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Nuvoton Quad-Copter User Manual

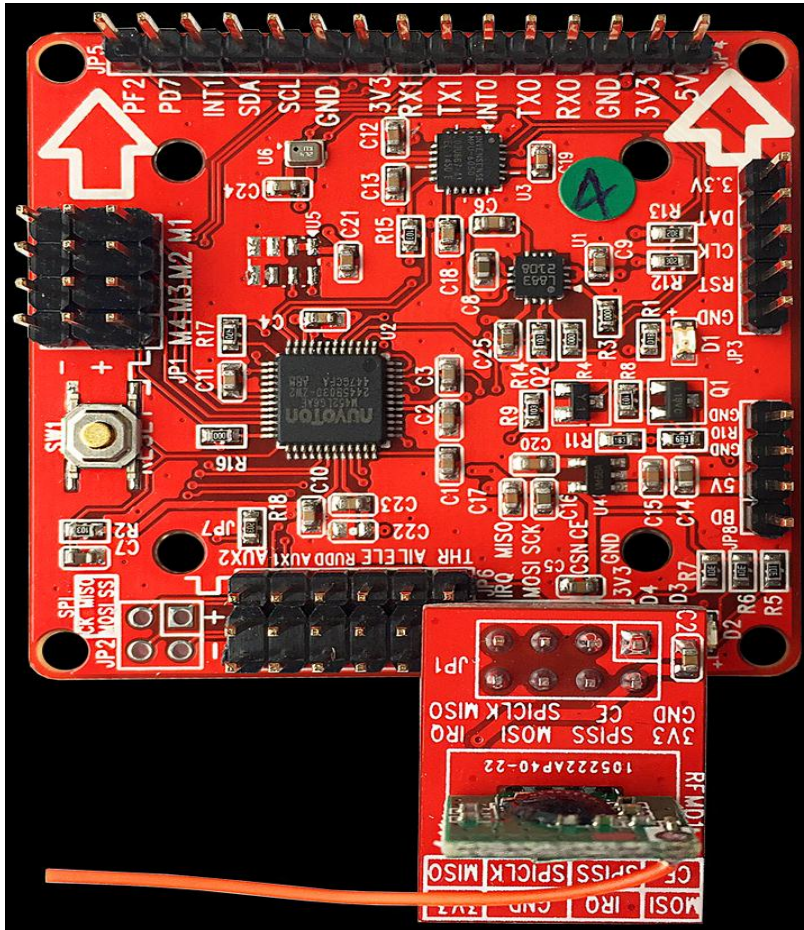
Product No.	M4 Quad-Copter Solution
Function	User Manual

File Information		
Name	Nuvoton Quad-Copter User Manual.pdf	
Project	M4 Application	
Function	User Guide	
Purpose		
Author	TZU-LAN SHEN	
Revision History		
Revision	Date	Comments
1.0	15/1/9	Original Plan
1.1	15/4/1	1. Add SSV RC and Common Receiver Connection Diagram 2. Add anti-USA (Mode 3) description
1.2	15/4/13	1. Add AUX1/AUX2 description 2. Add V1.3 pcb image
1.3	15/4/17	Add copter/joystick match process
1.4	15/5/14	Add RC channels range and update pcb picture v1.4

Release Note:

