch.

(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.



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.



CHAPTER 2

LINKING OF RECIEVER AND TRANSMITTER

10J Transmitter Specifications

Type: 2-stick, 10-channel T-FHSS / S-FHSS / FHSS selectable
Current Drain: 140mA

System features

- Futaba T-FHSS, S-FHSS 2.4GHz security
- Airplane, heli, glider and multi-rotor software
- 30-model memory
- S. Bus capable T-FHSS receiver
- Telemetry
- Synthesized voice for telemetry data
- Vibration alerts for alarm conditions and low battery
- User-updatable software (requires optional CIU-2 interface)
- Wireless data transfer among 10J transmitters
- Built-in S. Bus programming link for S. Bus servos
- 10-character model and user naming
- Large (128 x 64 dot) backlit LCD display
- Built-in diversity antenna
- Jog dial and 3 buttons for fast, easy programming
- Sub-trim and fail-safe (all channels)
- Trim step adjustability
- Trainer system
- Throttle cut
- 2 count-up/-down timers + integrated timer
- Model timer
- Range check mode
- 10 channels (one variable knob, five 2-position switches, two 3-position switches, one
- Servo reversing, endpoint adjustment, digital trims, dual rates/exponential* & ATL
- momentary switch, two digital levers)
- Servo cycle w/bar graph displays
- Assignable switch/lever/functions (Ch. 5-10)

Here are just some of the functions you'll find on the 10J:

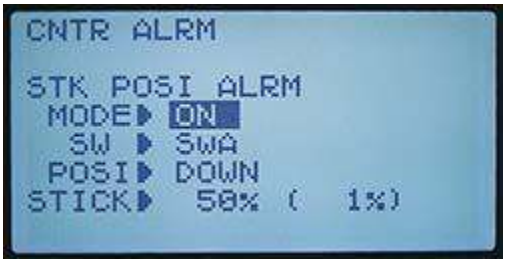
The large backlit LCD display helps make programming easy, as well as clearly showing the timers and telemetry data.

Aeroplane mode

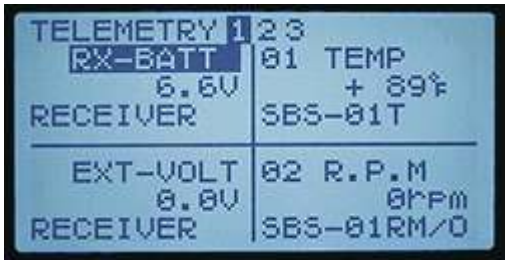
Multi-Rotor mode

Helicopter mode

Model Type Selection Menu



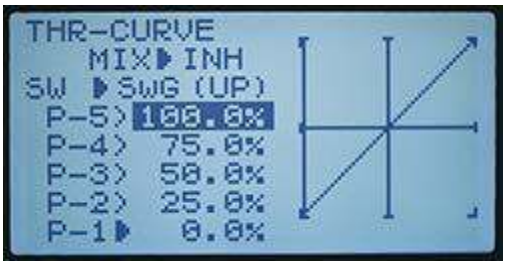
Mutli-Rotor Center Stick Alarm



Telemetry Menu
(Must use with Futaba sensor)

Receiver Type Selection Menu

Glider Butterfly Setup Menu



5-Point Throttle Curve

Programmable Mixing

Built-in S.Bus Servo Programmer

R3008SB 2.4GHz T-FHSS 8-Channel Receiver

The R3008SB is a T-FHSS telemetry-capable receiver that features S.Bus and S.Bus2 compatibility and 8 conventional ports. The receiver also features an external battery voltage connector. With S.Bus function, you can control more than 8 servos with S.Bus hub.

Type: Full-range flight receiver
Modes: T-FHSS
Features: High-voltage operation, frequency-hopping Spread Spectrum design, Dual Antenna Diversity, S.Bus and S.Bus2 compatibility
Voltage Input: 4.8V-7.4V battery or regulated output from ESC
Compatible Batteries: NiCd, NiMH, LiPo, LiIon or LiFe
Dimensions: 0.98 x 1.69 x 0.55 in (24.9 x 42.8 x 14.0 mm)
Weight: 0.34 oz (9.5 g)

LINKING OF RECIEVER AND TRANSMITTER

1 Place the transmitter and the receiver close to each other within one meter.

2 Turn on the transmitter and the receiver.

3 Push and hold the Link switch on the receiver.

4 When the link is complete, the LED on the receiver changes to solid green.

* Please refer below for LED status and receiver condition.

