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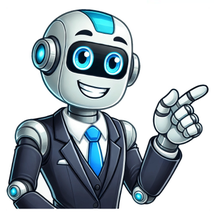

46.3K This tutorial explains how to setup TBS Crossfire for OpenTX radios such as the TX16S. I will also show you how to connect Crossfire receiver to a flight controller and configure it in Betaflight. Tracer is similar to Crossfire when it comes to setup, so most of the steps in this guide also apply. Some of the links on this page are affiliate links. I receive a commission (at no extra cost to you) if you make a purchase after clicking on one of these affiliate links. This helps support the free content for the community on this website. Please read our Affiliate Link Policy for more information. Further Reading: How to choose radio transmitter? Whats TBS Crossfire? TBS Crossfire is a popular radio control link for FPV drones, which is known to be reliable, easy to setup and great for long range flying. Crossfire is an external RF module that can be installed directly on the back of a radio transmitter (i.e. JR module bay). The TBS Tango 2 radio also has Crossfire built in. Rather than using the more common 2.4GHz, Crossfire operates on the 900MHz band. The low frequency is better at signal penetration through obstacles. Many pilots prefer Crossfire even though they dont intent to fly long range but for the stable link connection and resistance to failsafe in challenging environment. Range can largely depend on the conditions of the environment, but based on personal experience, I can fly 5 miles out easily using 250mW, and I wasnt even pushing the limit there. One of the main downsides of Crossfire is perhaps the larger receiver antennas which can be challenging to mount on smaller FPV drones. Crossfire TX Modules TBS Crossfire TX Module TBS Crossfire Micro TX V2 Built-in screen for changing settings Max Power up to 2W Extra features: Spectrum analyzer, Bluetooth module More practical and greater value No screen, settings changed via LUA script only Max Power up to 1W (1000mW) Lighter, smaller, cheaper AliExpress Amazon NBD GetFPV NBD Amazon TBS Crossfire V2 Nano Module TBS Tango 2 Radio (review) Same features and performance as the V2 JR module, but has Lite interface (for the Lite module bay such as the Jumper T-Lite, Frsky X-Lite and Tandem X20 radios) Compact and great build quality and yet with excellent ergonomics. The only radio with Crossfire built-in. AliExpress BuddyRC GetFPV GetFPV RMRC Amazon I think the Micro V2 module is more than capable for most people flying freestyle and racing. The built-in screen in the full size module is no big deal as you can change pretty much all the settings in the radio. The additional features of the full size module are not really that useful to be honest for most pilots. The only advantage IMO is having the 2W output power option, and I dont remember a time I need more than 250mW :) TX Antennas Stock Antenna Diamond Antenna (Upgrade) Good enough for most pilots Durable, Cheap Can be used for receiver Slightly more reliable performance Slightly more directional, more range in front of the pilot than behind Durable design for transport Amazon | AliExpress GetFPV | Amazon Receivers Crossfire Micro RX Crossfire Nano RX It uses a JST header for connection Same capability as the Micro RX, but a lot smaller! Connection is solder pads Amazon | GetFPV GetFPV|Amazon | NBD Crossfire Diversity Nano RX Dual antennas allows better range; Additional features to existing RX Amazon | GetFPV | AliExpress RX Antennas Mini Immortal T 2g lighter than Immortal T and much smaller, great for micro drones, but range is largely reduced compared to full size antenna Review (Discontinued) Updating EdgeTX Before we begin setting up Crossfire, its always a good idea to make sure your radios operating system (i.e. OpenTX or EdgeTX) is up to date for bug fixes and improvements. how to update OpenTX how to update EdgeTX Make sure to update SD card content as well as it contains the latest Crossfire LUA script for configuring Crossfire module and receivers. Updating TBS Crossfire Firmware The first thing you should do is toupdate the firmware on your Crossfire TX module for the latest features and bug fixes. Back in the days (before 2020), we had to download and install TBS Agent on our computers, but now we can use a web based tool to do flash firmware on our Crossfire module which is super handy. The online tool is called AgentM, its basically just a website: (Note: it only supports Google Chrome and Microsoft Edge browsers at the moment) Login with the same account that you use on TBSs website, username should be your email address. If you dont have a login, just register on TBSs website ( ). Connect your Crossfire TX module to the computer using a USB cable. No need to power on your radio for this to work, the module gets power from USB. And in Agent M, click link USB device, you will be prompted to connect to TBS Crossfire. Once connected, you will land on a new page where you can configure the Crossfire TX module. To update the firmware, click the Firmware button at the bottom, you should see a list of available firmware. The firmware version you are currently on will be marked with a blue tag Current. The update should only take a minute or two to complete. Every time you update the firmware on your TX module, you also need to update the firmware on your receivers this cannot get any simpler, just power on your