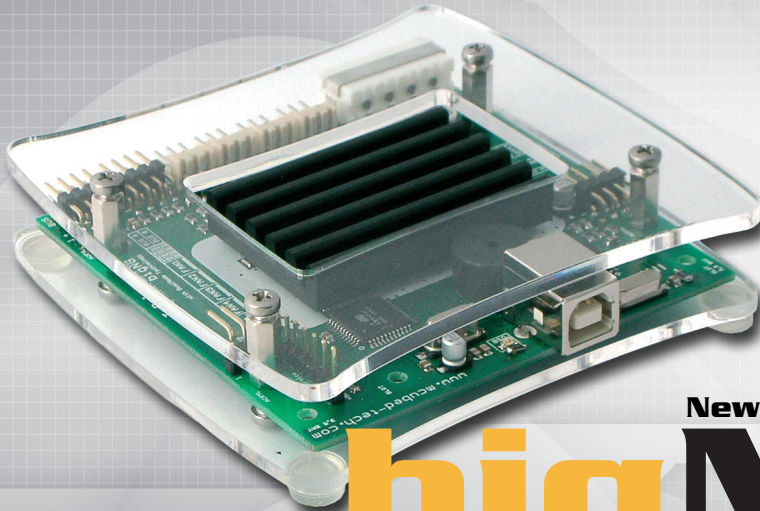# T-Balancer

With silent analogue and strong power mode

New Generation

bigNG

| 80W maximum Power | 4 channels & 6 sensors | Dual Silent or strong | H_2O cooling support | overheat protection | ATMEL Microprocessor INSIDE ® USB 2.0 |

Installation Guide

T-Balancer
With silent analogue and strong power mode

big NG
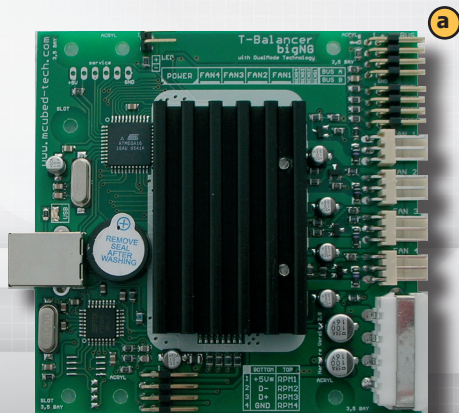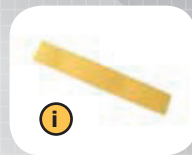New Generation

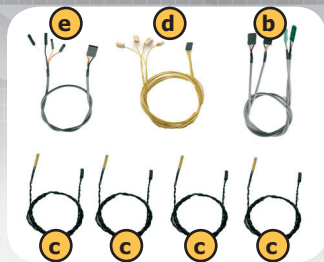| 80W maximum Power | 4 channels & 6 sensors | Dual silent or strong | H₂O cooling support | overheat protection | USB 2.0 |
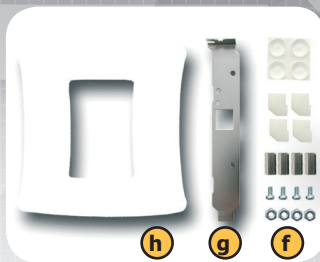
Package Contents

(a)	Controller unit
(b)	Temperature sensors digital (2x)
(c)	Temperature sensors analogue (4x)
(d)	RPM signal cable
(e)	Internal USB cable
(f)	Mounting material
(g)	Slot bracket
(h)	Acrylic case
(i)	mCubed Superstrong
(j)	Manual

DISCLAIMER:
For the installation of the T-Balancer you have to open the PC. If you are not familiar with installing PC-Components, please get in contact with a professional nearby. mCubed is not liable for any damage to your system due to the installation, any shortcut or even loss of data and for any other loss or damage (including indirect or consequential loss, financial loss, loss of profits or loss of use). For all other liabilities not referred to elsewhere in these Terms our liability is limited in damages to the price of the goods.
Full terms and conditions can be downloaded from www.mcubed-tech.com/T&C.pdf.

Assembling

The bigNG can be either installed in a 3.5" bay, in a chassis slot or in a separate acrylic case. Please choose the place where it should be mounted and attach the slot sheet, acrylic case or white mounting angles.

3.5" bay mounting:
Please mount white angles in each corner. Before fastening the screw try to insert the unit to its final position. In some PC cases it will fit very tight to allow the use of clip mounting.
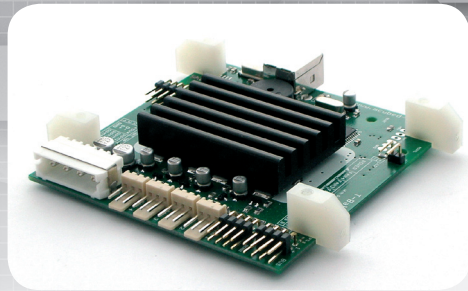

Slot mounting:
Please mount the white angles onto the board and fix the metal slot sheet onto them.
The controller doesn't need a PCI slot on the motherboard. To give it more stability, you should also fasten the outside screws of the slot sheet together with the chassis.
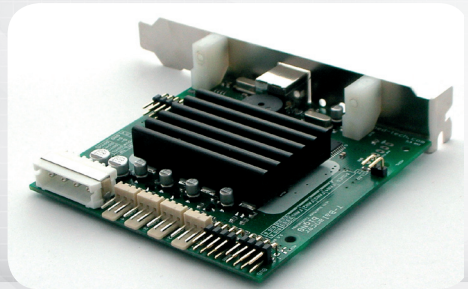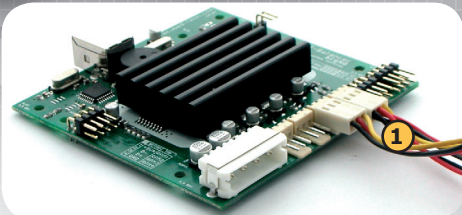