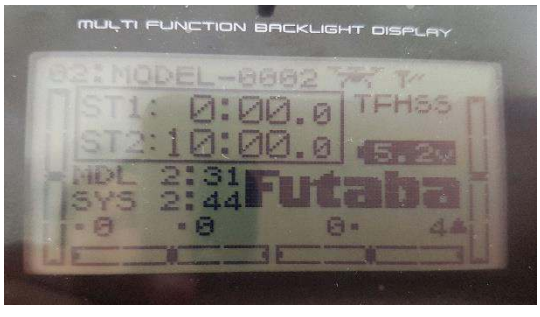
No signal reception: Red On

Receiving signals: Green On

Receiving signals, but ID is unmatched: Green Blink

TRANSMITTER CONFIGURATION SETTINGS

Turn on the transmitter and you will look display like this

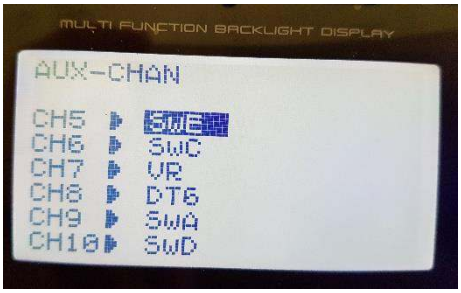


Step 01: Select the Model on your Transmitter and then press Execute.

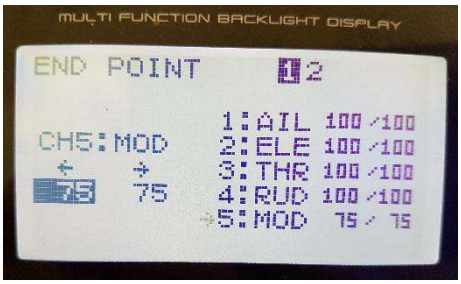
Step 02: Select the Execute parameter on your Transmitter and then select the Multicopter.

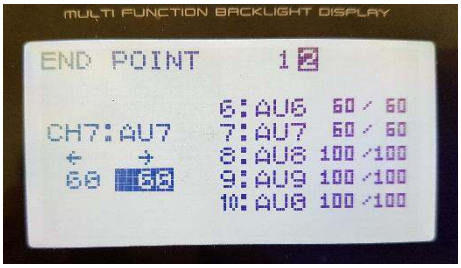
Step 03: Select the Model Name According to your choice.

Step 04: Select the Aux channels.

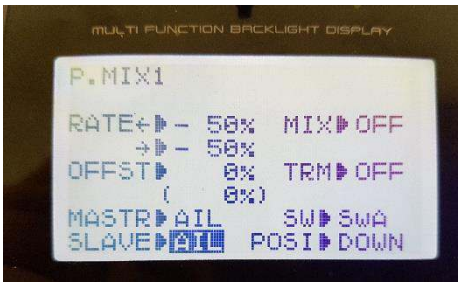


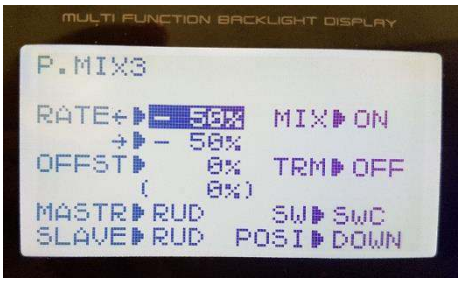
Step 05: Select the End Point.

