

Express LRS

How to configure the receiver as a GYRO

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User Guide

Table of Contents

Topic	Title	Page
1.	Parts list	3
2.	Wiring Diagram	3
3.	Download the firmware from Github	4
4.	Flash the firmware into the receiver	6
5.	How to enter binding mode	9
6.	Receiver hardware requirement	10
7.	How to navigate to the GYRO menus	10
8.	Gyro Inputs	12
9.	Gyro Output	15
10.	Gyro Mode	17
11.	Gyro PID's	18
12.	Gyro Settings	19
13.	Gyro Gain	19
14.	3D Printed receiver cradle	20
15.	Weight and EXPO control	
	Error! Bookmark not defined.	
16.	Inputs	
	Error! Bookmark not defined.	
17.	Mixer	
	Error! Bookmark not defined.	
18.	Special functions	
	Error! Bookmark not defined.	
19.	Basic setup – No Stabilization	
	Error! Bookmark not defined.	
20.	Receiver with an Accelerometer	
	Error! Bookmark not defined.	

1. Parts list

Receiver

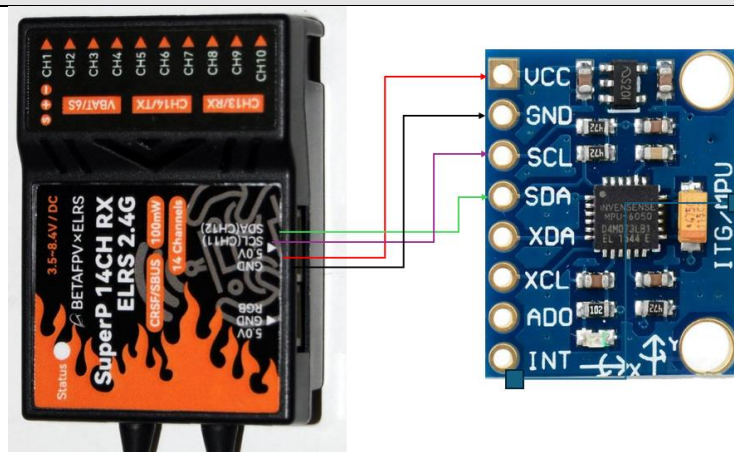
- Express LRS – Beta FPV Super 14CH Diversity Receiver



- GY-521 MPU-6050 MPU6050 3 Axis Accelerometer Gyroscope Module 6 DOF 6-axis Accelerometer Gyroscope Sensor Module 16 Bit AD Converter Data Output IIC I2C



2. Wiring Diagram



3. Bugs identified during my testing

1. With the BetaFPV SuperP receiver, after flashing the GYRO firmware, it does not enter WiFi mode even after the WiFi Interval time has elapsed. Refer to Chapter 5 for a workaround. I have not tested other receivers.
2. The Gyro Align on FLIP (Receiver inverted) are not working. Refer to chapter 13 for more details.
3. The master gain is only applicable to Rate mode. You will not be able to remotely adjust the gain on the other modes (i.e. SAFE, LEVEL HOVER). On these modes, the max gain set in the Axis gain is used. If its too much, the plane will shake on that axis during flight. The only way to fix it is to land and adjust the axis gain of that surface. Refer to chapter 14 for more details.
4. Can I request to add 5 positions in the mode channel in order to control the five modes if the GYRO either via two switches or via the 6-position switch of the RadioMaster? Refer to Chapter 11

4. Download the firmware from Github

URL = <https://github.com/awigen/ExpressLRS/tree/add-rx-gyro-support>

awigen / ExpressLRS Public

forked from ExpressLRS/ExpressLRS

Product Solutions Resources Open Source Enterprise Pricing

Notifications Fork 4 Star 20

Code Issues 3 Pull requests Actions Projects Security Insights

add-rx-gyro-supp... 6 Branches 0 Tags Go to file Code

This branch is 14 commits ahead of, 321 commits behind ExpressLRS/ExpressLRS:master.

awigen Gyro: Add hover mode strength setting 127765d · 2 years ago 1,752 Commits

.github	Use external targets repo (ExpressLRS#2400)	2 years ago
src	Gyro: Add hover mode strength setting	2 years ago
.gitattributes	Initial commit	7 years ago
.gitignore	Use external targets repo (ExpressLRS#2400)	2 years ago
LICENSE	Create LICENSE	4 years ago
README.md	Gyro: Change README.md to be a warning ...	2 years ago
betafpv-mpu6050.jpg	Gyro: Change README.md to be a warning ...	2 years ago

Readme GPL-3.0 license Activity 20 stars 0 watching 4 forks Report repository

Releases No releases published

Packages

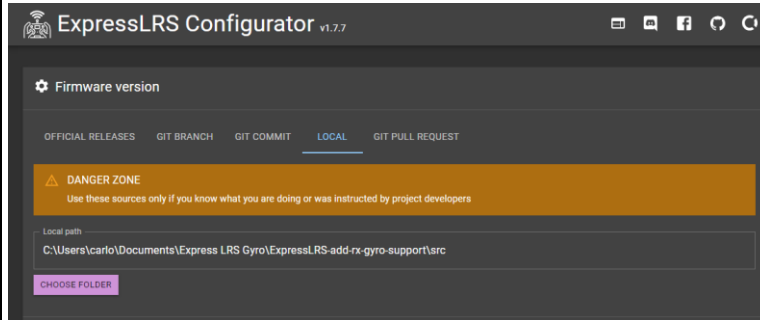
- Extract the firmware and save it in your local drive. In this example we will save it at C:\Users\carlo\Documents\Express LRS Gyro\ExpressLRS-add-rx-gyro-support

