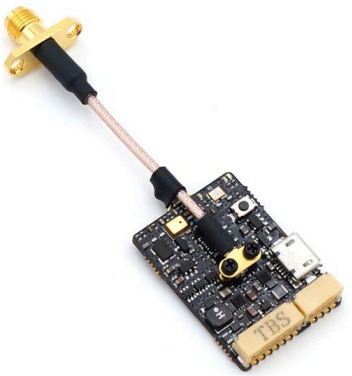
TBS UNIFY EVO 5G8 (HV) Video Transmitter

OSD capable, high power long range and freestyle VTx

Revision 2024-11-04



TEAM BLACKSHEEP
SERIOUS TOYS

The TBS UNIFY EVO is a new line of video transmitters which contains a professional On Screen Display (OSD), optimized for compatibility across multiple platforms and reduced to a small form factor, completely redesigned and tailored for use in small multirotors and FPV wings. It is tightly integrated with TBS Crossfire and TBS Crossfire-compatible products such as flight controls.

Key features

- World's smallest video transmitter containing a full-featured on-screen display
- 25mW (up to 800mW with HAM license*)
- Built-in microphone (with disable feature!)
- One button frequency and power setup
- Device configuration through OSD
- SMA pigtail connector with frame mounting holes integrated
- High voltage 7-26V (2-6S LIPO) input
- Clean voltage output for FPV Camera (5V / 200mA)
- Superior input noise filtering
- **2x CRSF Serial Port** for OSD data, device setup, expansion port for sensors etc.
- Smartaudio V2.1 for one-wire serial control
- High-quality branded U.FL connector with additional screw locking
- USB connector for firmware update and setup through TBS Agent
- Firmware update support through CRSF when paired with TBS Crossfire or Tracer

Specifications

	TBS UNIFY EVO	
Input voltage:	7V to 26V (2S - 6S LIPO) VBat, peak max 31V. *Connect directly to the battery or regulator with enough output power (>=7V, 1A)!*	
Power Output	Regulated 5V for Camera @ 200mA	
Extra features:	CleanSwipe PitMode 2x CRSF Smartaudio V2.1	
Remote software protocol	PWM, Barcodes, 2x CRSF or SmartAudio V2.1	
Output Power	CRSF: 14dBm (25mW) 20dBm (100mW*) 26dBm (400mW*) 29dBm (800mW*)	Smartaudio V2.1: 14dBm (25mW) 23dBm (200mW*) 27dBm (500mW*) 29dBm (800mW*)
Pit mode	**Activate:** press button during powered up. **LED: red blinking**	
	Deactivate: press button during power up. **LED: blue** (red & blue when unlocked)	
Pit mode -> flight mode	Command through SmartAudio V2.1 & CRSF	
Channels:	Band A (8ch), B (8ch), E (5ch) Fatshark 8ch Race Band 8ch Low Race Band 8ch **	
Audio	Yes, through microphone on-board	
Power consumption	25mW: 300mA 200mW: 370mA 500mW: 500mA 800mW: 650mA	25mW: 300mA 100mW: 350mA 400mW: 450mA 800mW: 650mA
Range:	Up to 4 km with omnidirectional RHCP antennas	
Antenna connector:	U.FL high strength SMA	
Port connector	Main connector: JST-GH, 7 pin 2nd Connector: JST-GH, 4 pin	
Dimensions:	22 (H) x 30 (W) x 4 (D) mm	
Weight:	7g excluding antenna	
Kit contents:	1x TBS UNIFY EVO, 1x 7pin cable (power, cam, crsf), 1x 4pin cable(crsf)	

** requires HAM license, special unlocking procedure!*
*** only where authorization has been granted*

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CleanSwitch

Attention

These video transmitters are capable of radio frequency transmissions and output power that may not be allowed in your country.

Please always check your local RF legislation to set the frequency and output power according to the regulation.

A general rule for RC aircraft is that they must always be controlled under sight of view, so check your RC regulations to keep up to date with them.

FAQ

If you have any questions after reading this manual, you should visit the TBS FAQ section.

