

## Features

X12 5-IN-1 AIO flight controller built-in 2.4G ELRS V2.0 and Openvtx  
VTX Power up to 400mw  
ELRS V2.0 Support  
NEW RS0802 KV20000 motors  
Runcam Nano3 The lightest 1/3 CMOS 800TVL Camera  
Smooth and powerful  
Compatible for 1S Lipo/LiHV  
Recommend 1S 450mah/550mah/650mah battery(Not include)

## Specifications

Brand Name: HappyModel  
Item Name: Mobula7 1S 75mm Micro FPV whoop drone  
Wheelbase: 75mm  
Size: 99mm\*99mm\*40mm  
Weight: 24g

## Package includes

Item Name	Qty
Mobula7 1S 75mm whoop Drone Frame (Mobula7 v4 frame)	1
Option1: X12 ELRS V1.0 flight controller built-in SPI ELRS 2.4G receiver	1
Option2: X12 Frsky V1.0 flight controller built-in SPI Frsky 2.4G receiver	
Option3: X12 Flysky V1.0 flight controller built-in SPI Flysky 2.4G receiver	
Option4: X12 PNP V1.0 flight controller without onboard receiver	
RS0802 KV20000 brushless motor	4
Gemfan 1610-2 bi-blade propellers(4cw+4ccw)	1
Runcam Nano3 1/3 CMOS 800TVL camera	1
Onboard 5.8G Openvtx 0mw-400mw VTX	1
1S parallel charging board	1
Propeller disassemble tool	1
Extra camera canopy	1

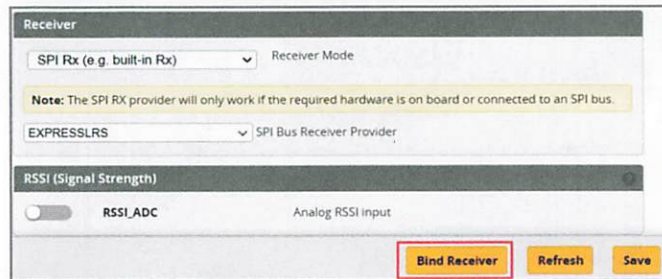
## BIND PROCEDURE

\*Need to update ExpressLRS TX module firmware to v2.0 before binding.

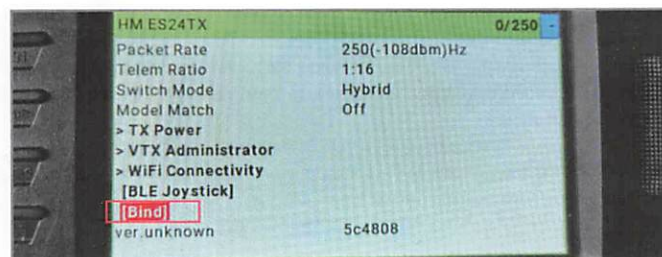
Bind procedure video

<https://bit.ly/3nJFyoR>

1). Connect Mobula7 1S ELRS with computer by Plug USB. Running Betaflight configurator and then move on Receiver tab then hit "Bind Receiver". The Green LED on the flight controller start blinking fast, it means onboard SPI ELRS receiver is in bind mode.



2). Turn on your radio transmitter and running ELRS.LUA v2 version, scroll down the menu and hit [Bind]. The Green LED on the flight controller would get solid first and then start to blinking slowly. It means bind successfully. Re-connect the USB and then you will find link was established.



## ARM/DISARM THE MOTOR

1)Turn on your radio transmitter and connect the battery to the Mobula7 1S ELRS. Then place Mobula7 1s ELRS horizontally on the ground.

2)Prepare your goggles, and match the channel with the VTX\_table

VTX Table

6 Number of bands

8 Number of channels by band

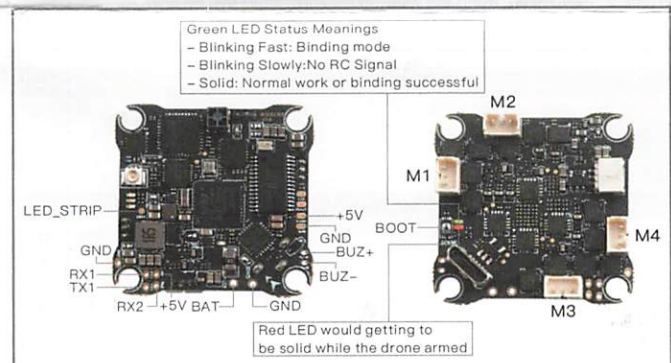
Name	Letter	Factory	1	2	3	4	5	6	7	8	
BOSCAM_A	A		5865	5845	5825	5805	5785	5765	5745	5725	Band 1
BOSCAM_B	B		5733	5752	5771	5790	5809	5828	5847	5866	Band 2
BOSCAM_E	E		5705	5685	5665	5645	5685	5605	5625	5645	Band 3
FATSHARK	F		5740	5760	5780	5800	5820	5840	5860	5880	Band 4
RACEBAND	R		5658	5695	5732	5769	5806	5843	5880	5917	Band 5
LOWRACE	L		5333	5373	5413	5453	5493	5533	5573	5613	Band 6

5 Number of power levels

1	2	3	4	5	
10	2	14	20	26	Value
0	RCE	25	100	400	Label

3)Toggle Aux1 switch to arm the motors, the Red LED at the bottom of the flight controller would get solid once armed, happy flying.







