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SmartAudio

SmartAudio is a single-wire solution for VTx control, originally developed by TBS on their Unify range of Analog Vtx devices.

A single wire from a UART Tx pin can be connected to a supported VTx, and then channels, power settings, etc, can be changed via Lua, Configurator etc.

Basic requirements are to:

- connect the Tx pad for the selected port to the SmartAudio input pin on the VTx
- in Configurator's Ports Tab, set the matching UART's Peripheral column to `VTX (TBS SmartAudio)`
- load or create a VTx table (4.1 or higher) so that the firmware knows how to talk to your VTx. For more information, see the VTX pages in the Wiki. Presets exist for common VTx devices.

Most of this document is of historical relevance and applies to earlier versions of Betaflight.

What's new

- 2017-02-12 Note on compatibility of SmartAudio V1 devices (Compatibility section)
- 2018-07-19 Note on operational mode switching
- 2020-07-25 Updated targets, removed broken link. Added link to latest revision of TBS SmartAudio documentation
- 2024-01-12 Introductory paragraph, filename change to improve sorting behavior

TBS SmartAudio

Latest manual: https://www.team-blacksheep.com/tbs_smartaudio_rev09.pdf

Setup

From teralift's post in Boris' thread (modified a bit)

- Targets TBS SmartAudio is supported on all F3, F4, F7 and H7 targets (except for those with integrated VTX).
- Wiring Just wire the SmartAudio wire to a free TX port, hardware UART or software serial. For software serial, be careful that your port may not be labelled TX, or port labelled TX may not work. (It can be freely assigned to valid timer port.) (There are some compatibility issues reported; if you have any problems, search the net before going into the BF github repo and cry for help.)
- Configuration The up to date configurator supports easy configuration of the SmartAudio on the selected port.

1. Goto Ports tab

2. Select TBS SmartAudio from Peripherals drop down menu

3. Speed can be left at AUTO.

BETAFLIGHT CONFIGURATOR 1.8.9

0V

Gyro Accel Mag Baro GPS Sonar

Dataflash: free 8.0MB

Enable Expert Mode Disconnect

2017-01-17 @ 11:25:51 -- MultiWii API version **received** - 1.28.0

2017-01-17 @ 11:25:51 -- Flight controller info, identifier: **BTFL**, version: 3.1.0

2017-01-17 @ 11:25:51 -- Running firmware released on: Jan 17 2017 11:23:01

2017-01-17 @ 11:25:51 -- Board: **OBFL**, version: 0

2017-01-17 @ 11:25:51 -- Unique device ID **received** - 0x2600453535510637393930

Hide Log

Scroll

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.

Port Identifier	Configuration	Serial Rx	Telemetry Output	Sensor Input	Peripherals
USB VCP	<input checked="" type="checkbox"/> MSP 115200	<input type="checkbox"/> Serial RX	Disabled AUTO	Disabled AUTO	Disabled AUTO
UART1	<input type="checkbox"/> MSP 115200	<input checked="" type="checkbox"/> Serial RX	Disabled AUTO	Disabled AUTO	Disabled AUTO
UART3	<input type="checkbox"/> MSP 115200	<input type="checkbox"/> Serial RX	SmartPort AUTO	Disabled AUTO	Disabled AUTO
UART6	<input type="checkbox"/> MSP 115200	<input type="checkbox"/> Serial RX	Disabled AUTO	Disabled AUTO	<input checked="" type="checkbox"/> Disabled <input type="checkbox"/> Blackbox logging <input checked="" type="checkbox"/> TBS SmartAudio <input type="checkbox"/> IRC Tramp

Save and Reboot

Port utilization: D: 11% U: 1% Packet error: 0 I2C error: 0 Cycle Time: 125 CPU Load: 3%

1.8.9

- Generic CMS 3.1 will come with the generic CMS (Configuration Menu System) that runs on top of multiple display devices; FC-integrated OSD, I2C OLED display and external OSD (MinimOSD variants) running latest version of MWOSD (Release 1.6.5 or later). (You even can switch between OSD and OLED while in CMS.) This means that users of external OSDs can control SmartAudio from the CMS.