Note

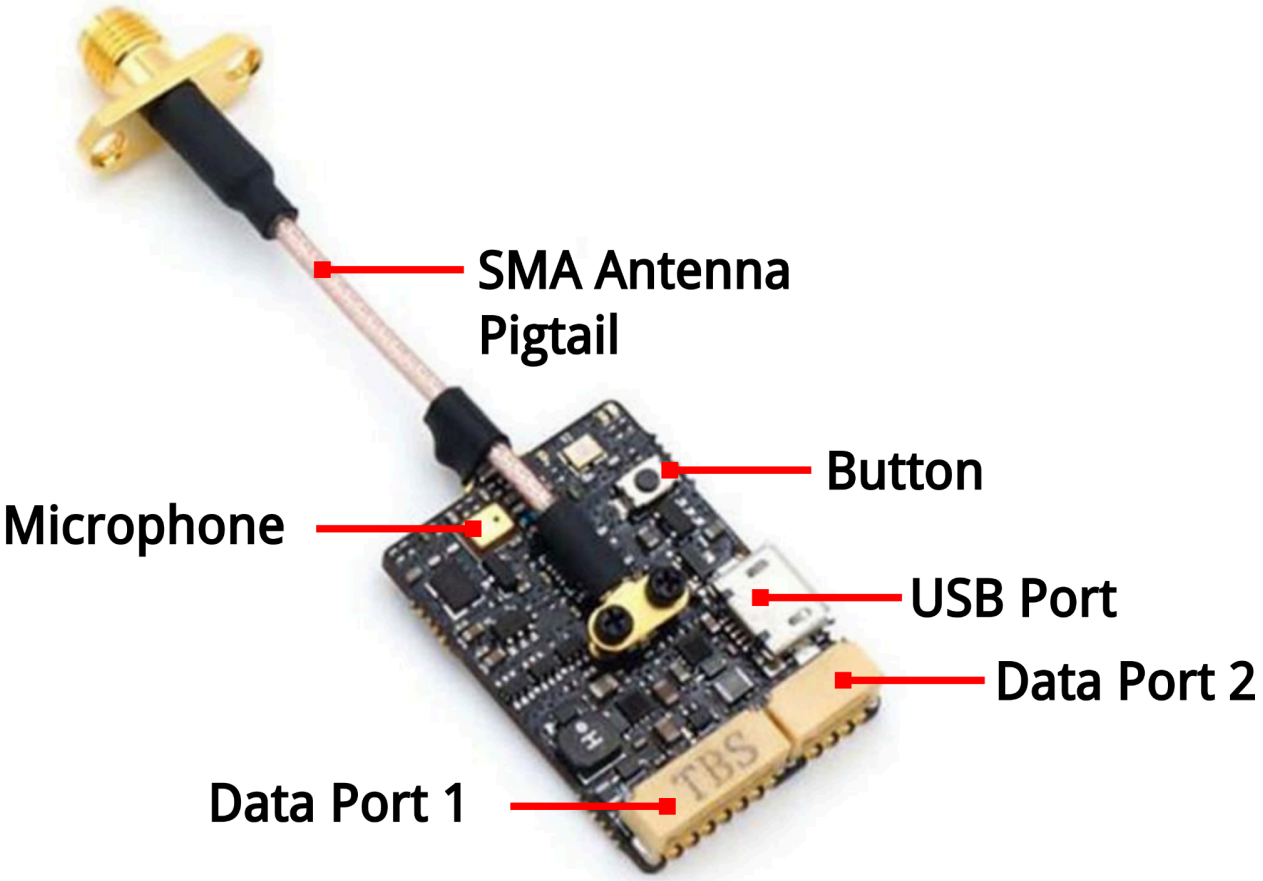
This manual is written based on *FW 1.17*. Please update your Unify to these or later versions if some functions are unavailable.

Updating

You need the TBS AGENT DESKTOP or WEB to update and configure your UNIFY EVO.

To update your CROSSFIRE, connect it to the transmitter's USB port and run the update via AGENT DESKTOP or WEB.

