GIGABYTE AMD A55 CHIPSET OC GUIDE

AMD Llano platform was launched recently, so end-users are trying to understand the platform and how it fits in the grand scheme of things. One thing is for certain, Llano platform has fantastic potential to make a great all rounder or home media PC, office machine, even a gaming machine on a budget. We finally have an integrated GPU platform with some solid graphics performance thanks to AMD!

The key to unlocking the potential of Llano platform is overclocking. GIGABYTE A-Series motherboard range has big overclocking capability. The purpose of this guide is to show and analyse that overclocking capability and provide some general pointers and key overclocking parameters, in order to get the most out of the platform to improve end user experience.

Let's start with the test system used.

SYSTEM:

- **GIGABYTE A55M-S2V v1.1** (F2 shipping bios)
- **AMD A6-3500** (tricore, 2.1GHz-2.4Ghz CPU, 444MHz GPU clock)
- 4GB RAM KIT, Kingston KHX2133C9BD3T1K2/4GX
- 750W Corsair HX750 PSU
- H70 Corsair water cooler
- Kingston SSDNow V Series 128GB SSD Drive (SATA0 port)
- ATI 11.7 Display Driver
- Windows 7 64-bit OS

The following benchmarks were used to assess performance and stability.

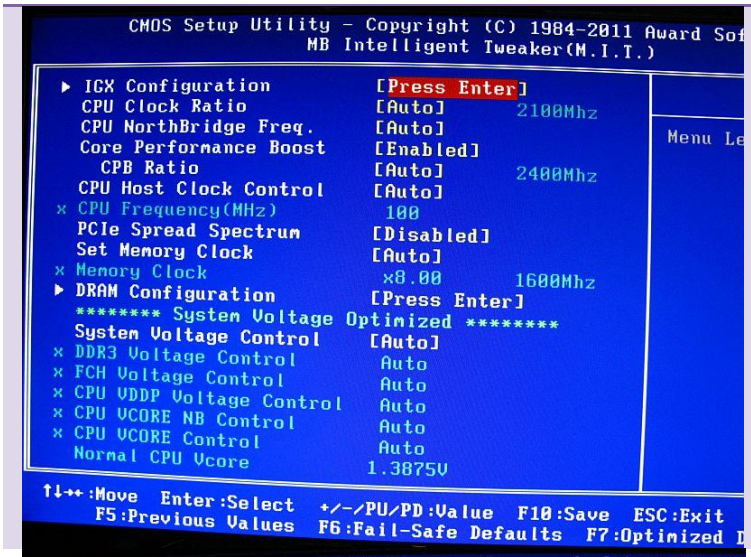
BENCHMARKS:

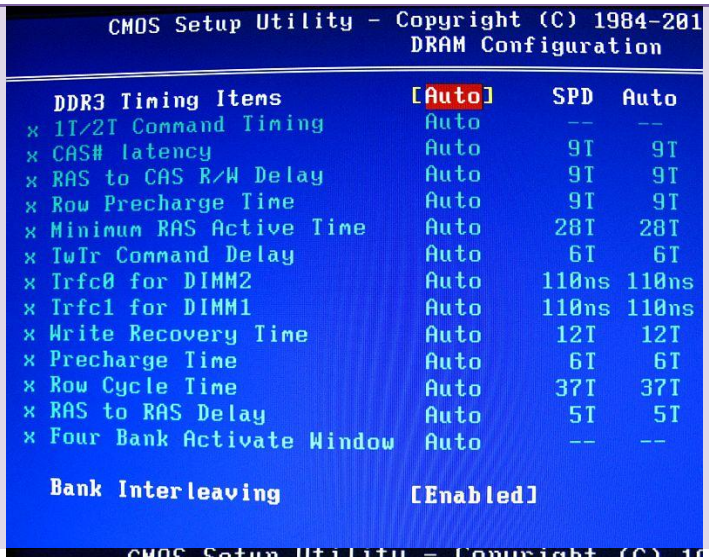
- 3DMARK Vantage Performance
- SuperPi 8M
- Cinebench CPU
- Cinebench OpenGL
- Dirt3 game
- wPrime 32M