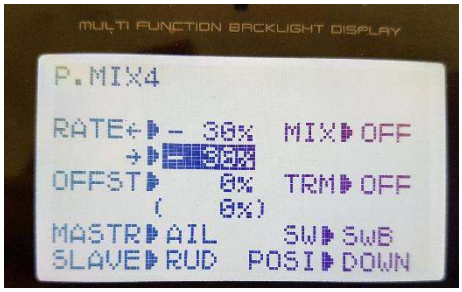


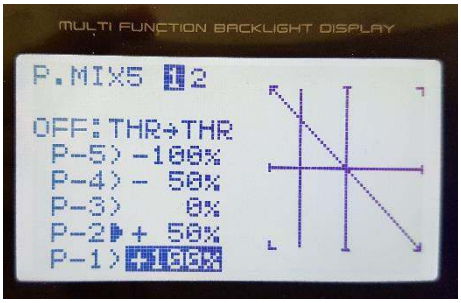


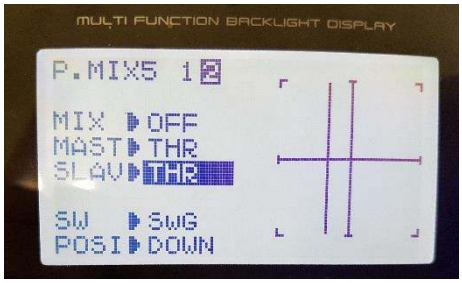
Step 06: Select the P-Mix 1--6. And then change the parameters for mix-1, mix-2, mix-3, mix-4, mix-5, mix-6 one by one.

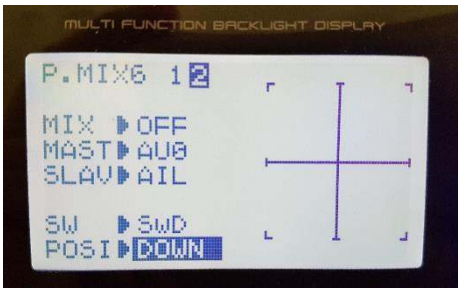


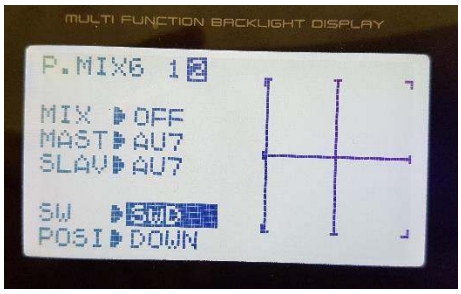


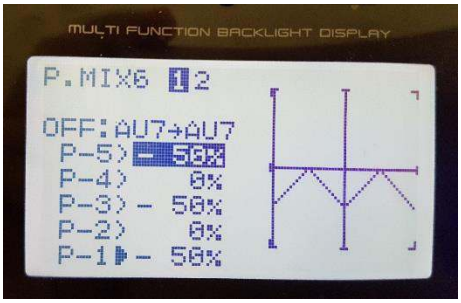




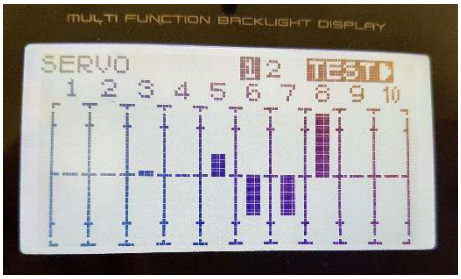








Step 07: Select the Servo. And then observe the movements by moving the joystick and verify if it is correct or not.