Acrylic case:
First take the bottom plate, 4 long screws, 4 nuts and assemble them.
Put the controller card onto the screws and mount it with the 4 bolts.
Close the case with the top plate and 4 small screws.
Fix the 4 self adhesive feet on the bottom.
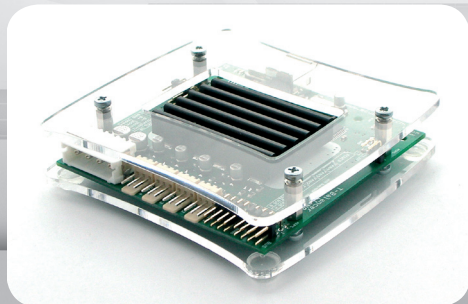
Connecting the T-Balancer

Turn off the PC power supply and disconnect the power cord from the power outlet, open the PC case and mount the T-Balancer inside it.

Step 1: Connect the fans to the fan connectors. Some fans may have little different connectors – it can be necessary to lift the female connector while attaching.

Step 2: Connect up to 4 analogue sensors. Plug them in vertically like the scheme on the top of the board shows (SENS1..4).

Step 3: Connect the digital sensors to the BUS terminals. Use the RED wire on PIN1 (+), otherwise it won't work.

Step 4: Connect the internal USB cable to the lower row of the connectors. Use the RED wire for +5V*. Use your motherboard description for connecting it to an internal USB header:

<pre>
RED: +5V USB
YELLOW: Data –
WHITE: Data +
BLACK: GND
</pre>

Step 5: You can also use an external USB cable to connect the T-Balancer to a standard USB port.

Step 6: Plug in a free 5,25" power connector from your PSU to the T-Balancer. Attention, push the connector with force, you should hear a "click".

Step 7: Remove the seal from the buzzer if present. This enables the acoustic alarm to perform.

Step 8: You can optionally connect a RPM signal cable to the motherboard. This allows to monitor RPM values with the motherboard (over BIOS or MB tools).

Step 9: You can optionally connect a case led to the bigNG. This led will show optical alarms.

Close your PC, reconnect the power cord and turn the system on.
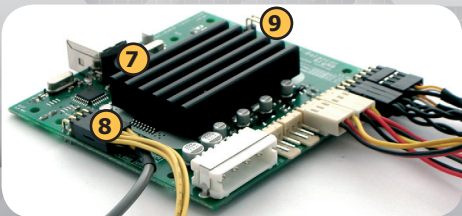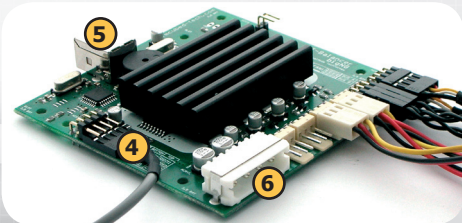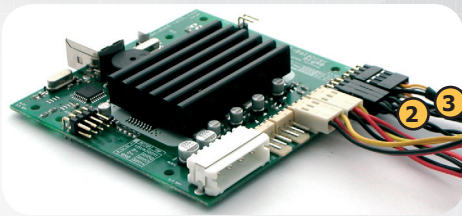
Connecting analogue sensors

Please note! This installation guide will only give an example of how to mount the sensors in a standard configuration.

The T-Balancer bigNG has 4 thin foil analogue sensors which can be placed anywhere in the chassis.

The thin analogue sensors are very sensible and easy to mount. But they are not so accurate like the digital sensors and more fragile. Please note which sensor is connected to which port.
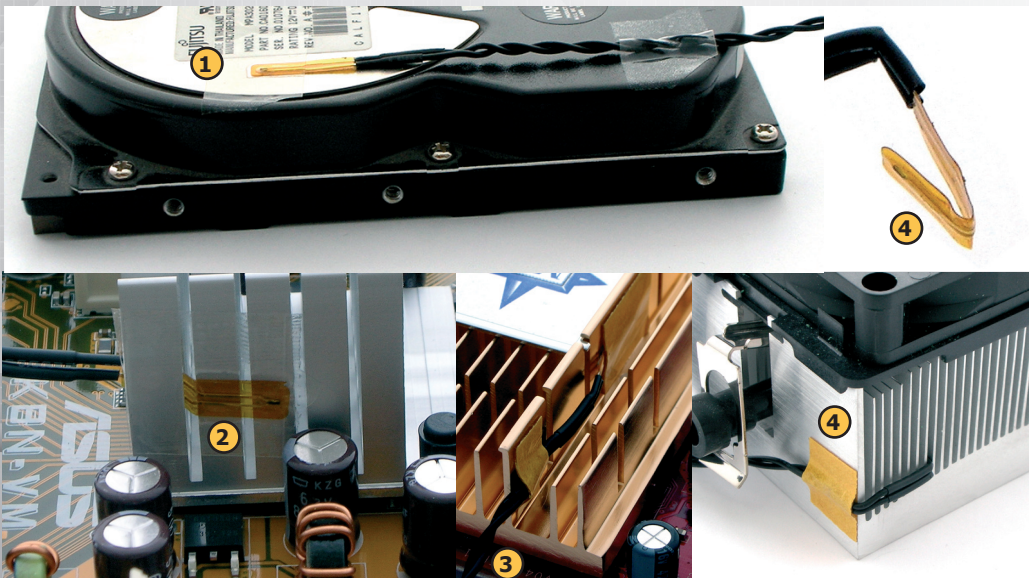
Stick the sensors directly or with the adhesive tape to the heat source. Please check after some time if the sensors get loose. Don't touch the stickers with fingers and clean the surface before fastening the sensors.

| SENS1 (HDD) | SENS2 (BRIDGE) | SENS3 (CPU) | SENS4 (VGA) |

Connecting digital sensors

Please note! At least one sensor must be connected to the T-Balancer to avoid various warning messages!