## FLIGHT CONTROLLER CONNECTION DIAGRAM



Ports Wiki

Note: not all combinations are valid. When the flight controller firmware detects this the serial port configuration will be reset.

Note: Do **NOT** disable MSP on the first serial port unless you know what you are doing. You may have to refresh and erase your configuration if you do.

Identifier	Configuration/MSP	Serial Rx	Telemetry Output	Sensor Input	Peripherals
USB VCP	 115200		Disabled ▾ AUTO ▾	Disabled ▾ AUTO ▾	Disabled ▾ AUTO ▾
UART1	 115200		Disabled ▾ AUTO ▾	Disabled ▾ AUTO ▾	Disabled ▾ AUTO ▾
UART2	 115200		Disabled ▾ AUTO ▾	Disabled ▾ AUTO ▾	VTX (TBS Srs ▾ AUTO ▾)

\*RX1/TX1/+5V/GND pads could be used for External Serial Based RX like TBS

Tracer or CRSF Nano

\*Only Enabled Serial RX for UART1 when use external Serial Based RX and choose correct receiver provider based on your receiver description.

## BOARD AND SENSOR ALIGNMENT AND FREQUENCY SETTINGS

Board and Sensor Alignment			
0	Roll Degrees	0	Pitch Degrees
0	Yaw Degrees		
First	GYRO/ACCEL	CW 90°	First GYRO
Default	MAG Alignment		
8.00 kHz	Gyro update frequency		
2.00 kHz	PID loop frequency		

We highly recommend 2.0KHZ for the pid loop frequency for a better experience.

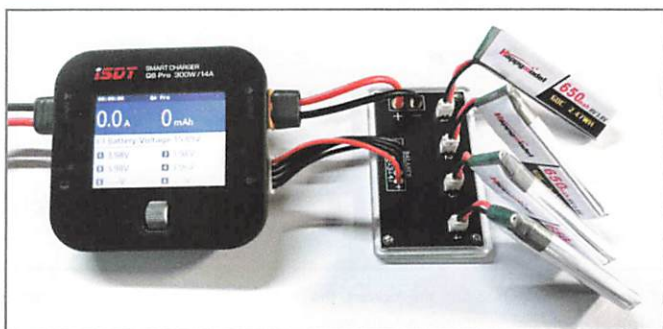
## MOTORS AND ESC SETTINGS

Mixer	
Quad X	
4	2
3	1
Motor direction is reversed	
ESC/Motor Features	
DSHOT300	ESC/Motor protocol
MOTOR_STOP	Don't spin the motors when armed
ESC_SENSOR	Use KISS/BLHeli_32 ESC telemetry over a separate wire
Bidirectional DShot (requires supported ESC firmware)	
10	Motor Idle (% static)

PROP OUT :Mount 1610 propeller on #1 and #4 motors, Mount 1610R propeller on #2 and #3 motors



## 1S PARALLEL CHARGING BOARD CONNECTION DIAGRAM



Note: 4 batteries must be used at the same time, we recommended that the voltage difference between the 4 batteries should not be too big

## DEFAULT PID AND FILTER SETTINGS

	Proportional	Integral	D Max	Derivative	Feedforward
Basic/acro					
ROLL	123	143	80	80	226
PITCH	116	135	77	77	212
YAW	123	143	0	0	226

Mode:	RPY	Low	Default	High
Damping: D Gains	1.85			
Tracking: P & I Gains	1.9			
Stick Response: FF Gains	1.3			
Dynamic Damping: D Max	0			
Drift - Wobble: I Gains	0.65			
Pitch Damping: Pitch Roll D	0.85			
Pitch Tracking: Pitch Roll P, I & FF	0.9			
Master Multiplier:	1.45			

	More Filtering	Default Filtering	Less Filtering
Gyro Filter	4		
Multipler:			
D Term Multipler:	1		

Profile independent Filter Settings	OFF	Profile dependent Filter Settings	ON
Gyro Lowpass Filter:		D Term Lowpass Filter:	
Gyro Lowpass 1: DYNAMIC Mode		D Term Lowpass 1: DYNAMIC Mode	
300 Min Cutoff Frequency (Hz)		75 Min Cutoff Frequency (Hz)	
550 Max Cutoff Frequency (Hz)		150 Max Cutoff Frequency (Hz)	
PT1 Filter Type		5 Dynamic Curve Expo	
Gyro Lowpass 2:		PT1 Filter Type	
Gyro Notch Filter 1:		D Term Notch Filter:	
Gyro Notch Filter 2:		150 Static Cutoff Frequency (Hz)	
Dynamic Notch Filter:		PT1 Filter Type	
Dynamic Notch Filter:		D Term Notch Filter:	
3 Notch Count		Yaw Lowpass Filter:	
300 Q Factor		Yaw Lowpass Filter:	
150 Min Frequency (Hz)			
600 Max Frequency (Hz)			