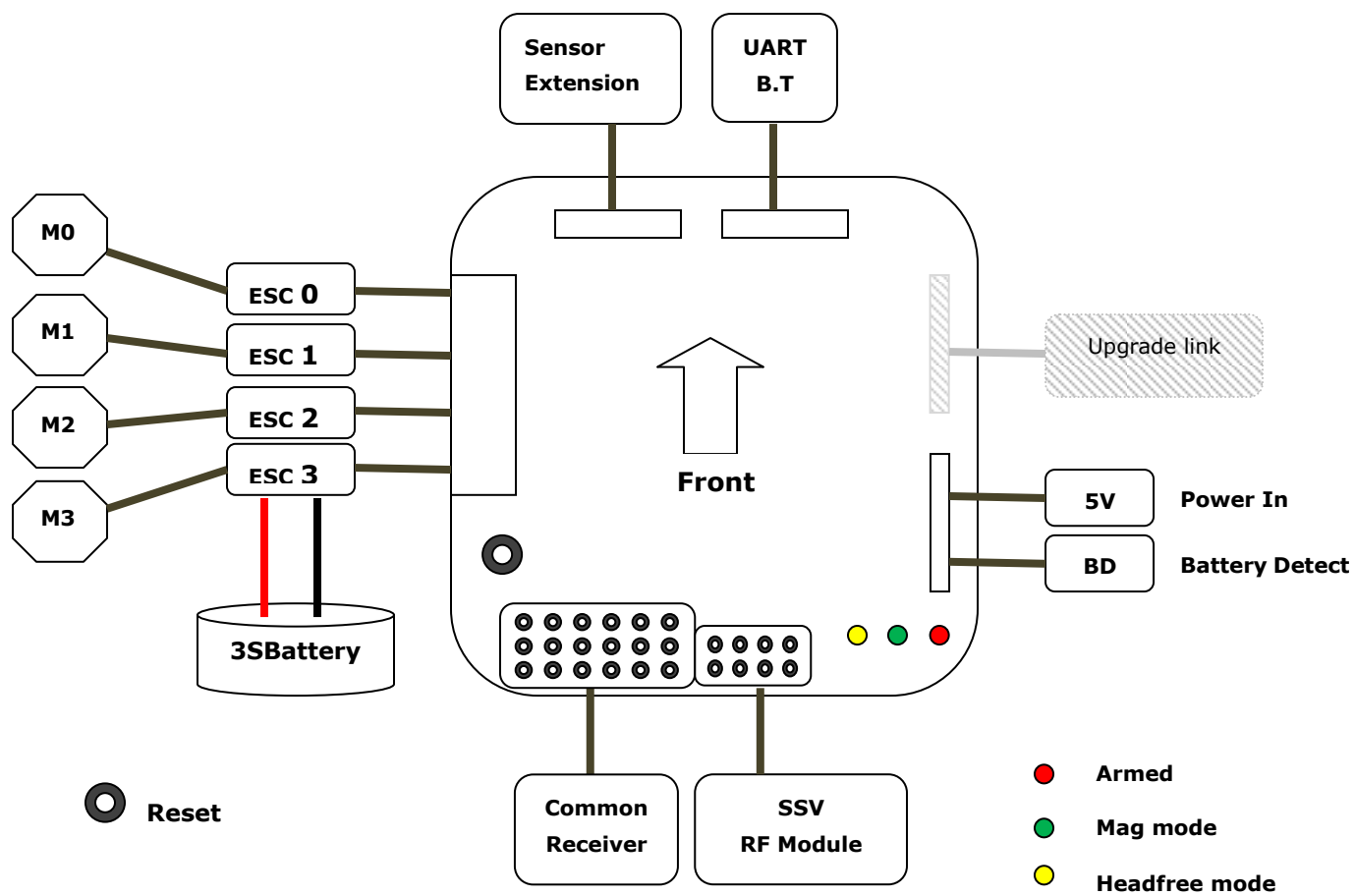
Revision 1.0	(1 st Draft Version)
Revision 1.1	RC feature update and anti-USA support
Revision 1.2	Add AUX1/AUX2 description
Revision 1.3	Match process
Revision 1.4	Add RC channels range