The T-Balancer bigNG has 2 high precise digital temperature sensors. They can be connected directly to the BUS A or BUS B connector. Connect them with the RED wire at the "+" sign of the bus connector, otherwise they will not work.

The digital sensors are very precise and more stable. They can be connected randomly to the bus. To identify the digital sensors, you can ping the SENSOR LEDs with the T-Balancer software. Nevertheless we suggest to note the mounting position of these sensors in the table beside.

Stick the sensor directly or with the adhesive tape to the heat source. Please check after some time if the sensor gets loose. Don't touch the sticker with fingers and clean the surface before fastening the sensors. Do not remove the protective foil from the digital sensors, it prevents from shortcuts.

Sensor Chip

Sensor address 0

Sensor address 1
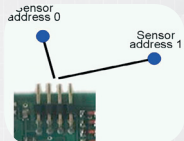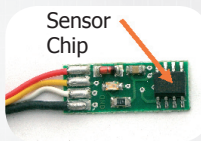
SENS0 (CPU)

SENS1 (VGA)

Note here, where you have placed your sensors, so that you remember when configuring lateron.
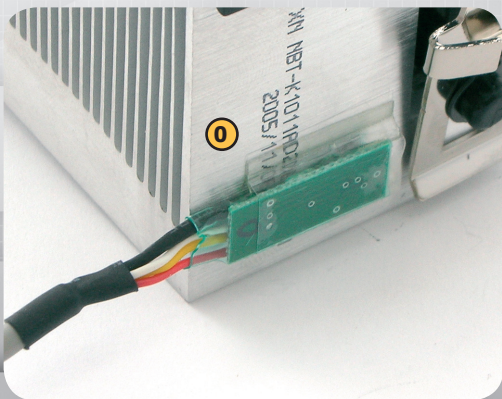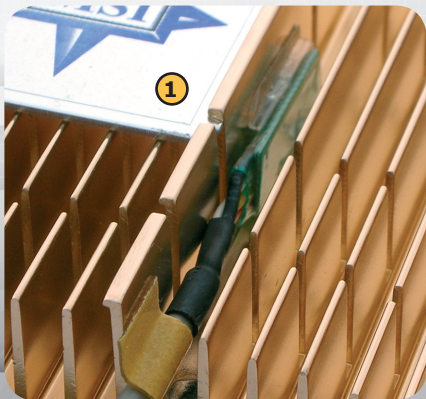
Connecting more digital sensors

Please note! This installation guide will only give an example of how to mount the sensors in a standard configuration!

You can connect 6 more digital sensors to the T-Balancer bigNG with the extension set ES DIGITAL. They can be connected randomly in a chain attached to one, both or any other free BUS connector of the T-Balancer system. With the help of the included 2 passive sensorhubs, you can multiply the available bus connectors.

To identify the digital sensors, you can ping the SENSOR LEDs with the T-Balancer software. Nevertheless we suggest to note the mounting position of the sensors in the table below.
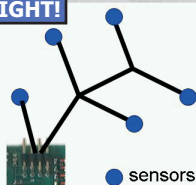
SENS0

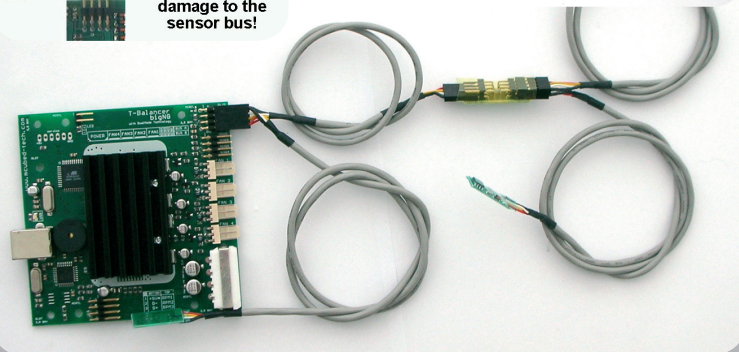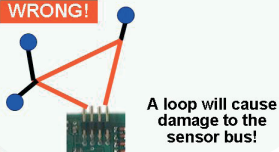SENS1

SENS2

SENS3

SENS4

SENS5

SENS6

SENS7

RIGHT!

sensors

WRONG!

A loop will cause damage to the sensor bus!

Connecting the miniNG and Sensorhub

Connect the T-Balancer miniNG in the same way like a digital sensor to the BUS. The BUS LED on the miniNG should be illuminated after connecting, if not turn the connector and replug it.

