



Федеральное государственное бюджетное образовательное учреждение высшего образования «Московский авиационный институт (национальный исследовательский университет)»

ВИДЕОРАЗБОР №2 ДЕМОНСТРАЦИОННОГО ВАРИАНТА ПРАКТИЧЕСКОГО ЭТАПА МОСКОВСКОГО КОНКУРСА МЕЖПРЕДМЕТНЫХ НАВЫКОВ И ЗНАНИЙ «ИНТЕЛЛЕКТУАЛЬНЫЙ МЕГАПОЛИС. ПОТЕНЦИАЛ»

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УСТАНОВКА ПРОГРАММНОГО ОБЕСПЕЧЕНИЯ НА ПОЛЕТНЫЙ КОНТРОЛЛЕР

Enable Expert Mode ?

Show release candidates ?

JHEF411 ? Auto-detect ?

4.5.0 [28-Apr-2024] ?

Warning

Please do **not** try to flash **non-Betaflight** hardware with this firmware flasher. Do **not disconnect** the board or **turn off** your computer while flashing.

Note: STM32 bootloader is stored in ROM, it cannot be bricked.

Note: **Auto-Connect** is always disabled while you are inside firmware flasher.

Note: Make sure you have a backup; some upgrades/downgrades will wipe your configuration.

Note: If you have problems flashing **try disconnecting all cables from your FC** first, try rebooting, upgrade drivers.

Note: When flashing boards that have directly connected USB sockets (most newer boards) ensure you have read the USB Flashing section of the Betaflight manual and have the correct software and drivers installed

IMPORTANT: Ensure you flash a file appropriate for your target. Flashing a binary for the wrong target can cause **bad** things to happen.

Core Only ?

Build Configuration

Radio Protocol
CRSF ?

Telemetry Protocol
Automatically Included ?

Other Options
*GPS *LED Strip *Magnetometers *OSD (SD) *VTX ?

Motor Protocol
DSHOT ?

Recovery / Lost communication

If you have lost communication with your board follow these steps to restore communication:

- Power off

Please load firmware file

Exit DFU Mode

Flash Firmware

Load Firmware [Online]

Load Firmware [Local]



НАСТРОЙКА БПЛА. ВКЛАДКА «НАСТРОЙКИ»

Setup

[WIKI](#)

Calibrate Accelerometer

Place board or frame on **leveled** surface, proceed with calibration, ensure platform is not moving during calibration period

Calibrate Magnetometer

Move multirotor at least **360** degrees on all axis of rotation, you have 30 seconds to perform this task

Reset Settings

Restore settings to **default**

Activate Boot Loader / DFU

Reboot into **boot loader / DFU** mode.

Heading: 0 deg
Pitch: 0 deg
Roll: 0 deg

Reset Z axis, offset: 0 deg



Info

Arming Disable Flags:

Battery voltage:	12 V
Capacity drawn:	1200 mAh
Current draw:	3.00 A
RSSI:	10 %

GPS

3D Fix:	False
Sats:	0
Latitude:	0.0000 deg
Longitude:	0.0000 deg

Instruments





НАСТРОЙКА БПЛА. ВКЛАДКА «ПОРТЫ»

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 reflash and erase your configuration if you do.

Identifier	Configuration/MSP	Serial Rx	Telemetry Output	Sensor Input	Peripherals
USB VCP	<input checked="" type="checkbox"/> 115200 ▾	<input type="checkbox"/>	Disabled ▾ AUTO ▾	Disabled ▾ AUTO ▾	Disabled ▾ AUTO ▾
UART1	<input type="checkbox"/> 115200 ▾	<input checked="" type="checkbox"/>	Disabled ▾ AUTO ▾	Disabled ▾ AUTO ▾	Disabled ▾ AUTO ▾
UART2	<input type="checkbox"/> 115200 ▾	<input type="checkbox"/>	Disabled ▾ AUTO ▾	Disabled ▾ AUTO ▾	VTX (TBS Sm: ▾ AUTO ▾
UART3	<input type="checkbox"/> 115200 ▾	<input type="checkbox"/>	Disabled ▾ AUTO ▾	GPS ▾ AUTO ▾	Disabled ▾ AUTO ▾
UART4	<input checked="" type="checkbox"/> 115200 ▾	<input type="checkbox"/>	Disabled ▾ AUTO ▾	Disabled ▾ AUTO ▾	Disabled ▾ AUTO ▾
UART5	<input type="checkbox"/> 115200 ▾	<input type="checkbox"/>	Disabled ▾ AUTO ▾	Disabled ▾ AUTO ▾	Disabled ▾ AUTO ▾