## VOLTAGE AND CURRENTS METER SETTINGS

Voltage Meter	
Battery	0.6 V
110	Scale
10	Divider Value
1	Multiplier Value

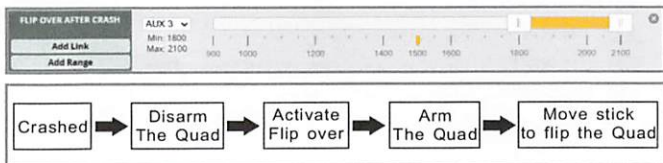
  

Amperage Meter	
Battery	0.00 A
470	Scale [1/10th mV/A]
0	Offset [mA]

## "FLIP OVER AFTER CRASH" PROCEDURE

Set one channel of your radio transmitter to activate the Flip over function in the Mode tab of Betaflight configurator.

The default Switch for Activate "Flip" is AUX3(Channel7)



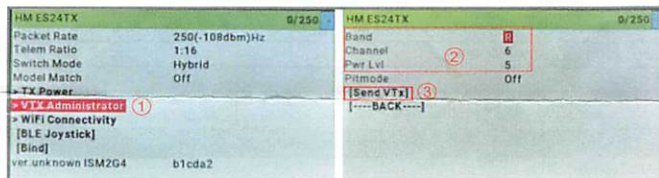
## VTX BANDS AND CHANNELS SETUP

Frequency and channel frequency table:

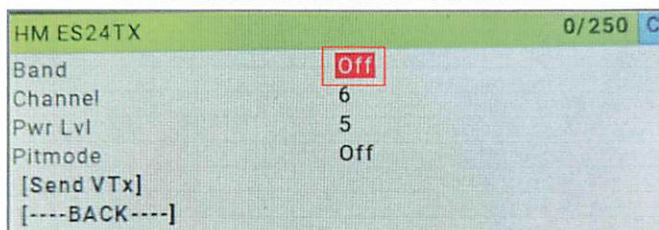
FR	CH	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
BOSCAM_A	5865M	5845M	5825M	5805M	5785M	5765M	5745M	5725M	
BOSCAM_B	5733M	5752M	5771M	5790M	5809M	5828M	5847M	5866M	
BOSCAM_E	5705M	5685M	5665M	5645M	5885M	5905M	5925M	5945M	
FATSHARK	5740M	5760M	5780M	5800M	5820M	5840M	5860M	5880M	
RACEBAND	5658M	5695M	5732M	5769M	5806M	5843M	5880M	5917M	
LOWRACE	5333M	5373M	5413M	5453M	5493M	5533M	5573M	5613M	

There are 2 ways to switch the vtx channels:

1)Run ExpressLRS.lua ,click VTX administrator then choose the Band Channel that you needed , and then click [Send VTX]



2)Use smart audio to change the vtx . First you should turn off band for vtx administrator from ExpressLRS.lua and then choose the belowing method:



1. Plug USB to Mobula7 1s ELRS then we should Go to Betaflight CLI type the command

Set vtx\_band=3

Set vtx\_channel=1

save

This command will change the vtx channel to 5705

2.Disarm the Mobula7 1S ELRS and then move the stick of the transmitter

THR MID YAW LEFT PITCH UP to enter OSD Menu Enter to Features then enter to VTX

SA to set VTX Band and channel



## FLIGHT CONTROLLER FIRMWARE UPDATE

1.Install latest STM32 Virtual COM Port Driver

<http://www.st.com/web/en/catalog/tools/PF257938>

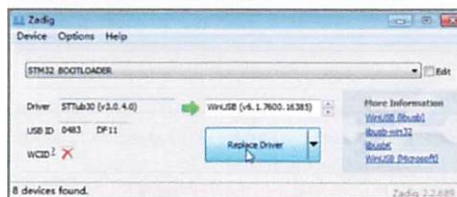
2.Install STM BOOTLOAD Driver (STM Device in DFU Mode)

3.Open Betaflight configurator and choose firmware target "CRAZYBEE F4SX1280", then select the firmware version.

4.There are 2 ways to get in DFU Mode: 1). solder the boot pad and then plug USB to computer 2).loading betaflight firmware and hit "flash", then it will getting into DFU Mode automatically.

5.Open Zadig tools to replace the drivers from STM32 Bootloader to WINUSB Driver.

6.Reconnect the flight controller to the computer after replace driver done , and open Betaflight Configurator, loading firmware and flash.



Firmware and diff download