

# TBS TRACER 2.4GHz RC System

Revision 2022-08-08

*High-speed drone control system based on TBS CROSSFIRE engine*



The TBS TRACER system is an RC link system made for FPV enthusiasts. It features unheard-of latency and performance without any of the clutter of choosing RF modes, link profiles. It just works. Two-way communications include telemetry functionality and support for 3rd party autopilots.

## Key features

- Low latency, high bandwidth, great range
- Constant 250Hz uplink & downlink rate for super-low latency
- Immune to on-board noise
- Two-way communication link with real-time link vitals and telemetry
- Self-healing frequency hopping link
- Super easy binding and configuration via OpenTXLUA, AGENT M, or TBS TANGO remote
- Free output mappable outputs & antenna diversity
- No issues when flying with multiple friends at the same time
- Dynamic or selectable RF power (local restrictions apply)
- Transmitter LED shows link health



---

# Table of content

[Attention](#)

[Getting ready](#)

[FAQ](#)

[Note](#)

[Updating](#)

[Hardware overview](#)

[Micro transmitter module](#)

[Nano transmitter module](#)

[Nano receiver:](#)

[Nano receiver PWM version:](#)

[Why two antennas on the receivers?](#)

[Radio connection](#)

[JR-bay radios](#)

[RC input Signals](#)

[Antennas](#)

[Adapter boards](#)

[FrSky inverter mod](#)

[Which transmitter is affected by this?](#)

[How to install the inverter mod](#)

[Software mod](#)

[TRACER with EdgeTX](#)

[General functions](#)

[Binding](#)

[General note/ model match](#)

[When do I need to bind again?](#)

[Binding issue - Double green flashing](#)

[Binding issue - OpenTX2.3.10](#)

[Transmitter](#)

[Receiver](#)



---

[Receiver Update \(OTA\)](#)

[Auto-bind & OTA](#)

[Multi-Bind](#)

[How to set it up](#)

[Failsafe setup](#)

[General setup](#)

[Cut](#)

[Failsafe position](#)

[Transmission power](#)

[Transmitter LED status indicator](#)

[Receiver LED status indicator](#)

[MyVTX \(available up to FW 4.XX\)](#)

[Video TX\(Since FW 6.03\)](#)

[RC by MAVLink](#)

[Encryption](#)

[Team Race](#)

[MAVLink \(since FW 6.13\)](#)

[Receiver functions](#)

[Output map](#)

[CRSE](#)

[Serial](#)

[SBUS](#)

[N.i. SBUS](#)

[MAVLink](#)

[PWM \(Ch X\)](#)

[PPM](#)

[DSMX](#)

[LQ](#)

[RSSI](#)

[RSSI/LQ](#)

[Smart Audio](#)



---

[GPS](#)

[GPIO \(out\)](#)

[Channel number](#)

[Available sensors with OpenTX](#)

[Missing sensors](#)

[In-built Voltage monitoring](#)

[BST connection](#)

[Additional information](#)

[TBS CLOUD](#)

[Menu](#)

[Initiate and Update the WiFi module](#)

[Connection to a WiFi hotspot](#)

[OpenTXsetup for TRACER TXmodule](#)

[LQ warning in OpenTX](#)

[Model-match in OpenTX](#)

[VTX connection using CRSF](#)

[VTX connection using SmartAudio](#)

[SmartAudio or CRSF for the VTX?](#)

[VT button is not working](#)

[GPS connection \(non-BST GPS\)](#)

[Connection to an FC](#)

[General wiring](#)

[CRSF with BetaFlight and similar firmware](#)

[CLI command](#)

[CRSF with KISS/ FETTEC](#)

[BST to Eagletree Vector](#)

[MAVLink with MAV FCs](#)

[Wireless configuration with ArduPilot/ PX4 by WiFi](#)

[Wireless telemetry](#)

[WiFi telemetry with BetaFlight/ INAV](#)

[Signal strength in BetaFlight - BF < 4.1](#)



---

[Signal strength in BetaFlight - BF 4.1 and later](#)

[CLI commands](#)

[Signal strength in INAV - INAV < 3.xx](#)

[Signal strength in INAV - INAV 3.xx and later](#)

[Link States](#)

[LQ - Link quality](#)

[RSSI - Received signal strength indicator](#)

[SNR - Signal-to-Noise ratio](#)

[Warning levels](#)

[What should I use in my OSD or radio?](#)

[Racing environment](#)

[Factory reset](#)

[Emergency Update](#)



## Specifications

|                             |                                                                                                                                |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>Type:</b>                | Two-Way Remote Control System                                                                                                  |
| <b>Band:</b>                | 2.4GHz band                                                                                                                    |
| <b>RF power</b>             | 25mw - 100mW selectable                                                                                                        |
| <b>Modulation:</b>          | TBS custom                                                                                                                     |
| <b>Antenna:</b>             | TX: 1x omnidirectional dipole antenna<br>RX: 2x flexible t-style antenna                                                       |
| <b>RC Channels:</b>         | up to 12-channel digital stream outputs, standard 2.54mm servo connectors                                                      |
| <b>Radio compatibility:</b> | Any radio with JR-style bay or Mini-module bay. OpenTXrecommended                                                              |
| <b>Interface:</b>           | TX: RGB LED light, push-button, configuration via CSRF<br>(TBS TANGO, OpenTXetc. ), WiFi                                       |
| <b>Failsafe:</b>            | Pre-set servo positions or stops outputting servo pulse - selectable in configuration menu or via push button                  |
| <b>Antenna connector:</b>   | TX: Standard SMA<br>RX: U.fl                                                                                                   |
| <b>Operating range:</b>     | 15mi+/25km+                                                                                                                    |
| <b>Input power:</b>         | Micro TX: +5 to 13V<br>Nano TX: +5 to 9V<br>RX: +3.3V to 8.4V<br>All reverse-polarity protected, compatible for 2s Lipo direct |
| <b>Power consumption:</b>   | TX: 1.1W, at 25mW<br>RX: 1W at 5V                                                                                              |
| <b>Ports:</b>               | Nano RX: 2x Pin-headers for 1x BST and 2x CSRF or 4x Servo<br>Nano PWM version: 6x Servo connector                             |
| <b>Working temperature:</b> | 0 - 40°C                                                                                                                       |
| <b>Size:</b>                | Micro TX: 73 x 56 x 35 mm<br>Nano RX: 11 x 8                                                                                   |
| <b>Weight:</b>              | TX: 38g<br>RX: 3.2 grams incl. antennas                                                                                        |



---

## Attention

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

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

## Getting ready

Getting set up and ready to fly is a quick and simple task. In most cases plug&play when using TBS equipment.

## FAQ

If you got any questions after reading this manual you should visit the [TBS FAQ](#) section

## Note

This manual is written based on *TRACER FW 6.17 and WiFi 2.04*. If some functions are not available for you, please update your TRACER to this (Beta) or a later version.

## Updating

To update and configure your TRACER, you need the [TBS AGENT DESKTOP or WEB](#).

To update your TRACER, connect it to the USB port of the transmitter and run the update by Agent M.

The receiver will then get the update while the next binding (details can be found in the [receiver update section](#))



---

## Hardware overview

The following diagram indicates essential inputs and features of the transmitters and receivers.

### Micro transmitter module



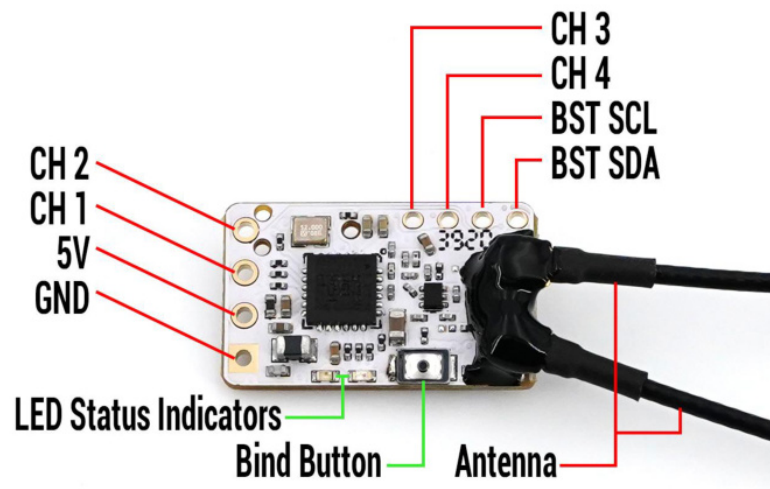
### Nano transmitter module



*The Nano transmitter includes the same internals and functions as the Micro transmitter. It is designed to fit into the mini-module bay of newer FrSky radios, TANGO 2 module bay, and any other radio with the mini-module bay.*

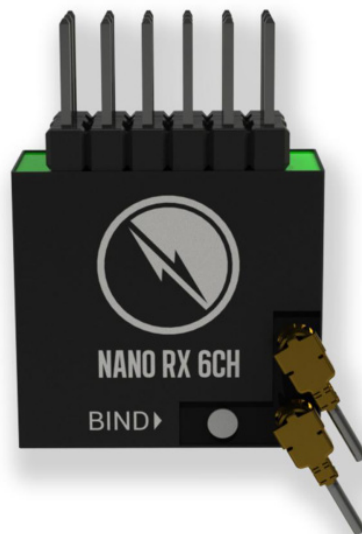


## Nano receiver:



## Nano receiver PWM version:

This RX is the same as the Nano RX but with 6 servo connectors installed. This saves you the need for the PWM adapter board.

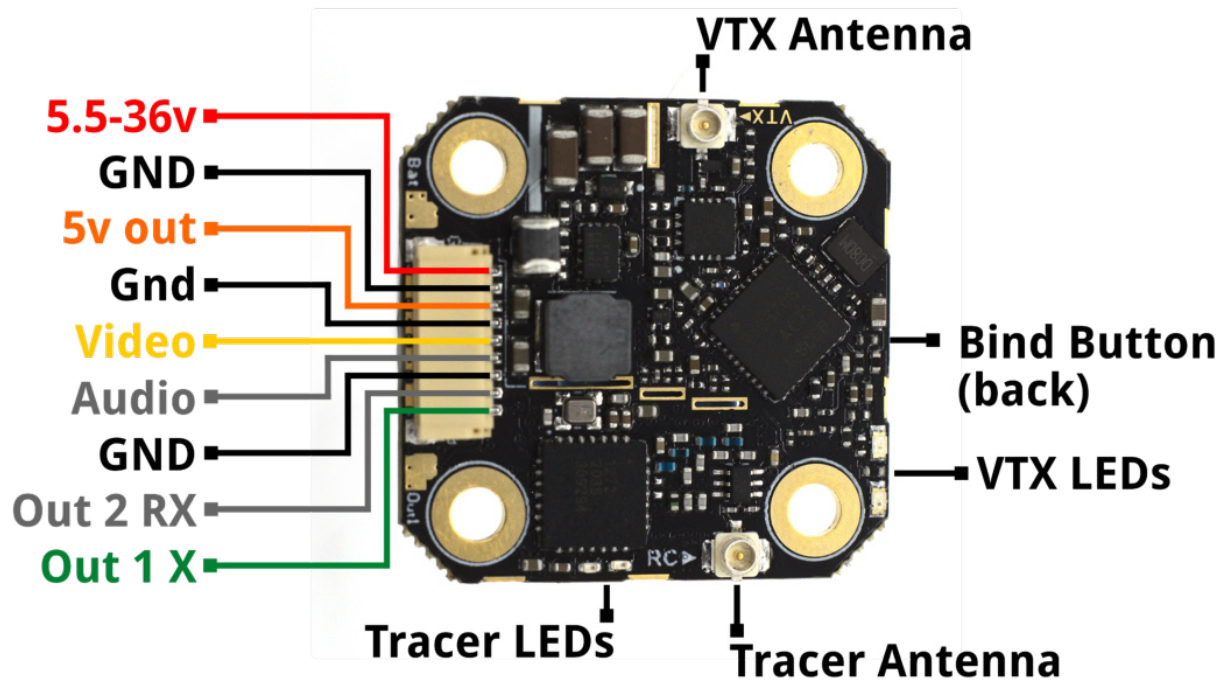


## Why two antennas on the receivers?

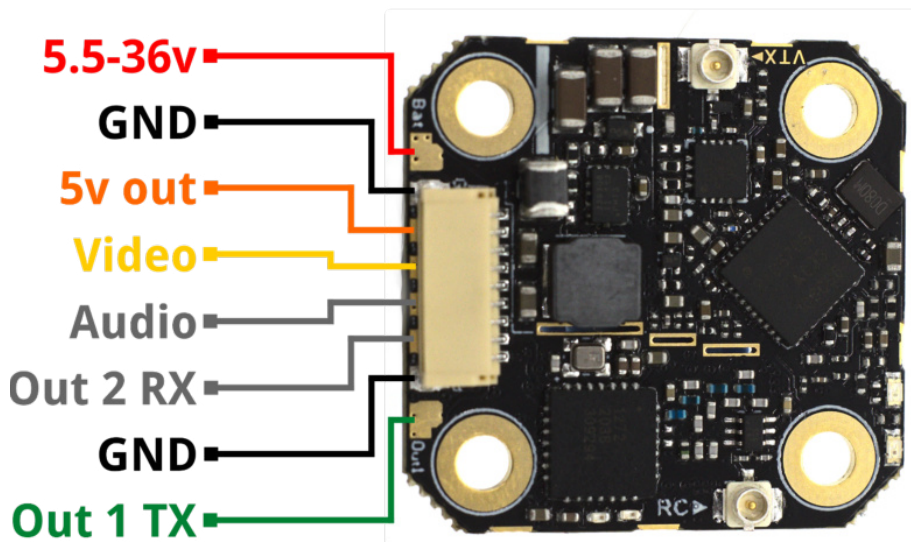
The TRACER receivers come with two antennas on each receiver. These antennas will give you antenna-based diversity (switching to the best antenna) as it is easy to block the small 2.4GHz antenna with your battery or any part of your drone. The result is a more reliable link and better range over a single antenna receiver.