- The firmware that we will be using is in the SRC the folder.
C:\Users\carlo\Documents\Express LRS Gyro\ExpressLRS-add-rx-gyro-support\src

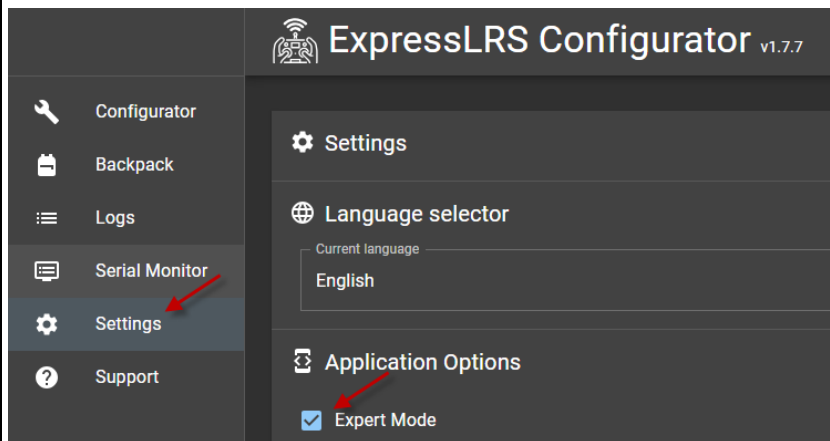
5. Flash the firmware into the receiver

Launch ExpressLRS Configurator

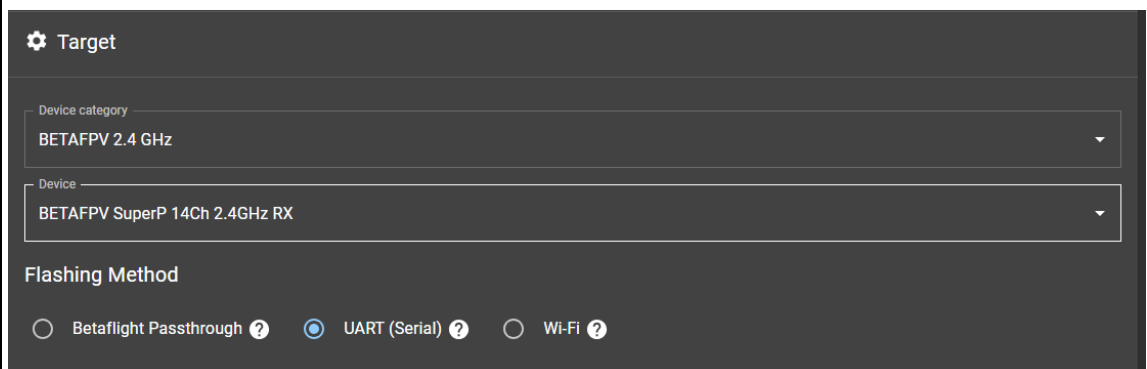
In the firmware section, select LOCAL and in the Local Path, enter the folder where you extracted the firmware under SRC folder. Refer to screen shot



If you don't see Local folder, navigate to Settings and set the Expert Mode

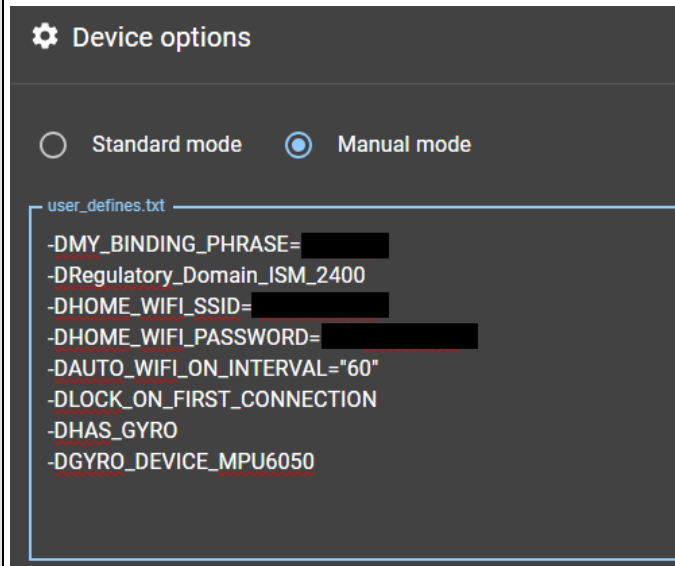


In the target section, select the receiver category. In this example its BETA FPV 2.4GHz. In the Device, select BETA FPV SuperP 14CH 2.4GHz RZ. Lastly select UART as the Flashing Method.