Sensors

miniNG or SensorHub
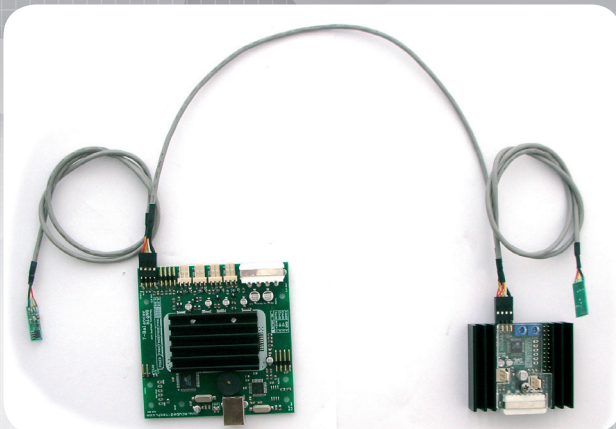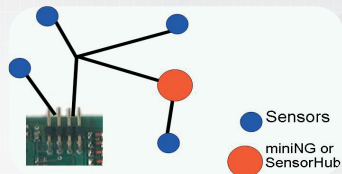
**Connect the Sensorhub** the same way like a digital sensor to the BUS. The STATUS LED on the Sensorhub should flash after connecting it and should be illuminated after a few seconds when the T-Balancer found the device. With the extension set ES analogue, you can connect more analogue sensors, water temp probes and even flowmeters to the T-Balancer with the help of included the analogue sensorhub.
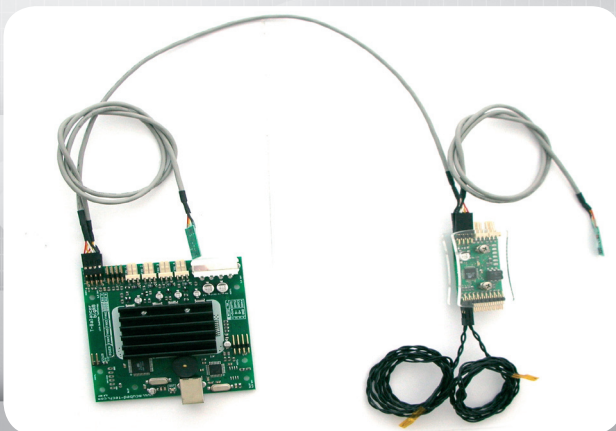
Software Installation

Navigator Installation
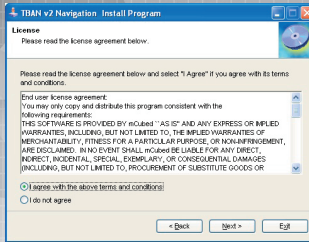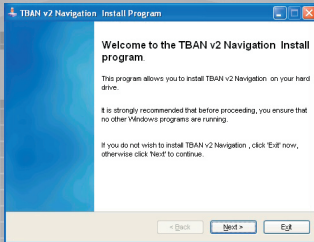
You can find the current version of the T-Balancer Navigator software on your CD-ROM and on the website **www.t-balancer.com** or in the forum: **www.mcubed-tech.com/forum** Insert the CD or download the file, run the setup and follow the instructions.

Driver Installation

After installing the software, connect the T-Balancer with USB. Windows should recognize a new device. Continue with installing the API driver from the subfolder.
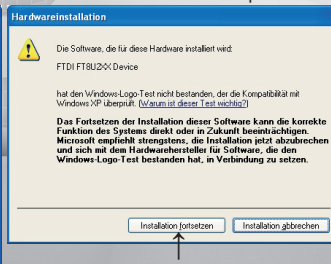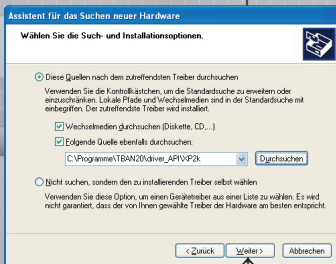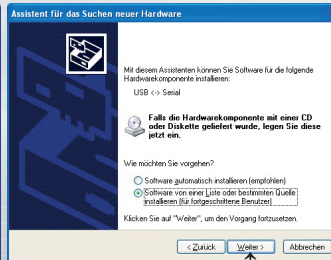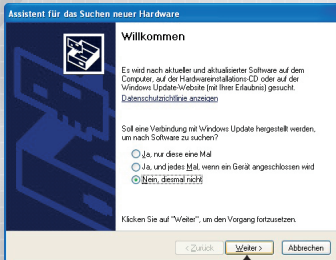
Q: Why 2 drivers?
A: For the T-Balancer Navigator the two driver are available. Use the API driver as default driver. Only in some special cases the VCP driver could be of interest. For example when more than one device should work parallel.

Q: My system doesn't find a new device?
A: Use the FTClean.exe in the folder \uninstall to remove all fragments of older drivers. Replug the T-Balancer and make sure that it is connected to the power.

Q: Problems with USB connection?
A: In some cases the internal USB cable can cause problems. Try to use a good external USB 2.0 cable. Activate "Safer transfer" in the options menue and activate the "USB connection monitoring" in the USB connection section with the API driver option.

First steps
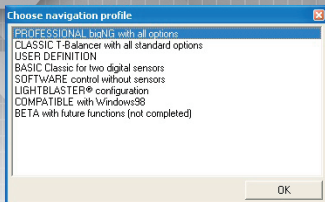
Choose a navigation profile

"Professional with all options" is recommended for this manual. But you can always go to Options -> Navigation Profile to change this setting also lateron.