radio and your quad, try to bind them again and you should be prompted to update firmware on the receiver (wirelessly). Installing Crossfire TX module in the Radio You can install the Crossfire TX module directly in the external JR module bay on the back of the radio. Insert the module carefully, make sure all the pins go into the sockets of the Crossfire module properly. The Crossfire module is fully compatible with radios with a JR module bay such as the Frsky Taranis X9D+, Jumper T18, T16, the RadioMaster TX16S and Radiomaster Boxer. It also works with Taranis Q X7, and Horus X10S, but there are some minor issues due to these radios inability to operate at full baud rate, causing problems such as constant warning of telemetry lost. There is a DIY mod you can do to fix it, but its quite difficult to do (involves soldering to the main processor) and therefore I dont recommend using these radios with Crossfire. Update: by flashing EdgeTX to these radios, you no longer need to do this hardware mod. Setup Radio to Enable Crossfire TX Module You will have to create a new model in the radio for Crossfire. A simple way is to duplicate an existing model and rename it to Crossfire. If you want to set it up from scratch, here is a tutorial on how to. Short press the Menu button to enter the Model Setup page, scroll down to Internal RF and set mode to OFF. Next set the mode under External RF to CRSF and change Channel Range to CH1-16. Once youve done this and exit this menu, the Crossfire TX module should power up (LED lights up on the back). RX and FC Connection Remember that almost all of the pins on the Crossfire receiver can be mapped in software. This means you can configure them to output whatever you want, andso there are more than 1 way toconnect your RX to the flight controller. The way I show you here is kind of the standard way that most people use, here are the connections: 5V to 5V GND to GND CH1 (Crossfire TX) to UART RX (FC) CH2 (Crossfire RX) to UART TX (FC) You can use any spare UART on the flight controller. Tutorial: How to setup Crossfire to output SBUS instead of CRSF You can also configure Crossfire receiver to output SBUS, this allows you to connect only CH1 to an RX pin on the FC, and leave CH2 unconnected. This is useful if you dont have a TX pin on the FC, but CRSF is a better protocol than SBUS because its faster and also allows telemetry and thats what I would recommend. You must not use Soft Serial for Crossfire receiver because its not fast enough to handle CRSF signal. In this example, I am connecting the Crossfire receiver to the UART 6 of the Kakute F4 AIO V2 FC. Crossfire Micro Receiver: Crossfire Nano Receiver: Binding Crossfire Receiver Crossfire Receiver Binding is very simple (most of the times), you can activate binding mode in the Crossfire LUA script. This LUA script comes with the latest version of EdgeTX and OpenTX, so you DO NOT need to download anything. TBS Crossfire Full Module Installed on the back of the Horus X10 Here are the steps to bind the Crossfire TX module and RX: Power on the RX, it should be flashing green, which indicates its waiting to bind (if its LED stays red, press the bind button on the RX, it should start flashing green) Turn on your radio, long press the System button to go to Radio Setup On the Tools page, select TBS Agent Lite In the next screen, select XF Micro TX (thats your TX module). In the next screen, select the second option Bind. You will be prompted the message Binding, It should only take a few seconds to bind. If the RX has outdated firmware, you will be prompted to update it, which will take a few minutes. Once its done, the receiver will flash green rapidly for a few seconds (loading firmware), then the green lights on both the RX and TX module will become solid. If update got stuck or fail, just try again. When binding is complete the radio will automatically exit binding mode, and the receiver LED should turn from red to green (solid). Hit the exit button on your radio to configure the Crossfire Nano receiver. Configuring RX from Radio Once your receiver is bound, you can now configure both the TBS Crossfire TX module and receiver from your radios Crossfire Configure Tool. If you dont see the option XF Micro/Nano RX, it means your receiver is either not bound or its powered off. The first thing you want to configure would be your receiver output mapping to get it talking to your flight controller. To do this, select XF Nano RX, scroll down to Output Map, and change Output 1 to CRSF TX, Output 2 to CRSF RX.Thats it :) Now you can configure the TX module. Region Leaving the Region setting to Open will allow maximum output power regardless which frequency you select. Credit: Crossfire Manual Frequency Its important to make sure you are using the correct frequency depends on where you fly. You have two options, 868MHz and 915MHz, one of these frequency will be used by the cellular system, which you should avoid otherwise you will get interference from cellular system, causing dropouts and failsafe. According to the Crossfire manual, the Blue and Purple regions should be using 915MHz while the Yellow region should be using 868MHz. For example, US should be using 915MHz while Europe should be using 868MHz. Credit: Crossfire Manual Here are the different frequency options. Only use the Race frequencies if you are actually racing as they sacrifice range for