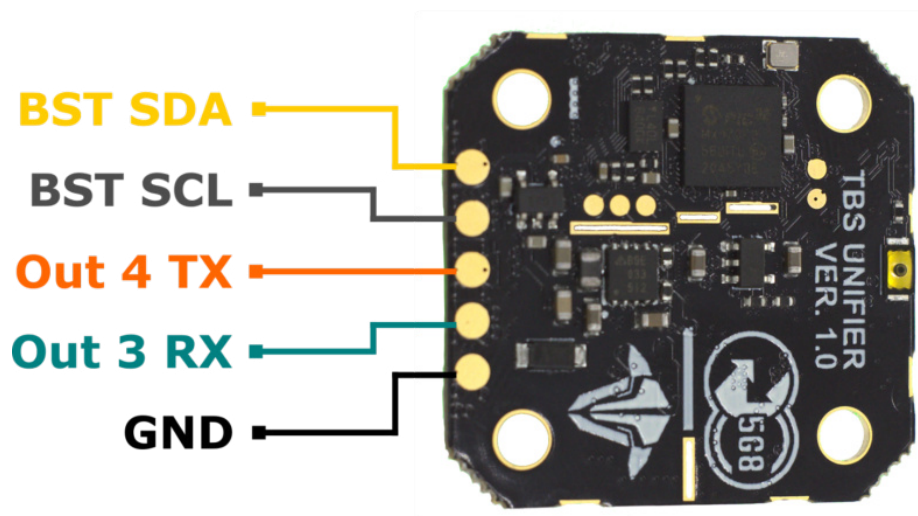


Sixty9 (FW 6.04 or later required):

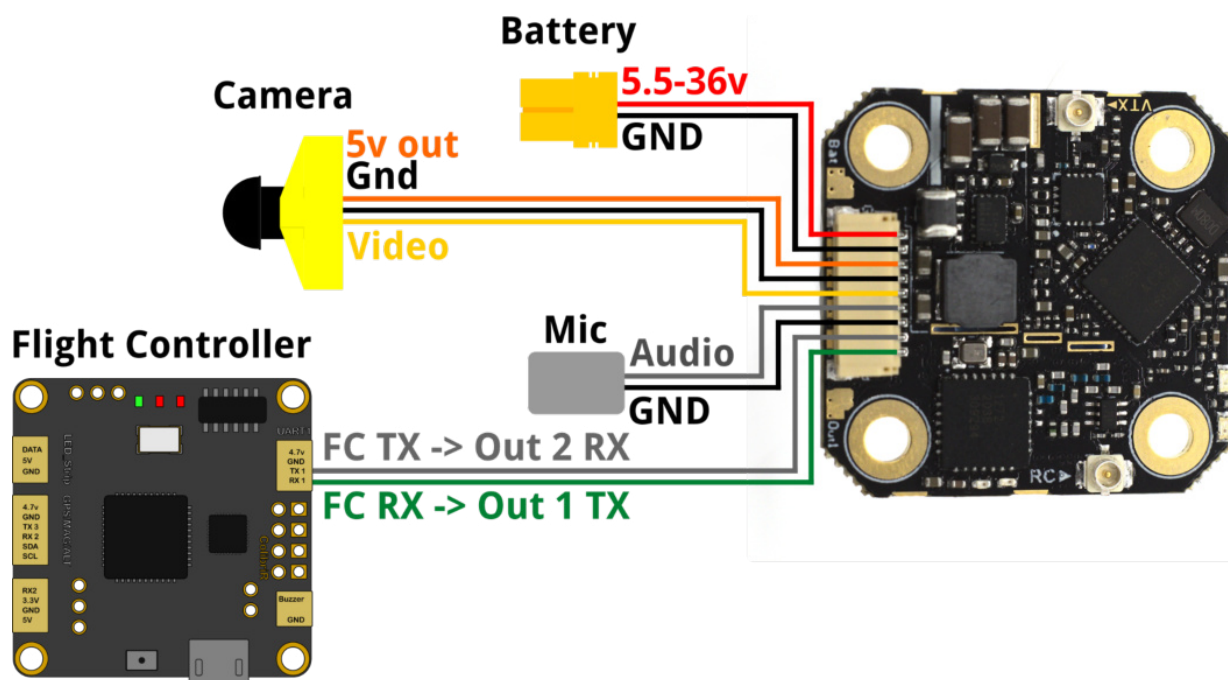


Solder pads:



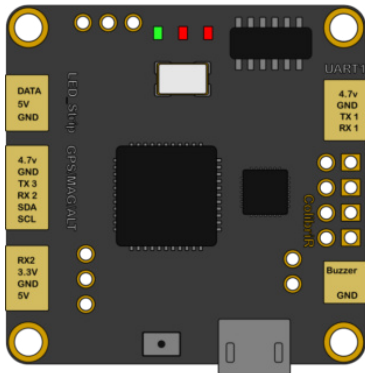


Wiring example:

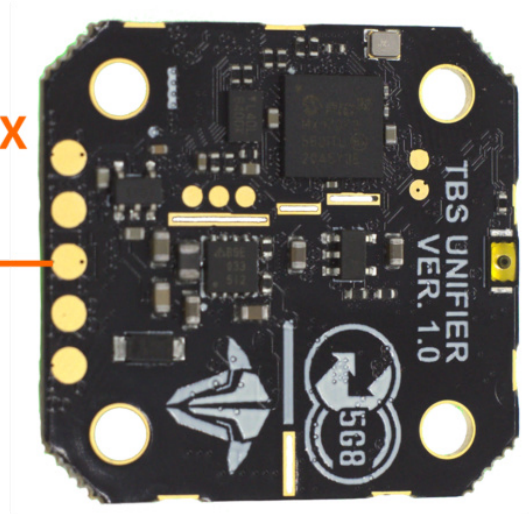


## SmartAudio setup (for FC control)

### Flight Controller



FC TX -> Out 4 TX



### Sixty9 Output map

|          |            |
|----------|------------|
| Output 1 | CRSF TX    |
| Output 2 | CRSF RX    |
| Output 3 | not used   |
| Output 4 | SmartAudio |
| Output 5 | not used   |
| Output 6 | not used   |

In BetaFlight, set up the UART as with any SmartAudio VTX and use the [TBS PRO32nano VTX tables](#)

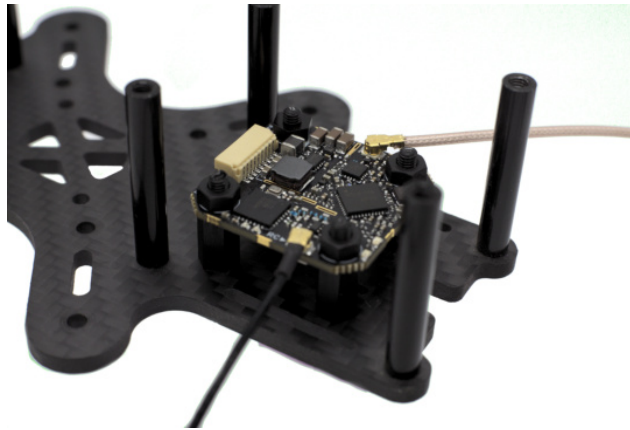
### Mounting:

30.5x30.5



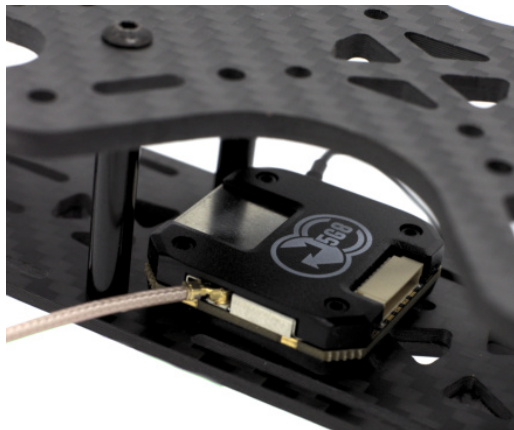
---

20x20



### Direct-mount, double-sided tape

Be sure to fasten with an additional zip tie, or bolt down the case with provided Phillips screws.



---

## Radio connection

### JR-bay radios

If you use a radio with a standard JR-bay style module bay, you can easily plug the TRACER transmitters into them.



### Potential JR-bay issues

When you have set up everything properly in OpenTX but your module still stays off, radio pins did not slide into the TRACER TX. In this case, you may need to nudge pins in the JR bay just a little bit to the right or left side and plug the module back in. The JR bays also have manufacturing tolerances - if the fit is too loose for your taste, you may want to place a small piece of soft foam inside the JR bay before fitting the JR TRACER TX.

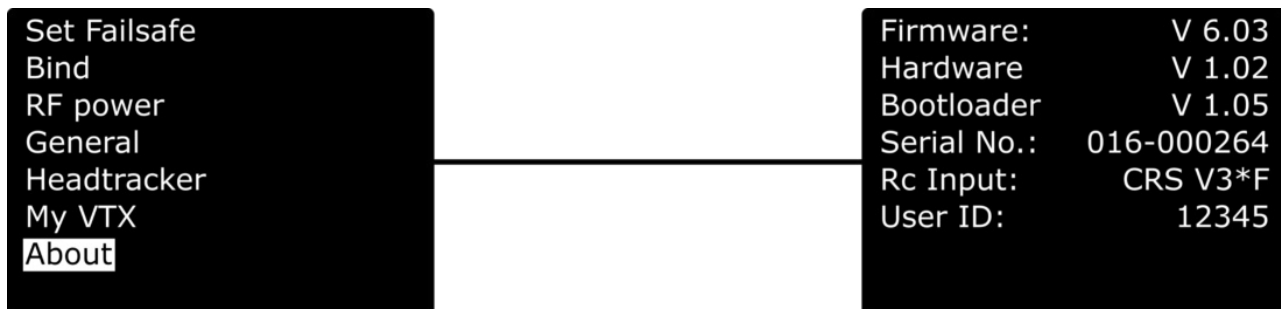


## RC input Signals

Depending on the remote and firmware you use, there are different input protocols available:

- PPM
- CRSF V1/ 2/ 3/ CRSFShot

In the Agent Lite/ M the detected signal can be found under *Transmitter/ About/ RC Input*



### PPM

PPM should only be used with radios not supporting CRSF. It got a high latency and no telemetry

### CRSF V1/ 2

CRSF enabled telemetry since version 2 and runs with low latency.

### CRSF V2s/ V3s

The *s* indicates that the lower communication speed has been enabled in the radio. Details can be found in the [mod section](#).

### CRSFShot

CRSFShot is CRSF V2, including the synchronization between the radio and the transmitter to eliminate the variable latency. This results in a mode locked-in feeling with your drone.

### CRSF V3

CRSF V3 is the latest revision of the CRSF protocol. It includes CRSFShot and reduces the latency between the radio and the transmitter even more. CRSF V3 got introduced with TRACER FW 6.03.

### CRSF V3\*

The *\** indicates a full-speed connection. As CRSF V3 raised the speed, even more radios require the hardware [mod](#).

With TRACERFW 6.09 (or later) and BF 4.2.9 (or later), you must install the telemetry wire between the receiver and the FC!



---

## Antennas

You got a big variety of antennas for your transmitter and receiver. The Antennas that come with your devices work fine and don't need to be replaced in general. Depending on your environment, your drone type, and your flying style, you may want to customize them. Here are the official TBS TRACER antennas, however any 2.4GHz u.FL antenna will work:



Flexible standard antenna



Sleeve antenna



Flexible PCB antenna



Immortal-T antenna

Other antennas can be found at the [TBS webshop](https://www.tbs-tracer.com/webshop) or premium antenna suppliers such as [VideoAerialSystems](https://www.videoaerialsystems.com).



## Adapter boards

There are many ways of installing the TRACER Nano RX into a model like these mounting boards. Most mounting boards will be advertised for CROSSFIRE Nano RX, however, the TRACER Nano RX are pin-compatible and will therefore work with both!



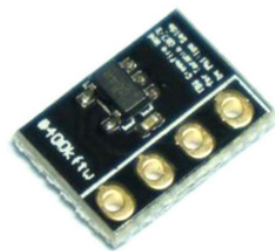
**Every adapter board or solder on FC that is designed for the CROSSFIRE Nano RX will also work with the TRACER receivers!**

On some of them, you can connect a Unify Nano32 with the TRACER receiver and use [the CRSF connection](#) to control the VTX.

## FrSky inverter mod

When you receive your TRACER transmitter, there is a small inverter chip included. This chip is a hardware mod that you can build into your FrSky radio to use the full communication speed between your radio and the TRACER TX as some of FrSky radios only have a slow transistor instead of an inverter chip included.

This mod is not necessary for the TRACER to operate properly with your radio but it helps with “Sensor lost” messages on certain radios as well as not properly working LUA scripts.



This modification requires good soldering skills and will void your radio's warranty. If you don't feel comfortable with this, use the [software mod](#) instead.



---

## Which transmitter is affected by this?

The older QX7 & X10(S) radio from FrSky with the S-Port pin at the bottom of the radio.

All new radios with “ACCESS” marking and older radios than the QX7 (with bottom S-Port pin) don't need this hardware mod.

## How to install the inverter mod

There is a detailed how-to available at [phillip seidels blog](#)

## Software mod

Instead of installing the hardware mod, you can simply lower the speed at which the radio communicates with your radio.

Navigate in your radio settings to the *Hardware* tab and set the *Max Baud* setting from **400000** to **115000**.

**If your radio is known to not need this soft/hardware mod, the BaudRate setting is not available!**



## TRACER with EdgeTX

If you are using EdgeTX on your radio and the AGENT Lite LUA or other related LUA does not load any data, you need to change the Baudrate setting for each model with TRACER. With FW 6.XX, you can set the Baudrate to the maximum available speed. With older firmware, set it to 400000Baud.



---

## General functions

### Binding

Binding the TRACER receiver to your TRACER Transmitter is an easy task and does not require 3 hands or any special jumpering.

**Make sure to power your drone with a lipo. In some cases, just USB power to the FC is not strong enough to properly power the receiver while bind mode is active**

### General note/ model match

You will notice that you can control any RC model, even if you changed the model in your radio\*. This is caused by the fact that the TRACER does not monitor the radio model. This means you have to make sure that you selected the right model in your radio before you power up the receiver.

