

Turbo Mode Howto

“When to use it and when you may not need to”

To date, including the release of version 1.5, all hamvoip Raspberry Pi images have run the Pi in the “ondemand” mode with a minimum speed of 600 MHz. and a maximum speed of 1200 MHz. What this means is that when the processor needs more “steam” it doubles the processor speed and then after that necessity subsides it settles back down to the slower speed. This is fine in most situations because the processor rarely if ever ramps up to the higher speed. However if you are more heavily loading your Pi such as using it in a hub situation with many connected nodes or you have many physical radio nodes or you just have some process running that takes a lot of CPU this change of speed can cause rather severe audio disruptions on your Allstar nodes. The speed change can be rather fast and actually add a “modulation” of dropouts to the audio. It has been our experience that this problem is rarely the case in most single node simplex nodes using simpleusb but has happened in more heavily loaded nodes.

If you experience these effects and it is not due to an Internet issue then it might be a good idea to try the turbo mode but if you do decide to use it there are some cautions you must follow.

DO NOT run turbo mode unless you have a heatsink on the CPU. Many Pi's come in packages with them installed but if not they are easily purchasable on the web. They have a thermal conducting double sided sticky tape that attaches it to the chip. Kits often include a heatsink for the smaller LAN/USB chip also. As an added safety measure I use a small fan blowing on the heatsink. Fans can be run at reduced speed using a small value resistor, typically 10-50 ohms for a 12V fan. Very little air has to move over the heatsink. Beware that most RPi cases have inadequate ventilation with no louvers in the covers. Either leave the cover off or cut a hole for ventilation. I cut a hole and use a small fan blowing down on the heatsink. CPU temperature is also greatly effected by the ambient temperature.

Most of us run these in “human” environments but if you have it somewhere that gets really hot you need to keep an eye on the temperature. The `cpu_stats.sh` script shows the core CPU temperature and allows you to view it from anywhere via an ssh login. The script lists the temperature in both Celsius and Fahrenheit. The CPU temperature should not go above about 60C in normal conditions. While it can run up to about 80C excessive heat can cause premature failure and in general is not a good thing. CPU temperature is based on processor speed and also loading so unless you are heavily loading the system it should not get to elevated levels. I run a heavily loaded hub in turbo mode at 1200 MHz. in ambient 72 degrees with a heatsink and a fan and it never goes above about 40C.

The turbo mode can be turned on or off using the `cpu_turbo.sh` script which will install automatically in version 1.5 code if you have updated.

To turn on Turbo Mode - **`cpu_turbo.sh on`**

To turn off Turbo Mode - **`cpu_turbo.sh off`**

Changes take effect on the next reboot.

Here is what the cpu stats output looks like:

Current CPU stats

```
cpuinfo_cur_freq = 600 MHz.  
cpuinfo_max_freq = 1200 MHz.  
cpuinfo_min_freq = 600 MHz.  
cpuinfo_transition_latency = 355000  
cpu frequency ondemand up threshold = 95  
cpu frequency scaling governor = ondemand  
Current CPU Temperature = 38C / 100F  
Core volt=1.2000V  
sdram core volt=1.2000V  
sdram I/O volt=1.2000V  
sdram PHY volt=1.2250V  
BogoMIPS : 38.40 X 4 CORES
```

This shows a system that is not running in turbo mode with heatsinks in ambient air of 72 degrees.

Current CPU stats

```
cpuinfo_cur_freq = 1200 MHz.  
cpuinfo_max_freq = 1200 MHz.  
cpuinfo_min_freq = 1200 MHz.  
cpuinfo_transition_latency = 355000  
cpu frequency ondemand up threshold = 95  
cpu frequency scaling governor = ondemand  
Current CPU Temperature = 40C / 104F  
Core volt=1.2688V  
sdram core volt=1.2000V  
sdram I/O volt=1.2000V  
sdram PHY volt=1.2250V  
BogoMIPS : 38.40 X 4 CORES
```

This is a system running in turbo mode with heatsinks and a fan in ambient air of 72 degrees.

If the CPU temperature was greater than 51C the temperature display would be in **yellow**. Above 61C it would be in **red**.