Q: What is a navigation profile?
A: Profiles reduce complexity of the menue structure. Enhanced options are hidden in different profiles.
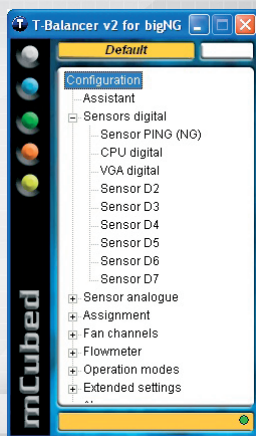
Transfer standard configuration with clicking on the grey button or press "1".

Q: Why transfer a standard profile?
A: Depending on the firmware and software version the T-Balancer should be loaded first with the standard configuration to synchronize all functions in the firmware with the Navigator Software.
This way all old settings are deleted and you start with a clean, proper and safe profile.

Q: How can I monitor, that the Navigator software is communicating with the T-Balancer firmware?
A: The ball in the lower right corner shows communication activity. If the ball is green blinking the communication works properly. Black ball indicates that values won't be logged to the database. Yellow ball shows a problem with communication port and grey ball shows a timing problem.
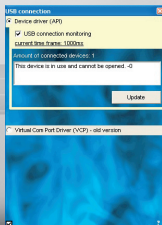
Choose an alternate USB driver

The API driver is standard and also recommended. If you need to change this driver to an alternative driver, please change here and also under windows-> device manager. The alternate driver (VCP) might be necessary, if you have software compatibily issues.

Configuration of the digital sensors
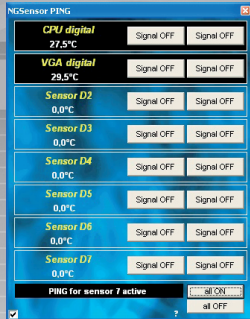
Now it is time for checking and calibrating the attached sensors.
Click on "Sensors digital" to get this window.
Click on the yellow label and enter a name for this sensor.
If you do not know, which digital sensors is placed at which location you can ping it. The pinged sensor will be illuminated.
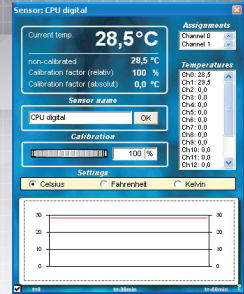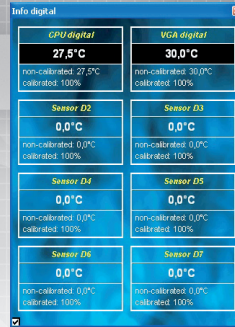
Q. Why naming the sensor?
A: This is optional, but helps within the further configuration process and also for monitoring.

Q: You have connected 2 digital sensors but not all of them are shown here?
A: Probably one or more of the sensors are connected in the wrong polarity
A: Go to the SensorPING menue and activate "all ON". Check which sensor is not illuminated, turn it and reconnect it. Repeat the SensorPing function. Please note, that old digital sensors (thicker) can't be pinged.

Q: What is a sensor calibration?
A: The sensor can not measure the real core temperature of a device because you cannot place a sensor close enough. The calibration allows you to modify the measured value in that way that it nearly shows the real core temperature values.

Q. Why can sensor 7 be deactivated?
A: If you use the semipassive kit for PSU the sensor number 7 is included in this set. A ping to this sensor would influence its proper function.

Q: How can I calibrate a sensors?
A: Click on "calibrated: 100%" and enter a new calibration value
A. Click on the corresponding sensor item in the navigation tree and see the extended setting in this window.

Configuration of the analogue sensors

Click on "Sensors analogue" to get the overview about bigNG's connected thin foil sensors.

Click on the yellow label and enter a name for the sensor.

All sensors can be calibrated relatively and absolutely.

Q: What is a "non-calibrated" temperature?
A: The real measured temperature at the sensor. For all controlling and monitoring functions only the calculated (calibrated) temperature applies.

Q: What is relative calibration?
A: Approximation to the real world though calculating a relative increase.

Q: What is absolute calibration?
A: Approximation to the real world though adding a constant value.

Configuration of the fan channels

Fan overview

CPU	Critical 60,0°C
100 % - 32,5°C	Hysteresis 2,0°C
	Switch off deactivated
Blockage recognition: OFF	Manual mode: ON

VGA	Critical 60,0°C
100 % - 32,5°C	Hysteresis 2,0°C
	Switch off deactivated
Blockage recognition: OFF	Manual mode: ON

Brigde	Critical 60,0°C
100 % - 32,5°C	Hysteresis 2,0°C
	Switch off deactivated
Blockage recognition: OFF	Manual mode: ON

Chassis	Critical 60,0°C
100 % - 32,5°C	Hysteresis 2,0°C
	Switch off deactivated
Blockage recognition: OFF	Manual mode: ON

Channel: CPU

Current speed **100 %**
Manual mode 100

rpm of ˙ 943 rpm
voltage of: 12,0 V
Maximum rpm 943 rpm
☑ manual

Critical 60,0°C
Hysteresis 2,0°C
Switch off deactivated 70,0°C
Manual start value 100 %
☐ Blockage recognition

Response curves
target temperature
Software sensor
Manuel mode

CPU

Sensor	in °C	
Temperature	32,0	
CPU digital	28,5	°
VGA digital	29,0	°
Sensor D2	0,0	°
Sensor D3	0,0	°
Sensor D4	0,0	°

PWM analogue

t=0 — Power t=-30min — Temp t=-60min

Click on "Fan channels" to get the overview about bigNG's output channels.

Click on the yellow label and enter a name for the fan channel.