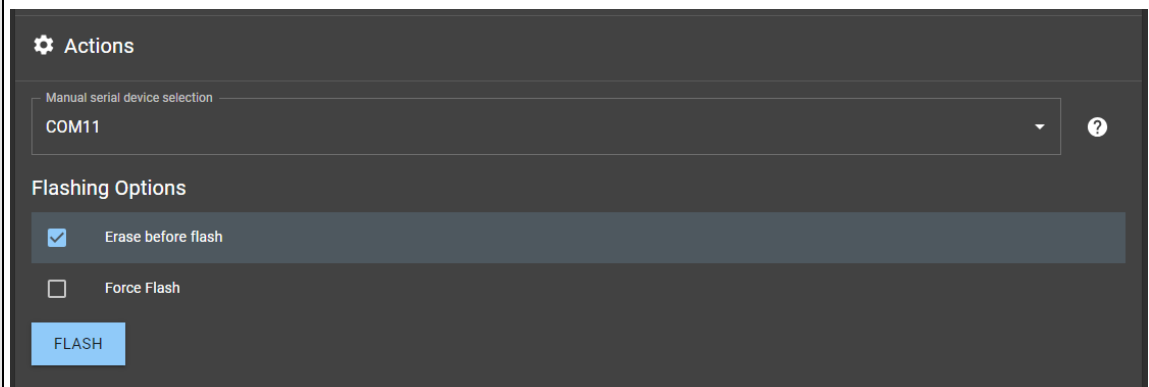


In the Device Option, select Manual Mode, Click COPY FROM STANDARD MODE and add 2 line highlighted in yellow:

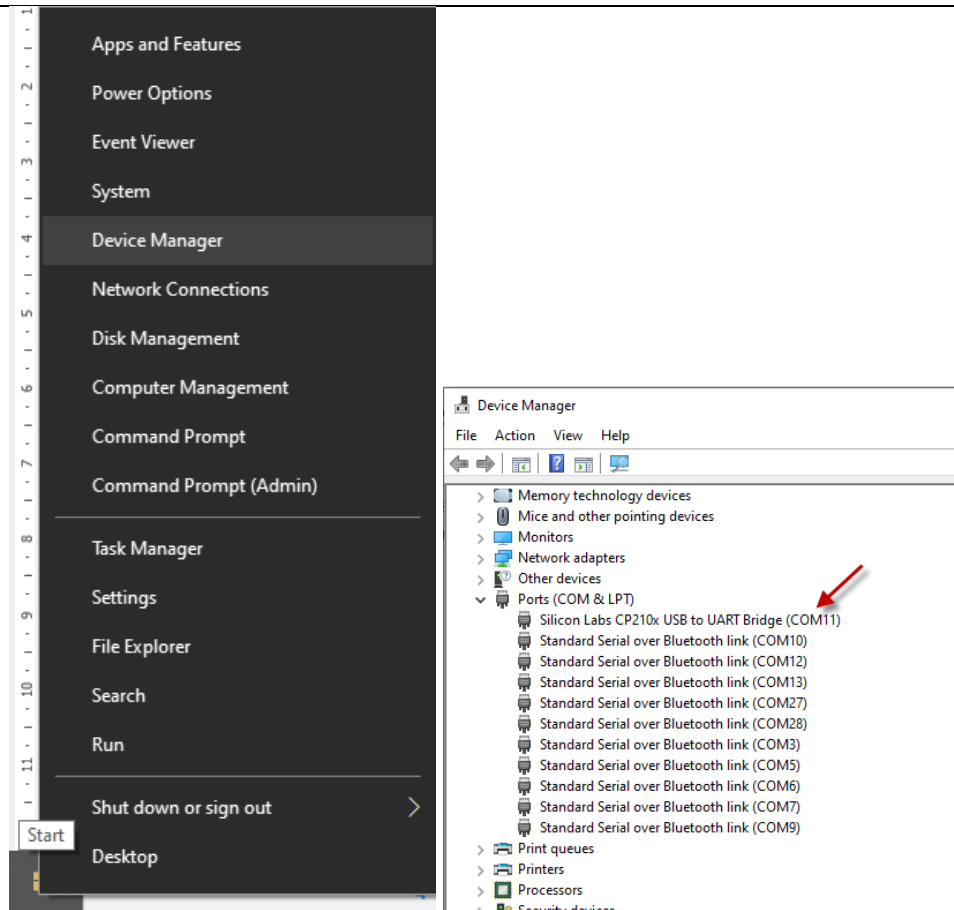
```
-DMY_BINDING_PHRASE="*****"  
-DRegulatory_Domain_ISM_2400  
-DHOME_WIFI_SSID="*****"  
-DHOME_WIFI_PASSWORD="*****"  
-DAUTO_WIFI_ON_INTERVAL="60"  
-DLOCK_ON_FIRST_CONNECTION-DHAS_GYRO  
-DGYRO_DEVICE_MPU6050
```



In the Action section select the COM Port where the USB cable is connected and set the Flashing Option to Erase before flash. Lastly click the FLASH button and wait until it is completed.