Overview


SMA Antenna
Pigtail
Button
Microphone
USB Port
Data Port 2
Data Port 1
TBS

Button menu control

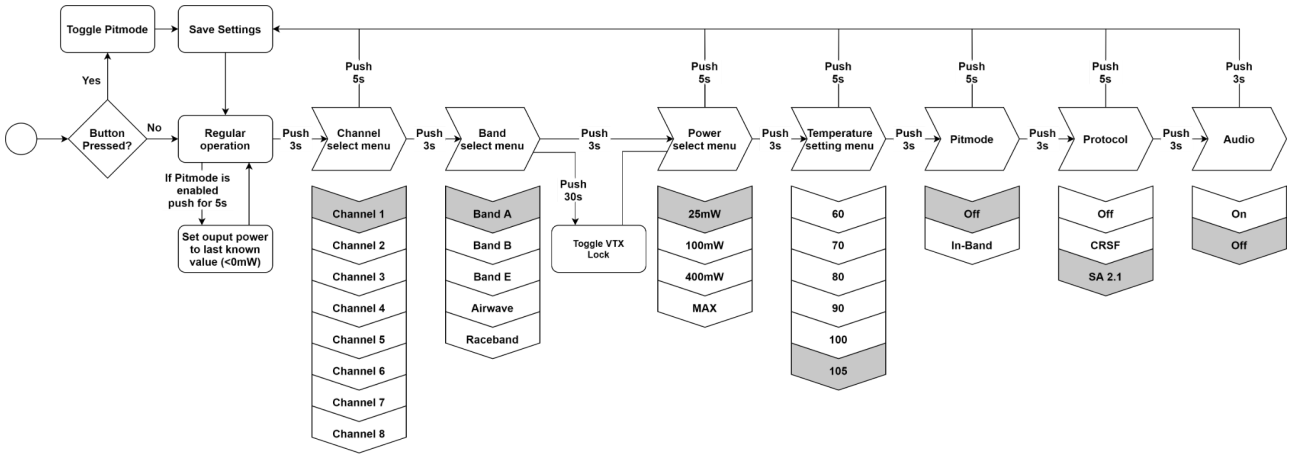
The menu consists of categories and settings. Pressing the button for 3 seconds toggles between categories, and pressing it for a short time toggles between settings. To enter the menu, hold the button for 3 seconds. LED colors signal the state of the menu; for an overview, see the menu table.

Unlock & power select mode

(FOR HAM USERS ONLY!) Press the button for about 30 seconds. The Red LED will flash 3 times to confirm. You have unlocked the video transmitter for use with all frequencies (see frequency table below).
NOTE: Unlock only works if you are inside the band selection menu

The power select mode is now accessible. Once unlocked, you can select the power level according to the table below. To lock the transmitter, go back into band-select menu, and press the button for 20 to 25 seconds again.

Button menu structure



Menu Table

RED LED		BLUE LED							
		1x	2x	3x	4x	5x	6x	7x	8x
1x	Channel	1	2	3	4	5	6	7	8
2x	Band	A	B	E	Airwave	Race			
3x	Power Level	25mW	100mW	400mW	800mW				
4x	Limit Temp.	60	70	80	90	100	105		
5x	PIT Mode	OFF	IN-BAND						
6x	CRSF/SA/PWM	OFF	CRSF	SA					
7x	Audio (Mic)	OFF	ON						

Frequency Table

Channel	1	2	3	4	5	6	7	8	
Band A	5865	5845	5825	5805	5785	5765	5745	5725	MHz
Band B	5733	5752	5771	5790	5809	5828	5847	5866	MHz
Band E	5705	5685	5665	5645	5885	5905	5925	5945	MHz
Airwave	5740	5760	5780	5800	5820	5840	5860	5880	MHz
Race Band	5658	5695	5732	5769	5806	5843	5880	5917	MHz
PowerLevel	25	100	400	800					mW

The selections in orange require a HAM license to operate legally. **Black** selections are only available on special request (custom firmware for large events with prior legal body approval). The video transmitter ensures that you cannot select illegal channels or power levels by accident:

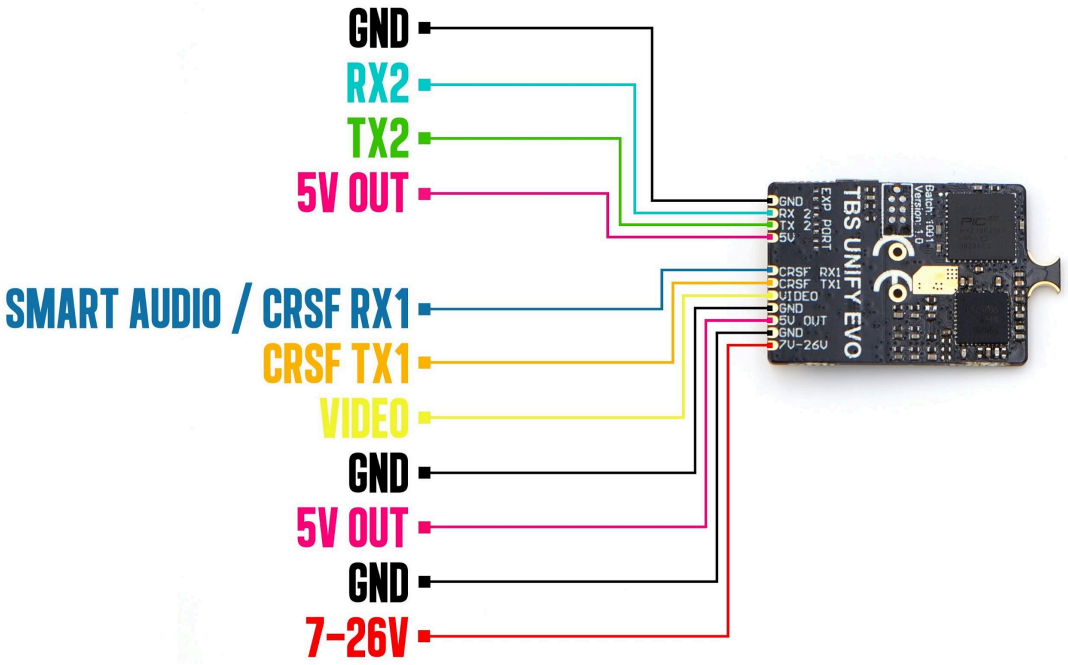
- When controlled by the push button, you will need to confirm having a HAM license by following the steps described above to unlock your video transmitter
- Through the CORE PRO, you must enter your HAM license number under the “Callsign” menu before you can access the high-power transmission settings and the locked-out channels.

Installation / Mounting

When installing the Unify EVO, please ensure adequate airflow during flight. Up to power levels of 200mW, no airflow is less critical. With higher power settings airflow is required to maintain the set power level.

If there is insufficient airflow to maintain the temperature limit, the Unify EVO will slowly reduce the output power to ensure proper function without any overheating. The reduction in output power is slow and gradual, so there is no immediate range issue. The red LED starts to blink as it regulates the output power.

Pinout



Control by Flight Controllers (Smartaudio)

Using any Smart Audio V2.1-compatible flight controller, simply connect the Smart Audio data pin to a free and supported port on your FC (see pinout below).

For Betaflight users, you can then configure the connected port in the Betaflight configurator to the Smart Audio V2.1 protocol. Ideally, you get a Betaflight firmware that supports the new SA2.1 (Betaflight >=V3.5.6) rather than the older SA2.0. This way, you get access to the new power levels of SA2.1.

Add the VTX table if you use BF 4.xx or later. You can download the VTX tables for all TBS UNIFY VTXs here.

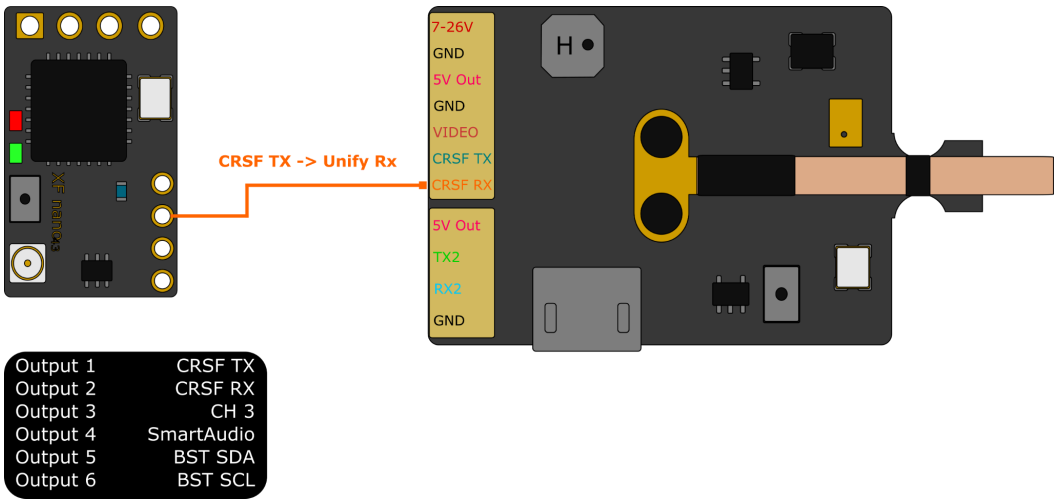
Control by Crossfire/ Tracer direct connection