You can also access the CPU stats via the web in the same way you access lsnodes, allmon2, or supermon. This can also be added as a link to supermon. Using your servers IP address or domain name and port if other than 80 you would enter:

192.168.1.100/cgi-bin/web_cpu_stats

Reasons to use or not use Turbo Mode

If you are using a single simplex node you probably do not need Turbo Mode. That being said you can certainly use it given the above precautions.

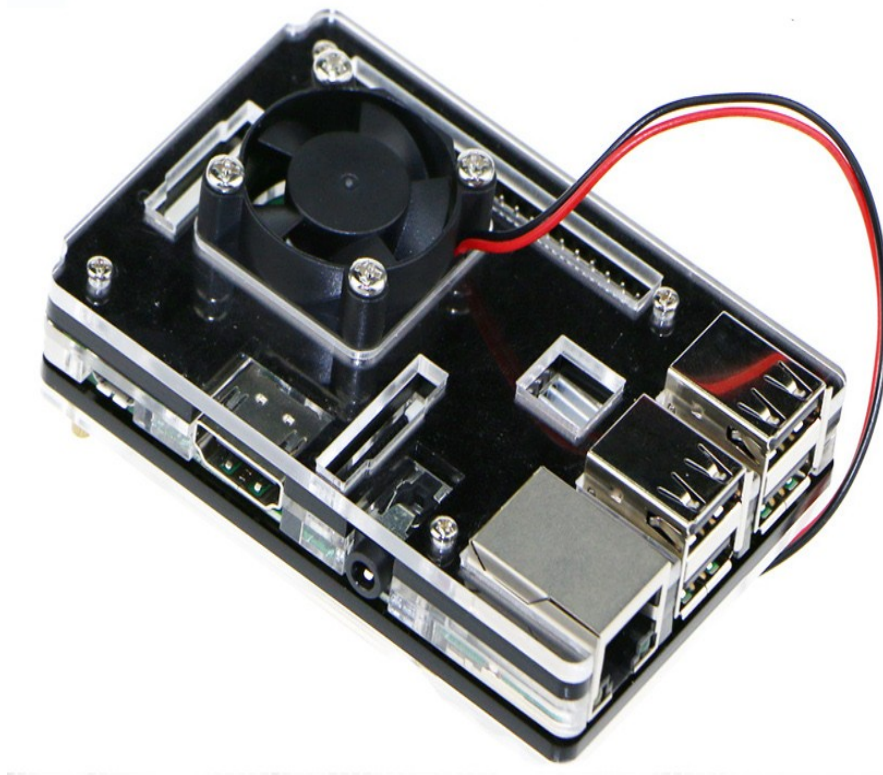
If you are using your Pi as an Allstar hub, loading it heavily, using usbradio, or experiencing audio glitches not related to something else then you would most probably benefit from Turbo Mode.

Possible cooling hardware

Here are a few examples of hardware that could be used to keep your Pi cool.

<http://www.ebay.com/itm/Clear-Case-Enclosure-Box-Cooling-Fan-3PCS-Heatsink-For-Raspberry-Pi-3-Model-B-/131857134112>

This looks neat. I have not tried it but it is certainly cheap enough.



Another style, a little more expensive but still reasonable.

<http://www.ebay.com/itm/Raspberry-Pi-3-Case-with-Cooling-Fan-amp-Heatsinks-Overclock-RetroPie-B-2B-/322371106289>



A set of 8 copper heatsinks.

<http://www.ebay.com/itm/Enokay-8-Pieces-Cooling-Copper-Heatsink-for-Raspberry-Pi-VGA-RAM-Cooling-Heatsin-/302174179574>

A set of 10 Aluminum heatsinks. I bought a set similar to this and they work fine.

<http://www.ebay.com/itm/10Set-30PCS-Aluminum-Heatsink-Cooler-Kit-For-Cooling-Raspberry-Pi-US-/332163972738>

Here is a link to a more expensive heatsink. Using a larger (copper) heatsink may negate the need for a fan.

<https://www.newegg.com/Product/Product.aspx?Item=N82E16835708008>