НАСТРОЙКА БПЛА. ВКЛАДКА «КОНФИГУРАЦИЯ»

Configuration

[WIKI](#)

Note: Not all combinations of features are valid. When the flight controller firmware detects invalid feature combinations conflicting features will be disabled.

Note: Configure serial ports **before** enabling the features that will use the ports.

System configuration

Note: Make sure your FC is able to operate at these speeds! Check CPU and cyclotime stability. Changing this may require PID re-tuning. TIP: Disable Accelerometer and other sensors to gain more performance.

12.00 kHz Gyro update frequency

6.00 kHz PID loop frequency ?

Accelerometer

Barometer (if supported)

Magnetometer (if supported)

Personalization

Craft name ?

Pilot name ?

Other Features

Note: Not all features are supported by all flight controllers. If you enable a specific feature, and it is disabled after you hit 'Save and Reboot', it means that this feature is not supported on your board.

Board and Sensor Alignment

0 Roll Degrees

0 Pitch Degrees

0 Yaw Degrees

Warning: No Gyro/Acc found

Default MAG Alignment

Dshot Beacon Configuration

Beacon Tone

RX_LOST Beeps when TX is turned off or signal lost (repeat until TX is okay)

RX_SET Beeps when aux channel is set for beep

Beeper Configuration

GYRO_CALIBRATED Beeps when gyro has been calibrated

RX_LOST Beeps when TX is turned off or signal lost (repeat until TX is okay)

RX_LOST_LANDING Beeps SOS when armed and TX is turned off or signal lost (autolanding/autodisarm)



НАСТРОЙКА БПЛА. ВКЛАДКА «ПИТАНИЕ И АККУМУЛЯТОР»

Battery

Onboard ADC Voltage Meter Source

Onboard ADC Current Meter Source

3.3 Minimum Cell Voltage

4.3 Maximum Cell Voltage

3.5 Warning Cell Voltage

0 Capacity (mAh)

Voltage Meter

Warning: Values limited to 25.5V.

Battery Scale

Divider Value

Multiplier Value

Amperage Meter

Warning: Values limited to 63.5A.

Battery Scale [1/10th mV/A]

Offset [mA]

Power State

Connected Yes (Cells: 2)

Voltage

mAh used

Amperage



НАСТРОЙКА БПЛА. ВКЛАДКА «ОТКАЗОУСТОЙЧИВОСТЬ»

Valid Pulse Range Settings

0 Minimum length

0 Maximum length

Stage 1 - Channel Fallback Settings

Roll [A]	Hold
Pitch [E]	Hold
Yaw [R]	Hold
Throttle [T]	Hold
AUX 1	Hold
AUX 2	Hold
AUX 3	Hold
AUX 4	Hold
AUX 5	Hold
AUX 6	Hold
AUX 7	Hold
AUX 8	Hold
AUX 9	Hold
AUX 10	Hold
AUX 11	Hold
AUX 12	Hold

Failsafe Switch


Stage 1 Failsafe Switch Action


Stage 2 - Settings

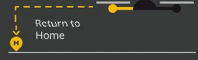
0,0 Period of time in Stage 1 failsafe after signal loss [seconds]

0,0 Failsafe Throttle Low Delay [seconds]