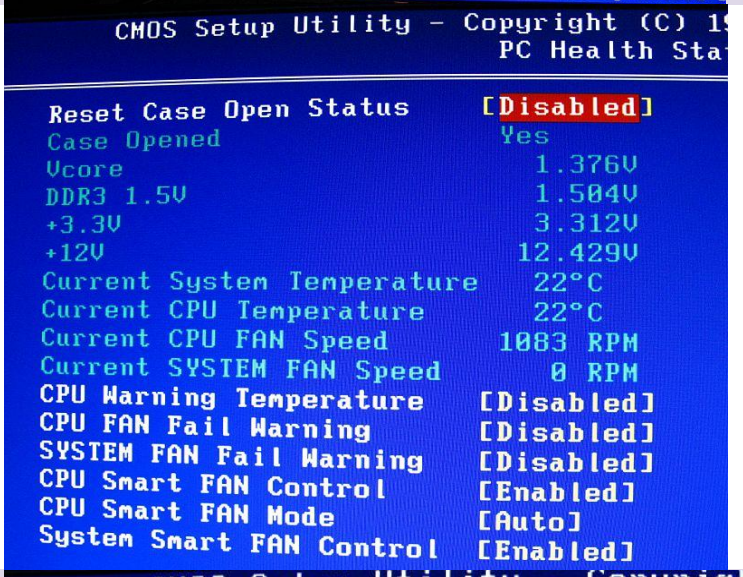
We chose a variety of CPU and GPU based benchmarks to try and understand how overclocking affects performance. In terms of CPU based benchmarks we chose SuperPi 8M, wPrime 32M and Cinebench CPU which test single and multi core performance. GPU based benchmarks include 3DMARK Vantage Performance, Cinebench OpenGL and Dirt3 DX11 video game.

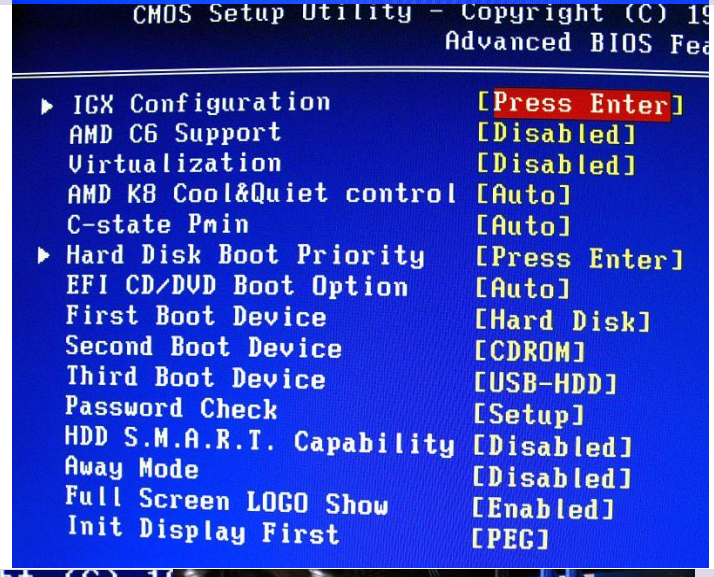
These benchmarks are in no way a final test of stability and for further stability testing it is recommended to use some form of CPU and GPU stress software. Ultimate stability is still the test of time.

