Nano flight mode

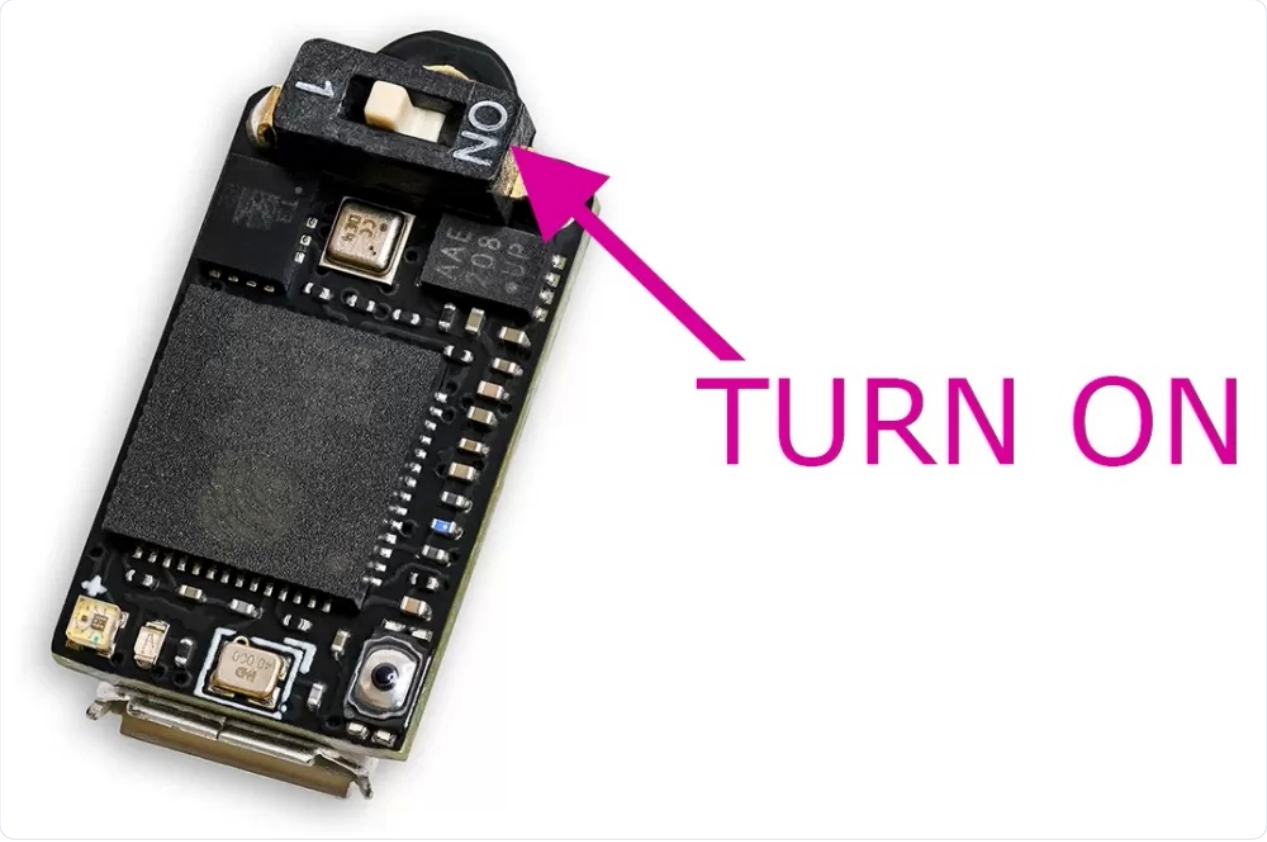
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Flight mode is how the Nano spends its time at the launch site: waiting on the pad, detecting the launch, recording the flight and saving the log afterwards. There is nothing to select. Switch the Nano on without a USB cable and it goes into flight mode.

THE SHORT VERSION

With the default settings, switch the Nano on, wait until it is flashing green, then put it in your rocket and fly. It will record the flight as long as your rocket goes above around 35 m.

The rest of this page explains in more detail how it all works and what the status LED means.



	Flight mode	USB mode
How	Switched on with no USB cable	USB cable connected
LED	Amber, then green blips	Slow blue breathing
Launch detection	Live once green	Never
USB drive	No	Yes

Plugging in a USB cable restarts the Nano into USB mode, and unplugging it restarts it into flight mode.

Switching on

When you switch it on, you will see in order:

LED	What it means
Dim white, yellow, blue, green, magenta (with a brief red), then orange	Start-up checks. The brief red is normal, and the orange stage is the longest
Red and orange alternating	Battery under about 3.70 V. Start-up carries on, but charge it before flying if you can
Pink, then the saving pattern	Only if a flight was never saved, for example after a power loss. It is rebuilt and saved, then the Nano restarts
Bright blue	Start-up complete
Pink, purple and blue sweep	A setting differs from its default
Red, then white lead-ins with coloured blinks	The last flight number, then its apogee (see altitude blinking)
Dark	Measuring the air pressure to set the pad altitude
Amber blips	On the pad and getting ready (next section)

A solid red that never moves on means the Nano couldn't start up properly. Switch it off and on again; a one-off glitch usually clears on a restart. If it keeps happening, please get in touch with support.