Your TBS Crossfire/ Tracer can control your TBS Unify EVO directly without needing an FC. This is helpful when you don't have an FC in your aircraft, have no free UART left, or don't want to control the Unify32 without any extra setup required. For details on how the Crossfire/ Tracer can be set up, visit the Crossfire or Tracer manual.

Crossfire/Tracer connection using Smartaudio

You can connect your Unify EVO to any Crossfire/ Tracer receiver. The VTX will then be controlled by Agent Lite by the *My VTX/ VideoTX* menu or in the VTX menu of the receiver:

- Set the EVO Dataport 1 to Smartaudio by menu or Agent X/L
- Select a free output pin capable of SA and connect it using Smartaudio



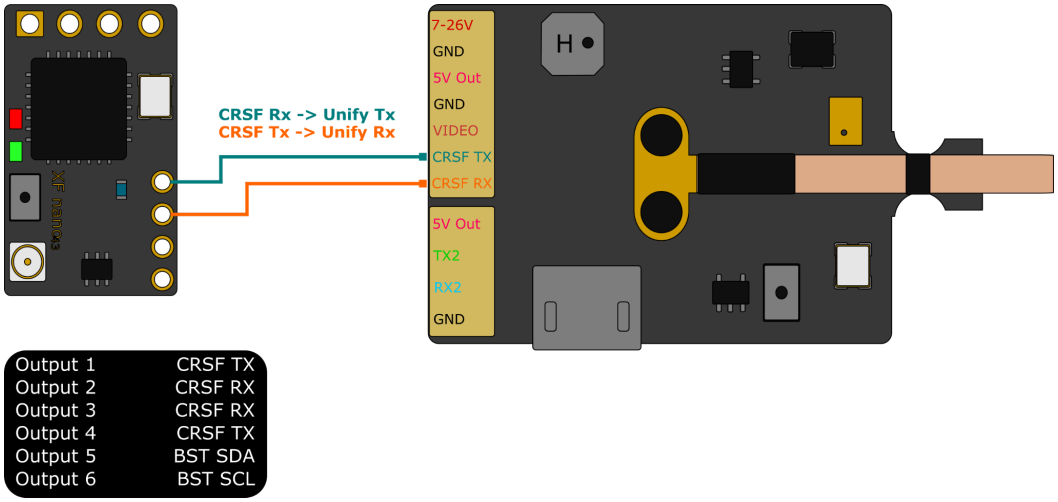
Wiring example

Now you can control your Unify by the *My VTX* menu or by the *VTX* menu of the receiver by Agent Lite etc.

Crossfire/Tracer connection using CRSF

All Unify PRO32 do have a full serial interface which has extended functionality compared to Smartaudio which is just a one-wire protocol.

- Set the EVO Dataport 1 to CRSF by menu or AGENT DESKTOP/ WEB
- Select a free output pin pair capable of CRSF and connect them using CRSF



Wiring example

Now you can control your Unify by the My VTX menu or by its own device menu by Agent lite etc.

Smart Audio or CRSF for the VTX?

