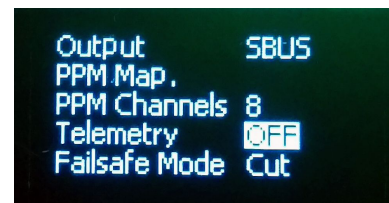# FPV Racing with TBS CROSSFIRE

The TBS Crossfire has emerged into a de facto standard for large drone events due to link reliability requirements. TBS would like to make sure every pilot can get the most out of their TBS CROSSFIRE system in each specific event. Please read the below instructions carefully, and good luck at the races!!

IMPORTANT - 5th of March, 2016 update !!

Thanks to amazingly fast feedback from the FPV racing community, we have detected and identified a new **bug in the latest V1.20 CROSSFIRE firmware**.

The bad news is, downgrading to V1.09 is NOT an option, as it does not meet the requirements of FPV racing. The good news, however, is that the problem in V1.20 can be solved by turning **TELEMETRY OFF**!

Instant fix: Push the joystick for 3 seconds to enter the menu. Make sure that your drone is powered on and connected to the TBS Crossfire. Then select "RX Micro", and make sure that TELEMETRY feature is OFF. You need to **do this for EVERY MICRO RECEIVER / RACER**!!

TBS is now preparing a custom firmware called "TBS CROSSFIRE DUBAI", which deletes certain options and assumes default values in accordance with what we know works, and is compatible with FPV racing. We are making this firmware public around Sunday, 6th of March, 2016 afternoon to late evening Dubai time and we will be taking the current V1.20 back into **BETA** status. Software updates are performed via the [TBS Agent](#). Please check back Sunday night for the update.
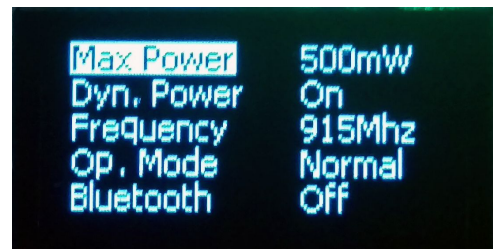
We apologize for any inconveniences and hope that this has not affected your trust in the TBS CROSSFIRE. Mistakes can happen especially with monumental firmware updates such as these. The goal has of the TBS CROSSFIRE has always been to offer the most reliable radio link, so we do not take mistakes like this lightly. While we spend our every waking second fixing the underlying problems of V1.20, we strongly recommend to use the TBS CROSSFIRE DUBAI release as soon as it is available. Once installed, the CROSSFIRE TX will pulse red, green and white, a salute to the United Arab Emirate's flag colors. The next V1.20 will be absolutely amazing and we promise to continue to spearhead innovation in R/C link technology.

Basics

The TBS Crossfire is ready to go within a few minutes out of the box. However, in FPV racing, latency is a huge factor. This is why you should avoid PPM when communicating between your R/C and the Crossfire TX, as well as the Crossfire RX and the Flight Control. On the flying side this is more easy as most of the FCs support SBUS, and so does the TBS Crossfire Micro RX. For your remote, you will need an OpenTX compatible remote (e.g. FrSky Taranis) with the latest update supporting the CRSF protocol.

- **Crossfire:**
- Update your TBS Crossfire system to V1.20 or later (TBS Agent download)
- Configure your TBS Crossfire Micro or Diversity receiver to SBUS (STM32 F3 microprocessor) or non inverted SBUS (STM32 F1 microprocessor) depending on FC.
- Use operation mode "Normal" only
- Use 8 channel mode

- **Remote Control:**
- For Open TX R/Cs update your remote to OpenTX 2.1.7 or later. Enable CRSF under "External RF -> Mode" - Instructional YouTube Video
- If your remote isn't OpenTX-based, plug the Crossfire into a DSC or PPM source (trainer port).
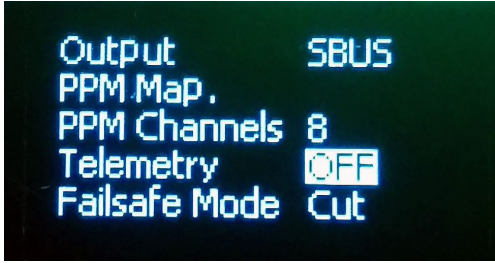

Race with multiple pilots

FPV races often have up to 8 pilots on the course at a time, as well as tight and nail-biting quad-vs-quad battles in close proximity to each other. To decrease the possibility of interference between the drones, we recommend disabling telemetry on your receiver when you fly in a race. We also suggest race organizers to verify this setting on all pilots by looking at the bright LED ring on the Crossfire TX. When telemetry is enabled, the LED will be a constant GREEN, while systems with telemetry disabled will display a pulsing ORANGE color.