If you are used to FrSky, it's the same behavior as when you set your receiver number to 00 in the mode settings (with FrSky receivers)

**\*Model matching with the TRACER and OpenTX is available since OpenTX2.3.10**

### When do I need to bind again?

There are only a few cases when you need to rebind your transmitter to the receiver:

- You updated your transmitter firmware
- You enabled multi-bind\*
- You did a factory reset on the receiver
- You are using a different TRACER TX with your receiver, without multi-bind
- You changed the model id/ receiver number in OpenTX\*

*\* you can avoid rebinding if you change these settings while the receiver is bound and powered up.*

### Binding issue - Double green flashing

If you get a double green flashing pattern on the receiver for several seconds after updating or binding, you got an authentication error. To solve this issue:

- Shut down the receiver
- Set the TX in bind mode
- Power up the receiver
- Push the *Bind* button on the RX

After the binding, the pattern may return but should be gone after a few seconds.





---

## Binding issue - OpenTX2.3.10

When you update your radio to OpenTX 2.3.10 or later you might find that all your receivers are now unbound. In that case, check the model match number. Due to the way OpenTX handles this feature, it might have set up a model number. In this case, just change it back to 00 and your receiver should be bound again.

## Transmitter

First, you need to set your transmitter in bind mode. To do this you have a variety of options, depending on the radio and transmitter type you use:

### Lua script (TANGO 2 and OpenTXradios only):

1. Turn on your radio
2. Navigate to the AGENT LITE LUA script and execute it
3. Open the *TRACER Micro TX/ Nano TX*
4. Scroll down to *Bind* and hit enter

### TBS TANGO 1:

1. Turn on your radio
2. Hold the rocker switch to enter the main menu
3. Scroll down to *Devices*
4. Under *TRACER Transmitter*
5. Click on *Bind*

### AGENT DESKTOP or WEB:

1. Connect your transmitter to AGENT DESKTOP or WEB by USB cable
2. Open TRACER Transmitter (*Manage*)
3. Navigate to the *Configure* tab
4. Under *Device*, click on *Bind*

### Button:

1. Power up the transmitter
2. Push the button of the Micro TX once

## Receiver

New receivers that have never been bound before will automatically accept a bind and do not need to be placed into bind mode. Receivers that have been bound to the same transmitter also do not need to be bound again. Placing the transmitter into bind mode is sufficient. If a bind doesn't work for some reason, you can force the receiver into bind mode. This procedure is the same for all receiver types available:

1. Power up the receiver
2. After 1 second, but within 1 minute, push the bind button on the receiver

**Note: Do not press the bind button while powering up the receiver. It will not activate bind mode!**



---

## Receiver Update (OTA)

Depending on the firmware on your transmitter and the receiver, a firmware update may be required.

With the transmitter and the receiver both in bind mode, you then will get a message on the radio/ AGENT DESKTOP or WEB, telling you that the receiver needs to be updated. The firmware will be sent to the receiver over the air (OTA). When the transmission is finished, the receiver and transmitter automatically bind and are ready to be used.

## Auto-bind & OTA

When you update your transmitter firmware, you need to rebind the receiver to run the OTA update. In this case, you don't need to hit the bind button on the receiver again, when it was bound before:

1. Power up your transmitter
2. Set it in bind mode
3. Power up the receiver
4. Wait a few seconds
5. Now you should get the update prompt without pressing the receiver bind button again

## Multi-Bind

You can use all your transmitters with all your receivers without rebinding them each time. This is useful if you own more than one transmitter module.

**Make sure you [initiated your WiFi module](#) before!**

How to set it up



Connect your TRACER TXto your pc via USB and wait for AGENT M to synchronize the device with your TBS account. Any TBS device is synchronized when the dot on the top of the device turned green



Tracer Micro Tx 2.4G  
Tacer Nano rx 2.4G  
Tracer WiFi

Connect your TRACER to the internet via the built-in WiFi module. You can provide access point information from your nearest WiFi hotspot, or create a temporary one on your phone. Wait for it to switch to "Online" under *TRACER WiFi/ About*

Firmware: V 3.81  
Hardware V 1.02  
Bootloader V 1.05  
Serial No.: 016-000264  
Rc Input: CRSFShot  
User ID: 12345

After a few seconds, you can navigate back to *TRACER Transmitter/ About*. Now you should see your user id. This user ID will be the unique binding ID. Each transmitter with this user ID can now bind to your receivers on the same firmware version.

Multi-Bind Enable  
Max Power 25mW  
Dyn. Power On  
Factory Reset

Enable the Multi-Bind option under *TRACER Transmitter/ General*

Repeat this step for every TRACER transmitter that you own (e.g. TRACER Micro TX, TRACER Nano TX, TANGO 2, etc)



---

## Binding

- If you've got a bound receiver, just bind/ update it with multi-bind turned off and while it's connected turn the multi-bind option *enable*. Wait a few seconds, then the link will come back again.
- On a new receiver, you can just bind it by the button as usual.
- On the other TRACER TX, just enable "Multi-Bind". When the first transmitter is shut down, you can power up the second transmitter. It should bind to this receiver within a few seconds.

## Disable Multi-Bind

- To disable the Multi-Bind option you just need to set the *Multi-Bind* option *off*. If the RC link between the TX and RX is running, just turn *Multi-Bind off* and wait a moment till the RC link regains.
- Otherwise, rebind the receiver by the button.

## Wrong ID/new ID

- You may need a "new" id. To get a new ID, simply connect your TRACER TX to AGENT M with the new/correct user account and let it synchronize with the TBS Cloud.
- Next time the WiFi module connects to the internet it will get the new ID after a few seconds.

## General note:

Model match affects multi-bind behavior. If the model ID is not the 00 in both radios, devices will not bind. If model-match is not available on your transmitter, it will assume model ID "00".



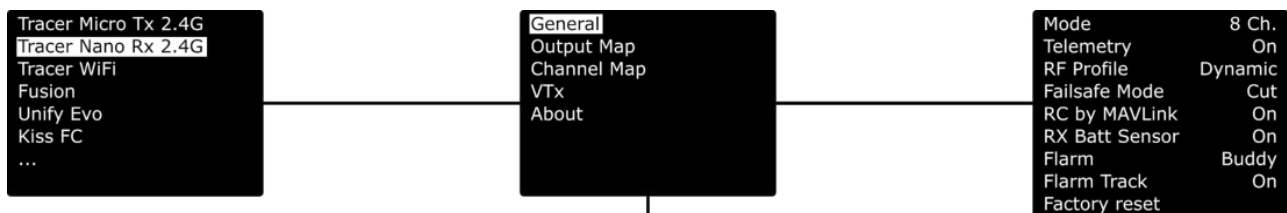
## Failsafe setup

The TBS TRACER supports two failsafe behaviors: cut and failsafe position. Setting them up correctly is crucial for the safety of your model.

### General setup

The failsafe setting is located in the menu of the receiver. To change the behavior:

1. Find your receiver in Radio/ Lua script/ AGENT M and select it
2. Open the General menu
3. Change the *Failsafe Mode* setting to what you need it to be



### Cut

This setting you need to use if you have in your aiRCraft a flight controller that is capable of handling failsafe behavior. When the link breaks up, the receiver will output no signal, which will be detected by your flight controller (e.g. BetaFlight, KiSS, Flight One, INAV, Ardupilot, etc).

### Failsafe position

If you use a model without a flight controller or with a flight controller that requires a special stick position (e.g. DJI NAZA), failsafe-position is what you need.

With this setting, the receiver will output a previously saved position for all channels.

#### Important:

*If you have set failsafe to "Position" and did not teach a position afterward, the receiver will output the last known position. This may lead to unwanted behavior!*

#### Saving channel position for failsafe

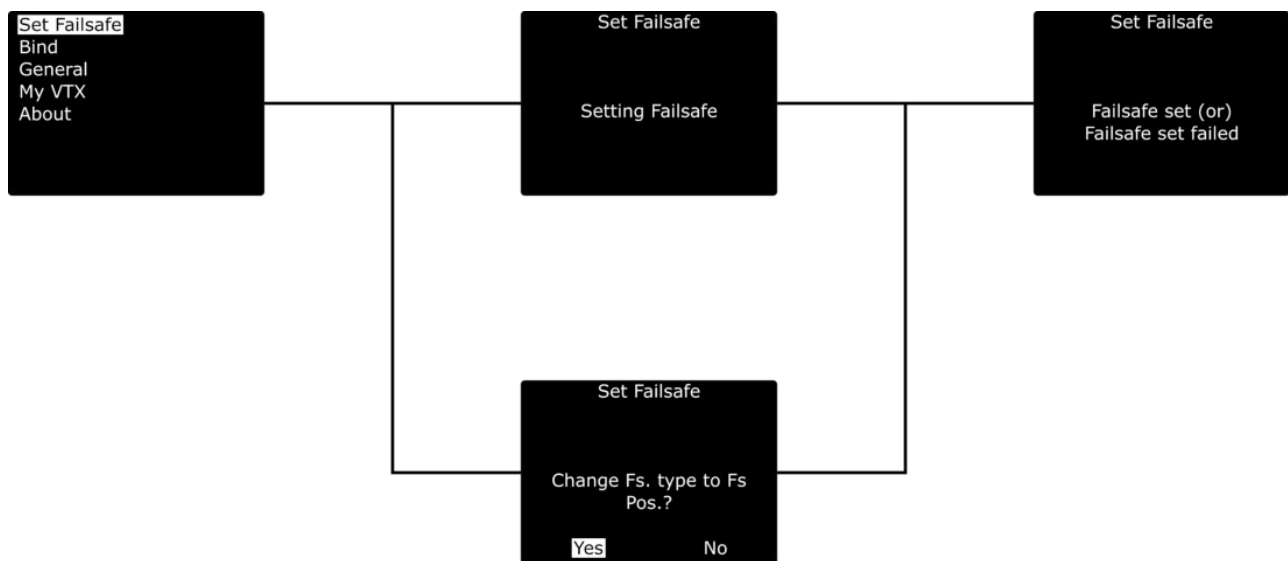
*This may require the help of a second person, as it can be tricky to hold the sticks and activate the teach button.*

1. Power up your bound receiver and your radio with the TRACER transmitter in it
2. Find your transmitter in Radio/ Lua script/ AGENT M and select it
3. Hold the sticks and switches in the position you want them to be in a failsafe situation
4. Select *Set Failsafe and wait for the confirmation for the set position*

If your failsafe option was set to *Cut*, TRACER TX will change the type to *Failsafe position (Fs. Pos)* if you



accept the request.



## Failsafe test

When you have set up or changed the failsafe behavior, it's important to test the correct function on the ground. To test it:

1. Remove the propeller from your aiRCraft
2. Power up the radio and the model
3. Arm the model (with FC) or move your sticks into a certain position (no FC)
4. Shut down your radio
5. Depending on the failsafe type and model, verify that the behavior is correct



---

## Transmission power

The transmitter's RF output power is highly configurable and can be selected dynamically via Radio/ Lua script/ AGENT M and select it. With 100mW you can achieve 15 km of safe range in rural conditions.

It is recommended to use the dynamic power option. This will allow you to fly at very low power and TRACER TX will increase the power automatically (faster than you can hit the power switch yourself) if you are about to lose the link.

Some output power restrictions apply depending on the available power souRCe:

| Power souRCe                          | Available output power      |
|---------------------------------------|-----------------------------|
| USB power input (+5V)                 | 25mW (14dBm)                |
| RC radio power input (+3.5 to +12.6V) | 25mW (14dBm), 100mW (20dBm) |

### To change RF power:

1. Find your transmitter in Radio/ Lua script/ AGENT M select *General/ TRACER TX and Max Power*
2. Pick the RF output power you require and exit the menu to confirm
3. The change is instant if the required input power is available and can be done at any moment

Every 6 dBm increase in output power results in a doubling of the theoretical possible distance that is achievable.

If you set a power level that can't be set due to the above power souRCe limits, it will still be remembered for later but the output power will be limited according to the table above.

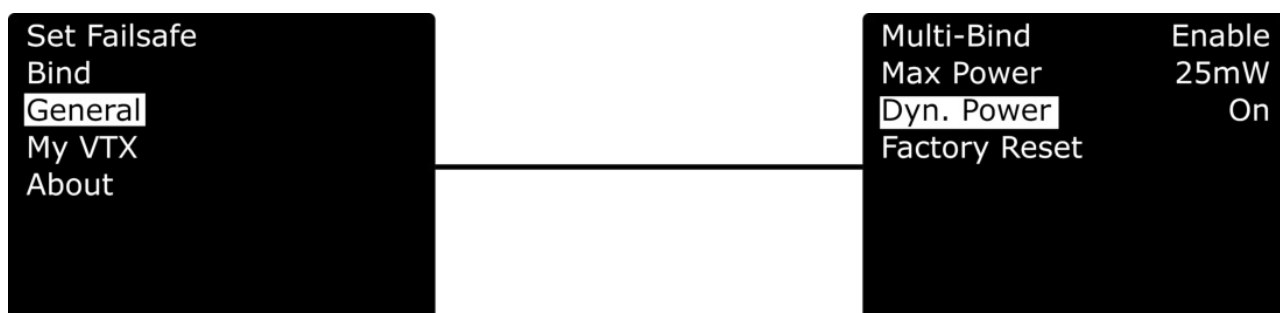


## Dynamic transmission power

The TRACER TX can automatically choose the power level most suitable for the situation at hand. For instance, if you fly close to the transmitter you only require minimal TX power, and the TRACER TX will, therefore, switch to the lowest possible output power level required to maintain a good RC link.

The maximum TX power level the system is allowed to use can be defined by changing *Max Power* in the configuration menu.

When you disable *Dynamic Power* the TRACER TX will output the power set up under *Max Power*.