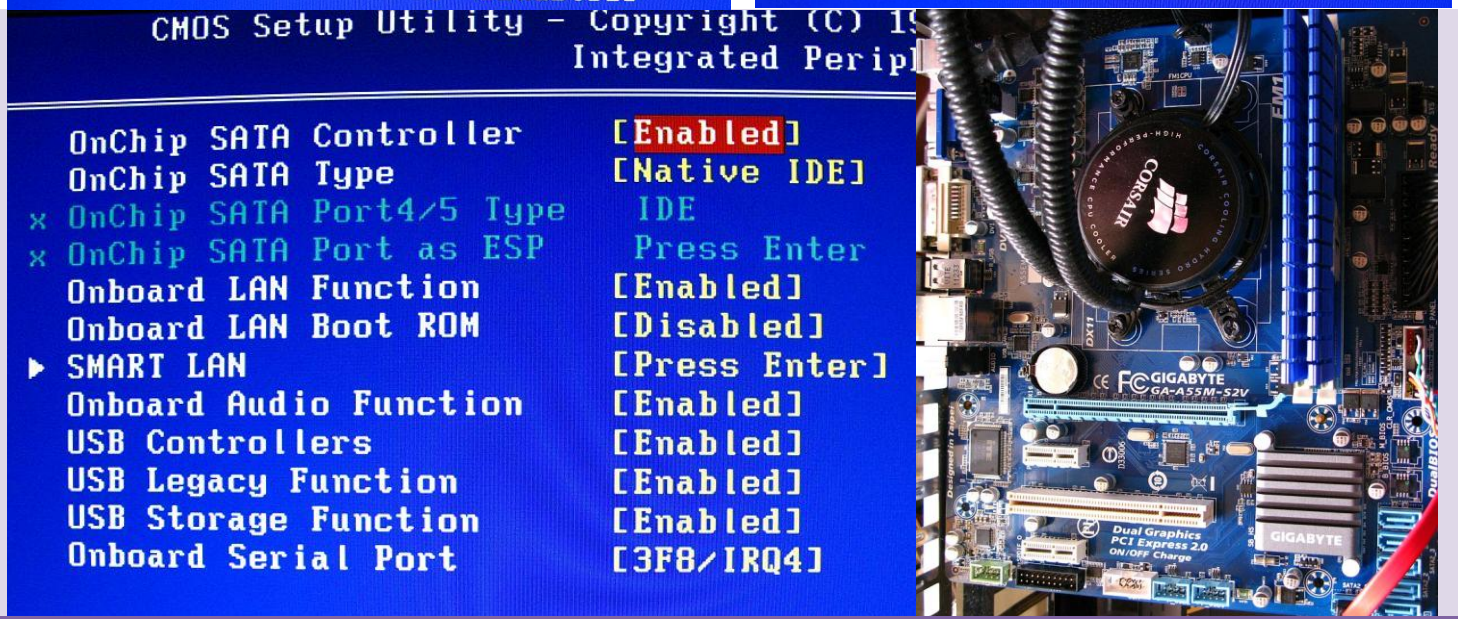
BIOS screenshots











BASICS/KEY OC PARAMETERS

Please be aware that current APUs are all locked. This means that even though a bios provides extra multipliers for CPUs or frequency adjustment on the GPU, they cannot actually set CPU multi or GPU frequency higher than default values. In A6 3500 APUs case, the max multi is 24x and that is the highest multiplier that can be set. A55M-S2V correctly sees the max multi and does not allow higher adjustments but in case you do get those options on other boards they do not work properly. Monitoring utilities may also show incorrect speeds to the real values in windows. Best way to check is to test both settings and determine where there is any change in the benchmark.

This board does offer GPU clock frequency change. Once again it is a locked APU and even though you can select frequency, it will not really change it. GPU frequency can only be changed via base clock adjustment on locked APUs.