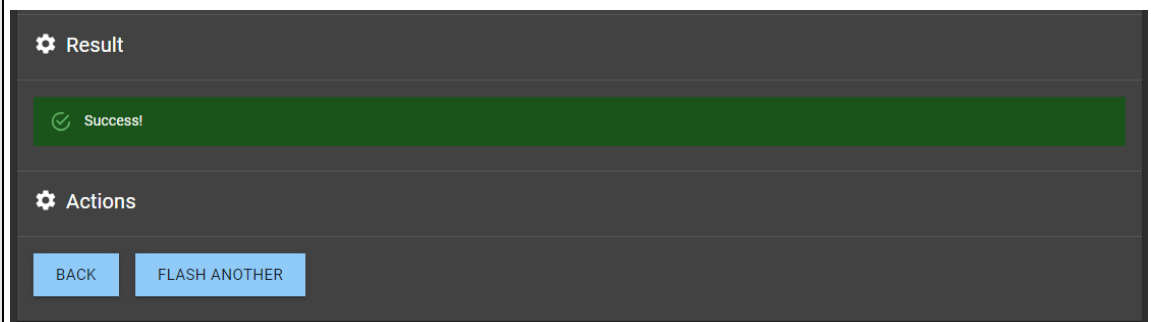


If you don't know the COM Port, right click the windows start button and then click Device Manager



The COM Port is COM11 indicated by the description “Silicon Labs CP210X”

Congratulations: You succeeded flashing the receiver with the BETA firmware for ExpressLRS with Gyro Stabilization.



Bug
identified

With the BetaFPV SuperP receiver, after flashing the GYRO firmware, it does not enter WiFi mode even after the WiFi Interval time has elapsed. Refer to Chapter 5 for a workaround. I have not tested other receivers.

6. How to enter binding mode

Issue;

After uploading the GYRO firmware, the receiver LED will slow flash orange. Which means, the receiver will not enter WiFi mode nor can be bound to a receiver. What you are looking is for the LED to double flash orange so that you can bind the receiver to the radio.

RGB status indication for SuperP 14CH Diversity Receiver is shown below.

RGB Color	Status	Description
Rainbow	Fade effect	Power on
Green	Slow flash	WiFi upgrading mode
Red	Quick flash	No RF chip detected
Orange	Double flash	Binding mode
Orange	Triple flash	Connected, but mismatched model-match configuration
Orange	Slow flash	Waiting for connection
	Solid on	Connected and color indicates packet rate

Solution

In order for the receiver to enter binding mode, you need to apply power the receiver 3 times in quick succession. On the third application of power, the LED must double flash orange indicating that the receiver is ready to be bind.

In the radio, navigate to ExpressLRS LUA script and hit the BIND button. Make sure that the binding phrase of the receiver and the model ID are the same and the distance between the receiver and radio is more than 1 meter.

BFPV 2G4Micro1W0/334C

Packet Rate333Hz Full(-105dBm)

Telem Ratio1:4 (6549bps)

Switch Mode16ch Rate/2

Link ModeNormal

Model MatchOff (ID: 20)

> TX Power (50mW Dyn)

> VTX Administrator

> WiFi Connectivity

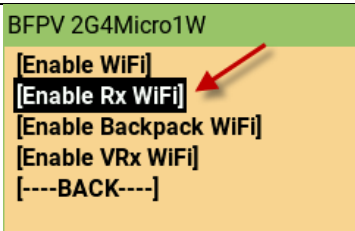
> Backpack

[BLE Joystick]

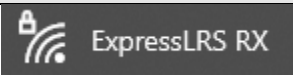
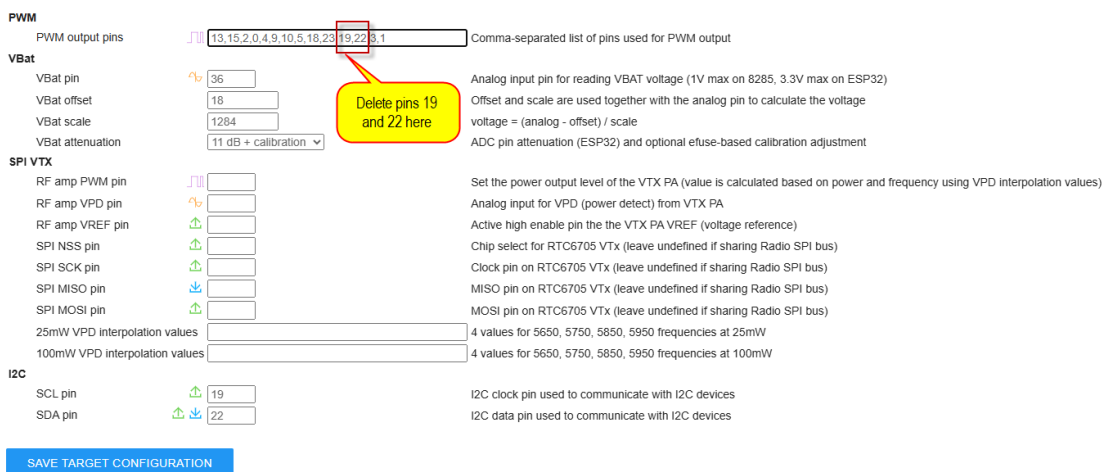
[Bind]

WiFi mode

To activate the Access Point of the receiver, navigate to the Enable Rx WiFi from the LUA script.