Stage 2 - Failsafe Procedure

Drop 

Land 

GPS Rescue 

Maximum altitude Altitude mode

0 Initial climb (meters)

0 Return altitude (meters) - **only applies in Fixed Altitude mode**

0,0 Ascend rate (meters/second)

0,0 Return ground speed (meters/second)

0 Maximum pitch angle

0 Descent distance (meters)

0,0 Descent rate (meters/second)

0 Throttle minimum

0 Throttle maximum

0 Throttle hover - **IMPORTANT: set this value accurately**

0 Minimum distance to home (meters)

0 Minimum satellites

Allow arming without fix - **WARNING: No fix = disarm on failsafe!**

Off Sanity checks



НАСТРОЙКА БПЛА. ВКЛАДКА «ПРЕДУСТАНОВКИ»

Presets Save backup Load backup Preset sources... Presets Wiki

Categories	Keywords	Authors	Firmwares	Status
Select... x v	Select... x v	Select... x v	4.2 x v	Select... x v

example: "karate race", or "5" freestyle"

Avatar HD VTXs

Community VTX

Author: jappyjan

Firmware: 4.2; 4.3

Keywords: vtx; vtx table; Avatar; Walksnail; digital; whoop

FPV.WTF MSP-OSD

Community VTX

Author: benlumley

Firmware: 4.2; 4.3

Keywords: vtx; dji; vista; air unit; fpv.wtf; wtfos; msp-osd; displayport; msp

Eachine Nano V2 VTX Table

Community VTX

Author: MrAlucardDante

Firmware: 4.2; 4.3; 4.4

Keywords: eachine; Eachine; nano; Nano; irc; IRC; tramp; TRAMP; Tramp; IRC Tramp; irc tramp; IRC TR...

Foxeer 5.8G Reaper Extreme 2.5W

Community VTX

Author: Foxeer Harvey

Firmware: 4.2; 4.3; 4.4

Keywords: vtx; vtx table; IRC; tramp; HV; nano; Foxeer; Extreme; 2.5W; 2500mW

HDZero VTXs

Community VTX

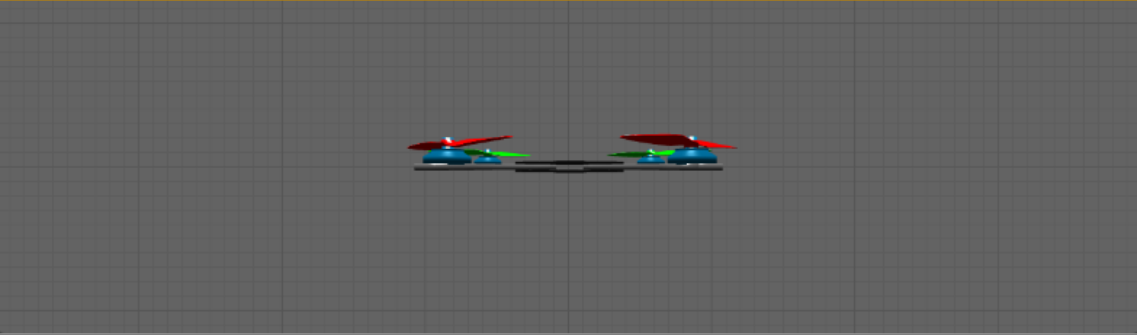
Emax NanoHawk 1S SmartAudio 2.0 VTX table

Community VTX



НАСТРОЙКА БПЛА. ВКЛАДКА «ПРИЕМНИК»