bandwidth for more consistent data packets. LBT means listen before talk. Region and frequency are not available for Tracer as its on 2.4GHz which the same frequency band worldwide. Max Power Higher output power means more range, but you dont always want to run at max output power. Firstly, higher output power drains the battery faster. Secondly if you fly with other people (especially if you are all using Crossfire or other 900MHz systems), it can interfere with other pilots and cause signal dropouts and failsafe if all are using max output power. For short distance (such as racing), its probably a good idea to use 25mW. For a typical FPV drone setup, setting power to around 250mW is adequate in most situations, which can give you miles of range in line of sight. Dyn. Power The dynamic output power option can help mitigate some of the problems mentioned with maximum output power. It dynamically adjusts the output power depending on signal strength. Beware that as soon as you unplug the quad, the transmitter will automatically go to maximum output power, which is not a good idea when you fly with other people who are also using Crossfire. In Tracer, you have 25mW, 100mW and Ludicrous which is about 1W. Because Tracer doesnt have as much range as Crossfire most people would just run Ludicrous with Dynamic power enabled so it brings the power down when you are flying nearby. Receiver Mode Theres one more settings you want to change, which is Mode in Receiver settings. You can only access receiver option when you have your receiver bound to the transmitter and powered on. These options are saved per receiver, so you have to set these for every quad you have. Mode is the number of channels you want to use, you have two options, 8 Ch and 12 Ch. Just select 12 channels. You will get four more channels to use. Maybe you dont need them, but 8Ch mode and 12Ch modes have basically no difference in terms of performance, the extra 4 channels will come in handy when you need them. However for fixed wings if you want all channels to have full resolution, you should leave it at 8Ch instead. But for multirotor its fine to use 12ch. Make sure telemetry is on, and set Failsafe to Cut so that the motors stop spinning in the event of signal loss, and your quad will drop out of the sky to minimize damage. RF Profile You can select which packet rate you want to run, options are 50Hz, 150Hz or Dynamic. It depends on if you want lower latency or long distance. 50Hz will have higher latency but gives you way more range because it has higher receiver sensitivity and also uses LORA modulation while 150Hz has lower latency but less range. You can set it to dynamic, it will shift to the lower latency as your signal gets weaker. However Betaflight devs actually dont recommend using Dynamic due to RC signal smoothing in the FC firmware which is tied to a fixed packet rate value, it wont work properly with dynamically changing packet rate. If you fly long range, lock it to 50Hz, if you do racing or just in close range, 150Hz should be fine. Configure Betaflight for Crossfire The last step in our software setup is enabling Crossfire protocol in Betaflight. Go to the Ports tab in the Betaflight configurator, and enable Serial RX in the UART youve connected to the TBS Crossfire receiver. Press Save. Now go to the Receiver tab, under the Receiver Section, select Serial (via UART), and select CRSF in the second option.Dont forget to enable Telemetry as well before pressing Save. Thats it, you have successfully setup Crossfire in Betaflight :) Go back to the Receiver tab, you should now see response from stick movement. This means your receiver is working! If the channels are in the wrong order, just try a different Channel Map. Check if end points (1000 and 2000) and mid points (1500) are correct, see this guide how to adjust if they arent correct. No stick movement? Try this command in CLI: set serialrx_inverted = OFF If you are still not getting any stick response, go back and check your wiring, Output Map setting in the receiver, and Betaflight configurations. Still nothing? Get some help over at IntoFPV.com! Telemetry To make sure Telemetry is working correctly, go to the Telemetry page in the radio, and select the option Discover new sensors, it should begin to pick up data from the flight controller including RxBt (drone battery voltage). Here is a list of available Crossfire Telemetry data, and what each means. To name a few frequently used ones: RxBt = Battery voltage, RQly = Link Quality, RFMD = Update Rate. Mounting Crossfire Receiver Antenna If you have been using other radio systems, the first problem you are going to run into is mounting the unusually large receiver antenna. Learn about the different ways of mounting Crossfire antenna and their effects. LQ and RSSI LQ and RSSI are the two measurements of how good your radio signal is.I have a detail tutorial explaining how to read LQ and RSSI in Crossfire. In this tutorial I will also explain how to display them on your Betaflight OSD, and setup voice warning in your radio. How many people can fly on Crossfire? According to TBS, theoretically, up to 50 people can fly at the same time using Crossfire. Real life tests have shown when 12 people are flying at the same time, radio link quality becomes noticeably worse but still flyable, so TBS dont recommend any more than that flying at the same time :) Edit