From AILERON8's post in Boris' thread:

There is a little info on SmartAudio setup in here, but you may need to do a bit of troubleshooting to make it work for your particular setup. Good luck! I look forward to setting up SmartAudio on my next BFF3 quad myself.

<https://github.com/betaflight/betaflight/issues/1029>

<http://team-blacksheep.com/tbs-unify-pro-5g8-manual.pdf>

Here is a tutorial by Amano13:

<https://tmr.kiwi/betaflight-mwosd-smartaudio-cms/>

From Boris:

The easiest is of course to get fc with OSD. That works absolutely flawless, but there is a separate betaflight repository with LUA scripts

<https://github.com/betaflight/betaflight-tx-lua-scripts>

I am thinking to add more howto videos to github locations. So those who are willing to make nice howto videos please post it in here.

User's Responsibility

The SmartAudio support unlocks certain capabilities of a SmartAudio device, to provide users with maximum flexibility. Therefore, it is user's responsibility to operate the device within the limits of respective local regulations.

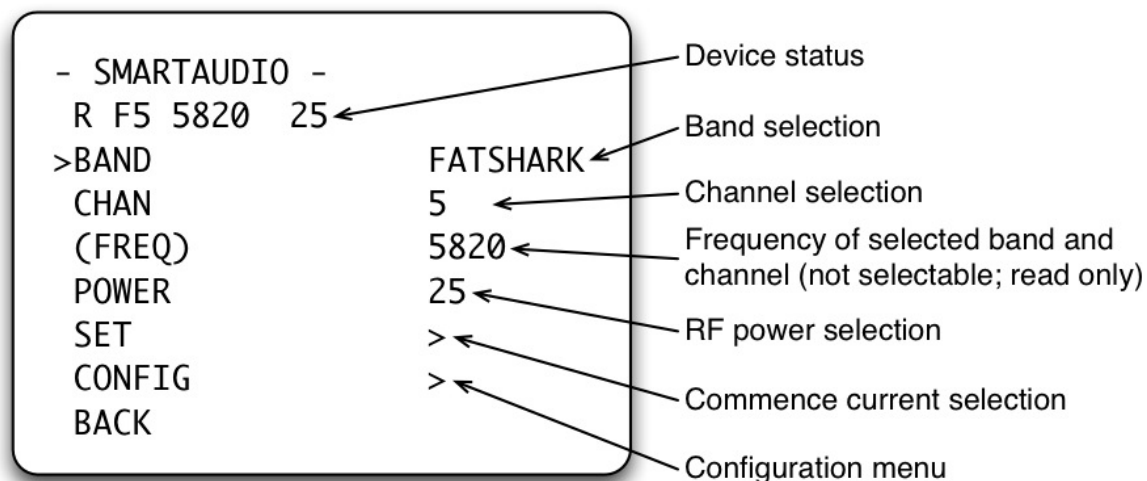
Compatibility

- Both SmartAudio V1, V2 and newer devices are supported.
- The SmartAudio V1 is NOT compatible with *some* hardware UARTs (as of 2017-02-12). If you have trouble with V1 devices with hardware UARTs, please try the software serial (available in v3.1.6 patch release or later).
- Unify 5G8 Pro Race Edition: Lower frequencies are not supported. Power setting can be selected as 500 or 800, but will only go up to 200, as will be indicated on the status line.
- SPARKY2: Due to the pull-up resistors, Flexi-port is not suitable for Unify 5G8 Pro, Pro HV and Pro HV Race edition. Main-port may be compatible (need testing).

SmartAudio CMS guide

The top menu (Band/Channel mode)

The top menu for SmartAudio VTX in band/channel mode looks like this.



SmartAudio VTX top menu (Band/Channel mode)

While most of the entries are intuitive, there are several things that need additional explanation.

Status Line

The status line on the top menu page of SmartAudio VTX menu indicates current status of the vtx in the following format:

```
m bc ffff ppp
```

where

m : Operational model, **F** (Freestyle) or **R** (Race).

b : Current transmitting band, **A** (BOSCAM A), **B** (BOSCAM B), **E** (BOSCAM E), **F** (FatShark/NexWave) or 'R' (Raceband).

c : Current transmitting channel, **1** through **8**.

ffff : Current transmitting frequency.

ppp : Current transmitting RF power, numeric value for mW (**25**, **200**, **500**, **800**), or **PIR** (In-Range Pit mode) or **POR** (Out-Range Pit mode).