RED AND BLUE ALTERNATING

If the LED alternates red and blue continuously, the Nano has found a problem with its storage and stopped on purpose, so nothing more is written to it. Your logs can still be read off with the flash dump tool on the log recovery page. Once you have them, hold the button for 9 seconds to erase the storage and start again.

On the pad

LED	What it means
Amber blip every 2 seconds	Getting ready. No launch can be detected yet
Green blip every 4 seconds	Ready for launch (empty device)
Three green blips every 4 seconds	Ready for launch (flights already stored)
Dim red glow between the blips	Start-up lock is holding. Launch detection starts once the glow stops
Short blue flash after the blip	Battery 3.68 to 3.74 V
Short orange flash after the blip	Battery 3.60 to 3.68 V
Short red flash after the blip	Battery under 3.60 V. Charge before flying

No battery flash means the battery is above 3.74 V.

While it is amber, the Nano is learning the pad altitude, waiting for the readings to settle and filling its record of the last few seconds on the pad. It stays amber a little longer if the rocket is being moved around; on a windy pad that never settles, it turns green anyway after a while. If it never turns green, the barometer couldn't give it a pad altitude, so restart it.

Once it is green there's no rush: on a full charge the Nano waits on the pad for just under 5 hours. While it waits it follows slow changes in air pressure, such as the weather drifting or carrying the rocket uphill, but ignores sudden

steps such as fitting a nose cone, closing a bay or a gust of wind. Once the pad has been calm for a while it drops to a lower power rate (see emode), and any movement puts it straight back to full rate.

While the rocket sits still on the pad, the Nano fine-tunes the gyro's calibration, which improves the tilt and angle figures. This only needs about a minute of the rocket being still. With `orientation` set to 9 (auto) it also works out how it is mounted, and locks that in at launch.

A short press of the button (under 2 seconds) plays the last flight number and apogee, and launch detection pauses while it plays. If no flight is stored, it gives one short purple blink.

Detecting the launch

Once the Nano is green and any start-up lock has passed, it confirms a launch in one of two ways:

1. **With thrust.** The altitude above the launch detect height (30 m by default) for 1 second, together with sustained thrust along the rocket's axis above the `launch_protection` setting, confirms the launch. The thrust has to still be going at that moment, and a knock, a drop or a sideways jolt doesn't count.

2. **On height alone.** The altitude above the launch detect height on its own for 2.5 seconds confirms the launch. This is used if the motor has already burnt out by then, which is usual for short motors, or if the thrust check is turned off.

Either way the log starts several seconds before the moment the launch was recognised, so nothing of the lift-off is lost. Lift-off time is found by looking back to where the climb began, and the launch and rail angles are taken from the pad readings just before it. The flight info page shows which way the launch was confirmed.

False trigger	What stops it
Handling, knocks or a drop	The thrust must be sustained, along the rocket's axis, and backed by a real climb
Wind, a gust, fitting the nose cone or closing a bay	The pad altitude ignores sudden pressure steps, and the height has to be held, not just touched
Switching on	A short warm-up after every start, plus `startup_lock` if you set it
Carrying the rocket uphill	The pad altitude follows slow changes
A USB cable connected	No launch is ever detected on USB

Set the launch detect height to suit your flight. As a rough guide, use about a quarter of your expected apogee, so around 50 m for a 200 m flight. We wouldn't go below 25 m, so handling on the pad and changing weather can't trip it, or above 100 m, so it still catches a lower flight in good time. The setting and its range are on the settings page.

Recording

The LED blips purple every 4 seconds while the Nano records, with the battery colour after it if the battery is getting low. The flight is held in the Nano's memory and nothing is written to the drive until the save, but a backup copy is kept in a separate area in case the power is lost.

By default recording stops once the altitude has been steady for 8 seconds after landing. It also stops if the log fills or the battery runs low, and everything recorded so far is saved. Burnout, ejection, landing and any extra stages are worked out afterwards from the whole recording.

There is no LED signal at apogee or landing, and the Nano never shuts down for temperature in flight mode, so an ejection charge warming the board can't stop a flight.

Saving the flight

When recording stops the LED turns pink and the save begins. It can take up to about 2.5 minutes for a long log at 833 Hz, and longer on a low battery, so leave it switched on until it has finished.

LED	What it means
Pink	The save has started
Red, green, then white	Combining the barometer and motion sensor data (TrueFuse)
Red, green, then orange	Removing spikes and smoothing the altitude (TruePath)
Red, green, then blue	Writing and signing the log and its flight info page
Solid blue, then 20 fast white flashes	Saved and checked

If the drive is short of space, the oldest logs are removed first. After writing, the Nano reads the log back to check it. If you don't see the white flashes, the check failed: the backup copy is kept and the save is tried again at the next power-on.

If the power is lost before the save finishes, the next power-on rebuilds the flight from the backup copy at a lower resolution, saves it as a normal log marked Recovered, and restarts. It is signed like any other log, so it can still be verified as genuine. There is more on the processing on the TrueFuse, TruePath and apogee page.

After the flight

By default the Nano gives a short red flash and goes to sleep once the flight is saved. Give it a firm shake for a second or two and it blinks the flight number and apogee, so you can read the result before you open the rocket; each shake gives one readout. Press the button or plug in USB to wake it fully. On a low battery it sleeps without watching for a shake, so only the button or USB will wake it.

The `maintain_power` setting can make it blink the apogee instead. For reading the blinks see altitude blinking, and for everything once the rocket is back in your hands see after landing.