● Nuvoton Fly Control Board



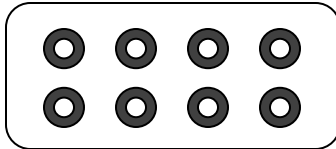
- ✓ Nuvoton cortex M4, 72 MHz
- ✓ 10 DOF sensor fusion.
- ✓ 400Hz AHRS refresh rate.
- ✓ Support 400Hz high-speed ESC .
- ✓ Support Quad-X frame copter.
- ✓ Support UART-BT tuning.
- ✓ Support user PID control.
- ✓ Support I2C sensor extension port.
- ✓ Support battery detects.
- ✓ Support radio R.C control. (option)

● Connection Diagram

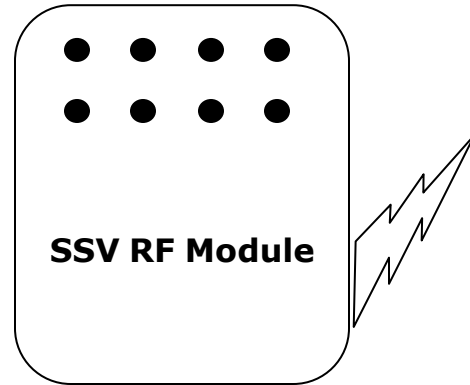
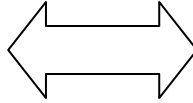


● SSV RF Connection

MISO SCK CE GND

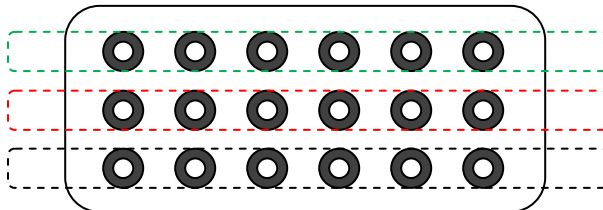


IRQ MOSI CS 3V3



● COMMON RC Receiver Connection

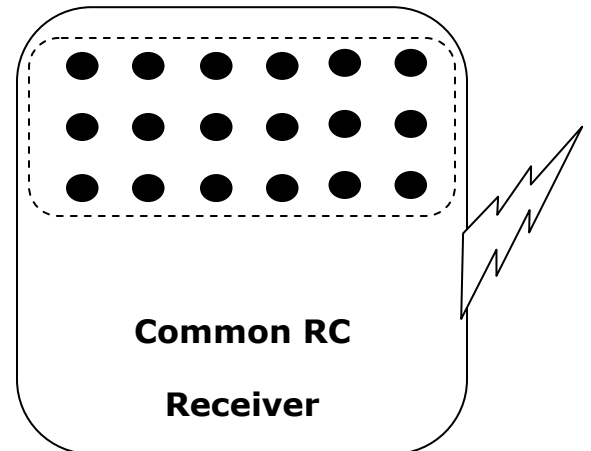
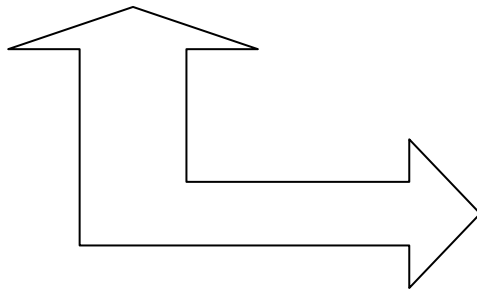
AUX2 AUX1 RUD ELE AIL THR



Signal

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- **AUX1 and AUX2 of COMMON RC Receiver**

PWM	<1500	>=1500
AUX1	Altitude Hold Mode OFF	Altitude Hold Mode ON

Altitude Hold Mode OFF:

Copter up and down controlled directly by user throttle.

Altitude Hold Mode ON:

Copter keeps it current altitude and user use throttle stick to adjust the altitude higher and lower.

PWM	<1333	1333 ~ 1666	>1666
AUX2	No MAG Mode	MAG Mode	HeadFree Mode

No MAG Mode:

MAG disable, the direction reference GYRO only. If your fly field has potential magnetic interference, use Normal Mode will be a good idea.