Both protocols had their advantages and disadvantages:

- **SmartAudio**
  - Single wire connection. Saves one PWM output (useful on a wing)
- **CRSF**
  - Fully configurable by LUA, FUSION, Agent X, etc.
  - CRSF readout - lets you use PITMode on a switch or navigate through OSD without the need for an FC, link stats readout, and more

Control by PWM channel

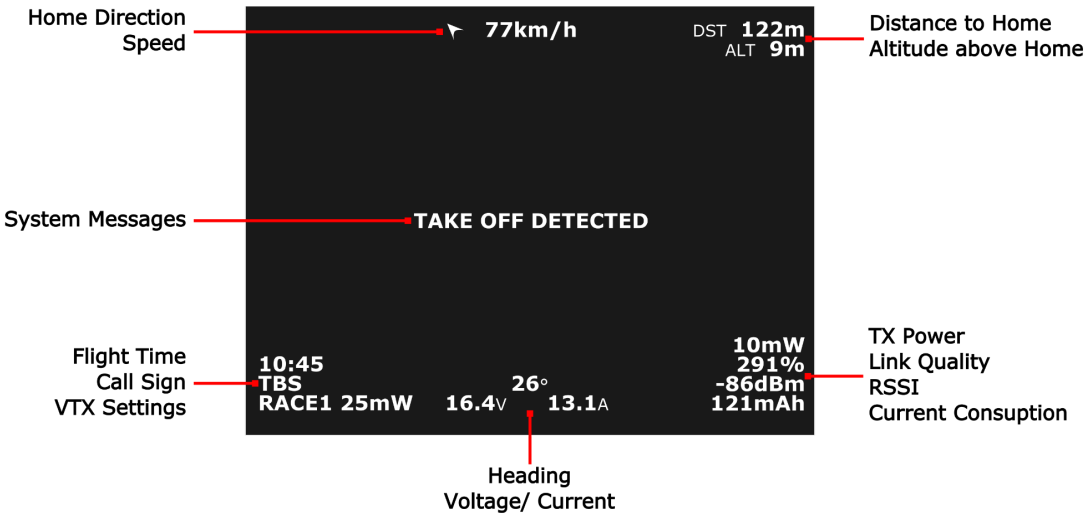
For setups without flight control and receivers that do not have CRSF capability, such as R/C cars or boats, we have enabled control for the button via PWM control. You can connect a PWM channel to the CRSF RX1 port and simply move a switch from low to high to press and high to low to depress the button. The single PWM channel is the most straightforward way of using a video transmitter. The menu control is identical to using the button. Follow the instructions from the *Button menu structure* to set up the Evo.

OSD Menu

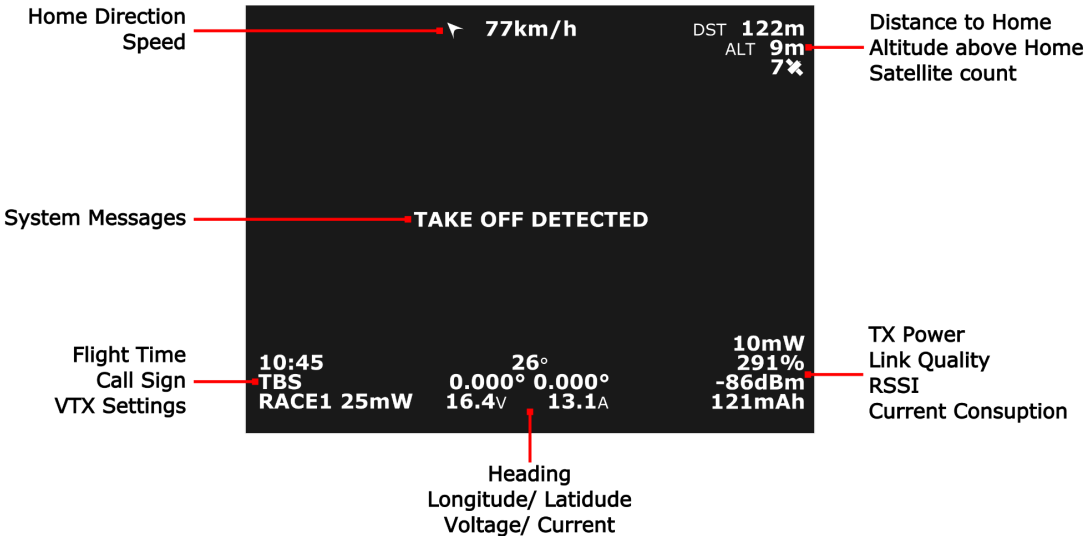
Connect your Unify Evo to any Crossfire/ Tracer receiver by CRSF for the full functionality. This includes OSD control by your sticks as well as RC link data readout (RSSI, LQ, SNR, and transmitted power) and much more.