	 <p>BFPV 2G4Micro1W</p> <p>[Enable WiFi] [Enable Rx WiFi] [Enable Backpack WiFi] [Enable VRx WiFi] [---BACK---</p>
WEB Interface	<p>To enter the receiver WEB Interface execute the following:</p> <ol style="list-style-type: none"> 1. On a mobile phone or PC, connect to Access Point ExpressLRS.

7. Receiver hardware requirement

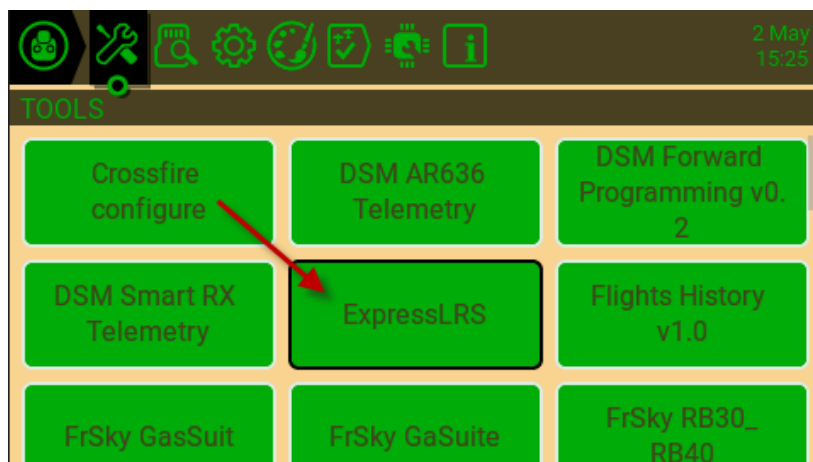
	 <p>Using a mobile phone or a PC, connect the ExpressLRS RX access point. Password = expresslrs.</p> <p>After the mobile phone or PC is connected to the access point, you can enter the WEB Interface by:</p> <ol style="list-style-type: none"> 1. Opening a WEB browser and enter URL = 10.0.0.1 2. Opening a WEB browser and enter URL = http://10.0.0.1/hardware.html <p>To configure the receiver to talk to the Accelerometer, you need to enter the hardware interface (http://10.0.0.1/hardware.html). Scroll down until you see PWM Output pins and delete pins 19 and 22. Don't forget to SAVE TARGET CONFIGURATION and REBOOT</p>  <p>PWM PWM output pins: 13, 15, 2, 0, 4, 9, 10, 5, 18, 23, 19, 22, 3, 1 Comma-separated list of pins used for PWM output</p> <p>VBat VBat pin: 36 VBat offset: 18 VBat scale: 1284 VBat attenuation: 11 dB + calibration Analog input pin for reading VBAT voltage (1V max on 8285, 3.3V max on ESP32) Offset and scale are used together with the analog pin to calculate the voltage voltage = (analog - offset) / scale ADC pin attenuation (ESP32) and optional efuse-based calibration adjustment</p> <p>SPI VTX RF amp PWM pin: [] RF amp VPD pin: [] RF amp VREF pin: [] SPI NSS pin: [] SPI SCK pin: [] SPI MISO pin: [] SPI MOSI pin: [] Set the power output level of the VTX PA (value is calculated based on power and frequency using VPD interpolation values) Analog input for VPD (power detect) from VTX PA Active high enable pin the the VTX PA VREF (voltage reference) Chip select for RTC6705 VTx (leave undefined if sharing Radio SPI bus) Clock pin on RTC6705 VTx (leave undefined if sharing Radio SPI bus) MISO pin on RTC6705 VTx (leave undefined if sharing Radio SPI bus) MOSI pin on RTC6705 VTx (leave undefined if sharing Radio SPI bus)</p> <p>25mW VPD interpolation values: 4 values for 5650, 5750, 5850, 5950 frequencies at 25mW 100mW VPD interpolation values: 4 values for 5650, 5750, 5850, 5950 frequencies at 100mW</p> <p>I2C SCL pin: 19 SDA pin: 22 I2C clock pin used to communicate with I2C devices I2C data pin used to communicate with I2C devices</p> <p>SAVE TARGET CONFIGURATION</p>
--	--

8. How to navigate to the GYRO menus

	Turn on your radio and make sure that you are in the correct model
	Power on your receiver.

