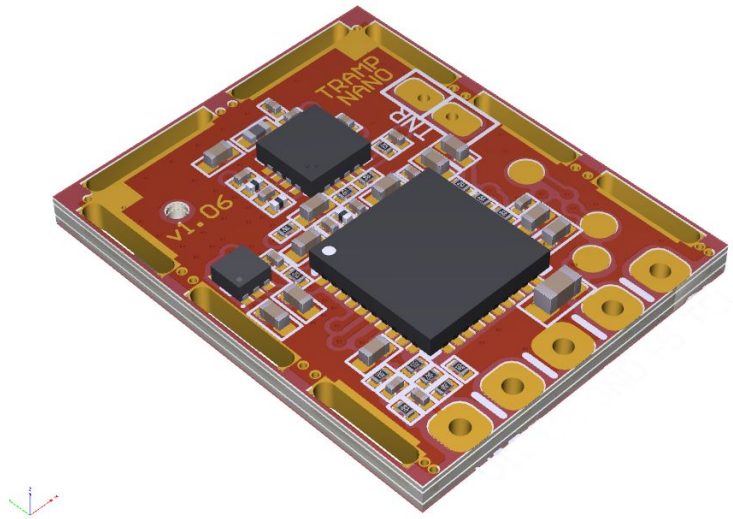
Tramp Nano

5.8 GHz Video Transmitter

Preliminary Operator's Manual

International edition, Rev 0.9 - April 2020



Specifications

RF Output	
Antenna Impedance	50 Ohms
Antenna Connector	Surface Mounted U.FL, with replaceable U.FL to SMA pigtail
Power Output	Linearly adjustable, ~1mW to > ~500mW [2] [3]
Channels	40 standard, arbitrary using Race Wand
Pit Frequency	User/Race Organizer Definable
Channel Change Glitching	Eliminated using Auto-Glitch technology
Mechanical	
Dimensions	L=18mm x W = 13mm x H = 3.3mm
Weight	1.01g (Tx only without SMA pigtail)
Audio/Video	
Connector	Soldered or pin headers
Pinout	Video, +5V Out, Gnd, +5V In, Telemetry
Modulation	FM, Video
Audio	None (no subcarrier transmitted, improving adjacent channel rejection)
TNR (Touch'n'Race)	
Connector	Two solder pads, TNR chip on-board, external antenna
Telemetry	
Standard	Tramp Telemetry, 3.3V logic levels, 9600 baud,1 stop, no parity, idle high
Power	
Voltage	5V
Power Consumption	25mW: 0.2A @ 5V, 100mW: 0.3A @ 5V, 500mW: 0.6A @ 5V
Environmental	
Storage Temperature	TBD
Operating Temperature	TBD

[2] Power limited by Tx temperature to extend transmitter lifetime. A hot transmitter (no airflow) will reduce power until a safe temperature is reached.
[3] Power output calibrated for 5V operation.

Introduction

The original Tramp HV was released in 2016, and pushed the boundaries of what was possible with an Analog 5.8GHz FPV Transmitter.

The Tramp Nano is the smaller cousin, more suited to today's lightweight models.

Control via Betaflight telemetry (Tramp Mode), button, or Touch'n'Race wand.

Specced as a **500mW** transmitter, in practice with sufficient airflow most Tramp nano can easily run at over **700mW**, especially on the lower channels.

Touch'N'Race (TNR)

When arriving at a race event using ImmersionRC TNR Technology, a pilot's quad is placed in 'Race Mode' during pilot registration. This is achieved without powering up the quad, and without any physical connection, using a TNR Wand.

When in Race Mode (identified by a blink code on the internal RGB LED), the transmitter will not transmit unless requested by the race director's TNR Wand. This typically happens during preparation for a race, while the previous heat is running.

Quads are 'wanded' safely while their batteries are disconnected, and assigned their race band, channel, and transmitter power level. When powered up, the quads will transmit on this assigned channel until the battery is disconnected, at which point they will return to the race-director assigned mode.

A race organizer may choose to allow quads which are not racing to transmit a very low power level on a 'Pit Frequency' to allow quads to be set up, and debugged, without interrupting a race. This pit frequency is defined by the race organizer to comply with local regulations.

This Pit Mode also allows quads powered up for equipment inspection to transmit an image.

Note that when leaving a race event, be sure to 'De-Wand' to place the transmitter back in normal operating mode. If you leave an event without De-Wanding, check the 'Emergency Unlock' procedure later in this document.