MAG Mode:

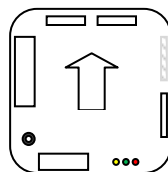
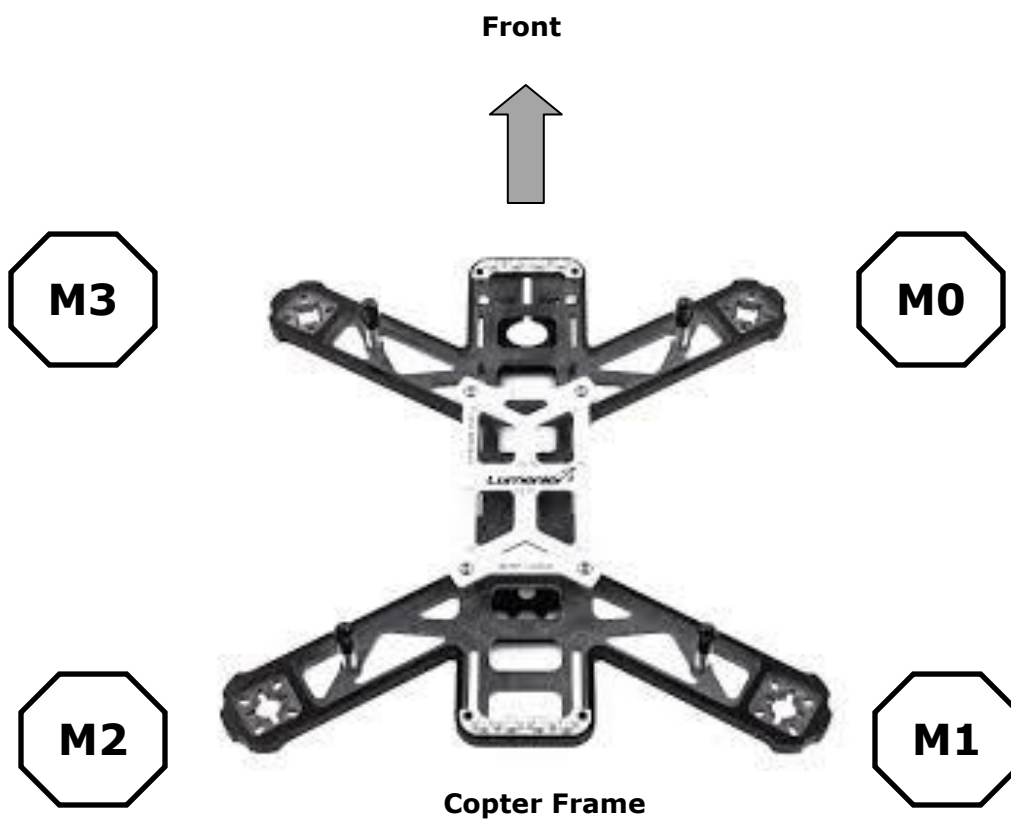
In MAG mode, direction will reference MAG which makes copter has a steady direction without GYRO drift.

HeadFree Mode:

When HeadFree mode enabled, copter keeps current direction as it's front direction(HeadFree direction). Copter head is no longer the forward direction, and it will mode front by the Headfree direction instead.

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● Frame Diagram






Fly Control Board

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● LED Status

There are 3 on board led. Red for arm state and gyro calibration, green for mag state and mag calibration and orange for Head-Free state. The arm state also implied the default stabilize mode.