OSD Overview

GPS set to *Basic*



GPS set to *Detail*



The available elements vary by the connected devices.

OSD Menu

When you open the OSD menu by holding the button for 3s or by the stick command (throttle down, yaw left for 3s)

General:

- **Data port:** *CRSF/ SA/ PWM Switch* - Input protocol used on port 1
- **Ext. Port:** *C.Sensor/ Off* - Not yet used
- **OSD:** *White/ Black/ Off* - Change the font color or disable the OSD
- **OSD Level:** Adjust if the OSD disappears in bright or dark areas
- **GPS:** *Basic/ Detail/ Off* - GPS information detail level
- **Heading Source:** *GPS/ YAW* - Source for heading estimation. GPS is only recommended for wings
- **Mic En.:** *On/ Off* - Enable/ disable the build- in microphone
- **Barcode:** *Enable/ Disable* - Use the barcode quick setup

VTX

- **Band:** *A/ B/ E/ AIR/ RACE/ USER* - Band selection
- **Channel:** *1-8/ User Frequency* - Channel/ Frequency selection
- **Power:** *25/ 100/ 400/ 800mW* - Output power selection
- **Temp. Limit:** *60/ 70/ 80/ 90/ 100/ 105* - Temp. limit when the output power will be lowered
- **Pitmode:** *Enable/ Disable* - Toggle Pitmode

Callsign

- Enter your call sign here

Channel Map

- **Stick Menu**: Enables/ disables stick control
- **Channels**: Setup for stick control
- **Pitode**: Channel used to toggle Pitmode by switch (if not enabled by the *VTx* menu!)

In-Build voltage sensor

When the Unify Evo does not detect an external voltage sensor, it will fall back to VIN voltage monitoring.

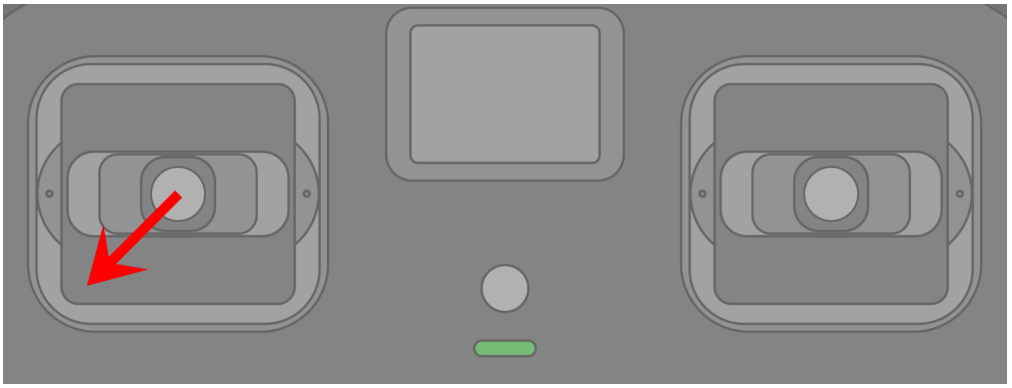
If your voltage shows a lower voltage (e.g., 5.0v), check the setting for the Crossfire/ Tracer voltage sensor and deactivate it (*CRSF Menu/ Receiver/ General/ Voltage Sensor -> Off)*

OSD Stick control

You can use the sticks of your remote to enter and navigate through the OSD. Make sure not to use any mixers on the channels you select for the sticks (e.g. wing mixer)!

