1 Subject

Affected Products	All products featuring the 4th (or later) Generation congatec Board Controller (cBC) except products with an Intel® Atom™ processor.
Subject	Fan Speed Control Settings
Confidential/Public	Public
Date (yyyy-mm-dd)	2018-04-25
Author	BEU

2 Affected Article Numbers

2.1 Product Data

Affected Number(s)	Product
N/A	Several *

*) Products based on Intel® Atom™ processors do not support automatic fan speed control because the congatec Board Controller (cBC) is not able to read out the CPU die temperature.

3 Information

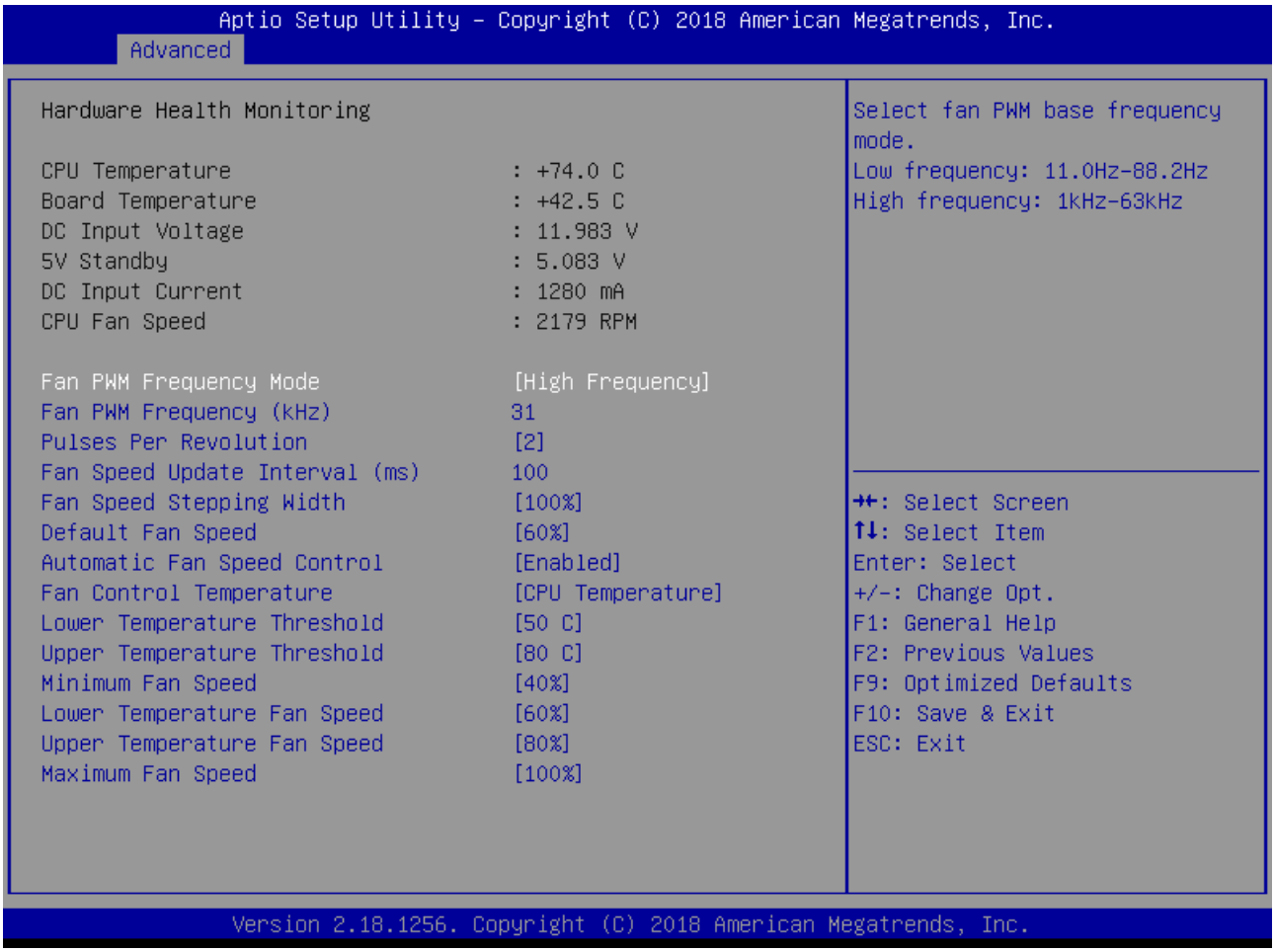
The congatec Board Controller (cBC) offers full hardware monitoring support, including automatic fan speed control. This CTN explains how the automatic fan speed control settings of the cBC work and how to adjust them to reduce fan noise. You may need to update the cBC firmware and BIOS for all settings to be visible and effective.

3.1 Where To Find The Settings

Follow the steps to see the fan speed control settings menu in BIOS:

1. Press the <DEL> or <ESC> key during POST.
2. Select “Advanced” from the menu bar.
3. Select “Hardware Health Monitoring” from the list.
4. Ensure “Automatic Fan Speed Control” is enabled.