## Transmitter LED status indicator

The RGB LED on the transmitter gives you at any moment an indication of your link status.

| Transmitter LED sequence                                                                                                                                                                                          | Description                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| Pulsing                                                                                                                        | Ready, trying to connect to a receiver or no down-link established |
| Green                                                                                                                          | Solid link, 150Hz or 50Hz link mode active                         |
| Blue                                                                                                                           | OTA Update of the receiver is running                              |
| Slow blue blinking                                                                                                             | Update confirmation required                                       |
| Fast green flashing <br>Fast blue flashing  | Transmitter bootloader active<br>Green till 6.17, blue since 6.18  |
| Fast red flashing                                                                                                              | Warning, a message is shown on the OLED display/ LUA Script        |
| Red/ blue flashing                                                                                                             | Transmitter firmware corrupted, reload FW by AGENT DESKTOP or WEB  |



## Receiver LED status indicator

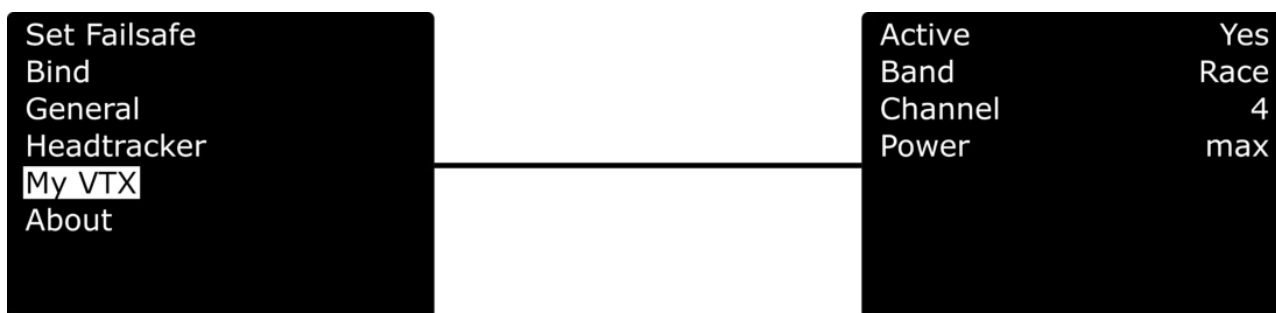
| Receiver LED indicators                                                                                            | Description                                                                               |
|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| Solid green                       | The link is up and running OK                                                             |
| Solid red                         | No packages received from the transmitter and receiver is in failsafe mode                |
| Slow red blinking                 | The receiver needs an update, confirmation on the TX is required                          |
| Slow green blinking               | The receiver is in binding mode                                                           |
| Fast green blinking               | Receiver bootloader active or firmware upgrade running                                    |
| Green is flashing                 | diversity RX is in Find-mode (up to 1 min. delay between flashing)                        |
| Double green blinking             | Authentication error. Rebind your receiver - <a href="#">more details</a>                 |
| Red/ Green blinking, any pattern  | Firmware issue, run the <a href="#">emergency update</a> for the receiver, then rebind it |

## MyVTX (available up to FW 4.XX)

With the MyVTX menu, you can set all your VTXs to the same channel, band, and output power without accessing all of them. This is useful if you are on a race with multiple drones and have to set them all to the same channel.

If you enable MyVTX, all other VTX settings will be overridden temporarily, till you disable it again.

Connect your VTX to the TRACER RX by CRSF or Smart Audio, activate MyVTX, and set it up\*  
(not required with KISS FC's)



| Settings           | Description                                                |
|--------------------|------------------------------------------------------------|
| Active             | activate/ deactivate the global VTX settings               |
| Band               | Band settings, Race/ Low/ A/ B/ E/ Airwave/ User Frequency |
| Channel/ Frequency | 1 - 8/ 5620 - 5920                                         |
| Power              | VTX power level, 25/ 100/ 400/ max mW                      |

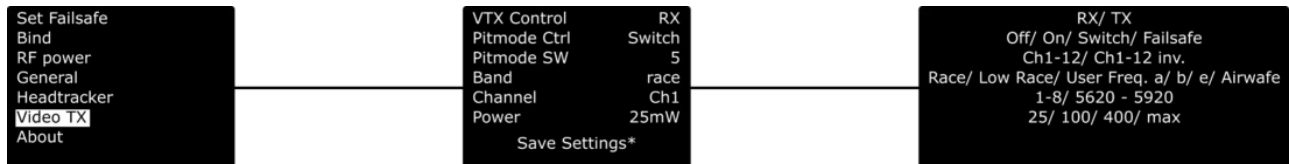
\*the available pins for the connection can be found in the [output map section](#) for the receiver



## Video TX(Since FW 6.03)

The *Video TX* menu is the successor of *MyVTX*. The function behind it remains the same: it allows for a global VTX setup without the need to set up each drone by itself. As soon as the drone powers up, the settings will be applied to the VTX.

As with *MyVTX*, the VTX must be connected directly to the TRACER receiver by SmartAudio, CRSF, or by a KISS FC.



| Settings      | Description                                                                                                                                                                                |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| VTX Control   | RX (off) or TX(on)                                                                                                                                                                         |
| PIT mode Ctrl | How to control PIT mode<br>On: PIT mode is active<br>Off: PIT mode is inactive<br>Switch: Turn PIT mode on/ off by a switch<br>Failsafe: PIT mode is off, will be on when failsafe happens |
| PIT mode SW   | Change the channel to switch PIT mode, Ch1-12, incl. Inverted direction<br>Visible when PIT mode Ctrl is set to <i>Switch</i>                                                              |
| Band          | Band settings, Race/ Low/ A/ B/ E/ Airwave/ User Frequency                                                                                                                                 |
| Channel       | 1 - 8/ 5620 - 5920                                                                                                                                                                         |
| Power         | VTX power level, 25/ 100/ 400/ max mW                                                                                                                                                      |
| Save Settings | Saves the new settings to the TRACER                                                                                                                                                       |

On a (team) race, PIT mode control set to *failsafe* is what you want. If you crash, shut down your remote, the VTX activates PIT mode, and the next pilot of your team can start his flight.

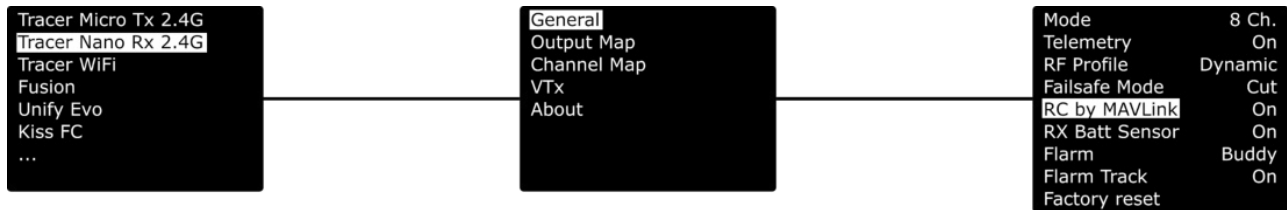
If you fly on your own and get stuck in a tree, simply switch the model in your radio to a new model with a different [receiver number](#) and continue flying with the next drone.



## RC by MAVLink

If you use MAVLink to connect to your FC, you can send your RC data over the same connection.

Depending on the MAVLink version used in your FC, you can send up to 12 channels by this (MAVLink V2).



Things to note:

- The RC data will not stop being sent if the TRACER telemetry link breaks up
- Latency-wise, it's as fast as SBus

## Encryption

Your CROSSFIRE is capable of Military-strength encryption of telemetry and PPM data (when enabled, binding will be exclusive to one receiver!) done simply by the transmitter menu under *CROSSFIRE TX/ Radio Settings/ Encryption*

**Note:** changing the encryption requires you to rebind your receivers again (by the bind button). Also, it disables Multi-binding.



## Team Race

When on a team race or using multiple drones on the same run, you can use the team race menu. It lets you switch your drone without the need to shut it down or switch the model in your remote. In combination with the VideoTXmenu setting for PIT mode, this is the easiest way to do so.

```
Set Failsafe
Bind
RF power
General
Headtracker
Video TX
Team Race
About
```

```
Pri. SW      Ch8
Pri. Type    2 Pos
Sec. SW      Ch9
Sec. Type    6 Pos
Curr. Range  1-12
OTx Model Id 00
```

- **Prim. Switch:** switch channel for the first switch (8-12)
- **Switch Type:** 2/3/6 pos. switch
- **Sec. Switch:** same as Prim. Switch
- **Switch Type:** same as Switch Type prim.
- **Current range:** min. model id - max. Model id
- **OTXModel id:** model id coming from OpenTX
- 

## MAVLink (since FW 6.13)

With FW 6.13 the new MAVLink menu was introduced. It includes Bluetooth (Standart TX only) and WiFi settings.

```
TRACER TX 2.4
TRACER WIFI
Nano receiver
...
```

```
General
MAVLink
WebUI
Pro
About
```

```
MAVLink      UDP
Port          5760
Uplink Cnt    248
Uplink Loss   12
Downl. Cnt    468
Downl. Loss   9
```

The transmitter will detect the incoming data and switch to *MAVLink* (If MAVLink data are detected) or *Emulation* (if non-MAVLink sources are detected).



## Receiver functions

### Output map

On all receivers, you can select what it should output on each pin. The available options for each differ for the receivers:

Note: since FW 6.0 the PWM output map has changed. The older options are in brackets:

| Receiver pin | Output type Nano RX/ 6Ch Nano Pwm RX, Sixty9                                                                           | Default    |
|--------------|------------------------------------------------------------------------------------------------------------------------|------------|
| 1            | PWM CH1 (PWM Ch1 to 12), PPM, RSSI, LQ, RSSI/LQ, SBUS, n.i. SBUS, CRSF TX, MAVLink TX, SmartAudio*, DSMX               | CRSF TX    |
| 2            | PWM CH2 (PWM Ch1 to 12), RSSI, LQ, RSSI/LQ, CRSF RX, MAVLink RX                                                        | CRSF RX    |
| 3            | PWM CH3 (PWM Ch1 to 12), RSSI, LQ, RSSI/LQ, CRSF RX, MAVLink RX, Serial RX, GPS RX                                     | PWM Ch. 3  |
| 4            | PWM CH4 (PWM Ch1 to 12), RSSI, LQ, RSSI/LQ, SBUS, n.i. SBUS, CRSF TX, MAVLink TX, Serial TX, SmartAudio*, DSMX, GPS TX | SmartAudio |
| 5 (BST)      | PWM CH5 (PWM Ch1 to 12), RSSI, LQ, RSSI/LQ, BST SCL                                                                    | BST SCL    |
| 6 (BST)      | PWM CH6 (PWM Ch1 to 12), RSSI, LQ, RSSI/LQ, BST SDA, GPIO                                                              | BST SDA    |

*\*SmartAudio **input** on Sixty9, available since FW 6.09*

### CRSF

CRSF is a protocol designed by Team BlackSheep and championed through the TBS CROSSFIRE and now TBS TRACER remote control system. It has been integrated into most popular remote controls, 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. It is by far the most advanced RC protocol available to date.

CRSF can be selected on multiple outputs at the same time to connect several devices at once

### Serial

The bridge feature gives you the ability to pass any kind of serial UART data from any device connected to the receiver to any device connected to the transmitter. If you selected *Serial TX* on a capable pin the following pin will be set to *Serial TX* and the following to "Bridge RTS" (if not used by any other Serial protocol). Please connect your device according to this information. The baud rate is set to 57600 8N1 and the voltage level is 3.3V only. The RTS pin will change to logical high when the internal FIFO is almost full and low if the FIFO is almost empty. There is no hardware flow control for the uplink as the wireless close-range telemetry module does not support it.



---

## SBUS

SBus is a “one wire” that is used by FrSky and other brands. The signal is inverted, which means on an F4 FC you need to use a pad with a built-in signal inverter. Those pads are mostly labeled with “SBus” on your FC

### N.i. SBUS

Not inverted SBUS is the same as SBUS except that the signal is not inverted. This can be used for FCs that have no signal inverter built-in and require SBus as an input signal.

## MAVLink

MAVLink is a very lightweight, header-only message marshaling library for air vehicles. Most of the common flight controllers support the MAVLink message format. For specific message documentation please refer here: [MAVLink Messages](#)

If you select “MAVLink TX” on one of the available outputs the corresponding output will be set to “MAVLink RX”. There is no hardware flow control required as we support software flow control (RADIO\_STATUS message) on both ends. You can connect it to any telemetry port of a MAVLink compatible FC. The MAVLink baud rate is set to 57600 baud. The MAVLink TXpin needs to be connected to the FC telemetry RX pin and the MAVLink RX pin needs to be connected to the FC telemetry TXpin. TRACER supports MAVLink V1 and V2, which will be selected automatically by the incoming messages.

You can use the MAVLink connection to send your RC data as well. If your FC supports MAVLink V2, this includes up to 12 channels, with V1 up to 8 channels.

## PWM (Ch X)

If you select CH X, the TRACER will output a standard 50Hz PWM signal that can be used for all servos and FC's without digital RC input.

## PPM

Sends up to 12 channels by PPM. Only use it on old-style flight controllers with no serial RC input.

## DSMX

DSMX is designed to use the TRACER as a backup system for Spektrum receivers.

## LQ

Translates the Link Quality from 0 -100% to a PWM signal from 1000µs to 2000µs. This can be used for old-style OSDs with only analog RSSI input. It is the most reliable indicator for knowing your signal quality, and we recommend configuring warning levels to 50% for the TBS TRACER.

## RSSI

Translates the RSSI from 0 - 130dBm to PWM signal from 2000µs to 1000µs. This can be used for old-style



---

OSDs with only analog RSSI input

## RSSI/LQ

Combines the LQ and RSSI and translates them from 0 -100% to a PWM signal from 1000µs to 2000µs. The RSSI/LQ value will always show the worse value of both

## Smart Audio

SmartAudio is a protocol developed by TBSto change VTX settings using OSD. SmartAudio is a single-wire UART protocol, running over the (Audio)-wire. All versions of Smart Audio are supported.

## GPS

Connect any UBLOX GPS receiver directly to your CROSSFIRE RX to get GPS-related telemetry without the need for an FC. #todo link

## GPIO (out)

Use the Output as GPIO to control relays etc. The high level is 3.3V, low level is 0V. Make sure not to exceed 5mA. The output will be high when the channel exceeds 30%.

## Channel map

The channel map menu is almost like the output map, except that you can change the channel order which also affects the channel order for any serial protocol. If you own a radio without flexible channel mapping, you can do it here.

This is also used to inject the LQ sensor for your FC. An example can be found in [this section](#).

The possible settings:

- **Channel 1-12:** Any channel coming from the remote
- **LQ:** same as the output map setting
- **RSSI:** same as the output map setting
- **RSSI/LQ:** same as the output map setting

Example:

|            |     |
|------------|-----|
| Dst. Ch. 1 | CH1 |
| Dst. Ch. 2 | CH2 |
| Dst. Ch. 3 | CH3 |
| Dst. Ch. 4 | CH4 |
| Dst. Ch. 5 | CH5 |
| Dst. Ch. 6 | CH6 |
| Dst. Ch. 7 | CH7 |
| Dst. Ch. 8 | LQ  |



## Channel number

Transmitted number of channels. Can be set to **8** or **12** channels.