Preview



Roll [A]	<div style="width: 100%; height: 10px; background-color: red;"></div>	1500
Pitch [E]	<div style="width: 100%; height: 10px; background-color: purple;"></div>	1500
Yaw [R]	<div style="width: 100%; height: 10px; background-color: blue;"></div>	1500
Throttle [T]	<div style="width: 100%; height: 10px; background-color: cyan;"></div>	1500
AUX 1	<div style="width: 100%; height: 10px; background-color: teal;"></div>	1500
AUX 2	<div style="width: 100%; height: 10px; background-color: green;"></div>	1500
AUX 3	<div style="width: 100%; height: 10px; background-color: limegreen;"></div>	1500
AUX 4	<div style="width: 100%; height: 10px; background-color: yellow;"></div>	1500
AUX 5	<div style="width: 100%; height: 10px; background-color: orange;"></div>	1500
AUX 6	<div style="width: 100%; height: 10px; background-color: brown;"></div>	1500
AUX 7	<div style="width: 100%; height: 10px; background-color: gray;"></div>	1500
AUX 8	<div style="width: 100%; height: 10px; background-color: steelblue;"></div>	1500
AUX 9	<div style="width: 100%; height: 10px; background-color: magenta;"></div>	1500
AUX 10	<div style="width: 100%; height: 10px; background-color: purple;"></div>	1500
AUX 11	<div style="width: 100%; height: 10px; background-color: green;"></div>	1500
AUX 12	<div style="width: 100%; height: 10px; background-color: blue;"></div>	1500

Receiver

<Select One>
v

Receiver Mode

Telemetry ?

TELEMETRY Telemetry output

RSSI (Signal Strength) ?

RSSI_ADC Analog RSSI input

Channel Map

RSSI Channel

v

Disabled
v

'Stick Low' Threshold

Stick Center

'Stick High' Threshold

0
v
?

0
v
?

0
v
?

RC Deadband

Yaw Deadband

3D Throttle Deadband

0
v
?

0
v
?

0
v
?

RC Smoothing

Off
v

Smoothing Mode



НАСТРОЙКА БПЛА. ВКЛАДКА «РЕЖИМЫ»

Modes

[WIKI](#)

Configure modes here using a combination of ranges and/or links to other modes (links supported on BF 4.0 and later). Use **ranges** to define the switches on your transmitter and corresponding mode assignments. A receiver channel that gives a reading between a range min/max will activate the mode. Use a **link** to activate a mode when another mode is activated. **Exceptions:** ARM cannot be linked to or from another mode, modes cannot be linked to other modes that are configured with a link (chained links). Multiple ranges/links can be used to activate any mode. If there is more than one range/link defined for a mode, each of them can be set to **AND** or **OR**. A mode will be activated when:

- ALL **AND** ranges/links are active; OR
- at least one **OR** range/link is active.

Remember to save your settings using the Save button.

Hide unused modes

ARM	AUX 2 ▾ Min: 1350 Max: 2100		✕
Add Range			
ANGLE	AUX 2 ▾ Min: 1700 Max: 2100		✕
Add Link			
Add Range			
HORIZON			
Add Link			
Add Range			
HEADFREE			
Add Link			

[Save](#)



НАСТРОЙКА БПЛА. ВКЛАДКА «РЕЖИМЫ»

ARM – режим, который позволяет запустить двигатели БПЛА;

AIR MODE – улучшает управляемость БПЛА при нулевом газе;

ANTI GRAVITY – уменьшает «провалы» при резком изменении газа, путем увеличения I-коэффициента ПИД регулятора, управление становится более гладким;

ANGLE – режим полета, в котором поддерживается горизонтальное положение с помощью акселерометра; управление джойстиком влияет на угол наклона самолета;

FAILSAFE – функция позволяет настроить автоматическую посадку в точке «Дом» при потере радиосвязи;

BEEPER – функция позволяет настроить включение звукового сигнала;

HORIZON – в данном режиме сохраняется горизонтальное положение с помощью акселерометра, перемещение ручки управления влияет на угол, но в экстремальных ситуациях летательный аппарат может сделать переворот и вернуться в горизонтальное положение;

BLACKBOX – функция включает или отключает запись бортового журнала;

FLIP OVER AFTER CRASH – в данном режиме квадрокоптер вращает пропеллеры только с одной стороны в обратном направлении, чтобы перевернуться при падении вверх дном.