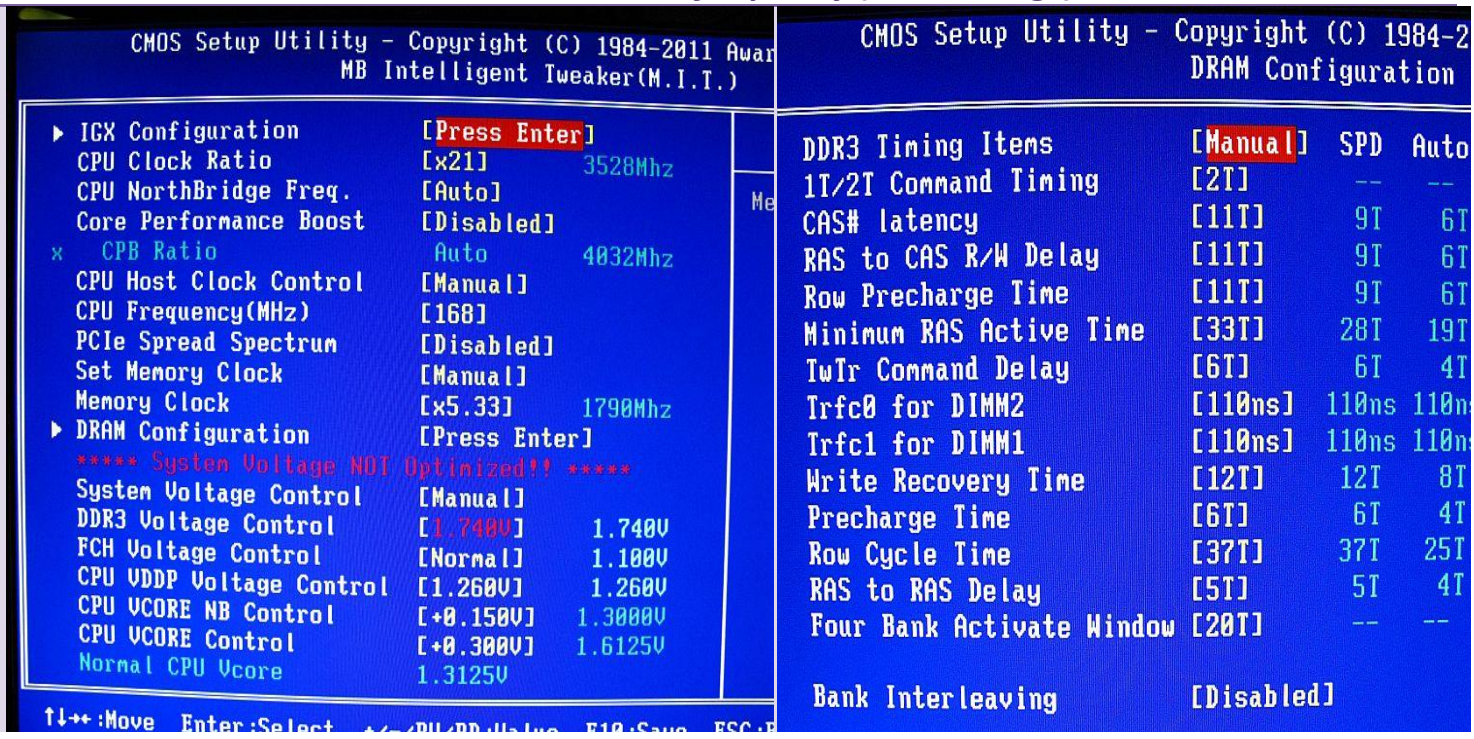
How to OC Llano platform properly?

Reference Clock Adjustment

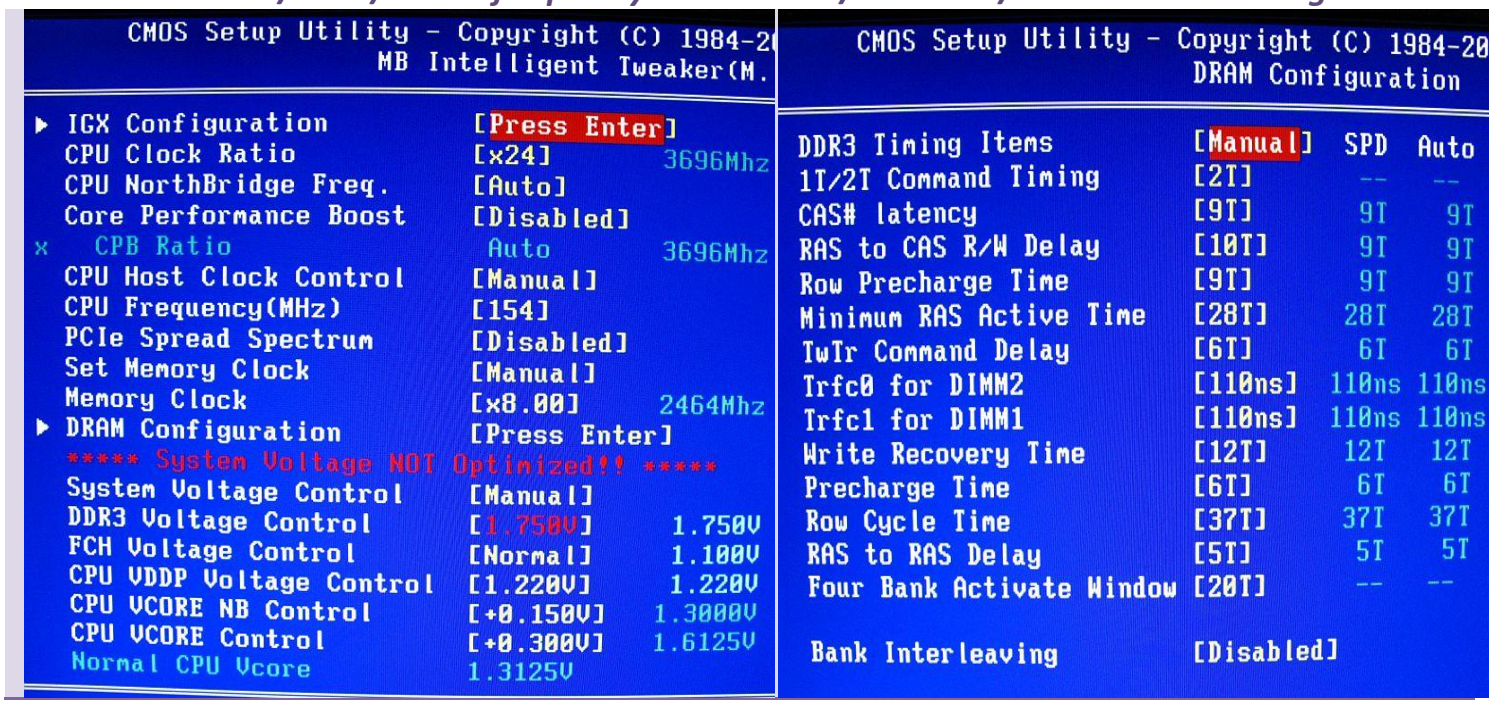
Given the fact APUs are currently locked the only way to properly overclock this platform is to control the reference clock or base clock(bclock). Default value is 100Mhz and it can be adjusted upwards. Bclock will control CPU, memory and GPU frequency. Increasing bclock to 110Mhz will increase CPU, RAM & GPU frequency by 10% for example. If we set 24x multiplier on CPU, x5.33 Memory ratio and 110Mhz bclock, the new CPU frequency will be 2640Mhz(24x110), RAM frequency will increase from 1066MHz to 1172Mhz (110x5.33x2) and GPU frequency will increase from stock 444Mhz to 488.2MHz (444x1.10).