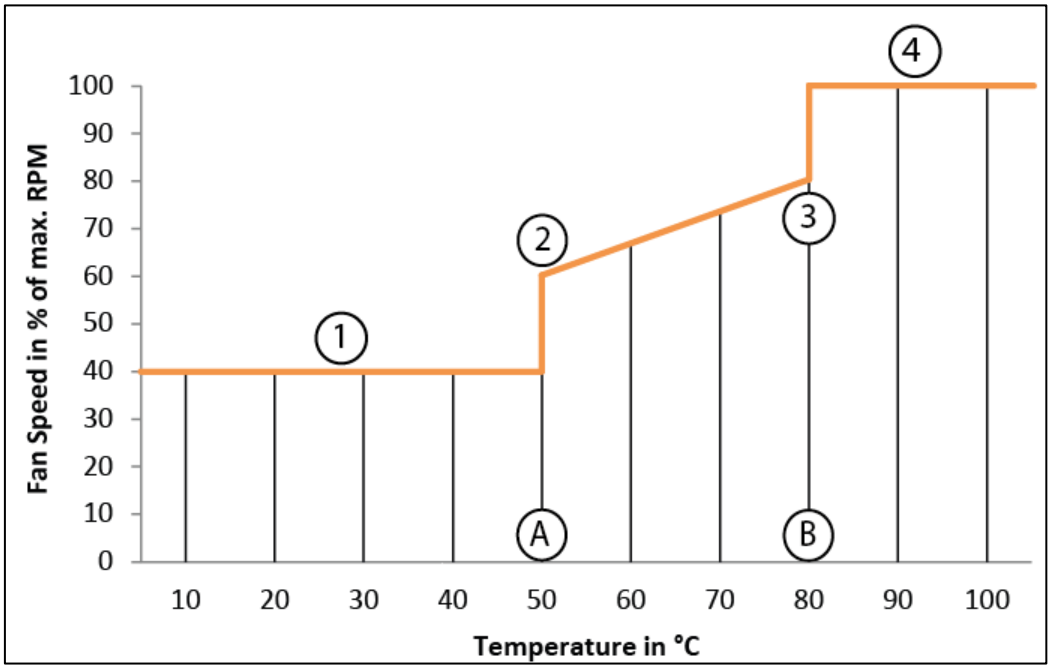
You will see the settings as shown in the screenshot below.



3.2 Fan Speed Settings Explained

The graph below illustrates how the default settings change the fan speed at different temperatures.

Default Fan Speed Settings



Ⓐ Lower Temperature Threshold

Between Lower and Upper Temperature Threshold, the fan speed changes gradually.

Ⓑ Upper Temperature Threshold

Between Lower and Upper Temperature Threshold, the fan speed changes gradually.

① Minimum Fan Speed

If the temperature is below Ⓐ, the fan speed is set to the Minimum Fan Speed.

② Lower Temperature Fan Speed

At temperature Ⓐ, the fan speed is set to the Lower Temperature Fan Speed.

③ Upper Temperature Fan Speed

At temperature Ⓑ, the fan speed is set to the Upper Temperature Fan Speed.

④ Maximum Fan Speed

If the temperature is above Ⓑ, the fan speed is set to the Maximum Fan Speed.

There are two more settings which need further explanation:

- Fan Speed Update Interval (ms)

  This setting controls how frequently the fan speed is adjusted by the cBC. You can set it to adjust from every 1000ms up to every 100ms.

- Fan Speed Stepping Width

  This setting controls how much the cBC adjusts the fan speed after each Fan Speed Update Interval (ms) in percentage of the max. supported RPM.

Note

For these two settings to be effective, you need a 4th Gen cBC with CGBCP435 (or later) firmware or a 5th Gen cBC with GEN5P007 (or later) firmware. If these settings are not visible, update the BIOS to the latest available version.