Use the 8 channels setting whenever you can. A lower amount of data between the TX and RX converts to better RC link performance.

## Available sensors with OpenTX

With an OpenTX-based radio you can receive the following sensors, depending on your connected hardware:

| Datapoint | Description                                        | Data souRCe                   |
|-----------|----------------------------------------------------|-------------------------------|
| 1RSS      | Uplink - received signal strength antenna 1 (RSSI) | TBS TRACER TX                 |
| 2RSS      | Uplink - received signal strength antenna 2 (RSSI) | TBS TRACER TX                 |
| RQly      | Uplink - link quality (valid packets)              | TBS TRACER TX                 |
| RSNR      | Uplink - signal-to-noise ratio                     | TBS TRACER TX                 |
| TPWR      | Uplink - transmitting power                        | TBS TRACER TX                 |
| TRSS      | Downlink - signal strength antenna                 | TBS TRACER RX                 |
| TQly      | Downlink - link quality (valid packets)            | TBS TRACER RX                 |
| TSNR      | Downlink - signal-to-noise ratio                   | TBS TRACER RX                 |
| ANT       | Sensor for debugging only                          | TBS TRACER RX                 |
| GPS       | GPS Coordinates                                    | TBS GPS / FC                  |
| Alt       | GPS Altitude                                       | TBS GPS / FC                  |
| Sats      | GPS Satellites acquired                            | TBS GPS / FC                  |
| Hdg       | Magnetic orientation                               | TBS GPS / FC                  |
| RXBt      | Battery voltage                                    | TBS GPS / FC/ TRACER RX/ CORE |
| Curr      | Current draw                                       | TBS GPS / FC/ CORE            |
| Capa      | Current consumption                                | TBS GPS / FC/ CORE            |
| Ptch      | FC Pitch angle                                     | FC                            |
| Roll      | FC Roll angle                                      | FC                            |
| Yaw       | FC Yaw angle                                       | FC                            |
| FM        | Flight mode                                        | FC                            |
| VSPD      | Barometer                                          | FC                            |

\* SouRCe: FC means all FC's with MAVLink or CRSF connection. Core means Core Pro, FPVision, Unify EVO



## Missing sensors

If you got issues finding sensors or only a few appear, make sure to disable *Ignore Instances* in the telemetry settings page of your radio



## In-built Voltage monitoring

TRACER's receivers are capable of measuring the voltage of their power supply. This becomes handy when you use an RC glider where space matters.

This feature works on up to a 2s LiPo (max. Operation voltage for all receivers!) for almost all receivers, except for the Nano RX rev 43 and lower.

If you experience issues with another voltage sensor in your system, you can disable the TRACER sensor in the settings under *Receiver/General - Voltage Sensor*

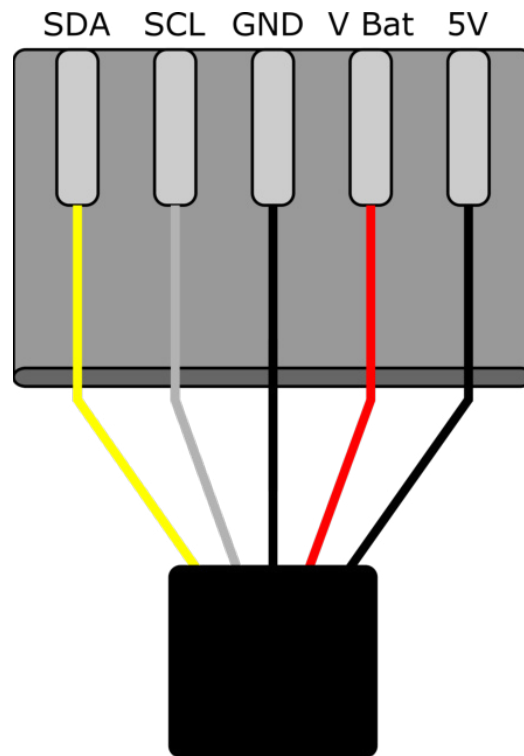
## BST connection

BST (Blacksheep telemetry) is a bus system used by TBS to connect your gear like the TBS GPS puck, CORE PRO, etc. All devices are connected in parallel. The BST bus needs to get clean 5V to power up the connected devices:

| Power type:                 | BST 5V    | VBATT     | BEC 5V   | FC 5V    |
|-----------------------------|-----------|-----------|----------|----------|
| TBS TRACER                  | ✓ PWR IN  |           | ✓ PWR IN |          |
| TBS BLACKBOX (discontinued) | ✓ PWR IN  |           |          | ✓ PWR IN |
| TBS GPS                     | ✓ PWR IN  |           |          |          |
| TBS CORE PRO / FPVISION     | ✓ PWR OUT | ✓ PWR IN  |          |          |
| TBS CURRENT SENSOR          | ✓ PWR IN  | ✓ PWR OUT |          |          |



If you own a TRACER Nano RX, there is no longer the complete BST plug available on it. In this case, just connect SCL to SCL and SDA to SDA on all devices. The Pinout of the plugin general:



*Note: even if the BST bus got the same labels as your non-TBS GPS or compass (SCL and SDA), they don't work on the BST bus!*



---

## Additional information

### TBS CLOUD

All TBS transmitters and the FUSION video receivers include a built-in WiFi module that allows you to connect all your gear through the TBS CLOUD. This allows using features like VTX follow, dynamic VTX power with a FUSION module, and other upcoming features.

### Menu

- **WiFi Client**
  - **AP Mode:** enables/ disables the WiFi module
  - **Default SSID:** enables/ disables the SSID broadcast of TRACER TX hotspot
  - **SSID:** SSID/ name of the selected external hotspot
  - **Password:** password for the externally selected hotspot
  - **Connect:** manually connect to the network. Only necessary when a new network is chosen in the *SSID* option
  - **Scan:** scans for WiFi networks. Found networks can be chosen under *SSID*, manually reconnect by *Connect* is required
  - **Forget WiFi:** erases all saved networks and their passwords
  - **Upgrade:** starts the self-update for the WiFi firmware (Internet connection required). **FW 2.03 or later required**
- **MAVLink (UDP/ TCP)**
  - **MAVLink:** select the protocol (UDP or TCP) or turn the MAVLink stream off.
  - **Port:** change the UDP/ TCP port where the telemetry will be sent (WiFi 2.03 uses TCP)
  - **UPLINK CNT etc:** Status of the MAVLink stream, works only with TCP
- **WebUI**
  - **WEB UI:** enables/ disables the WEB UI
  - **AP Lock:** enables/ disables password authentication for TRACER TX internal WiFi hotspot
  - **Password:** set up a password for TRACER TX internal WiFi hotspot
  - **Login:** enables/ disables password authentication for TRACER TX internal Web Ui
  - **Password:** set up a password for TRACER TX internal Web Ui
- **PRO**
  - **WiFi Power:** power level of the WiFi module
  - **TBS CLOUD:** enables/ disables the TBS CLOUD connection
  - **Autoscan:** enables/ disables the scanning for previously bound Hotspots



- **About**

- **WiFi:** name of the WiFi hotspot/ Network your TRACER is connected to
- **IP:** IP address the TRACER module was assigned by the WiFi network
- **Server:** connection status
- **firmware:** the version number of the WiFi firmware
- **Hardware:** hardware revision of the WiFi module
- **Bootloader:** the version number of the WiFi Bootloader firmware
- **Serial Number:** serial number of the WiFi module

## Initiate and Update the WiFi module

To use the CLOUD functions, you need to initiate the WiFi module first:

- Download and unpack the firmware files for the WiFi module from [TBS](#)
- Connect the TRACER TX to your radio and power it up
- On your PC or phone search for a new WiFi network like "TBS\_TRACER\_AP\_xxxxxx"
- Connect your pc with this network. On Windows machines, this can take up to one minute
- Open your browser and enter IP in the address bar: 192.168.4.1
- Click on *Select file* and search for the unpacked firmware files you downloaded before



- Hit *Update* and wait for the website to reload
  - **Do not shut down your radio during the WiFi module updating process**
- Now you can see the WiFi module of your TRACER TX in the *menu/ LUA script and AGENT M*

[Here](#) you can find the whole process as video



---

## Connection to a WiFi hotspot

Once your WiFi module is initiated, you can now connect to an external hotspot. The easiest way is to connect it by the **Web-UI**:

- Connect the TRACER TX to your radio and power it up
- On your PC or phone search for a new WiFi network like "TBS\_TRACER\_AP\_xxxxxx"
- Connect your pc/ phone with this network. On Windows machines, this can take up to one minute
- Open your browser and enter IP in the address bar: 192.168.4.1
- Open the *WiFi* tab
- Click on Scan to search for available WiFi hotspot/ networks
- Click on the name of the found network you want to connect to - the name will be entered for you
- Enter your password and hit Connect/ Disconnect
- When you refresh the WebUI page after a few seconds, you will see the IP address assigned by the WiFi network for TRACER TX

**Note: if WiFi hotspot/ network has no internet connection, CLOUD-based features will not work.**

**Agent M/ Lite menu works as well:**

- Connect the TRACER TX to your radio and power it up
- Navigate in the TRACER menu to *WiFi/ General*
- Hit *Scan* to search for available networks
- Under *SSID* you can select the found network
- Enter the password for the selected WiFi hotspot/ network in the *Password* option
- Select *Connect* to start the manual connection to the selected WiFi hotspot/ network
- Done

## OpenTXsetup for TRACER TXmodule

If you own an OpenTXradio, you need to set up your model profile like this:

**Internal RF: off and External RF: CRSF**



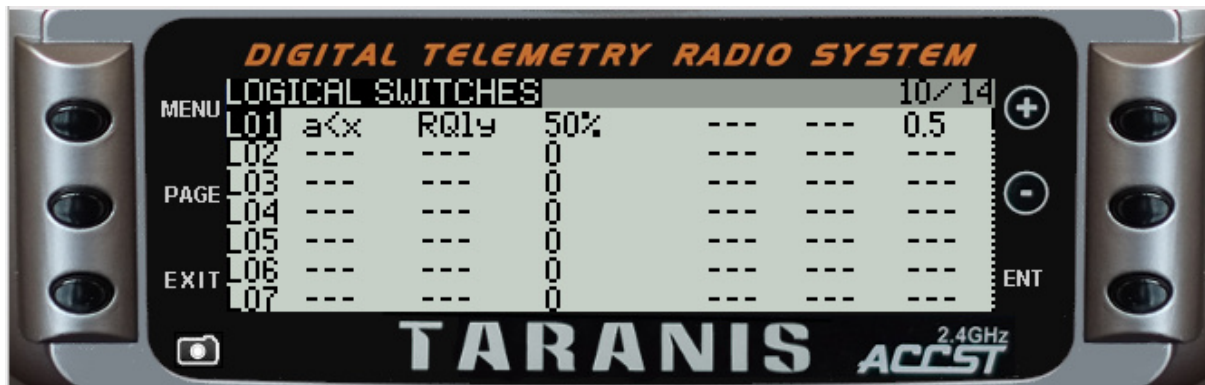
Note: those settings need to be done on all model profiles where you use your TRACERTXmodule.



Using the CRSF protocol will give you the lowest possible latency from your stick to the drone and full telemetry back to your radio.

## LQ warning in OpenTX

The setup for the radio is very simple:



The small delay (0.5s) prevents warnings to be triggered when LQ is below minimum level only for a short time



When the logical switch is on the voice alert will be triggered every time they are active.

What they mean:

SF1: when L01 is active, play the selected track once

For the sound files, you can create your own by any TTS website or choose one of the default OpenTXsound files.



## Model-match in OpenTX

Model match enables you to make sure that a specific receiver and drone with it only bind if the correct radio model profile is selected. In case you switched from a drone to a wing and forgot to change the model profile, the RX will simply not bind (unless you start the bind procedure).

You need to make sure that you don't use the same model id in two different models' profiles. In this case, the RX will bind to TRACER TX if you select any of these models' profiles.

| Model Id<br>radio 1 |   | Model Id<br>radio 2 |
|---------------------|---|---------------------|
| 00                  | ✓ | 00                  |
| 01                  | ✗ | 00                  |
| 03                  | ✗ | 01                  |
| ./.                 | ✓ | ./.                 |
| 00                  | ✓ | ./.                 |

### Note:

*Model Match with the TBS TRACER is available since OpenTX since V2.3.10*

In OpenTX your model number in the memory will be set as the default Model ID when you create a new model. E.g when your new model got the internal number 11, the *Model ID* will be set to 11 as well. This also happens when you upgrade OpenTX from a non-Model match capable version to 2.3.10 or later.

If a previous bound RX does no longer bind after the OpenTX upgrade to 2.3.10 or later you need to revert the *Model ID* to 00.