Note that the status line indicates "running" status of the VTX device, and values may be different from band, channel and power setting entries below the status line.

Operational Models

In Betaflight, a SmartAudio device operates in one of two operational models:

Race

This is a model that gives minimum interference to other pilots. A SmartAudio device powers up in pit mode, and remain in pit mode until transmission is commenced.

When operating in this model, left most character of the status line is **R**. If the device is in pit mode, current power field of the status line is either **PIR** or **POR**, until transmission is commenced.

While in the pit mode, changes to **BAND**, **CHAN** and **POWER** will not take effect until **SET** menu entry and associated confirmation is done (transmission commencing). **BAND**, **CHAN** and **POWER** can be modified after commencing, but they all still require **SET** to take effect.

Refer to TBS Unify 5G8 Pro Manual for explanation of "In-Range" and "Out-Range".

Freestyle

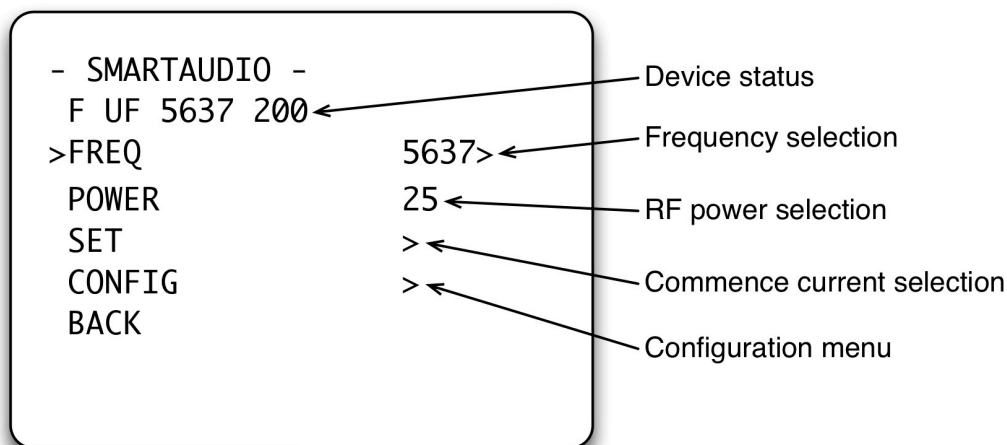
This is a model used when flying alone. A SmartAudio device will power up actively transmitting at band and channel with power as they were set before the power cycle. When operating in this model, left most character of the status line is **F**, and current power field matches that of power level selection menu entry. Changes to **POWER** takes effect immediately, but changes to **BAND** and **CHAN** must be commenced by **SET**.

Switching between Freestyle and Race

There is an **OPMODEL** entry in the **CONFIG** sub-menu. Select either **FREE** or **RACE**. A device must be power cycled immediately after the selection for the change to take effect.

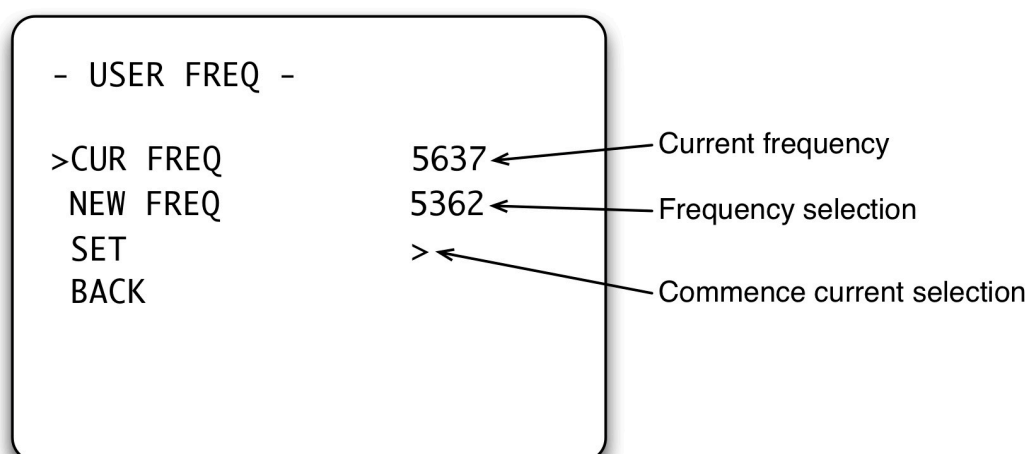
The top menu (Band/Channel mode)

When a SmartAudio device is in user frequency mode, the SmartAudio CMS Top Menu looks like this.