Open the OSD

Roll/ Pitch centered, Throttle down, Yaw left for 3s



Mode 2

Navigation

- **Roll right:** Open the submenu or setting
- **Roll left:** leaf the submenu or setting
- **Pitch up:** Navigate through the settings/ increase a value
- **Pitch down:** Navigate through the settings/ decrease a value
- **Throttle/ Yaw:** Not used

Channel map example with active wing mixer

If you use a model with active mixers (Wing, etc.) you need to adjust your settings for the stick control. *This is just an example and might need to be adjusted for your setup!*

- **Radio settings:**
    - Channel 1 - Throttle
    - Channel 2 - Wing mixer left
    - Channel 3 - Wing mixer right
    - Channel 4 - Yaw
    - Channel 5 - Pitch
    - Channel 6 - Pitmode switch (optional)

- **Crossfire/ Tracer Channel Map**
    - No adjustment required
- **Crossfire/ Tracer Output Map**
    - Output 1 - Src 1
    - Output 2 - Src 2
    - Output 3 - Src 3
- **EVO Stickmenu**
    - **Pich Ch:** 5
    - **Throttle Ch: 1**
    - **Yaw Ch:** 4
    - **Pitmode:** 6

Barcode Control

The video transmitter can be controlled via barcodes through your camera. This allows you to enable Pitmode, and power up your video transmitter by holding the barcode in front of your camera. Or simply carry your favorite channel in your pocket or on your backpack and revert to that channel easily and quickly.

You can download a PDF barcode catalog from this link:

- http://www.team-blacksheep.com/tbs-vtx-barcodes.pdf

Android app:

- https://noahwaldner.ch/en/tbs-barcode-generator
- https://apocolipse.github.io/UnifyEvoBarcodeGenerator/

Raw .json file:

- http://firmware.team-blacksheep.com/barcodes

We are always expanding the functionality. If you have any crazy ideas for implementing barcodes for your races or other purposes, please let us know! We're happy to expand the functionality at all times!

Technology showcase

PitMode

PitMode is a mode in which the video transmitter runs on incredibly low output power. This prevents interference with others at events while still allowing a minimum of visibility for emergency last-minute setting changes.

Pit Mode has been slightly modified in behavior with the TBS UNIFY EVO line. The main button on the video transmitter is used to toggle Pitmode flag at power-up, and SmartAudio / CRSF can modify this flag as well. Smart Audio / CRSF can also enter pit mode during runtime using the power setting 0mW, which will not modify the flag (the VTx will never power up at the 0mW power setting). To leave Pitmode during operation, simply set your desired power setting using Smart Audio, CRSF, or the button menu.

SmartAudio 2.1

SmartAudio is a protocol developed by TBS for OSD to VTx communication. SmartAudio is a single-wire UART protocol, running over the Audio-wire. All newer generation OSDs at TBS, all UNIFY PRO series VTX, and all modern flight controllers support SmartAudio!

With the UNIFY EVO line, we have launched SmartAudio V2.1. Over the regular SmartAudio, it changed control for PitMode in operation to a switch(on / off) rather than a flag that is refreshed on reboot.

If you are an OSD or VTx developer interested in adding support for SmartAudio, please check our SmartAudio specification. SmartAudio is a free-to-use protocol. If you'd like to use "TBS SmartAudio" in your marketing, you may contact us for licensing options:

- http://team-blacksheep.freshdesk.com/

CRSF

CRSR is a protocol designed by Team BlackSheep and championed through the TBS Crossfire remote control system. It has been integrated into the most popular remote controls and is an incredibly high bandwidth (low latency) full duplex serial data transmission protocol. It comes with native functionality such as OTA (over-the-air) firmware upgrades, localized configuration menus, and a smart routing protocol.

With the advent of the TBS UNIFY EVO, for the first time in FPV history, a VTx now supports this functionality. We can configure the channel, output power, and pitmode settings. Additionally, software updates via the TBS Crossfire platform are now possible.

CleanSwitch

A new feature introduced with the TBS UNIFY PRO 5G8 is CleanSwitch. When video transmitters power up or change frequency, they usually send a burst across the entire band which disturbs fellow flying pilots. All UNIFY EVO 5G8 video transmitters will remain in their lowest power output (less than 0.1mW) while changing channels and powering up. This ensures interruption-free racing, even with multiple video transmitters changing channels or powering up. Despite all this, TBS UNIFY PRO & EVO are still the fastest video transmitter on power up, thus ensuring they are the perfect choice for any application where quick channel changes are a necessity!

Manual designed by ivc.no, written by TBS, ivc.no and kamikatze-fpv.de.