History Mar 2018 Guide created Jan 2019 Updated product links and setup detail Dec 2019 Added screenshots for Jumper T16 Jun 2020 Updated Agent X new version, Crossfire LUA script changed to Tools in OpenTX, added Micro TX V2 Feb 2023 Updated instructions and product links 0 ratings0% found this document useful (0 votes)2K viewsThe document provides a quickstart guide for the TBS CROSSFIRE Diversity Nano RX, a compact diversity receiver measuring 24 x 18 mm. It retains the key features of TBS's CROSSFIRE receiver sAI-enhanced title and descriptionSaveSave tbs-crossfire-diversity-nano-quickstart For Later0%0% found this document useful, undefined If you want to fly longer range with Crossfire then the TBS Crossfire Nano Diversity is likely to be the most ideal choice of receiver. The setup is similar to that of the TBS Nano receiver, however there are a few extra things to consider due to the additional features that come with Team Black Sheeps diversity offering. If you are using TBS Nano Receiver, check out this guide instead. The TBS Nano Diversity is a fully featured TBS Diversity receiver, including the ability to make use of a backup battery in the event of battery ejection. Awesome! If you are just looking for a quick reference wiring diagram / pinout to aid you with a build, check out the wiring overview. This guide aims to help you understand some of the many various configuration options available for the TBS Nano Diversity receiver. You will need a TBS Nano Diversity receiver and one of the compatible Crossfire transmitter modules. We will assume that if you are reading this, you are likely already using TBS Crossfire and have a good understand about what it is. Whether you are new to the TBS Crossfire ecosphere or you already have a good understanding, there is somegood information hereworth checking out too! The following reference diagrams are for the TBS Nano Diversity receiver and aim to provide a clear reference to assist in your build. You can also consult the TBS Crossfire manual and TBS Nano Diversity quickstart guide for further information. The following diagram shows the pinout for the TBS Nano Diversity. It shows the available functions for each pin. This diagram is designed to be used as an easy reference when wiring the receiver. Some functions are duplicated and in these cases you can choose whatever pin you prefer to use. The following table shows the various functions that are available for each channel on the TBS Nano Diversity receiver. In order to choose the function that you want to operate on a particular pin, use the channel mapping menu accessible from your TBS Crossfire transmitter module (either Lua script or OLED display on the full sized Crossfire). You can sort the table by clicking the column headers. For example if you wish to connect CRSF Tx, simply click the header to sort the table and show all suitable pins at the top. You can also scroll the table left and right to reveal all of the functions. The table shows which functions are compatible with each pin. ReceiverPinPWMPPMCRSFRxCRSFTxSerialRxSerialTxSBUSinv.SBUSn.inv.MAVLinkRxMAVLinkTxRSSILQRSSI/LQSerialRTSDSMXSmartAudio Ch. 1 Ch. 2 Ch. 3 Ch. 4 Ch. 5 Ch. 6 Ch. 7 Ch. 8 The following diagram shows typical wiring between TBS Nano Diversity Rx, a flight controller and TBS Pro Nano video transmitter. If you are planning to use a TBS video transmitter (VTx), such as the Unify Pro Nano shown in the diagram, you have two options for wiring: CRSF Tx and CRSF Rx from the VTx can be wired to a spare UART (serial port) on the flight controller. This allows data to be passed between the Unify and Crossfire system via the flight controller. CRSF Tx and CRSF Rx can be wired directly to an additional UART on the TBS Nano Diversity receiver for direct communication between the receiver and the VTx (shown above with the dotted line). When your TBS gear onboard the drone is connected using the CRSF, it allows for some awesome additional functionality. For example, if you are using TBS Fusion as your video receiver (VRx) then it is possible to use CRSF to synchronize the video settings automatically between the VTx and VRx. Unlike the smaller TBS Nano receiver, the TBS Nano Diversity receiver can be connected to a backup battery. There is a special pin for connecting the battery and TBS Nano Diversity will automatically charge the backup battery from the main pack when connected. If the TBS Nano Diversity is connected to a backup battery it will remain switched on in the event of losing power after a crash, such as if the main battery is ejected. This allows the TBS Nano Diversity receiver to function as a beacon in order to aid recovery of the drone. TBS Nano Diversity receiver can also reconnect to the TBS Crossfire transmitter and send crash site GPS coordinates. If the telemetry connection was lost before the crash, for example as you came down behind a mountain, the GPS coordinates that you have may not be accurate. However if you travel to this position it is a lot more likely that your Crossfire system will be able to establish a connection and provide your transmitter module with an updated set of GPS coordinates of the actual crash site. Crossfire will perform these crucial functions with or without a backup battery and with any of the available receiver modules. There are some limitation as to what battery can be used for the backup battery. The