SmartAudio VTX top menu (Frequency mode)

It allows direct entry of arbitrary frequency between 5600 and 5900MHz, by selecting the **FREQ** entry, which will take to a submenu like this.



SmartAudio User frequency selection menu

The **NEW FREQ** allows selection of a new frequency, and **SET** will commence the transmission at the frequency. Accelerating auto repeat can be used here to prevent you from grounded when making a large change.

Switching between band/channel mode and user frequency mode

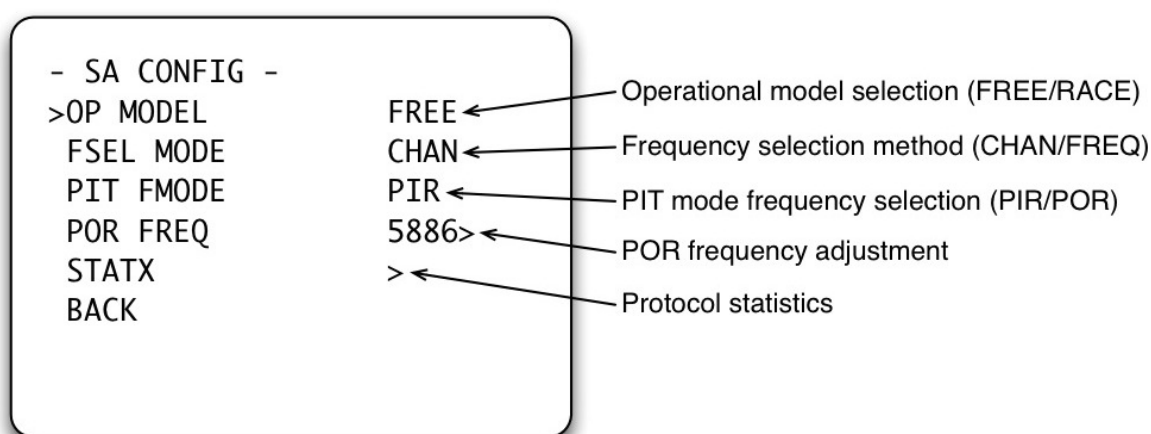
To switch from band/channel to user frequency mode:

- (1) Navigate to **SA CONFIG** menu.
- (2) Change **OP MODEL** to **FREE** if not already **FREE**.
- (4) Power cycle the SmartAudio device (You don't have to power cycle the FC).
- (5) Navigate back to SmartAudio VTX top menu.

To switch from user frequency mode to band/channel mode:

- (1) Navigate to **SA CONFIG** menu.
- (2) Change **FSEL MODE** to **CHAN**.
- (3) Power cycle the SmartAudio device (You don't have to power cycle the FC).
- (4) Navigate back to SmartAudio VTX top menu.

CONFIG sub-menu



SmartAudio VTX CONFIG menu

OP MODEL

Selection between race operational model (**RACE**) and freestyle operational model (**FREE**). Requires power cycle to take effect.

When race operational model is selected, the frequency selection mode (**FSEL MODE**) will automatically set to **CHAN**. This is by the specification of the current hardware (Unify 5G8 Pro/Pro HV/Race).

FSEL MODE

Frequency selection method. Requires power cycle to take effect.

- Channel mode ('CHAN'): Frequency is selected by specifying band and channel.
- Frequency mode ('FREQ'): Frequency is specified by numerical value in MHz. When set to frequency mode, operational model is automatically set to freestyle, and top menu will be altered to enable direct frequency adjustment.

The Frequency mode (**FREQ**) is only available when the operational model is freestyle (**FREE**). To choose the frequency mode, first switch the operational model

to free style.

PIT FMODE

Specifies frequency to use while in pit mode. Requires power cycle to take effect.