Best Practices

Connectors and Cables

The trend to miniaturize FPV video transmitters, and dramatically decrease weight requires the use of smaller, and therefore more fragile connectors than used on 'legacy' transmitters.

Be careful with the tiny U.FL RF connector, especially when using the locking U.FL to SMA plug.
Pull mating plugs vertically off of the board, and avoid sideways movement.
Try to use strain-relief on U.FL antennas, so that in a crash an antenna cannot rip off of the quad, and take the U.FL connector with it.

The transmitter may safely be stuck to the inside of a carbon fibre frame using double-sided foam tape.

Try to avoid sharp bends in the tiny RF cable, which will reduce power output levels.

Powering the Tramp Nano

The Tramp Nano is designed to run from a regulated 5V supply, as is available on most modern flight controllers or PDBs. DO NOT run the Tramp Nano directly from Lipo voltage.

While not recommended, It does function down to approx 3V, enabling use on 1s micro platforms. At lower voltage, power output will be lower than the normally calibrated value.

Airflow

Even though the Tramp is equipped with a thermal protection system, it is recommended to ensure a good amount of airflow around it. Encasing the Tramp (or any other high-power electronic device) in foam (or similar) with no airflow is not recommended, and may result in premature failure.

The Tramp Nano will intelligently reduce output power levels if the board temperature heats beyond preset limits.

Several steps are used, starting with the least aggressive (25% reduction in output power), until the board temperature is safe, and sustainable.

TNR Board

The TNR board must be placed on your quad so that it is accessible by the race marshal. If you have a flat carbon fibre top plate (which is the case for 99% of the quads out there), you may stick it to that plate with some double-sided tape. Use the thicker ~1mm thick foam tape instead of the very thin 'carpet tape' to ensure that the close proximity of the frame doesn't affect the TNR range.

Note that the smaller NFC tags are a little less sensitive than the original Tramp HV tags, and may struggle to be read by some Android smartphones. The IRC Wand will however read them normally.

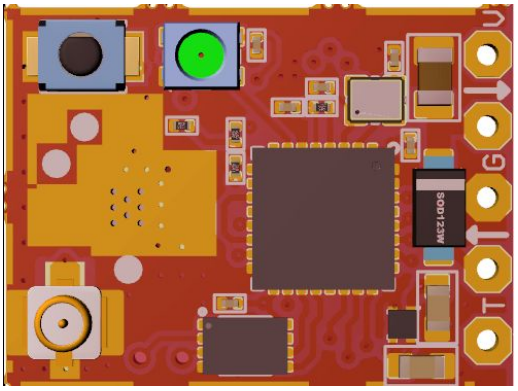
Antenna Compatibility

The pigtail supplied with the Tramp sports a standard SMA connector, NOT a RP-SMA which is used by some other manufacturers.

If a RP-SMA connector is screwed onto a standard SMA, it will appear to be connected, but will actually be open-circuit, potentially damaging the Tx.

Ensure that one of the connectors has a pin, and the other has a hole to receive the pin. If both have a hole (or both have a pin) then they are not compatible.

Pinout



Video

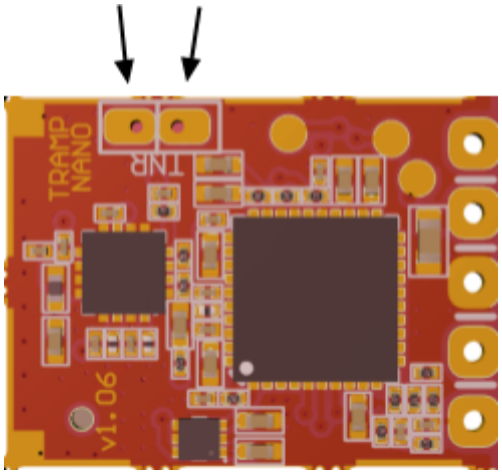
+5V Out

Gnd

+5V In

Telemetry In/Out

TNR connections are solder pads on the bottom of the board. Only needed if TNR functionality is required. Simply wire two thin wires between the TNR pad and the



Telemetry

The Tramp Nano supports standard Tramp telemetry commands, as supported by the Tramp HV.

3.3V logic is required, 5V logic is not supported on this telemetry pin (5V logic is hard to find these days, so shouldn't be a concern).

Interesting side-note… numerous non-IRC transmitters use the Tramp protocol. Total number of manufacturers who asked permission, or the full specs… ZERO. Good job that kind of thing doesn't upset us :-)

Another interesting side-note, the Tramp Nano uses the same crystal-controlled UART as the Tramp HV, ensuring that baud rate stays the same even when transmitters are toasty-hot. Other transmitters on the market don't seem to understand this….