Click on the fan name to get the window for extended settings.

Q: What is a critical temperature?
A: If the channel temperature reaches this value all fans will be set to full power and an alarm will be performed.

Q: What is a hysteresis?
A: To avoid oscillating fans the hysteresis delays the fallback of the speed when temperature changes.

Q: What is a switch-off temperature?
A: If the channel reaches this value the sensorhub will activate the emergency switch-off procedure to shut down the PC.

Q: How can I activate the switch-off?
A: You need an analogue sensorhub connected and you need to activate this function in the switch-off section.

Q: What is a manual start value?
A: If you use a channel not in an automatic mode the controller will load this value after rebooting.

Q: What is blockage recognition?
A: If a fan is blocked or damaged the controller will increase output power and/or perform an alarm.

Q: What is PWM or analogue?
A: PWM is a more powerful and efficient method of power control for high load. Analogue mode is very silent and more compatible to other devices.

Configuration of the sensor assignment

Click on "Assignment" to see the possiblities.

Click on "Easy 1-to-1" to make a simple direct sensor-to-fan relation.

Click on "Matrix" to use the full functionality with multiply sensor support.

Click on "Transfer" to send the changed assignment to the T-Balancer hardware. Click on "Refresh" to confirm if the actual assignment has changed properly.

	CPU 35,5 °C	VGA 34,5 °C	Brigde 31,5 °C	Chassis 33,0 °C
CPU digital	✔			
VGA digital		✔		
Sensor D2				
Sensor D3				
Sensor D4				
Sensor D5				
Sensor D6				
Sensor D7				
SH Analog 0				
SH Analog 1				
SH Analog 2				
SH Analog 3				
SH Analog 4				
SH Analog 5				
HDD analog				✔
Bridge analog			✔	
CPU analog	✔			
VGA ambient		✔		✔

Q: Why sensor assignment?
A: The software sensor assignment gives you the possibility to mount all digital and analogue sensor anywhere in your case and assign them afterwards to your connected fans.

Q: Why more sensors to one channel?
A: This is one most important advantages of logical sensor assignment. If a channel uses the temperatures of more then one sensor you have the safety of a redundant industrial system. If a sensor fails, you have an alternative sensor.

Q: How does assignment of many sensors work?
A: The channel will use the hottest temperature of all sensors which are assigned to the same fan channel. This value will be relevant for all operating modes and temperature limits. So it will also work if one sensor would fall off the heatsink and would deliver wrong, too low values.

Q: Why more channels to one sensor?
A: This can be interesting if one fan (for example Chassis) cools more than one heat source. This way the fan reaction will be adequate to the hottest source which needs more airflow. Calibration of a sensor can help to make the allowed values of each sensor comparable.

Configuration of the operation modes

Click on "Operation modes" to see the possible adjustments. Click on "Panel" to use a specific channel in manual mode.

Click on "Overview curves" or on "Response curves" in the fan channel windows
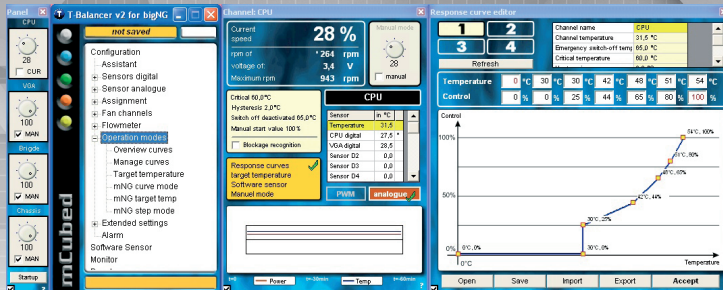
Q: Why use channel in manual mode?
A: Manual mode is not recommended for an automatic fan controller but it can help to find good adjustments. The temperature alarm warnings and actions are still active.

Q: How can I activate manual and curve mode?
A: Per default all channels are manual – you will see the check in the panel windows and the "MAN" sign. To activate an automatic curve mode deactivate the check, click on the link to response curves in fan channel windows or click "Accept" in curve editor. Activate "MAN" through sending a manual value or simply activate the check.
Remark: A manual channel will be loaded with 100% output after a reset. Use the "manual start value" to influence this value.

Q: Which curve should I use?
A: Normally the most effective connection between temperature and power is a stepping progressive curve like in the picture above – it should allow semipassive and low noise use. For hot and powerful device more zoomed curves should be better. Simple stepping curves can be interesting for irritable fans. Change temperatures depending on your hardware.

Q: Are there standard curves?
A: Click on "open" to see a few predefined curve models. Some curves may not be perfectly adapted to your settings – have a look that temperature warning limits are higher than the end of curve.
A: You can import and export curves to the curve manager's database.

Q: I cannot change the first and last value?
A: This is normal. Start temperature and power on maximum temperature are always constant. You can configure start and maximum temperature in other windows of the T-Balancer software.

Q: What is with critical and switch-off temperature?
A: The critical warning temperature should be higher than the last point of the curve or the warning message will appear in normal use. Switch-off temperature should also be higher and even higher then the critical warning value.
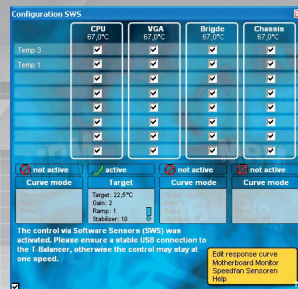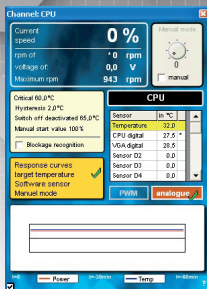
Click on "Target temperature" to open the configuration windows

Q: Why use channels in target mode?
A: This mode is the easiest solution to keep a defined temperature of your monitored components.