Our testing has two goals, to find the max bclock and to combine the max bclock with max CPU and memory frequency.

Max bclock: 168MHz frequency (bios settings)



Max CPU/RAM/bclock frequency mix: 3.7GHz/2464Mhz/154Mhz bios settings



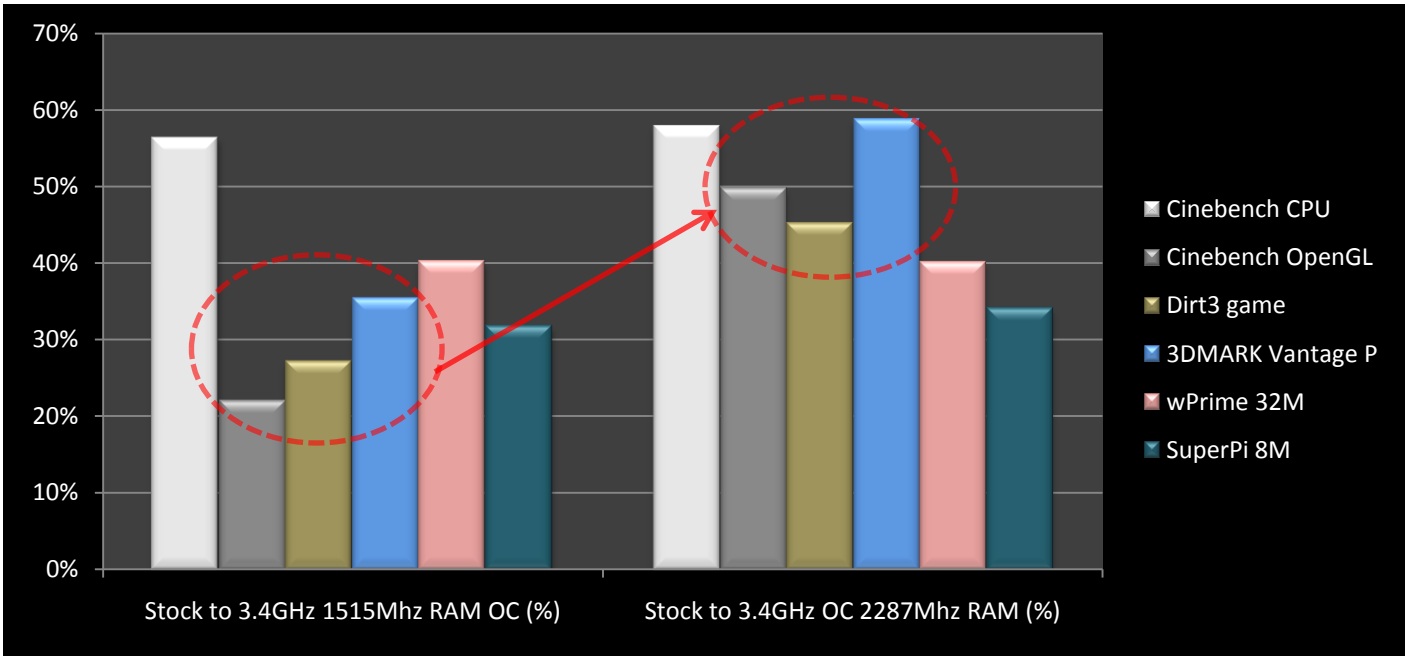
Memory speed and timings:

GIGABYTE bioses tend to work well with auto speed and timing controls generally however AMD Llano is the first platform I am aware that has drastic impact on gaming performance and as such it may require some more tuning to max out the memory speeds. Increasing memory frequency can yield 20%+ increase in gaming FPS alone and combined with overclocking over 50% with this particular system.

> **Frequency Increase**: Memory dividers on AMD A-series platform consist of x5.33, x6.66, x8.00 and x9.33 ratios. We've covered how bclock increases ram frequency previously with x5.33 and 110Mhz bclock. If we change the memory divider to x6.66, the new memory frequency will be 1465Mhz (110x6.66x2). If we change to x8.00 ratio RAM frequency increases to 1760MHz (110x8.00x2) and x9.33 ratios increases it to 2052Mhz (110x9.33x2).
>
> **Timing Control**: As you increase memory ratios and frequency you may have to adjust (or loosen) memory timings to stabilise the higher frequency overclock. If you select a higher ratio and the system fails to boot it may be the result of memory frequency limit at given volts and timings selected by bios (CAS#, RAS to CAS R/W, Row Precharge Time and Minimum RAS Active Time). CPUz reports these timings as 6-6-6-18 for example. What you may need to do is boot at previously stable multiplier and go to DRAM Configuration menu and manually adjust timings. If you see 8-8-8, try selecting 9-9-9-27 or 10-10-10-30. Some modules will also gain stability if you disable Bank Interleaving. If that is so leave it turned off otherwise turn it on as it improves performance of the system.

Memory plays a crucial role in improving graphics performance of A-Series APUs and this was very evident when we compared stock vs 3.4GHz (1515Mhz RAM) vs 3.4GHz (2287MHz RAM) in the chart below. Benchmarks that are only CPU bound such as Cinebench CPU, wPrime 32M and SuperPi 8M only saw minor improvements while GPU bound benchmarks (Cinebench OpenGL, Dirt3 & 3DMARK Vantage) clearly had a much larger increase in performance.

Effects of memory overclock on system performance (highlighted GPU based benchmark increases)



For a more detailed article on how high performance ram with AMD A-series APUs improves DX11 gaming performance visit GIGABYTE Tech Daily.

VOLTS

There are three groups of volts which need to be tweaked when you start overclocking Llano. They are related to memory , CPU and graphics processor.

DDR3 Voltage Control or VDIMM controls memory voltage. In our case we used memory rated at 1.65v. Some memory ICs scale with higher voltage as frequency and timings are increased beyond manufacturer specifications. Raise this voltage in small steps and check for stability. Our modules are based on Hynix ICs which can scale with volts up to 1.75v. Raising voltage will stabilise higher frequencies or tighter timings in most cases. If the modules don't scale with more voltage leave the volts at stock.