User Interface

Button/LED

Startup LED Behavior

The RGB LED indicates the state of the transmitter shortly after powerup.

Steady Green means that the transmitter is currently transmitting in 'Normal Mode', and will behave much like any other FPV Transmitter.

Flashing Blue means that the transmitter is in Race Mode, and is either not transmitting, or transmitting low-power on a pre-configured Pit Frequency.

Flashing Magenta means that the transmitter is in Race Mode, and is currently transmitting on its assigned Race Frequency.

Setting Channel/Band/Power using the button

First, a disclaimer, this transmitter was not designed to use the button as the primary user-interface. The TNR Wand is by far the easiest way to configure the transmitter, and provides both feedback of which channel a transmitter is on before it is powered up, and define the current band/channel, and power level.
The UART based 'Tramp' Telemetry control interface is also a preferred user interface.

Three 'Menu Options' are available using the button and LED, shown in the flowchart below.

NOTE: When in Race Mode, under the control of the race director, the button will have no effect, other than the unlock procedure below.

Another NOTE: When a flight controller is controlling the Tramp using telemetry, the button is also locked out (for obvious reasons)

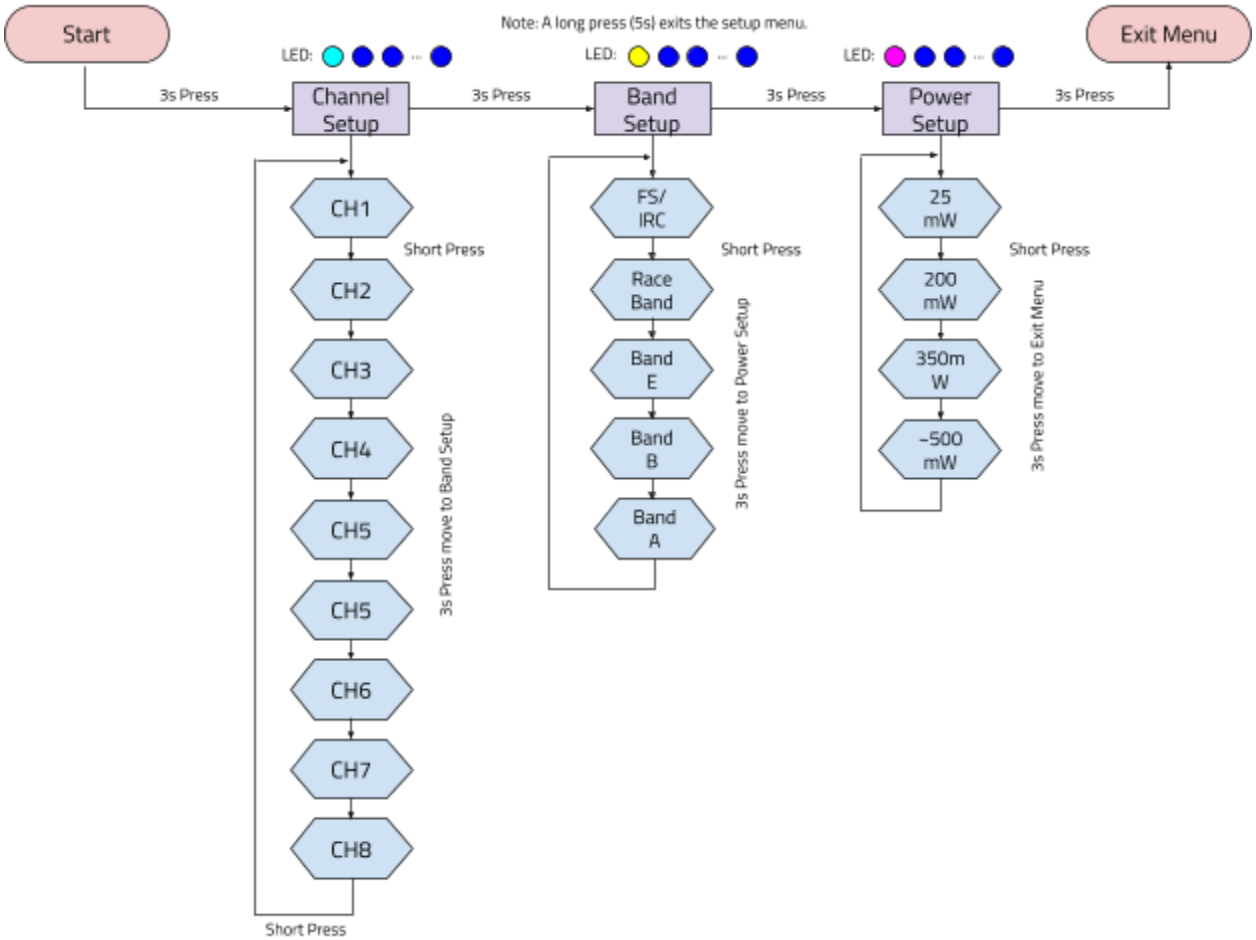
Emergency Unlock procedure (leaving Race Mode after an event)