Red

-  **Copter armed, and mode stabilized mode**
-  **Gyro calibration**
-  **Copter dis-armed**

Green

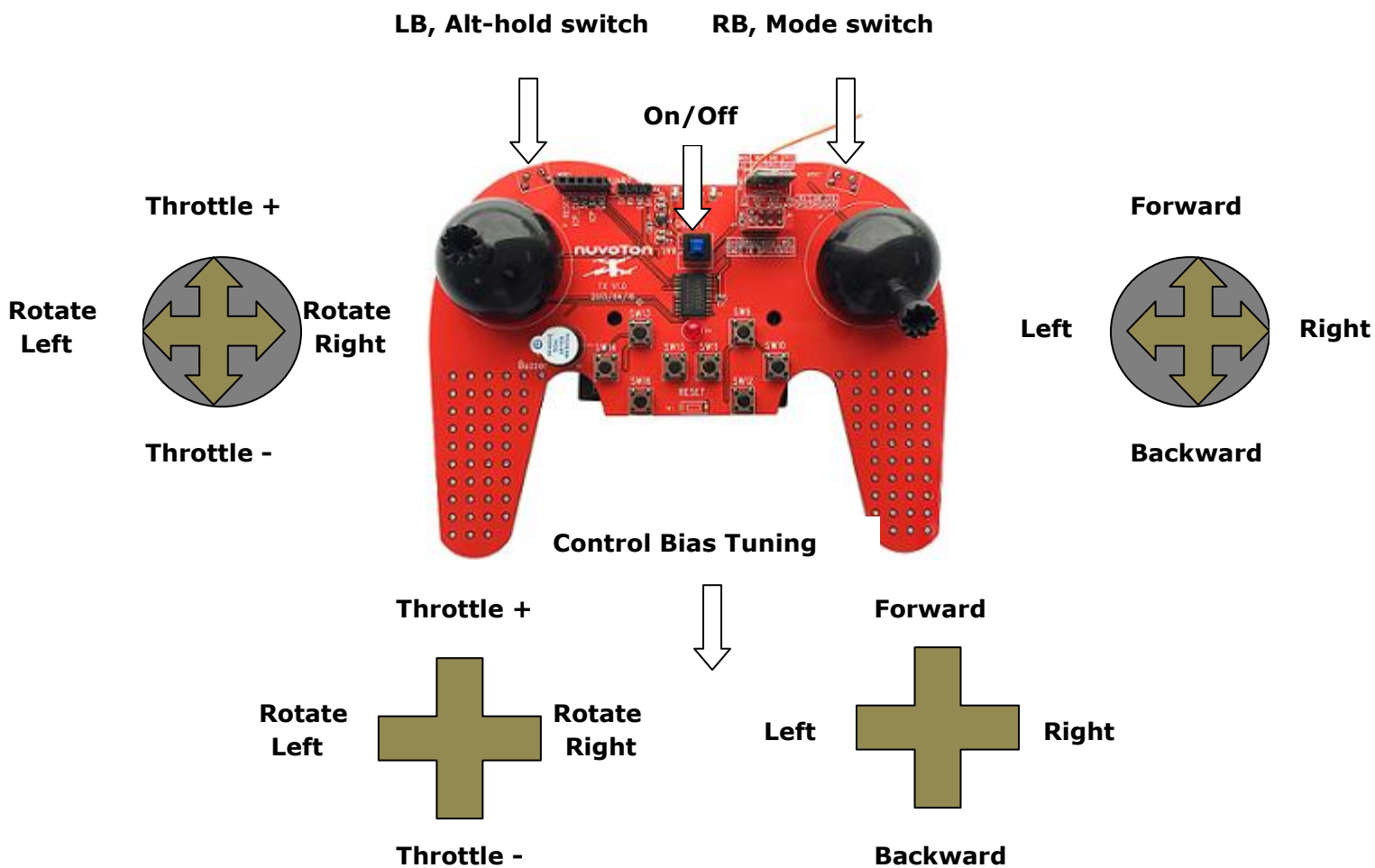
-  **Mag mode on**
-  **Mag calibration**
-  **Mag mode off**