- In-Range (`PIR`): Pit mode frequency is specified by band and channel set before the power cycle.
- Out-Range (`POR`): Pit mode frequency is specified by the value of `POR FREQ` .

WARNING Do not change this entry to POR without VRX capable of receiving at frequency specified by the `POR FREQ` entry. If you do without such VRX, you will be blinded until Out-Range pit mode is cleared.

POR FREQ

Specifies frequency to use while in *Out-Range* pit mode.

STATX

Protocol statistics between a flight controller and a SmartAudio device. May help you to trouble shoot connection problems.

Trouble shooting

Recovery from accidental Out-Range pit mode

- You can cancel pit mode by button operation. Refer to the Unify manual.
- You can use alternative CMS device such as I2C OLED to cancel the Out-Range mode.
- You can tap or connect VIDEO OUTPUT from OSD and connect it to external display or goggle's VIDEO INPUT.

Modify VTX Settings (TBS Unify / TrampHV) using Spektrum VTX Setup Menu

Please read the Spektrum VTX setup section on the IRC Tramp Wiki page: [IRC-Tramp#modify-vtx-settings-tbs-unify--tramp-hv--rtc6705--using-spektrum-vtx-setup-menu](https://www.betaflight.com/docs/wiki/guides/current/SmartAudio)

Modify VTX Settings (TBS Unify / TrampHV) using FrSky TARANIS Menu

<http://www.nitbeatfpv.com/tramphv-unify-vtx-settings-taranis>

Note: The bf script linked in this 'how to' link isn't the latest one. You need the one linked here. <https://github.com/betaflight/betaflight-tx-lua-scripts>

Taranis upgrading and setup

Originally Posted by elmattbo: Ensure opentx 2.2 on the radio and avoid rc11. If upgrading from 2.1 you will have to copy in the new file structure for 2.2 to the sd card - back your sd card up first. The early bf 3.1 releases do have SmartAudio selectable in the ports tab but don't necessarily work, so update to the latest bf. Install the lua scripts linked from the bf wiki (x7, x9 as appropriate) into the scripts folder on the Taranis sd card. Attach the vtx audio lead to either uart 1 or 3 tx pin (RG SSD FC - Connect to the UART available on the FC you use). Select tbs SmartAudio for the appropriate UART in the ports tab. Go to display in the Taranis and set a screen to 'scripts' it should then offer you the lua script you installed earlier. From the main model screen a long press of page will bring up the bf scripts and you press menu to cycle to the vtx screen. Update from elmattbo: So after trying it today I found that the vtx didn't respond to changes in the lua script. Tried a power reboot after changing settings but it made no difference. I suspect I'm missing something in the set up, but it could be that the taranis reads the vtx, but doesn't write any changes. I have read that the half wave duplex (or whatever it is) communications protocol took a little figuring out for the devs so the issue may be in betaflight too.

Fixed! I hadn't saved the settings with a long press of the Taranis menu. Change VTX Settings Store or Reload values - Long Press MENU button Switch screens - Short Press MENU button Navigate between values - "+" & "-" buttons EDIT value - Press ENTER

Modify VTX Configuration (TBS Unify / TrampHV) using CLI Settings

As of Betaflight version 3.3.0, CLI settings to modify the VTX configuration are supported. See the [VTX CLI Settings](#) page for more information.