### Model Id (Receiver No.) in OpenTX

```
MODEL SETUP 2/13
Mode          CRSF
Channel Range CH1- 16
Receiver No.  00
Trainer
Mode          Slave/Jack
Channel Range CH1- 0
PPM frame    22.5ms 300u -
```

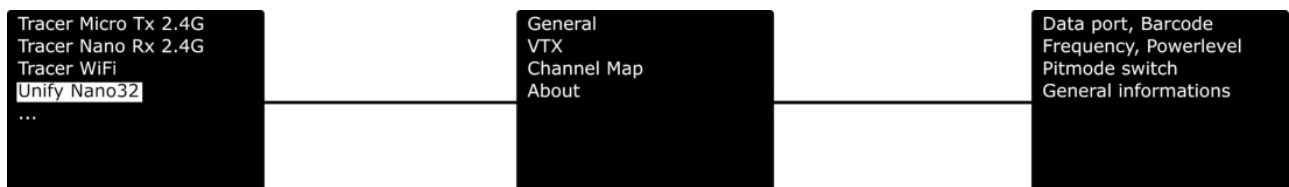
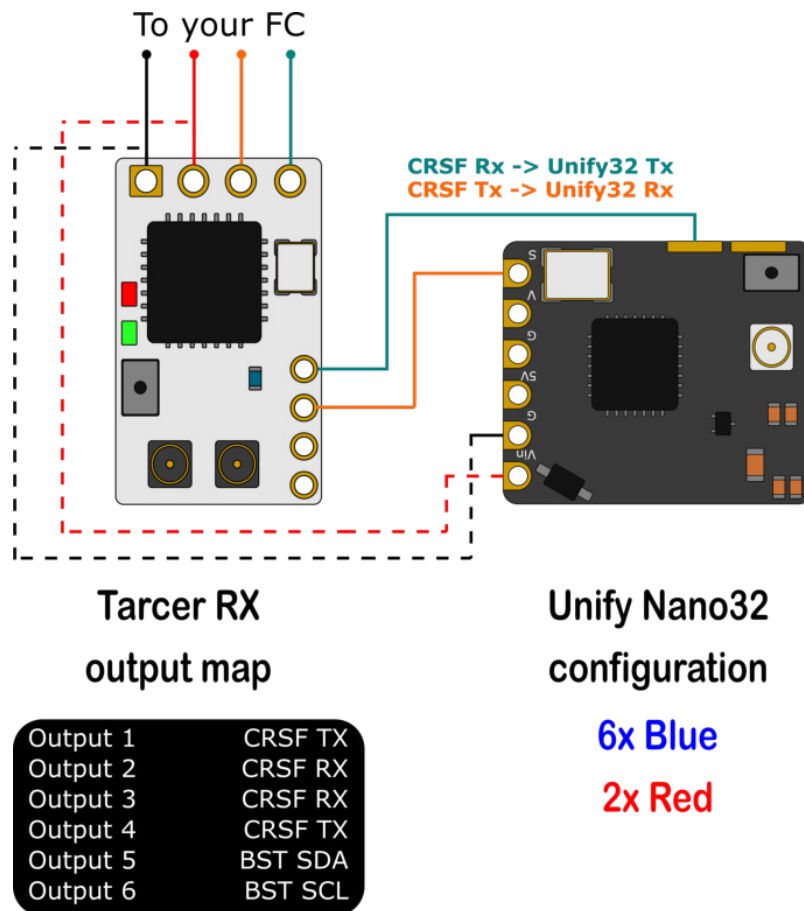


## VTX connection using CRSF

All Unify32 and Evo line VTX from TBS are capable of using CRSF to communicate with the TRACER ecosystem.

- Select a free output pin capable of CRSF (check the [output map section](#) for available outputs)
- Set the Unify32 to CRSF by button or USB (Evo and Unify32 HV)
- Connect them (TRACER CRSF TXto VTX CRSF RX, TRACER CRSF RX to Unify CRSF TX)

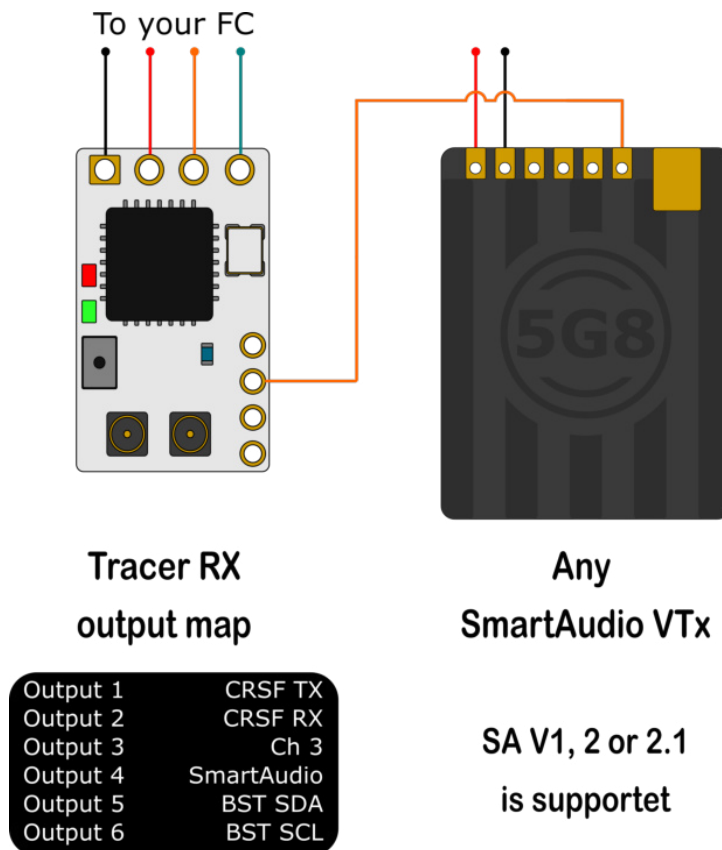
### Wiring example:



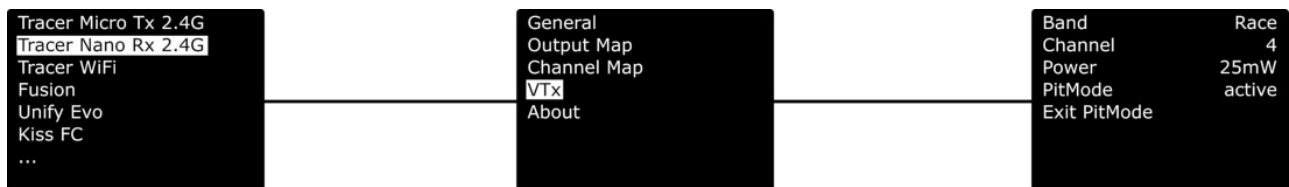
## VTX connection using SmartAudio

If you own any Unify or any other VTX with SmartAudio capability, you can connect it to your TRACER receiver as well.

- Select a free output pin capable for SA (check the [output map section](#) for available outputs)
- Connect them (TRACER SA TXto VTX RX/ SmartAudio pad)



When the VTX is found by the receiver, a new *VTX* (not *VideoTX*!) menu will show in the LUA/ CRSF menu of the transmitter



---

## SmartAudio 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 M, etc.
  - CRSF readout - let you use PIT mode on a switch or navigate through the Unify Evo OSD without the need for an FC, link stats readout with the Unify EVO OSD

## VT button is not working

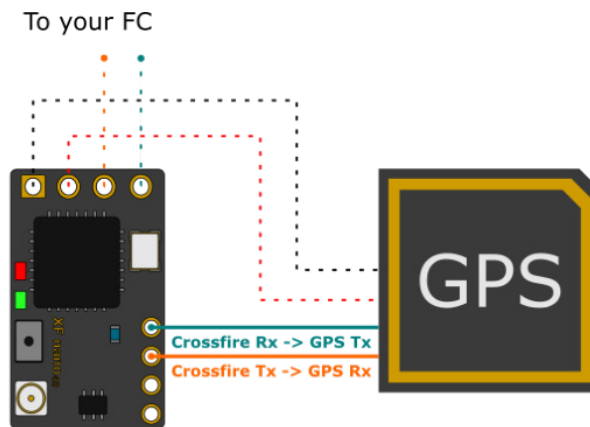
When the Unify32 detects a signal on the SmartAudio Signal-in pad, it will disable the button. To change the VTX to CRSF or SA, you can unsolder the wire (FC connection) or foRCe your TRACER RX to not output any signal.

- Set the output of the TRACER RX to CH X (PWM) for the pin where the VTX is connected to
- Shut down the TRACER TXand RX
- Power up just the drone with the TRACER RX and the Unify32
- Change the Unify32 settings by the button
- Turn the transmitter back on
- Set the output map back to CRSF or SmartAudio



## GPS connection (non-BST GPS)

You can direct wire your UBlox GPS to pin3/4 of your CROSSFIRE receiver to get GPS based telemetry data back to your remote and into your drone (currently only supported by KISS FW). The receiver will adjust its baud rate to work with the GPS.

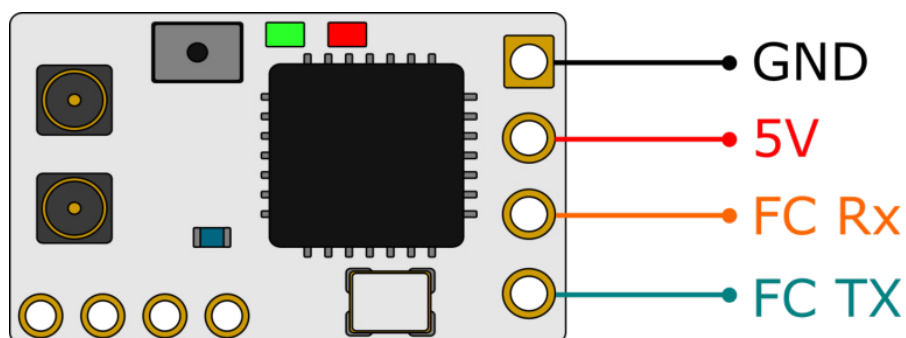


Crossfire RX  
output map

|          |         |
|----------|---------|
| Output 1 | CRSF TX |
| Output 2 | CRSF RX |
| Output 3 | GPS RX  |
| Output 4 | GPS TX  |
| Output 5 | BST SDA |
| Output 6 | BST SCL |

## Connection to an FC

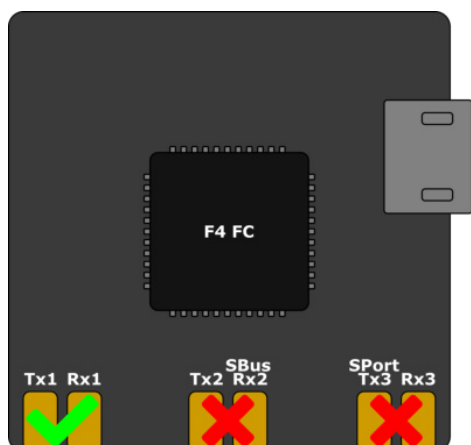
### General wiring



If you use SBus or any other protocol except CRSF or MAVLink, you only need to connect the receiver TX line to your FC. Use CRSF whenever possible to get the best experience with your TRACER.

CRSF also works with just the TX line. You just lose the FC telemetry

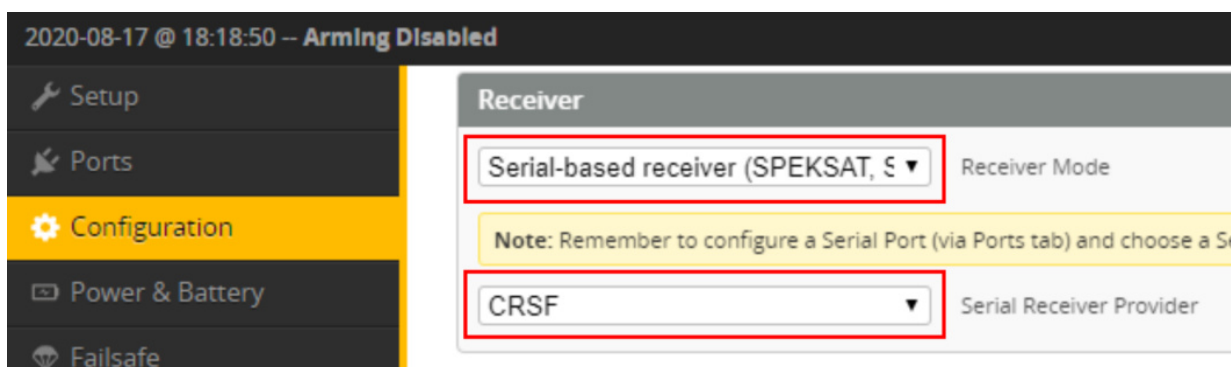




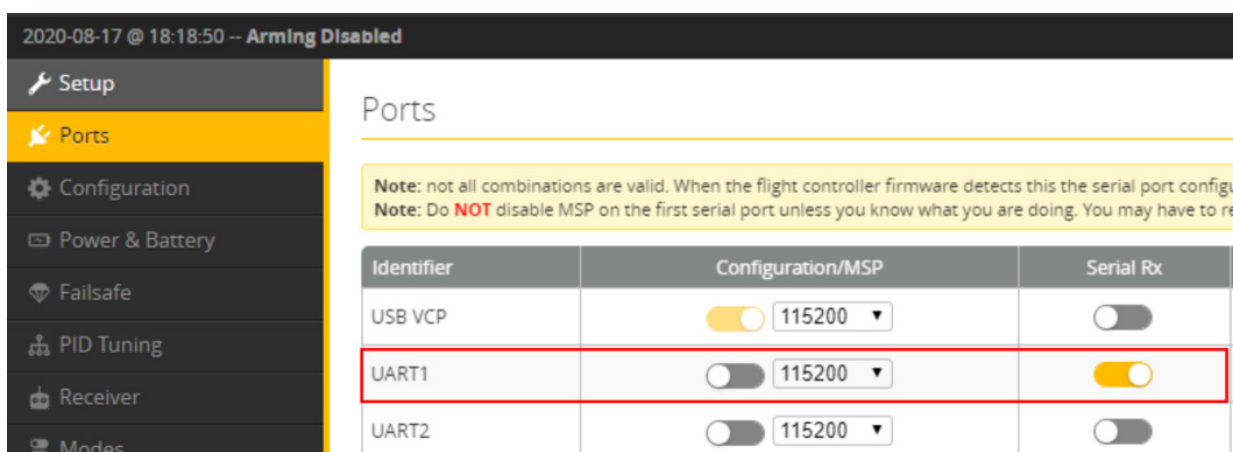
If you use an **F4 FC**, make sure you don't use UARTs with labels *SBUS* or *S-PORT*. Those UART's got a hardware-inverter installed which does not work with CRSF.