НАСТРОЙКА БПЛА. ВКЛАДКА «GPS»

GPS Configuration

UBLOX Protocol

Auto Config

Use Galileo

Set Home Point Once

European EC Ground Assistance Type

0,0 Magnetometer Declination [deg]

GPS

3D Fix: True

Number of Satellites: 10

Altitude: 0 m

Speed: 0 cm/s

Heading IMU / GPS: 0 / 134 deg

Current Latitude / Longitude: **47.491941 / 19.053977 deg**

Dist to Home: 0 m

Positional DOP: 0.00

GPS Signal Strength

Gnss ID	Sat ID	Signal Strength	Status	Quality
GPS	1	<div style="width: 10%; background-color: green;"></div>	unused	unusable
GPS	2	<div style="width: 80%; background-color: green;"></div>	USED	fully locked
GPS	10	<div style="width: 85%; background-color: green;"></div>	USED	fully locked
GPS	15	<div style="width: 85%; background-color: green;"></div>	USED	fully locked
GPS	18	<div style="width: 75%; background-color: green;"></div>	USED	fully locked
GPS	23	<div style="width: 85%; background-color: green;"></div>	USED	fully locked
GPS	26	<div style="width: 85%; background-color: green;"></div>	USED	fully locked
SBAS	123	<div style="width: 10%; background-color: green;"></div>	unused	fully locked
SBAS	136	<div style="width: 10%; background-color: green;"></div>	unused	fully locked
Galileo	1	<div style="width: 10%; background-color: green;"></div>	unused	searching
Galileo	15	<div style="width: 80%; background-color: green;"></div>	USED	fully locked

Current GPS location



НАСТРОЙКА БПЛА. ВКЛАДКА «ДВИГАТЕЛИ»

Mixer

QUAD X

Motor direction is reversed

Motor direction

ESC/Motor Features

DSHOT600 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)

14 Motor poles (number of magnets on the motor bell)

0 Motor Idle (% static)

3D ESC/Motor Features

RESET gyro

Refresh: 20 ms

Scale: 2000

X: 0.00 (0.00)

Y: 0.00 (0.00)

Z: 0.00 (0.00)

RMS: 0.0000

Motors

1	2	3	4	5	6	7	8
1000	1000	1000	1000				
R: 0	R: 0	R: 0	R: 0				
E: 0.00%	E: 0.00%	E: 0.00%	E: 0.00%				
T: 0°C	T: 0°C	T: 0°C	T: 0°C				
1000	1000	1000	1000	1000	1000	1000	1000
							Master

Motor Test Mode / Arming Notice:
Moving the sliders or arming your craft with the transmitter will cause the motors to **spin up**.



НАСТРОЙКА БПЛА. ВКЛАДКА «ЭКРАННОЕ МЕНЮ»

1 2 3 Elements

- Adjustment range
- Altitude With 1 decimal
- Angle: pitch
- Angle: roll
- Anti gravity
- Artificial horizon
- Artificial horizon sidebars
- Aux value
- Battery average cell voltage
- Battery current draw
- Battery current mAh drawn
- Battery current Wh drawn
- Battery efficiency
- Battery usage Graphical remaining
- Battery voltage
- Blackbox log status
- Camera frame
- Compass bar
- Core temperature
- Craft name
- Crosshairs
- Debug

Preview for OSD Profile 1 Font Default

Drag elements to change position

Active OSD Profile

Current: OSD Profile 1

Video Format

Auto PAL NTSC HD

Units

Imperial Metric British

Timers

1	Source:	On time
	Precision:	Second
	Alarm:	▾
2	Source:	On time
	Precision:	Second
	Alarm:	▾
3	Source:	On time
	Precision:	Second
	Alarm:	▾

Font Manager
Save



НАСТРОЙКА БПЛА. ВКЛАДКА «ВИДЕОПЕРЕДАТЧИК»

Selected Mode

- Enter frequency directly ?
- RACEBAND Band ?
- Channel 5 Channel ?
- 25 Power ?
- Pit Mode ?
- 0 Pit Mode frequency ?
- On until first Low Power Disarm ?