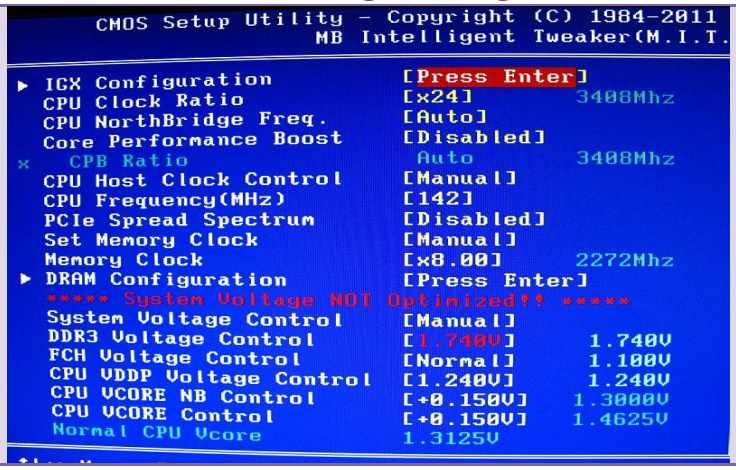
GPU volts

CPU VCORE NB Control, this is the main GPU voltage but it only requires a slight bump. Ideally, it should be tested gradually in +0.05 increments. This voltage can be pushed to 1.45v if there is sufficient cooling and if the GPU scales with volts.

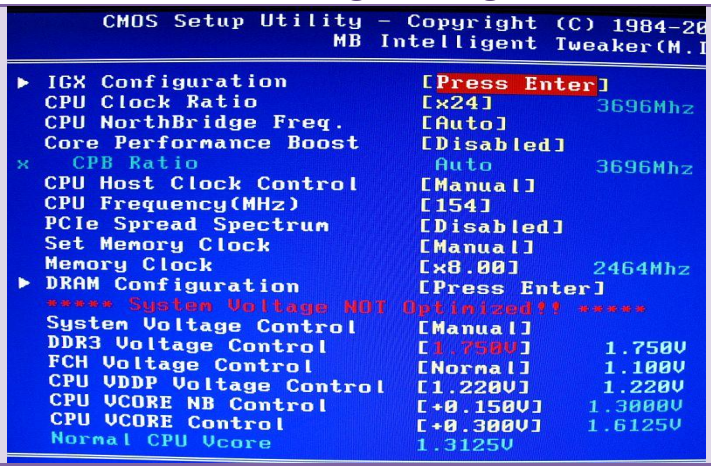
CPU VDDP Voltage Control, helps stabilise GPU and base clock at high frequency. This voltage in most cases can be left at 1.2v (stock) but in most testing we used 1.24. Raising higher to 1.3 can negatively affect main GPU voltage control. For max clocks a delicate balance is required between VDDP and core. Every APU will act differently with volts so generally look to increase VDDP only slightly (in +0.04 jumps).

CPU VCORE Control is the main CPU voltage and as you increase the frequency voltage needs to be adjusted accordingly. We've found that you will gain generally 100Mhz with every 0.05v increase in VCORE but heat and silicone frequency limit may affect max clocks.

3.4GHz OC voltage settings used



3.7GHz OC voltage settings used



Other parameters

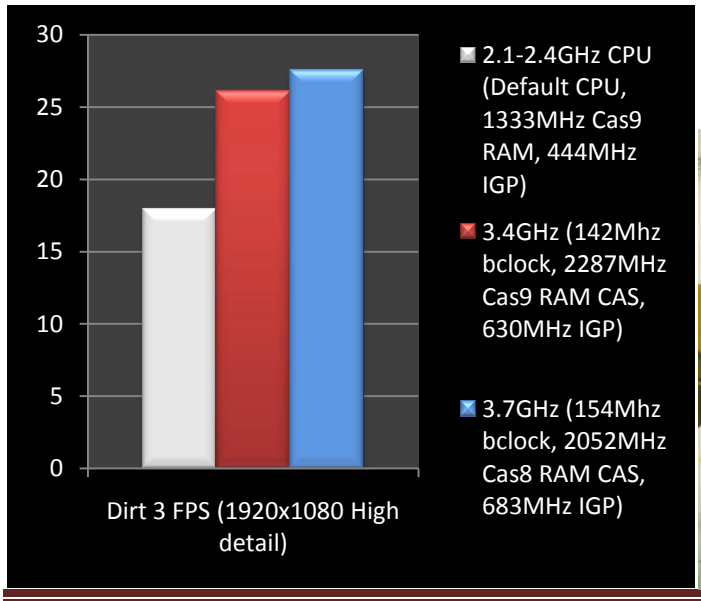
SATA Controller setting: Stick to Native IDE as AHCI has problems clocking bclock past 108Mhz when enabled.