Orange

-  **Head-Free mode on**
-  **Head-Free mode off**

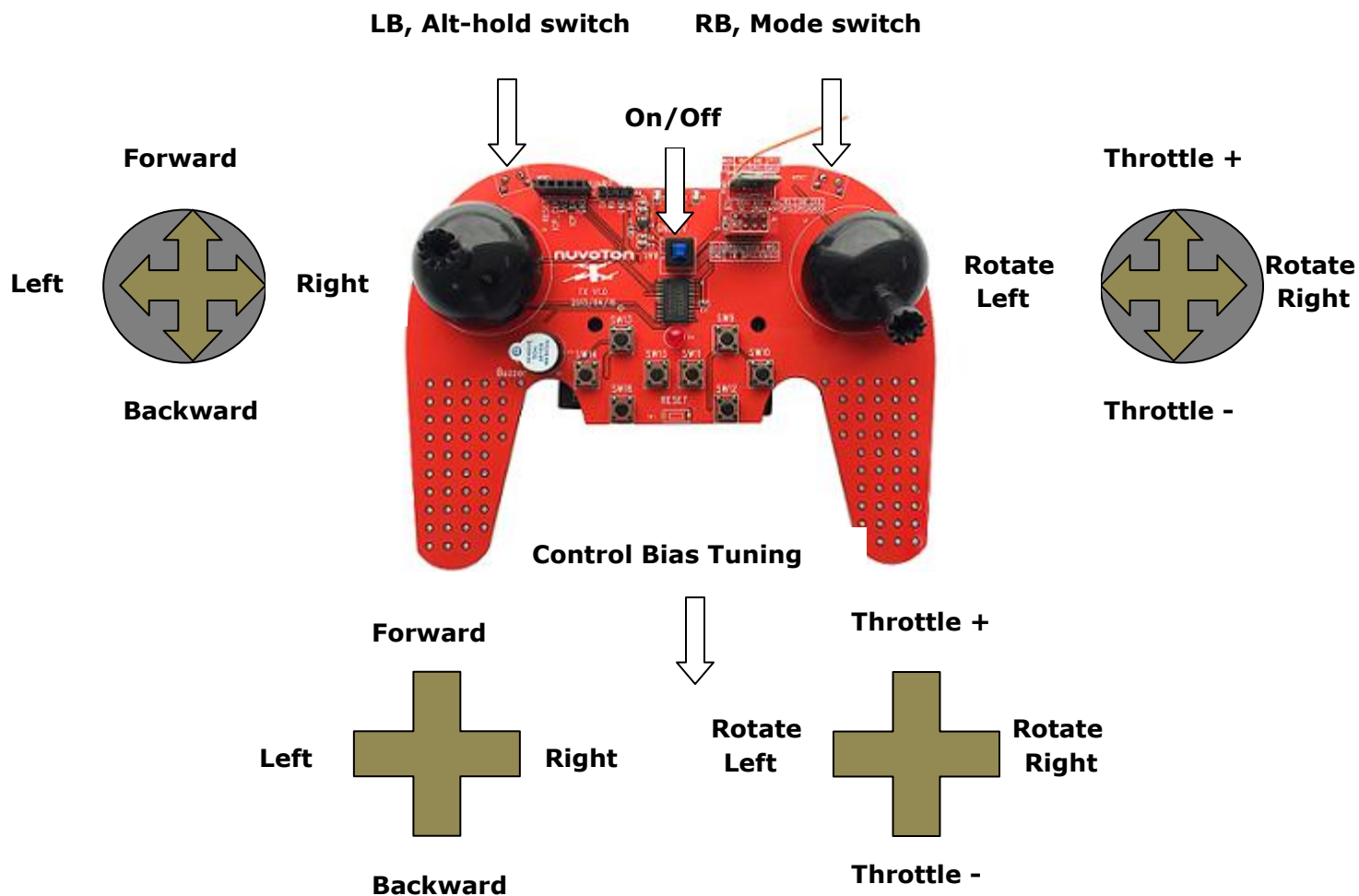
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- **Remote Controller (USA, mode2)**



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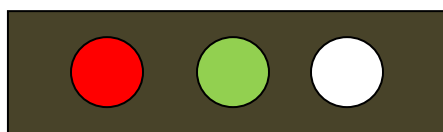
- **Remote Controller (Anti-USA, mode3)**






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● Remote Controller LED

There are 2 LED in front of remote controller. Red for radio connection to copter, arm and during calibration state, green for altitude hold state.