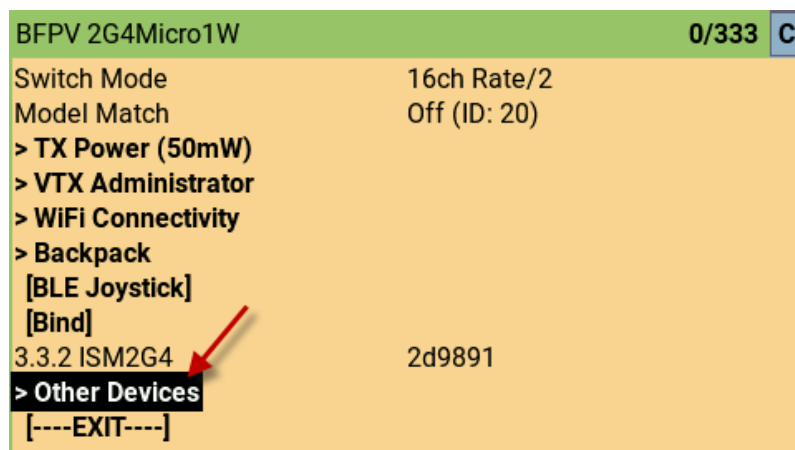
Check if the radio binds with the receiver. If not, refer to chapter 5 on how to bind the receiver.

After you radio binds with the receiver, Press the SYS button on the radio. Then press Express LRS.

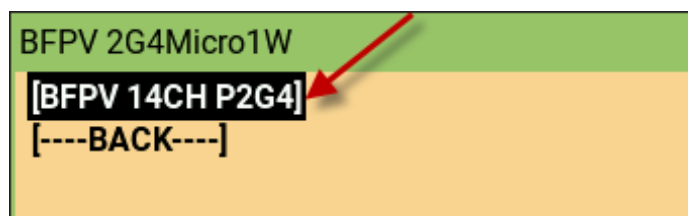


If you don't have this option, you need to install the LUA script for ExpressLRS from <https://www.expresslrs.org/quick-start/transmitters/lua-howto/>

Now click on Other Devices



Then click BFPV 14CH P2G4



You will be presented with the GYRO Configuration Options.

	<div> <div>BFPV 14CH P2G4</div> <div> <div>Protocol</div> <div>Rx Mode</div> <div>Tlm Power</div> <div>[Loan Model]</div> <div>[Return Model]</div> <div>> Output Mapping</div> <div>[Set Failsafe Pos]</div> <div>> Gyro Modes</div> <div>> Gyro Gains</div> <div>> Gyro Inputs</div> <div>> Gyro Outputs</div> </div> <div> <div>CRSF</div> <div>Diversity</div> <div>100mW</div> </div> </div>
<h2>9. Gyro Inputs</h2>	
	<p>In the "Gyro Inputs" menu you can setup mappings between input channels to gyro functions. Assign the input function according to the screen shots below.</p>
	<p>To enter the GYRO Input configuration click Gyro Inputs</p> <div> <div>BFPV 14CH P2G4</div> <div> <div>Protocol</div> <div>Rx Mode</div> <div>Tlm Power</div> <div>[Loan Model]</div> <div>[Return Model]</div> <div>> Output Mapping</div> <div>[Set Failsafe Pos]</div> <div>> Gyro Modes</div> <div>> Gyro Gains</div> <div>> Gyro Inputs</div> <div>> Gyro Outputs</div> </div> <div> <div>CRSF</div> <div>Diversity</div> <div>100mW</div> </div> </div>
	<div> <div>BFPV 14CH P2G4</div> <div> <div>Input Ch</div> <div>Function</div> <div>[----BACK----</div> </div> <div> <div>1</div> <div>Roll</div> </div> </div>
	<div> <div>BFPV 14CH P2G4</div> <div> <div>Input Ch</div> <div>Function</div> <div>[----BACK----</div> </div> <div> <div>2</div> <div>Pitch</div> </div> </div>

	<div>BFPV 14CH P2G4</div> <div> Input Ch 3 Function None [---BACK---] </div>	
	<div>BFPV 14CH P2G4</div> <div> Input Ch 4 Function Yaw [---BACK---] </div>	
	<div>BFPV 14CH P2G4</div> <div> Input Ch 5 Function None [---BACK---] </div>	<p>This is used as the Arm/Disarm channel. Do not assign a function.</p>
	<div>BFPV 14CH P2G4</div> <div> Input Ch 6 Function Mode [---BACK---] </div>	<p>This is used to control the flight mode of the GYRO</p>
	<div>BFPV 14CH P2G4</div> <div> Input Ch 7 Function Roll [---BACK---] </div>	
	<div>BFPV 14CH P2G4</div> <div> Input Ch 8 Function Pitch [---BACK---] </div>	
	<div>BFPV 14CH P2G4</div> <div> Input Ch 9 Function None [---BACK---] </div>	

I use this for my FLAPS. Do not assign a function.

BFPV 14CH P2G4

Input Ch

Function

10

None

BACK

I use this for my FLAPS. Do not assign a function.

BFPV 14CH P2G4

Input Ch

Function

11

Gain

BACK

This is used to remotely control the Gain of the GYRO from your radio.