## CRSF with BetaFlight and similar firmware

In the BetaFlight configurator, navigate to the *Configuration* tab and select *Serial-based receiver* and then *CRSF*



In the Ports tab, enable Serial RX for the UART to which your receiver is connected



**CRSF does not work on Soft Serial ports!** In INAV 4.1 they are enabled by default. If you experience issues, disable the feature



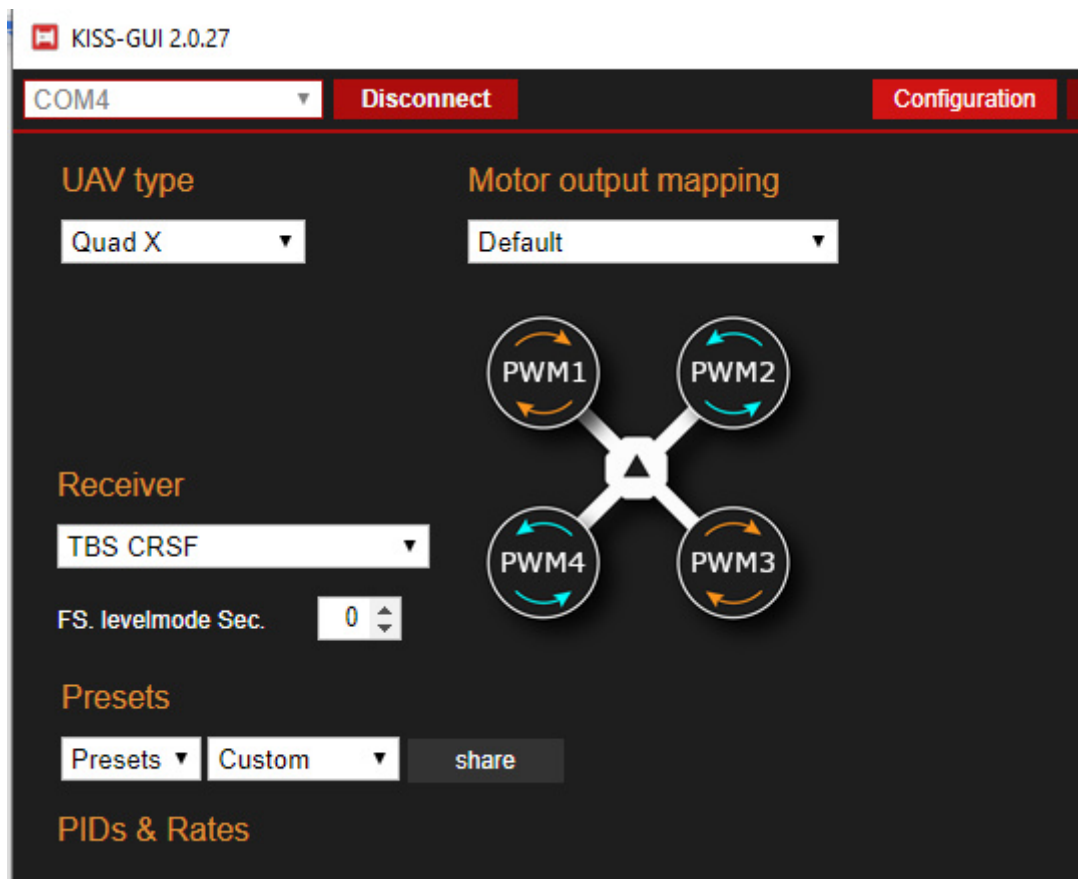
CLI command

**set failsafe\_recovery\_delay = 1**

## CRSF with KISS/ FETTEC

Depending on the KISS FC you are using, connect the TRACER RX using the FCCRSF protocol to the FC's RC input port.

In the configurator, enable CRSF as RC Type:



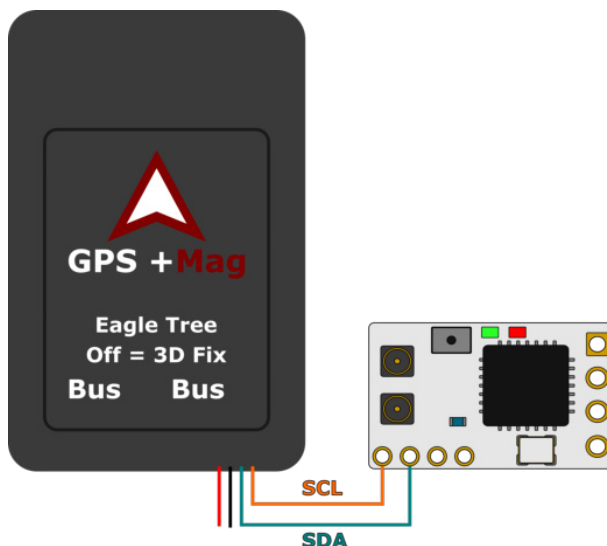
If you got a TBS UNIFY32 VTX connected to your Kiss/ FETTEC FC by CRSF, it will show up in the CRSF LUA/ TANGO 1 device menu, etc. as it was connected straight to the receiver.



## BST to Eagletree Vector

If you use an EagleTree vector FC, you can connect the ET bus to the BST bus to get LQ and RSSI in the osd as well as telemetry from the FC back into the TRACER.

To wire it up, just connect *SCL* to *SCL* and *SDA* to *SDA*. A common ground should already exist by the RC connection to the FC.



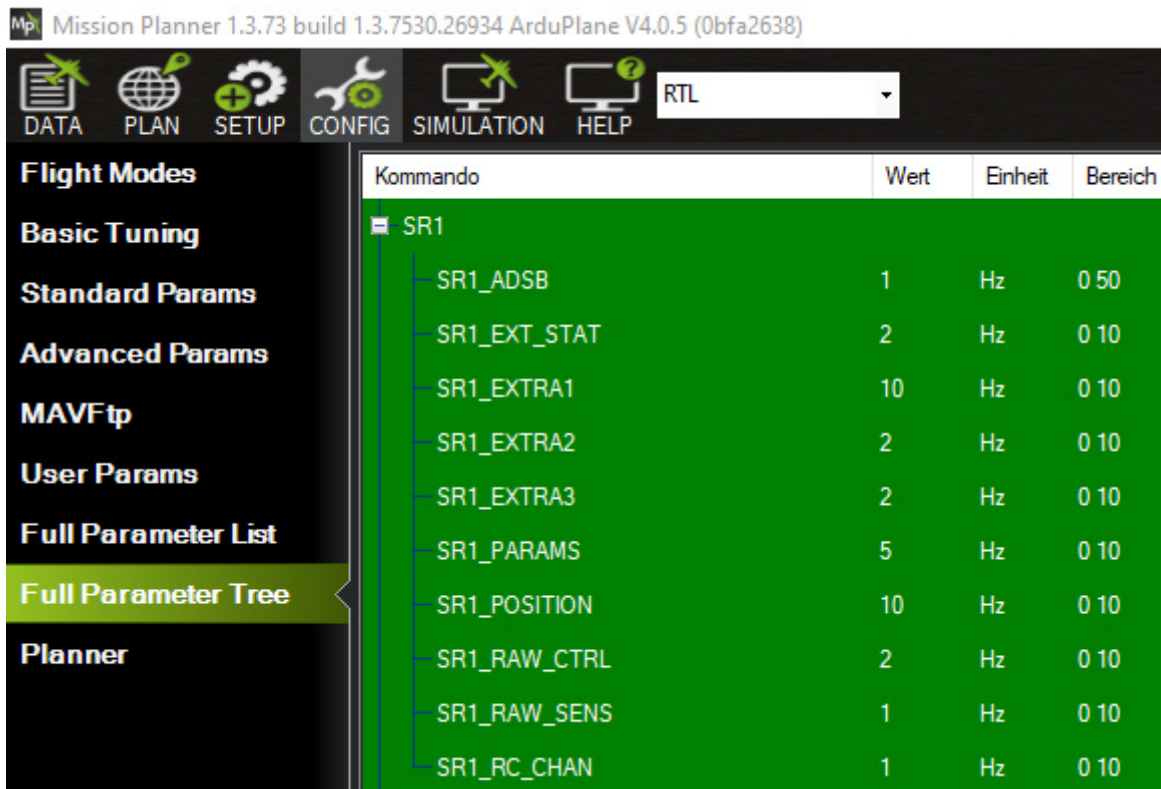
## MAVLink with MAV FCs

If you use an FC with MAVLink like ArduPilot/ PX4, you can use the MAVLink capabilities of the TRACER. Connect a MAVLink capable output to the Telemetry port of your FC. On PIX FCs it's mostly the TELEM1 port and set the TRACER RX output map to MAVLink TX and RX.

|          |            |
|----------|------------|
| Output 1 | CRSF TX    |
| Output 2 | CRSF RX    |
| Output 3 | MAVLink Rx |
| Output 4 | MAVLink TX |
| Output 5 | BST SDA    |
| Output 6 | BST SCL    |

On the FC you need to configure the telemetry port. Otherwise, the TRACER will not be able to receive telemetry data from the FC until you connect it to Mission Planner. Your *TELEM1* can be found as *SR1*





If you use MAVLink, you can also use the *RC over MAVLink* option to save the extra wiring. The details can be found [in this section](#).

If you use the PX4 firmware, you don't need to configure the telemetry port to get it running.

**For the best experience, you should use ArduPilot 4.10 TRACER 6.1X and WiFi 2.04 or later.**

**There the Baud Rate must be set to 115200 Baud (SERIALx\_BAUD = 115200, SERIALx\_PROTOCOL = 2)**

## Wireless configuration with ArduPilot/ PX4 by WiFi

Over the built-in WiFi module, you can get MAVLink data to your pc or mobile device for live telemetry as well as full MAVLink data transmission (as with the Bluetooth module).

You need to [set up your WiFi module](#) for that to work.

You can connect to your TRACER in two ways:

- Both are in the same WiFi network
- Straight connection to the TRACER access point



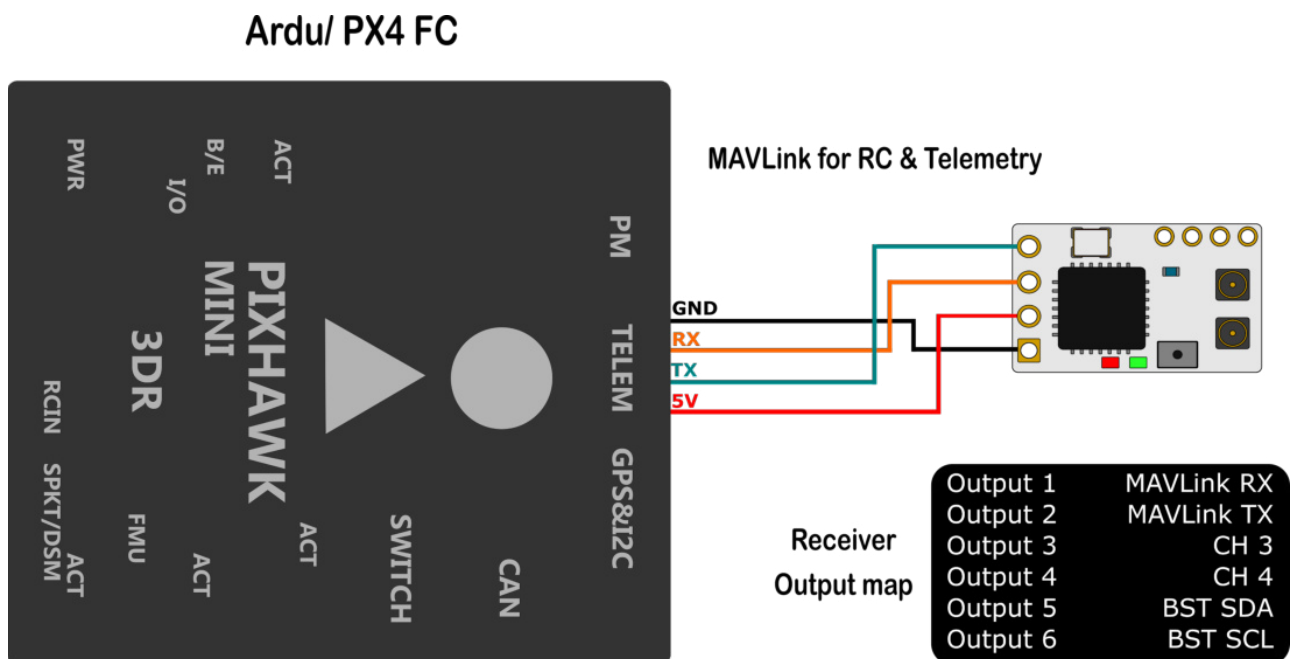
When you are connected, you need to use the following settings:

- **Connection type:** UDP (WiFi up to 2.02) or TCP (since WiFi 2.03)
- **IP (TCP only):** 192.168.4.1 (when connected straight to the WiFi module)
- **Port:** 8888 (can be changed in the TRACER WiFi settings)

The port can be changed in the settings of the WiFi module if you need to.

In the WiFi settings, you can enable or disable the MAVLink data. To change this, navigate to and set *MAVLink* to *on*.

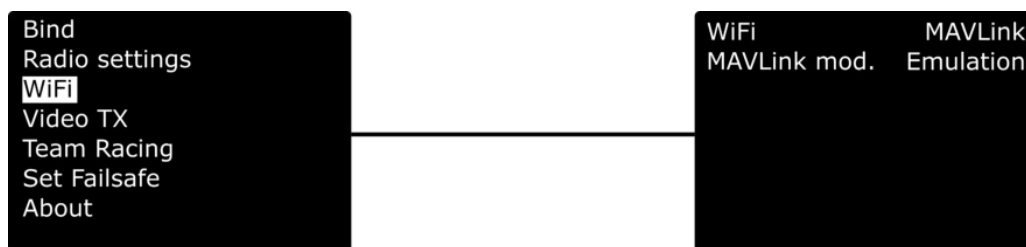
## Wiring diagram



## Wireless telemetry

Getting real-time telemetry data from your TRACER by WiFi is an easy job.

You can find the WiFi details [here](#). In the TX/ WiFi settings, you need to enable the MAVLink stream first:



---

## WiFi telemetry with BetaFlight/ INAV

For the WiFi telemetry, don't need an extra MAVLink connection to your FC. It packs the telemetry data into a MAVLink header that can be used by ground control software like MissionPlanner or QGround.