*Red led will blinking 2 seconds when successfully connect to copter. If there is no led blinking, check the controller battery and the power supply of copter.

- Red**
-  **Radio connect to copter, armed, and mode stabilized**
 -  **Gyro calibration**
 -  **Copter dis-armed or controller disconnect to copter**

- Green**
-  **Altitude hold on**
 -  **Altitude hold off**

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● Copter Arm

Move throttle stick lower-right (min throttle and rotate right) to start the motor. The red led will start blinking (gyro calibration), and turned on when copter armed ready.

**Please turn off altitude hold mode before arming copter, copter can't be armed in altitude mode for safe reason.*

For USA (Mode 2)



For Anti-USA (Mode 3)



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● Copter Disarm

Move throttle stick lower-left (min throttle and rotate left) to stop the motor. The red led will turned off when copter dis-armed.

For USA (Mode 2)



For Anti-USA (Mode 3)



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● Copter Expert Mode

The expert mode provides an aggressive control for user. Copter becomes more sensitive to response user control. Move left stick lower-right and move right stick to lower-left at the same time. The red led will start blinking and the copter is now in expert mode when led on steady. You can switch back to standard mode by first dis-arm copter than arm the copter again by normal arm process.



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● **Copter and Joystick Match Process(SSV RC)**

For the SSV remote control system, user has to make a copter and a joystick pair for the control relationship. The joystick can control only the paired copter. Nuvoton copter supports max 8 copters can play at the same time. Each copter/joystick pair has it's specific communication channel. The match process between copter and joystick as below:

- Power on your copter and joystick
- The copter green led (MAG enable) on at beginning
- The copter green led (MAG enable) off and joystick makes a beep sound – match done

*If no match between copter and joystick over 10 seconds, re-power on both copter and joystick again.

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● **SSV RC Remote Controller Notice**

The suggestion remote control range is less than 50 meter diameter, the distance could be even shorter if there are obstacles between copter and joystick. The other 2.4G signal (Wi-Fi, other RC ..) can also interfere the remote control. If you feel the copter is out of control once a while, find another place to fly is a good idea.

● **Common RC Remote Controller Notice**

Nuvoton fly controller has define the necessary channel range for common RC control. User should follow the definition and make sure your RC controller satisfy the condition.

Channel	Min	Mid	Max	Type	AltHold	Mode
THR	<1090	-	>1920	Continuous		
ROLL	~1100	-	~1900	Continuous		
PITCH	~1100	-	~1900	Continuous		
YAW	<1090	-	>1920	Continuous		
AUX1	<1500	-	>1500	2 level	V	
AUX2	<1333	~1500	>1666	3 level		V

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● **Copter Ready To Fly Suit Suggestion**

Parts	Quantity	Specification	Description
Copter Frame	1	QAV250	The full carbon fiber frame is better and motor center to center distance is about 250 mm
ESC	4	12A	EMAX 12A ESC
Motor	4	1806	EMAX 1806/2280KV BLDC
Propeller	4	6045	Plastic propeller (No fiber)
Battery	1	2200mah/30C	FULLYMAX Ki-Po 30C/Burst60C 11.1V(3S)/XT60 Connector
Battery Charger	1	Fast charger for 3S Li-Po	iMax B6
RC Controller	*1	6 CH	Devo7
RC Reciver	*1	6 CH	RX701
Low Battery Detector	#1	Detect 3S Li-Po	Beep when battery low

* Optional, If you don't have SSV 2.4G RC, you can by common RC TX/RX.

Optional, you need a battery charger to charge your Li-Po battery for safty.