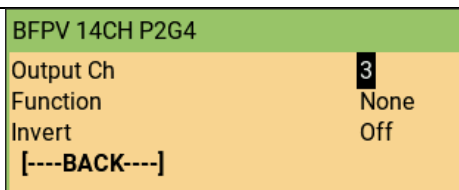
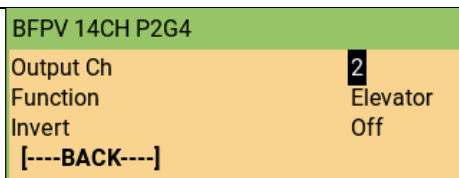
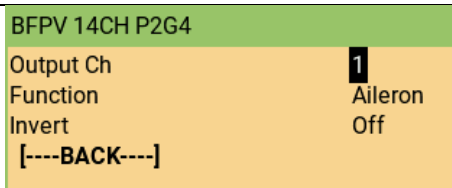
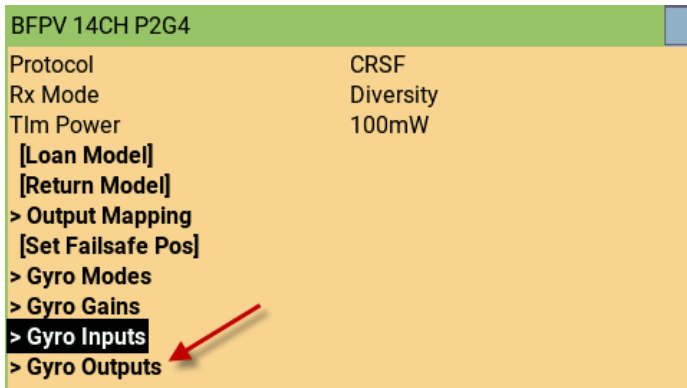
In summary, the input mapping are:

Input Channel	Function	Remarks
1	Aileron Left	
2	Elevator Right	
3	None	This is your throttle control
4	Rudder	
5		This is the Arm/Disarm control
6	Mode	
7	Aileron Right	
8	Elevator Left	
9		This can be used to control FLAPS
10		This can be used to control FLAPS
11	Gain	

10. Gyro Output

In the "Gyro Outputs" menu you can setup mappings between gyro functions and PWM output channels. For each channel you can setup gyro output inversion. A typical setup is having two aileron servos where one of the output channels needs to be reversed.

To enter the GYRO Input configuration click Gyro Outputs



No assignment here. This is the throttle output.



	<div>BFPV 14CH P2G4</div> <div> <div>Output Ch</div> <div>Function</div> <div>Invert</div> <div>[---BACK---</div> </div> <div> <div>5</div> <div>None</div> <div>Off</div> </div>	
	No assignment here. This is the Arm/Disarm output.	
	<div>BFPV 14CH P2G4</div> <div> <div>Output Ch</div> <div>Function</div> <div>Invert</div> <div>[---BACK---</div> </div> <div> <div>6</div> <div>None</div> <div>Off</div> </div>	
	<div>BFPV 14CH P2G4</div> <div> <div>Output Ch</div> <div>Function</div> <div>Invert</div> <div>[---BACK---</div> </div> <div> <div>7</div> <div>Aileron</div> <div>Off</div> </div>	
	<div>BFPV 14CH P2G4</div> <div> <div>Output Ch</div> <div>Function</div> <div>Invert</div> <div>[---BACK---</div> </div> <div> <div>8</div> <div>Elevator</div> <div>Off</div> </div>	
	<div>BFPV 14CH P2G4</div> <div> <div>Output Ch</div> <div>Function</div> <div>Invert</div> <div>[---BACK---</div> </div> <div> <div>9</div> <div>None</div> <div>Off</div> </div>	
	No assignment here. This is the flaps output.	
	<div>BFPV 14CH P2G4</div> <div> <div>Output Ch</div> <div>Function</div> <div>Invert</div> <div>[---BACK---</div> </div> <div> <div>10</div> <div>None</div> <div>Off</div> </div>	
	No assignment here. This is the flaps output.	
	<div>BFPV 14CH P2G4</div> <div> <div>Output Ch</div> <div>Function</div> <div>Invert</div> <div>[---BACK---</div> </div> <div> <div>11</div> <div>None</div> <div>Off</div> </div>	
	No assignment here. This is the Gyro Gain output.	

11. Gyro Mode

The gyro mode is controlled using Channel 6. The available flight modes are:

GYRO Mode	Channel 6	Remarks
Off	-100	Gyro is in OFF mode
Rate	100	This is the most basic gyro mode. Changes to the angular velocity in any direction will result in a correction.
Lock/Hold		Not yet available
Safe		In this mode the gyro will work to limit pitch and roll angles within the configured limits.
Level	0	In this mode the gyro will work to keep the pitch and roll angles at zero when channel inputs are zero. If the roll stick command is 50%, the gyro will attempt to keep the roll angle at 50% of the max roll angle.
Hover		In this mode the gyro will add corrections to elevator and rudder channels in order to keep aircraft pointing directly upwards.
Knife Edge		Not yet available

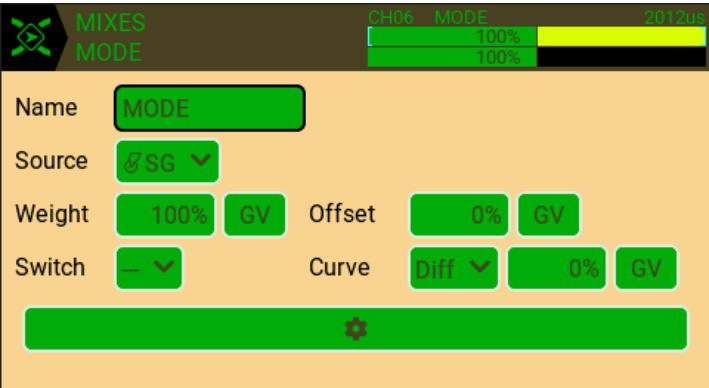
For this exercise, we will only be testing Level and Rate mode.