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	<input checked="" type="checkbox"/>	5865	5845	5825	5805	5785	5765	5745	5725	Band 1
BOSCAM_B	B	<input checked="" type="checkbox"/>	5733	5752	5771	5790	5809	5828	5847	5866	Band 2
BOSCAM_E	E	<input checked="" type="checkbox"/>	5705	5685	5665	5645	5885	5905	5925	5945	Band 3
FATSHARK	F	<input checked="" type="checkbox"/>	5740	5760	5780	5800	5820	5840	5860	5880	Band 4
RACEBAND	R	<input checked="" type="checkbox"/>	5658	5695	5732	5769	5806	5843	5880	5917	Band 5
LOWRACE	L	<input checked="" type="checkbox"/>	5333	5373	5413	5453	5493	5533	5573	5613	Band 6

5 Number of power levels ?

1	2	3	4	5	Value
1	2	3	4	0	
25	100	200	400	PIT	Label

Current Values

Device ready	True
VTX Type	SmartAudio 2.0
Band	RACEBAND
Channel	5
Frequency	5806
Power	25
Pit Mode	No
Pit Mode frequency	0
Low Power Disarm	On until first arm

?
Save Lua Script
Save to file
Load from file
Load from clipboard
Save



НАСТРОЙКА БПЛА. ВКЛАДКА «ЧЕРНЫЙ ЯЩИК»

Blackbox

[WIKI](#)

Blackbox configuration

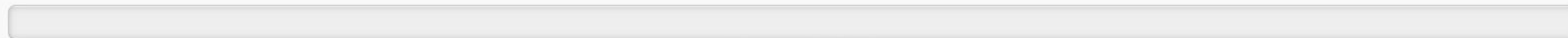
- Onboard Flash Blackbox logging device
- 1/4 (2kHz) Blackbox logging rate
- NONE Blackbox debug mode

Outboard serial logging device

You can log to an external logging device (such as an OpenLager) by using a serial port. Configure the port on the Ports tab.

Onboard dataflash chip

Flight logs can be recorded to your flight controller's onboard dataflash chip.



Free space 16.0MB

Directly saving flash to file is slow and inherently prone to error / file corruption.

In some cases it will work for small files, but this is not supported and support requests for it will be closed without comment - use Mass Storage mode instead.

Mass Storage Mode

Reboot into **mass storage device (MSC)** mode. Once activated, the onboard flash or SD card on your flight controller will be recognised as a storage device by your computer, and allow you to download your log files. Eject



НАСТРОЙКА БПЛА. ВКЛАДКА «КОМАНДНАЯ СТРОКА»

Note: Leaving CLI tab or pressing Disconnect will **automatically** send "exit" to the board. With the latest firmware this will make the controller **restart** and unsaved changes will be **lost**.

Warning: Some commands in CLI can result in arbitrary signals being sent on the motor output pins. This can cause motors to spin up if a battery is connected. Therefore it is highly recommended to make sure that **no battery is connected before entering commands in CLI**.

```
set tpa_mode = D
set tpa_rate = 65
set tpa_breakpoint = 1350

rateprofile 0

# rateprofile 0
set rateprofile_name = -
set thr_mid = 50
set thr_expo = 0
set rates_type = ACTUAL
set quickrates_rc_expo = OFF
set roll_rc_rate = 7
set pitch_rc_rate = 7
set yaw_rc_rate = 7
set roll_expo = 0
set pitch_expo = 0
set yaw_expo = 0
set roll_srate = 67
set pitch_srate = 67
set yaw_srate = 67
set throttle_limit_type = OFF
set throttle_limit_percent = 100
set roll_rate_limit = 1998
set pitch_rate_limit = 1998
set yaw_rate_limit = 1998
set roll_level_expo = 0
set pitch_level_expo = 0

# end the command batch
batch end
```



Write your command here. Press Tab for AutoComplete.

[Submit Support Data](#)[Copy to clipboard](#)[Clear output history](#)[Load from file](#)[Save to File](#)



СПАСИБО ЗА ВНИМАНИЕ!