Using both SmartAudio and microphone at the same time

General concept of wiring

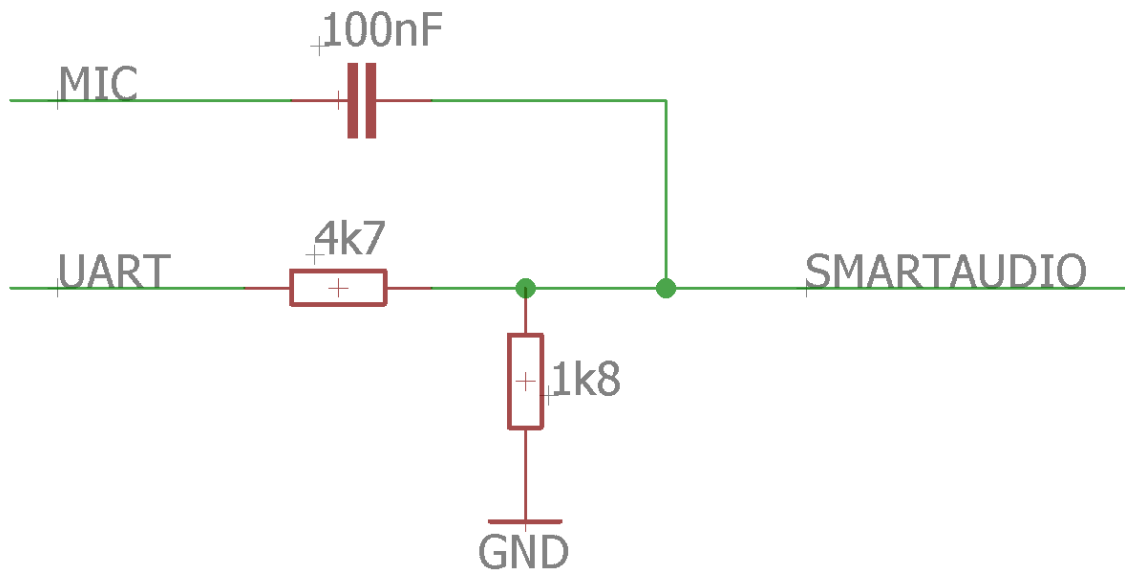
The digital signal can be connected either directly or using a Resistor.

If it comes from a microcontroller with 3.3V, best solution is to use a voltage divider to ~0.9V for a proper audio level (4k7 and 1k8 resistor values in our case).

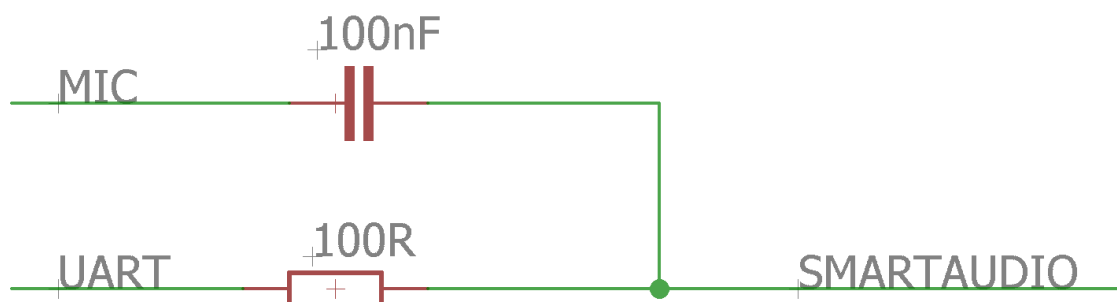
The analog signal needs to be ac coupled using a series capacitor from audio source to the SmartAudio signal. Ideal capacitance is around 100nF.

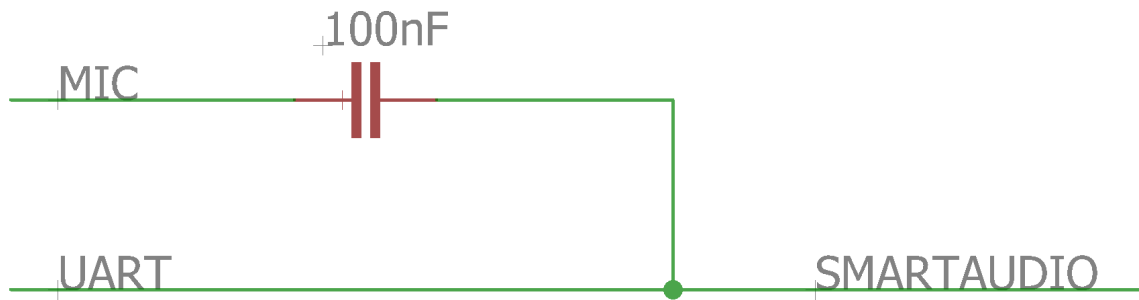
(The click sound in your audio will disappear after arming)

Ideal connection:



These two configurations might work as well depending on how it is used and connected:





Youtube

 [Joshua Bardwell](#)

 [Ivan Efimov](#)

Community

 [Discord](#)

 [IntoFPV](#)

Links

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 [VitroidFPV](#)

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Built with Docusaurus

made with  by **VitroidFPV** and **un!t**