BFPV 14CH P2G4		
Position 1	Off	→ Channel 6 = -100
Position 2	Off	
Position 3	Level	→ Channel 6 = 0
Position 4	Off	
Position 5	Rate	→ Channel 6 = 100
[----BACK----		

Unfortunately, you can only use 3 flight modes at a time. In this exercise, we will be using switch SG. Refer to chapter 8 on how to assign the mode channel.

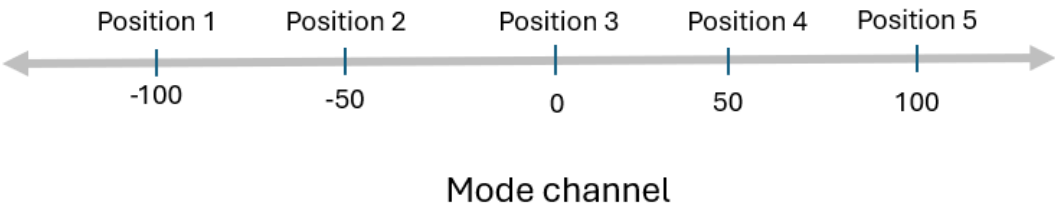
BFPV 14CH P2G4	
Input Ch	6
Function	Mode
[----BACK----	

Here's the mixer configuration to control the flight modes.



Feature request

Can I request to add 5 positions in the mode channel in order to control the five modes if the GYRO either via two switches or via the 6-position switch of the RadioMaster?



12. Gyro PID's

BFPV 14CH P2G4	
Gyro Axis	Roll
P Rate	35
I Rate	0
D Rate	10
Axis Gain	50
[---BACK---	

BFPV 14CH P2G4	
Gyro Axis	Pitch
P Rate	35
I Rate	0
D Rate	10
Axis Gain	50
[----BACK----	

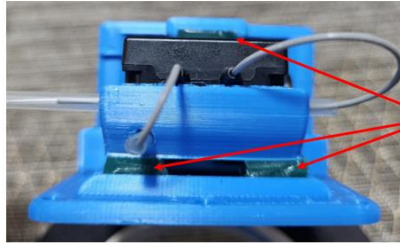
	<div>BFPV 14CH P2G4</div> <div><div>Gyro Axis</div><div>Yaw</div></div> <div><div>P Rate</div><div>35</div></div> <div><div>I Rate</div><div>0</div></div> <div><div>D Rate</div><div>10</div></div> <div><div>Axis Gain</div><div>50</div></div> <div>[---BACK---</div>	
13. Gyro Settings		
	<div>BFPV 14CH P2G4</div> <div><div>Gyro Align</div><div>90</div></div> <div>[Calibrate Gyro]</div> <div>[Set Subtrims]</div> <div><div>SAFE Pitch</div><div>45deg</div></div> <div><div>SAFE Roll</div><div>45deg</div></div> <div><div>Level Pitch</div><div>60deg</div></div> <div><div>Level Roll</div><div>60deg</div></div> <div><div>Launch Angle</div><div>10deg</div></div> <div><div>Hover Auth</div><div>8</div></div> <div>[---BACK---</div>	
Bug identified	The Gyro Align on FLIP (Receiver inverted) are not working.	
14. Gyro Gain		
	<p>The gain channel is configured in chapter 8 wherein in this example, channel 11 is the gain channel.</p> <div><div>BFPV 14CH P2G4</div><div><div>Input Ch</div><div>11</div></div><div><div>Function</div><div>Gain</div></div><div>[---BACK---</div></div>	
	<p>The gain is controlled using potentiometer S2 where -100 is the minimum gain and +100 is the maximum gain.</p> <div><div><div><div>MIXES</div><div>GAIN</div></div><div><div>CH11</div><div>GAIN</div><div>100%</div><div>100%</div></div></div><div><div>Name</div><div>GAIN</div></div><div><div>Source</div><div>OS2</div></div><div><div>Weight</div><div>100%</div><div>GV</div><div>Offset</div><div>0%</div><div>GV</div></div><div><div>Switch</div><div>-</div><div>Curve</div><div>Diff</div><div>0%</div><div>GV</div></div><div><div></div></div></div>	
Bug identified	The master gain is only applicable to Rate mode. You will not be able to remotely adjust the gain on the other modes (i.e. SAFE, LEVEL HOVER). On these modes, the max gain set in the Axis gain is used. If its too much, the plane will shake on that axis during flight. The only way to fix it is to land and adjust the axis gain of that surface.	

15. 3D Printed receiver cradle

I have read that GYRO performance is affected by excessive vibration so I decided to 3D print a cradle and use the Kyosho Z8006 Zeal Vibration Absorption Sheet to protect the receiver and accelerometer from vibrations. Here's the cradle and how it is assembled.



Receiver cradle



Vibration dampening