- **Crossfire settings:**
- Disable telemetry under RX settings
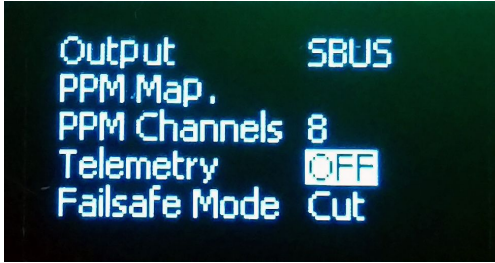- Set RF power to 500mW (Dynamic power will be automatically disabled if telemetry is disabled)

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Flying freestyle

In most cases, freestyle events have only one or two pilots flying at a time. In this case we recommend you to use telemetry as well as dynamic power. Both of these settings will ensure the maximum performance for your RF link, as well as equal robustness in terms of maximum range and penetration.
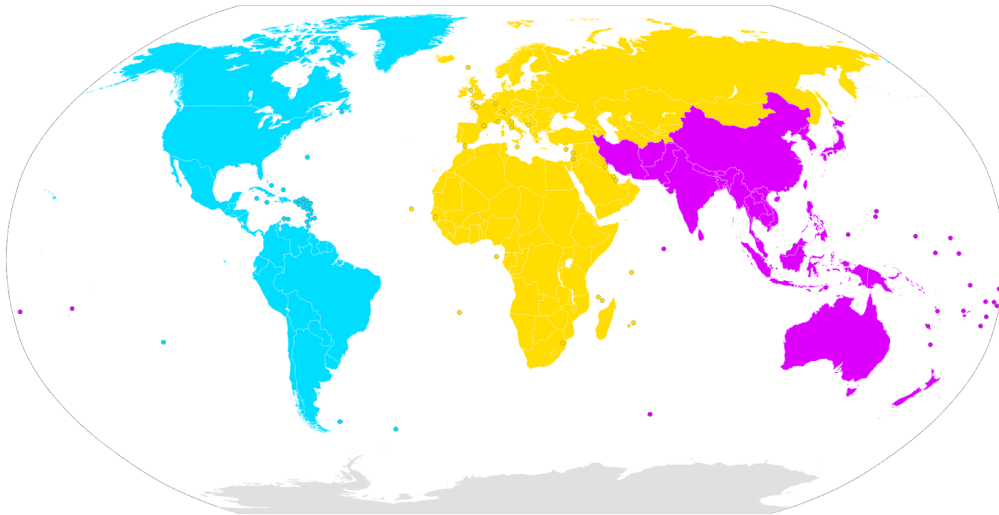
- **Crossfire settings:**
- Disable telemetry under RX settings
- Set RF power to 500mW
- Disable dynamic power

Legalities

There are international and harmonized standards governing the use of the bands that the TBS CROSSFIRE operates in. The rules are pretty simple: In all yellow areas of above map (ITU region 1), you are required to set the TBS CROSSFIRE to 25mW and operate it on 868 MHz band. While 25mW does not sound like a lot of power, thanks to TBS CROSSFIRE's self-healing algorithms and low noise floor, we can reach up to 25km range on 25mW! The rest of the world requires 915 MHz setting and allows up to 1W of output power. TBS as well as organizers of big race events have done countless of tests both in the labs, in the real world, and on site, to ensure that the R/C link can be forgotten about, no matter where you fly.

For the World Drone Prix in Dubai, UAE, the organizing committee has filed for special exemption of the TBS CROSSFIRE for 915 MHz and up to 500mW of output power.

Why Crossfire?!

In short: reliability. Typical ISM bands are easily crowded at races thanks to Wifi, broadcasting equipment and a lot of remote controls running at the same time, making traditional remote controls problematic. Racers need more range as race courses become larger, creating the need for UHF systems. Mini quads often exhibit on-board noise that peaks at traditional UHF frequencies (400 - 450MHz), making testing, optimization and achieving a reliable R/C link a nightmare. The tiny form factor of the Crossfire micro RX, its compatibility with most R/Cs and all flight controllers, the race-features and unheard of R/C link penetration as well as the adherence to harmonized standards make the TBS CROSSFIRE the logical choice for race organizers and racers alike.

To learn more about the TBS Crossfire system, please visit:

team-blacksheep.com/crossfire

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