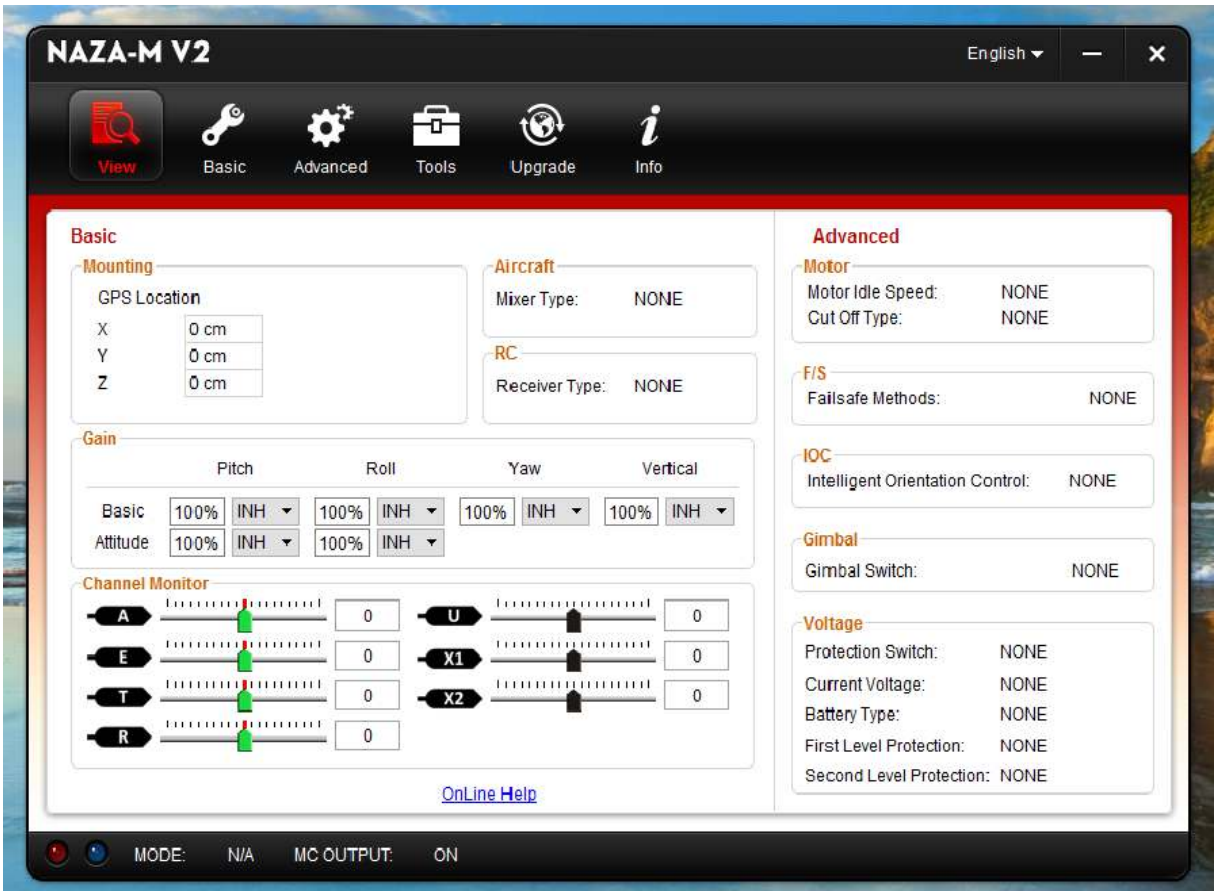
CHAPTER 3

ASSISTANT SOFTWARE INSTALLATION AND CONFIGURATION

SOFTWARE AND DRIVER INSTALLATION

Note: The installer in EXE format is supported on Win XP, Win7, Win8 (32 or 64 bit)[1].

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.



[1] For Windows 10, a suitable driver needs to be installed following the instructions at:
https://flitetest.com/articles/dji-naza-m-windows-10
https://www.rcgroups.com/forums/showthread.php?2462912-DJI-and-Windows-10

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.

Recommended Parameters

Aircraft	Basic Gain				Attitude Gain		Max Angular Rate	
	Pitch	Roll	Yaw	Vertical	Pitch	Roll	Pitch	Roll
S900	100	100	100	100	160	160	220	220
F450	95	95	70	100	100	100	300	300
F550	110	100	80	100	100	100	300	300

CHAPTER 4

BASIC FLYING

CONTROL MODE KNOWLEDGE

<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 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%.

COMPASS CALIBRATION

Step 1 Compass Calibration Without GPS module, please skip this step. If you use with GPS module, follow step-by-step for calibration.

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 360o) 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 360o) until the LED turns off, meaning the calibration is finished.

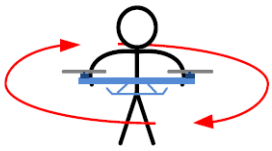


Fig.1

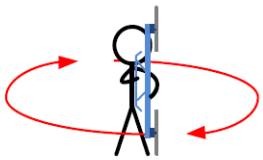


Fig.2

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

a) The flight field is changed.

b) When the multi-rotor mechanical setup has changed:

* If the GPS/Compass module is re-positioned.

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

* When the mechanical structure of the multi-rotor is changed.

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

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

ASSEMBLY CHECKING LIST

Carry out the following procedures (is based on Intelligent Mode of Motor Stop) to make sure all configurations are correct.

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.

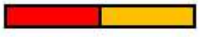
3. After the 4 times Yellow LED disappears, toggle the control mode switch on your transmitter to make sure it is working properly. For example, LED blinks (●●●●), which means the system is in ATTI. Mode and the GPS signal is worst Check it with LED indicator to specify the current working mode for MC. 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	Signal is best (GPS satellites > 6) : NO LED
ATTI. Mode: ● (●● indicates that is stick(s) not at center)	Signal is well (GPS satellites = 6) : ●
GPS Mode: ● (●● indicates that is stick(s) not at center)	Signal is bad(GPS satellites = 5) : ●●
	Signal is worst (GPS satellites< 5) : ●●●

LED DESCRIPTION

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.