If the Tramp was not removed from Race Mode after an event, a simple procedure may be followed to manually unlock it.

Press the button on the side of the tramp before applying power, apply power, and hold the button for 10 seconds until the LED is lit.

(Yes, we know this is tedious, but it is this way to reduce the probability of accidentally leaving race mode at an event)

Button/UI Menu



Bands, Channels, and Frequencies

Depending upon the Tramp variant purchased, the power output level, and available transmit frequencies can vary.

It is highly recommended to understand the rules and regulations in your country before using the Tramp. Transmitting outside a legal band is something frowned upon by the authorities, and may result in a fine, or confiscation of equipment.

As a rule of thumb, the following charts should help understand which frequencies are legal in each of our main markets.

International Version

	1	2	3	4	5	6	7	8	
1	5740	5760	5780	5800	5820	5840	5860	5880	IRC/FS
2	5658	5695	5732	5769	5806	5843	5880	5917	RaceBand
3	5705	5685	5665	5645	5885	5905	5925	5945	Band E
4	5733	5752	5771	5790	5809	5828	5847	5866	Band B
5	5865	5845	5825	5805	5785	5765	5745	5725	Band A

ITU Region 2: The Americas

	1	2	3	4	5	6	7	8	
1	5740	5760	5780	5800	5820	5840	5860	5880	IRC/FS
2	5658	5695	5732	5769	5806	5843	5880	5917	RaceBand
3	5705	5685	5665	5645	5885	5905	5925	5945	Band E
4	5733	5752	5771	5790	5809	5828	5847	5866	Band B
5	5865	5845	5825	5805	5785	5765	5745	5725	Band A

ITU Region 1: Europe

	1	2	3	4	5	6	7	8	
1	5740	5760	5780	5800	5820	5840	5860	5880	IRC/FS
2	5658	5695	5732	5769	5806	5843	5880	5917	RaceBand
3	5705	5685	5665	5645	5885	5905	5925	5945	Band E
4	5733	5752	5771	5790	5809	5828	5847	5866	Band B
5	5865	5845	5825	5805	5785	5765	5745	5725	Band A

Thermal Regulation

This is an area where the Tramp differs from most 5.8GHz video transmitters on the market. Transmitters of this size and weight class, which shed the traditional heat-sinks used to keep electronics cool, need to protect themselves against overheating by being a little smarter.

The Tramp continuously monitors the internal temperature, and regulates the power output in several steps until the temperature is within safe limits.

This practice ensures that the components used in the transmitter are not used outside of their maximum operating conditions, and will eliminate premature failures.

When in a reduced power output mode, as soon as airflow is present, the transmitter will quickly increase power output to requested levels.

When is this useful? Imagine a quad sat on the starting grid of a race for several minutes, as other pilots get ready, props stationary.
The Tramp HV will lower its power output until a safe level is reached. As soon as the quad takes off, the airflow from the props will quickly cool the transmitter, and increase power output before the quad reaches a distance from the pilot where full power is required.

Note that as with any high-power video transmitter, ensure that adequate airflow is available when a model (whether it be a wing, or a quad) is in normal flight.

Tramp Nano RGB LED Interpretation

The Tramp Nano is equipped with an RGB LED which shows the status of the transmitter at all times.

LED Sequence	Meaning	Transmitter Active
	Normal Mode, Transmitter Active	Yes
	Normal Mode, Telemetry Packets received (blue blinks)	Yes
	Pit Mode	Yes (low power)
	Race Locked (Transmitter Not Active)	No
	Race Locked, Transmitter Active (until next power cycle)	Yes (race freq)
	Channel Setup Mode, blue flash count = channel number	-
	Band Setup Mode, blue flash count = band setting	-
	Power Setup Mode, blue flash count = power setting	-

Revision History

V1.28.2

- First Version for Nano Tramp