Q: What is the reaction time?
A: You can select different reaction times to adapt the cooling circuit optimal to your system. Fast control behaviour will result in quick and strong reactions of the fans and will only work well if the heatsink is small, easy to cool and the distance between sensor and heatsource not too much.

Q: What is a user defined reaction?
A: With this setting you can adjust your control parameters by yourself to optimise the behaviour a little bit.

Q: The fans are oscillating all the time up and down?
A: Typical sign of too fast control reaction. Slow down the reaction time or switch to curve mode.

Q: Which software do I need for temperature readouts from the motherboard onboard sensors?
A: The navigator software 2.9 and higher supports Motherboard Monitor and Speedfan.

Click on "Software Sensor" to see the available modes.

Q: Which operation modes can I choose?
A: You can use curve and target temperature mode. For curve mode the curves from the curve manager are used. For target mode you can use own settings in the configuration window.

Q: How can I activate this mode?
A: Click on the "not active" or "active" text to toggle the mode on or off. The symbol will show the actual state.

Q: Why do I get a warning message when closing the navigator software?
A: When a software control mode is active the navigator must run or no action will happen after closing the software. To avoid this message, you can deactivate the checkbox in the options menue.

Q: The T-Balancer will reboot all 30 seconds?
A: You have to connect at least one digital sensor to avoid a bus error that forces a reboot of the unit. Also if you only want to use the software sensors from your motherboard.

Q: How to decide which sensors I should use?
A: Select the window of the motherboard sensor readout software you want to use. Click on the available sensors to select them.

Extended Settings

Click on "Frequency"

Q: What means frequency?
A: This value is the frequency for PWM output mode only.

Q: Why change the frequency?
A: Some fans react with a little noise to PWM powering. But normally it is possible to find a frequency which is more suitable for these fans.
PWM frequency is for all PWM driven channels the same. But you can set channels separately into the analogue mode. PWM doesn't affect channels in analogue mode.

Q: Is the corresponding Hz value right?
A: It is only a reference for global orientation and does not reflect the real pulses per second.

## Click on "FanAmp"

Q: Can I connect a FanAmp?
A: If you use a FanAmp as power amplifier for your load, the output signal have to be inverted:
0% means full power
100% means 0% output power.
You need a special crossed cable to connect a FanAmp with the T-Balancer.
This function can result in unexpected behaviour if not used properly.

Click on "Blockage recognition"

Q: What is blockage recognition?
A: This function helps to keep informed if all fans keep spinning. It will try to detect the motion and release an alarm if an unexpected blockage occurs.
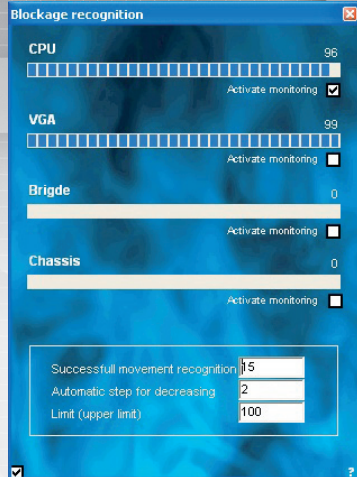
Q: What is the progress bar for?
A: In PWM mode the fan speed detection is not exact. But the T-Balancer can detect parts of the original RPM signal and create a new signal based on few inputs.

Q: Why different adjustment settings?
A: The recognition model needs a success, a decrease value and a limit. It is like a glass of water with a leak:
-> higher succes rate fills the glass faster
-> higher decrease rate lets the water leak out faster
-> higher limit is the water level
This way you can adjust the way the blockage recognition works.
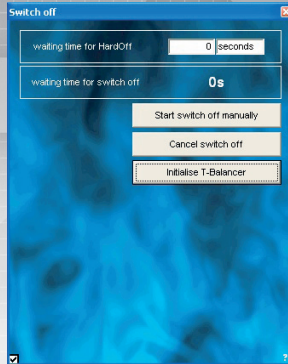
Q: What happens when blockage detected?
The power to the fan will increase step by step until a RPM signal is detected. If 100% were reached and the fan still doesn't spin, an alarm will be performed.

Extended Settings
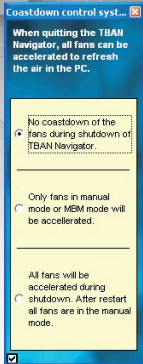
"Coastdown"
This function allows to speed up all fans when closing the T-Balancer software. This provides fresh air which might be needed if a PC shuts down.

"Switch-off"
If you have a sensor hub connected to the T-Balancer you can use and configure the switch-off function here.
If for example water flow reduces below a defined level, there might be the chance of a leak.
So the T-Balancer shuts down the PC to save the hardware.

Click on "Flowmeter" to get the Flowmeter values

Q: Can I use a flowmeter?
A: With the extension set ES analogue you can use up to 2 flowmeters simultaneously.

Q: Why should I use a flowmeter?
A: Flowmeters increase the reliability of water cooled systems enormously because pumps will loose their efficiency over time. Air bubbles in the system resulting from low reservoir level also reduce the cooling power extremely.

Q: Why use a shutdown?
A: If the waterflow in cooling system is very low or much higher then normally it is possible that the water circuit is damaged. This would lead to a very fast overheating of the components, and water could leak out into the case and may cause electrical shortcuts.