TBS Nano Diversity does not have the ability to prevent over discharge. Therefore it is important that the backup battery pin must be connected to a 1S Lipo battery which features a built in battery management system (BMS). This type of 1S Lipo is readily available and is often used in small rechargeable electronic devices. TBS Nano Diversity will automatically charge the backup battery when powered from the main battery. This is a very cool feature to have for those wanting to fly longer range and in general when there is a greater risk of loss. Another primary feature of the Nano Diversity receiver when compared with the standard nano receiver is the inclusion of a second radio chip. Unlike the standard Nano receiver which has a single radio chip connected to its onboard microcontroller, the Nano Diversity actually has two radio transceiver chips. This allows us to connect two different antenna to the receiver, one to each of the onboard radio chips. This gives the Diversity Nano receiver the ability to communicate with the Crossfire transmitter on the ground using either of its antenna. Antenna diversity is not just used in FPV, it can be found in many different areas that utilize radio communications. Check out this Wikipedia article for a little further information if you are interested. Having the option to use two antenna on our quad allows us to overcome some of the shortcomings of a single antenna solution. There are two approaches that I see being used for FPV drones, each giving a slightly different benefit. Antennas mounted on FPV drones are always omni-directional so that the signal is received as evenly as possible no matter the orientation of the drone. However in practice an omni-directional antenna does not receive or transmit a signal in a completely even sphere. Its pattern of sensitivity is more of a donut around its axis with a dead spot above and below it. This means that as you bank your drone over, the moment the antenna is pointing directly at your radio it will lose signal if you are a certain distance away. Polarisation diversity involves taking two antennas and mounting them orthogonally so that the dead spot of one antenna is covered by the coverage of the other and vice versa. When using TBS Diversity Nano with two orthogonally positioned antenna, if you bank over so that the dead spot of one antenna is pointing at your radio, the other antenna at 90 degrees will have a good connection. In this case the receiver will automatically switch to the best antenna RSSI and the connection will not be lost. This type of antenna placement would be well suited to longer range freestyle type builds. Anyone wishing to perform freestyle maneuvers at distance or with poor line of sight could consider mounting two Immortal-T antenna orthogonally. Another type of problem that can occur with FPV radio links is the drone itself causing a loss of line of sight. This can be more of a problem for larger drones. If your drone banks over and the actual chassis of the drone blocks line of sight to the radio, it can cause loss of radio link. Like with the problem of polarisation, the problem of black spotting can become more pronounced at a greater range. Mounting a pair of matching antenna on opposing sides of the drone, such as at the very front and back, means that black spots from the chassis itself can be eliminated. Ultra long range builds using 7-inch frames or larger will benefit from a BardPole in the same polarization mounted to the front and back of the drone. This will ensure a rock solid link whether travelling towards or away from oneself. Orthogonal placement maybe not so much a concern in this case as those looking to prioritise range are not likely to fly in a straight line and wont be performing so many acrobatic maneuvers. Update your Crossfire Transmitter to V2.88 or above before binding! Yet again TBS is redefining long range flying! With the TBS Crossfire Diversity Nano RX we have taken the most powerful Crossfire receiver. Presenting the smallest full-fledged diversity receiver of any frequency, even boasting a power-redundancy circuit (battery not included!) True Diversity, Full range The TBS CROSSFIRE Diversity Nano Receiver is a compact R/C receiver with 8ch outputs (PPM, SBUS, and CRSF capable), with best-in-industry noise-rejection and record-breaking range capability. It is the only receiver to provide a true dual-input stage, chip-based diversity, with the usual filtering and noise rejection from onboard video systems. Beacon Mode Ever lost a plane and spent hours looking for it? Enter the TBS CROSSFIRE beacon mode. The diversity nano receiver comes with a LiPo battery port where you can connect an optional backup port (1s). It will keep the receiver running for a full day after all onboard electronics are gone. It will be screaming for help by giving you its GPS coordinates, and also blasting out RF beacon signals that will allow you to pinpoint its location even if no GPS was ever on your airplane. The backup battery (1s) will also be charged as soon as you apply power to the rig. Specifications Weight 1.8g (receiver only) Size 24mm x 18mm Requires Firmware V2.87 Input Power +3.3V to 8.4V Includes 1x TBS Crossfire Diversity Nano Receiver 2x TBS Crossfire Micro Receiver Antenna 1x Spare shrink tube 14x 30awg silicon connection wires Downloads

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