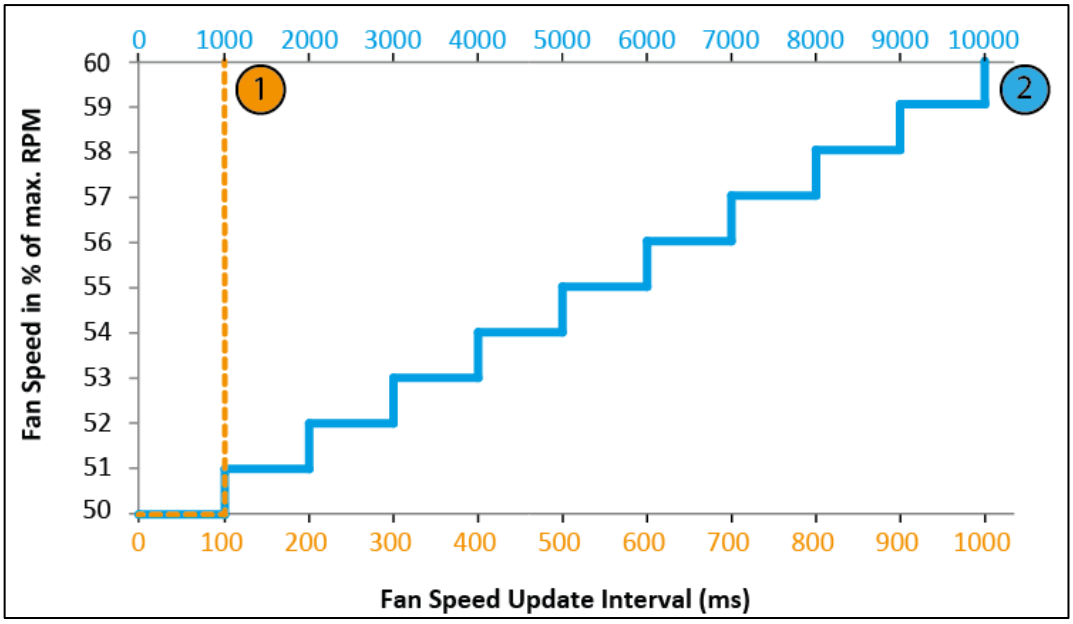
To illustrate how the Fan Speed Update Interval (ms) and Fan Speed Stepping Width work, the graph below shows the effect of the default and adjusted settings:

① Fan Speed Update Interval 100ms and Fan Speed Stepping Width 100% (Default)

② Fan Speed Update Interval 1000ms and Fan Speed Stepping Width 1% (Adjusted)

We assume the fan is currently at 50% speed and the required speed changes to 60%.

Fan Speed Update Interval (ms) and Fan Speed Stepping Width Settings



Note

The graph does not take into account that the required fan speed may change during each interval. It also does not take into account that each fan needs some time (usually a few ms) to increase its speed due to inertia.

The results are:

① The fan reaches the required speed instantly after the first 100ms interval.

② The fan reaches the required speed after 10000ms. A similar setting may be desirable to reduce fan noise as explained in the next section.

3.3 How To Reduce Fan Noise

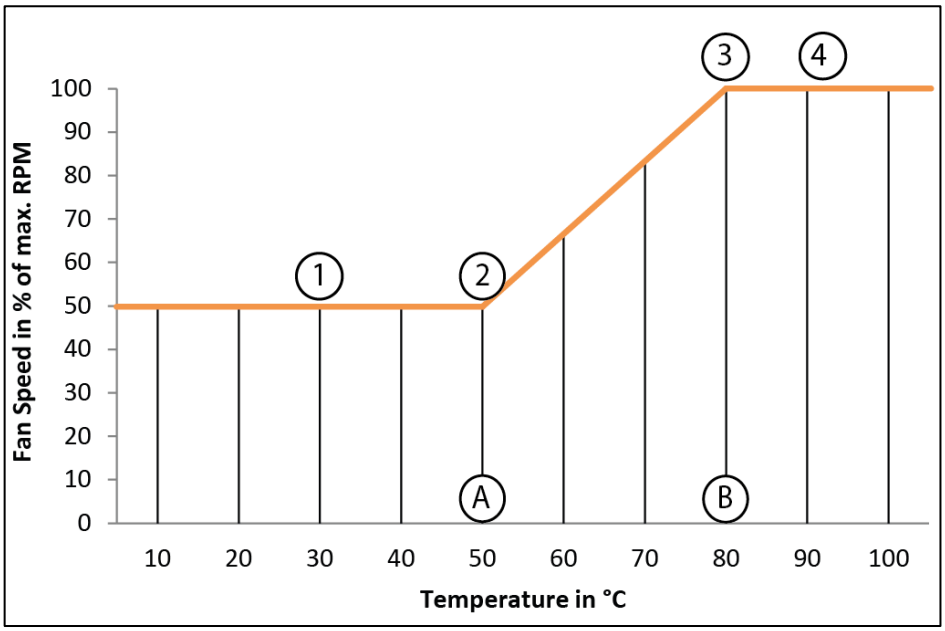
To reduce fan noise, you can adjust the default settings.

- Set the same value for Minimum Fan Speed and Lower Temperature Fan Speed.
- Set the same value for Maximum Fan Speed and Upper Temperature Fan Speed.
- Increase the Fan Speed Update Interval (ms).
- Reduce the Fan Speed Stepping Width.

The first two settings eliminate the fan speed jumps at Ⓐ and Ⓑ as illustrated below. The last two settings smoothen the fan speed between the two thresholds.

The optimal settings depend on many variables (fan characteristics, CPU, use case, cooling solution, environment, desired noise reduction, etc.) and usually requires some trial and error.

Adjusted Fan Speed Control Settings



Note

Poorly adjusted settings can trigger CPU throttling even before the fan speed reaches its max. RPM. CPU throttling reduces the CPU temperature at the expense of performance.

4 Revision History

Revision	Date (yyyy-mm-dd)	Author	Changes
1.0	2018-04-25	BEU	Initial release
1.1	2018-10-18	BEU	Updated affected products and required cBC firmware