Q: What is a measurement range?
A: The sensorhub can be adjusted to different ranges to increase the accuracy and resolution of the flowmeters. High resolution with long measurement windows, fast reaction with small measurement windows.
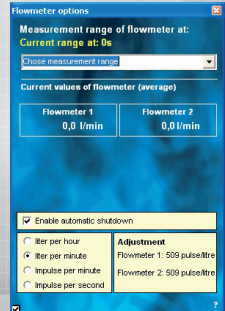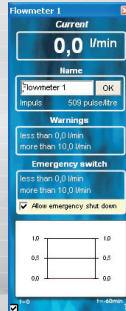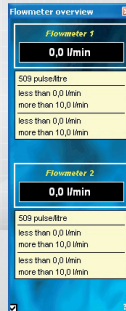
Extended Settings

**Click on "Alarm" to configure alarm settings**

Q: What to do when an alarm occurs?
A: If you configure your system the first time click on the grey button to transfer the standard profile.
A: Open the Navigator, you will see an alarm explanation. You will see a description of the actual alarm when you open this window. Follow the message in the coloured box.

Q: Should I deactivate the alarm?
A: Normally it is not recommended to disable any of the alarm functions. In special cases it can be useful to switch of the flashing LEDs or the shutdown function.
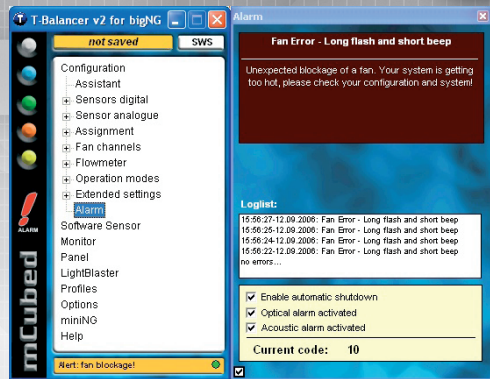
When the T-Balancer is starting:
>> The STATUS LED starts blinking quickly
>> Fans speed up slowly
>> SENSOR LEDs are on for a few seconds
>> STATUS LED stops blinking quickly when fans are at their full speed

Ready for use when:
>> illuminated USB LED shows connection to the motherboard
>> the STATUS LED below the onboard heatsink should blink slowly
>> the fans are at 100% speed (default setting)

Alarm Signals
>> SYSTEM START: Code 1
>> SHORT STATUS LED FLASH: Code 0   Normal state
>> LONG STATUS LED FLASH: Code 5   Sensor assignment error
>> LONG BLINK and SHORT BEEP: Code 10   Blockage of a fan
>> LONG BEEP: Code 18   Critical temperature reached
>> DURABLE BEEP: Code 20   Emergency switch off temperature reached
>> STATUS LED FLITTER: USB Reset in progress

Overview
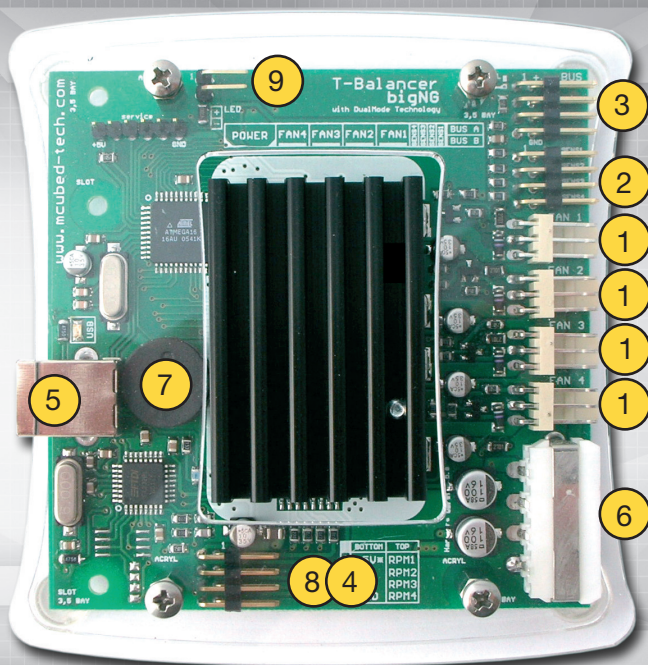
Safety information:
>> for indoor use only
>> avoid humidity
>> only for use in PCs
>> max. temperature of heat sinks is 80°C, do not touch it!
>> Avoid contact with chassis to prevent from shortcuts

(1) FAN CONNECTOR
(2) ANALOGUE SENSORS
(3) DIGITAL SENSORS (Sensor Bus)
(4) INTERNAL USB
(5) EXTERNAL USB
(6) POWER CONNECTOR
(7) ALARM BUZZER
(8) SIGNAL OUTPUT
(9) EXTERNAL LED

Turn off the PC power supply and disconnect the power cord from the power outlet, open the PC case and mount the T-Balancer inside it.
(1) Connect the fans to the fan connectors. **(2)** Connect up to 4 analogue sensors. **(3)** Connect the digital sensors to the BUS terminals. **(4)** Connect the internal USB cable. **(5)** You can also use an external USB cable. **(6)** Plug in a free 5,25" power connector. **(7)** Remove the seal from the buzzer if present. **(8)** You can optionally connect a RPM signal cable. **(9)** You can optionally connect a case led.
Close your PC, reconnect the power cord and turn the system on.