*Note: You need to cancel the "loading parameter" dialog in MissionPlanner etc, as it will not get past this dialog. The important telemetry data will be sent anyway.*



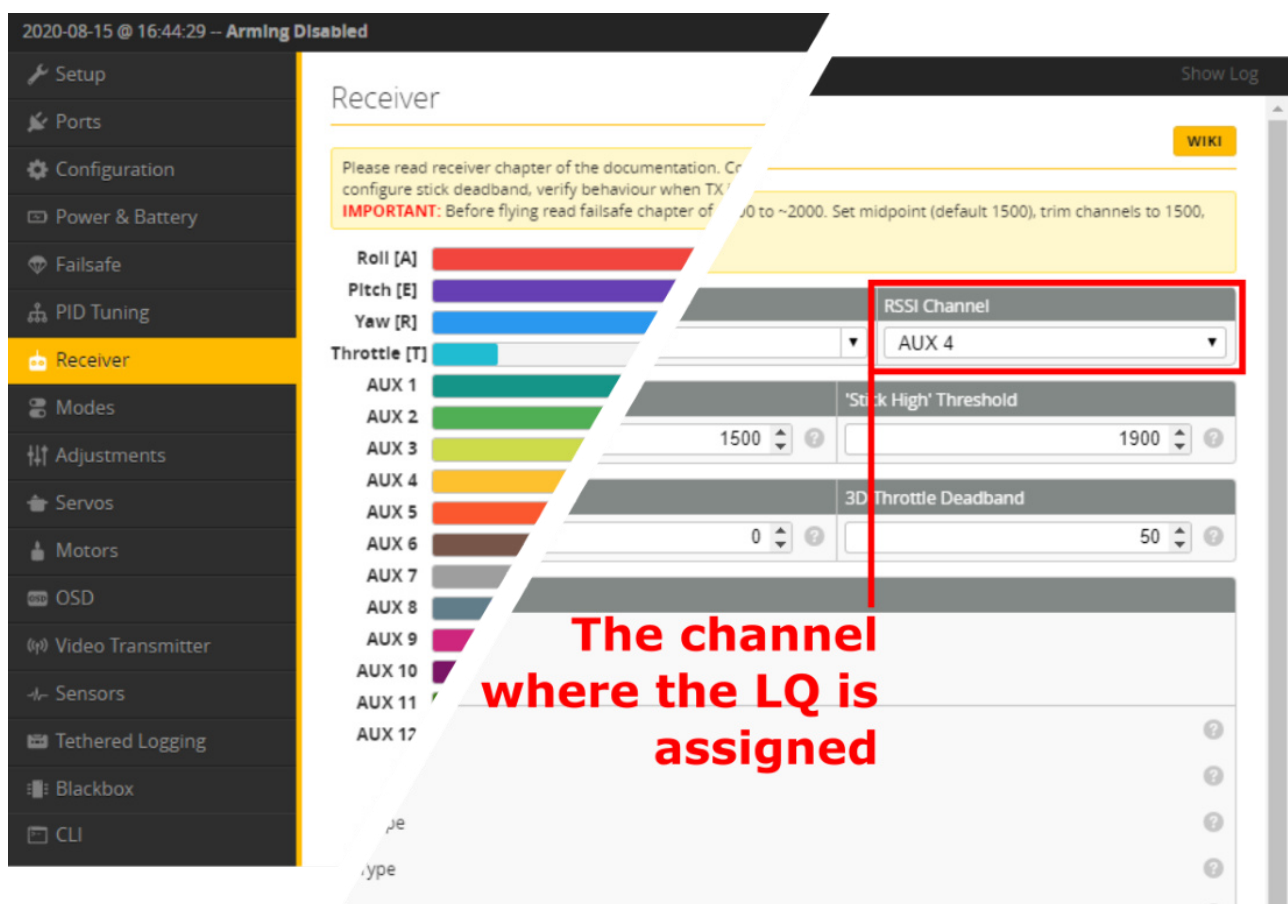
## Signal strength in BetaFlight - BF < 4.1

If you use an older BetaFlight version or a new one, you need to assign the LQ sensor to a channel.

|            |     |
|------------|-----|
| Dst. Ch. 1 | CH1 |
| Dst. Ch. 2 | CH2 |
| Dst. Ch. 3 | CH3 |
| Dst. Ch. 4 | CH4 |
| Dst. Ch. 5 | CH5 |
| Dst. Ch. 6 | CH6 |
| Dst. Ch. 7 | CH7 |
| Dst. Ch. 8 | LQ  |

In the TRACER receiver channel mapping, assign LQ to an unused channel. If you set it up by LUA, you can assign it to channel 1, even when you use the 8 channel mode of the TRACER.

In BetaFlight, set the assigned channel as *RSSI Channel* (AUX1 = channel 5, etc)



2020-08-15 @ 16:44:29 -- Arming Disabled

Setup  
Ports  
Configuration  
Power & Battery  
Failsafe  
PID Tuning  
**Receiver**  
Modes  
Adjustments  
Servos  
Motors  
OSD  
Video Transmitter  
Sensors  
Tethered Logging  
Blackbox  
CLI

Receiver

Please read receiver chapter of the documentation. Configure stick deadband, verify behaviour when TX is off.  
**IMPORTANT:** Before flying read failsafe chapter of the documentation. Set midpoint (default 1500), trim channels to 1500.

Roll [A]  
Pitch [E]  
Yaw [R]  
Throttle [T]  
AUX 1  
AUX 2  
AUX 3  
AUX 4  
AUX 5  
AUX 6  
AUX 7  
AUX 8  
AUX 9  
AUX 10  
AUX 11  
AUX 12  
AUX 13  
AUX 14  
AUX 15  
AUX 16  
AUX 17

RSSI Channel  
AUX 4

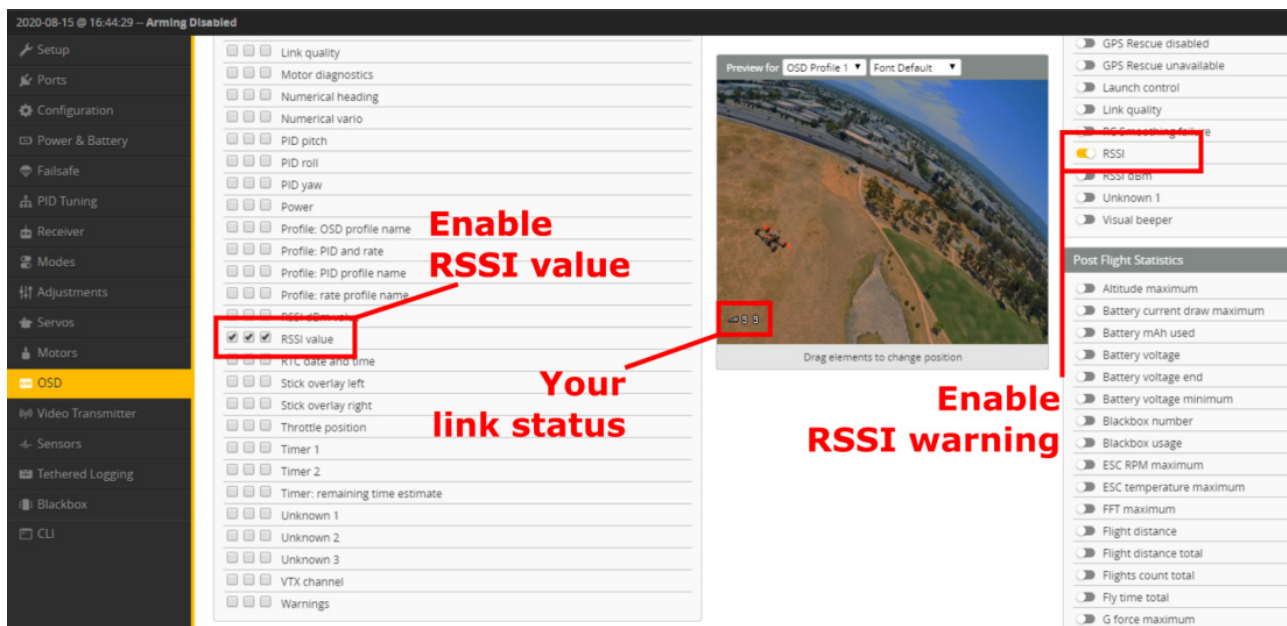
'Stick High' Threshold  
1500  
1900

3D Throttle Deadband  
0  
50

**The channel where the LQ is assigned**



For the OSD tab, set it up like this:

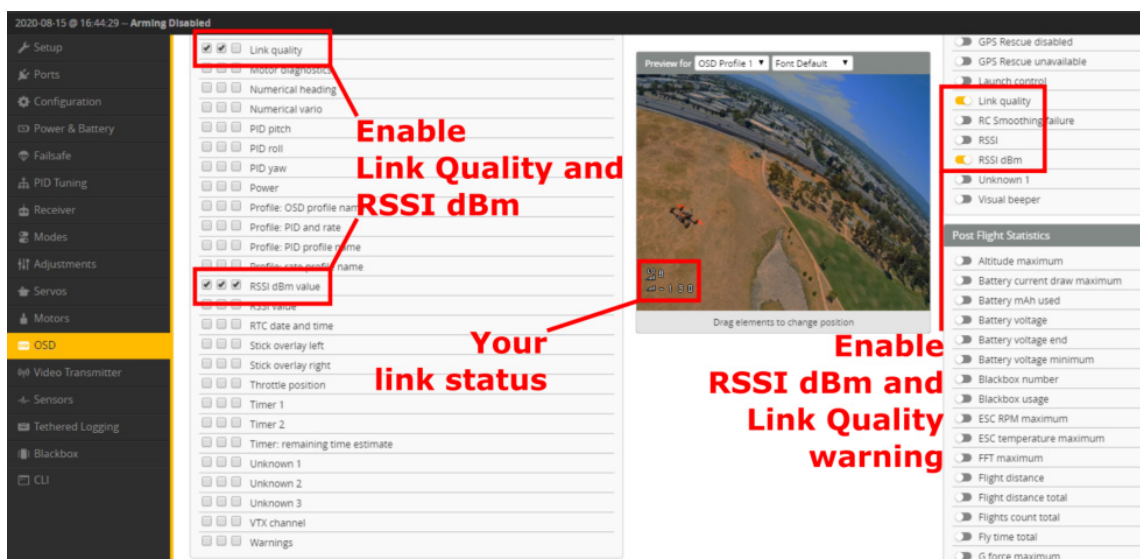


## Signal strength in BetaFlight - BF 4.1 and later

Since version 4.1 BetaFlight can read the LQ information from the CRSF stream. This will give you the RSSI reading in dBm (0 - -130) and the LQ reading similar to the TBS OSD (300 - 0 %).

To use this new method, you need to disable the RSSI channel setting in the receiver tab and activate the following elements in the *OSD* tab. Also, make sure that the *RSSI\_ADC* option is disabled (general BetaFlight settings)

With DJI, LQ does not work. Therefore you need to enable "RSSI" in the OSD tab. LQ does not need to be assigned to a CRSF channel.



---

## CLI commands

set osd\_link\_quality\_alarm = 50

set osd\_RSSI\_dbm\_alarm = -95

### DJI/ older BF versions:

set osd\_RSSI\_alarm = 70

## Signal strength in INAV - INAV < 3.xx

In INAV, it's almost the same as with the old BetaFlight method, except that you don't need to assign LQ to a channel in the channel map menu.

INAV reads the LQ from the CRSF stream and outputs it automatically on **Channel 17** (from INAV).

## Signal strength in INAV - INAV 3.xx and later

With INAV 3 the LQ readout can be set up the same way as for BF 4.1 and later. The CLI commands are not necessary.

## Link States

### LQ - Link quality

The number of packages that arrive correctly. If the number starts to drop, more packages are lost. On the TBS TRACER, it scales from 0 to 100% linearly.

### RSSI - Received signal strength indicator

A very technical indicator meant for professionals. It shows how "loud" the received signal is (including noise!)

The RSSI is logarithmic which results in a massive drop at the beginning and slows down the lower it gets.

Rule of thumb: doubling the range will result in a drop of -6dBm. An example:

- RSSI at 1m = -10dBm
- RSSI at 2m = -16dBm
- RSSI at 4m = -22dBm

The TRACER can go down to the noise floor before the RC link breaks up. The elevation above the noise floor is indicated by SNR (see below).

If you use RSSI as a sensor by the channel/ output map menu or as an OpenTXtelemetry sensor, it will be shown like this:

- **-0.1dBm** = 100%



- **-130dBm = 0%**

## SNR - Signal-to-Noise ratio

It shows you the ratio between the noise floor and your TRACER signal.

To judge RSSI properly you need to know the SNR and compare it with your RSSI value. The TRACER can receive signals in the noise down to 0dB, as the SNR is already scaled to offset the modulation requirement of 6dB.

### Example:

A RSSI of -80dBm is fine. But with an SNR of 2dBm, it's really bad. This means the noise floor is at -82dBm

Positive numbers mean the TRACER signal is "louder" than the noise,  
negative numbers mean the noise is louder than the TRACER

## Warning levels

| Sensor   | Prewarning | Critical |
|----------|------------|----------|
| RSSI     | -90dBm     | -95dBm   |
| LQ       | None       | 50%      |
| RSSI/ LQ | 30%        | 20%      |
| SNR      | 4dB        | 0dB      |

## What should I use in my OSD or radio?

The easiest way to set up your OSD or radio warning is by **using LQ**. It is linear which makes it easier to monitor for most people, while RSSI has a logarithmic scaling which makes it drop rapidly at the beginning and then slower the further you go.



## Racing environment

When racing try to unify the power output across your peers.

Recommended settings:

- **Max output power:** 100mW
- **Dynamic power:** off

## Factory reset

If you experience a strange behavior with your TRACER, a factory reset can help solve them.

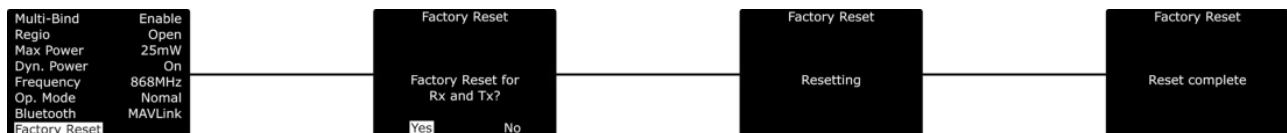
The process is the same for all transmitters and receivers:

- Power up your device
- Navigate into the transmitter or the receiver menu
- Under "About" you can find the "Factory reset" option
- When you started it, follow the instructions on your display/ radio
- When the reset is finished, **you need to power cycle your device**

If you did the reset for the receiver you need to rebind it by pushing the *Bind* button.

**Check and adjust your settings after the power cycle. Everything will be set to default.**

**On the receiver, the failsafe position must be saved again if you want to use it!**



---

## Emergency Update

If an OTA update for the receiver fails, it will no longer work. In this case, you need to use the built-in emergency update feature:

- Hold the bind button
- Power up the receiver
  - The led on the RX starts to flash rapidly
- Release the button
- Push and hold the button again
  - The led will start to blink in a double-pattern
- As soon as the led switches to rapid flashing again, you can release the button
- When the pattern changes back to slow, single blinking the emergency update is finished

Now the receiver is working again and automatically turned on the bind mode. Now you can power up your transmitter, start the binding and run the OTA update again

Manual written and designed by Kamikatz-fpv in cooperation with TBS