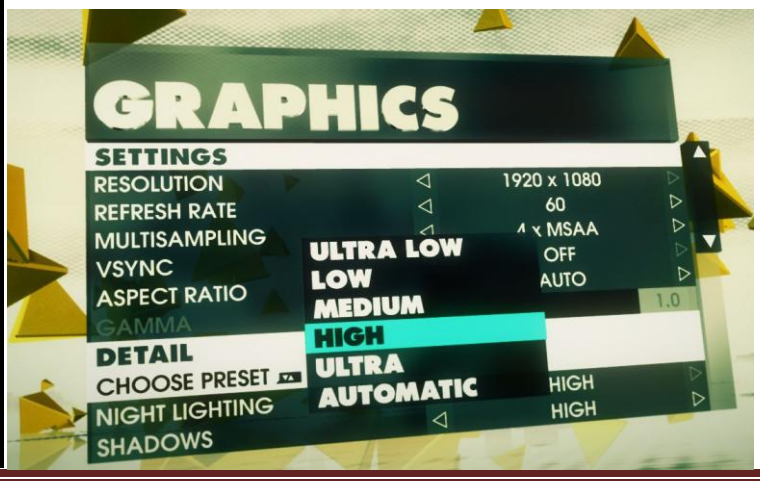
Power Management Options: It is generally recommended to force power options to max performance in windows and disable AMD Cool&Quiet and C-State in bios. Also use DVI/HDMI ports when overclocking.

GAMING - Dirt3

This is really where this APU shines and what gives something tangible to try and extract more MHz out of the stock frequencies. We decided it would be interesting to use Dirt3 at high quality settings and 1920x1080 resolution. It was obvious from the start that the test system was a bit sluggish at default bios settings as even the menus were taking a bit longer than normal to navigate through. Average fps at stock were below 18fps in the in-game benchmark. Not really playable! We needed 25fps+ for it to be smooth. 3.4GHz and 3.7GHz OCs with high RAM frequency averaged 26fps and 28fps respectively making it playable. Pretty impressive from an integrated GPU!

Graphics settings used to test performance



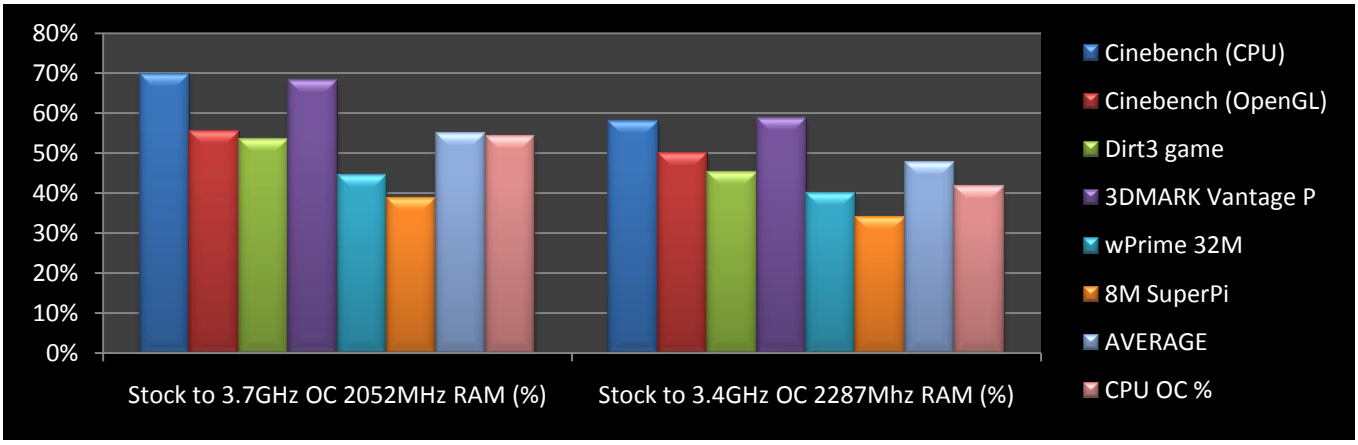


Final overclocking results and conclusions

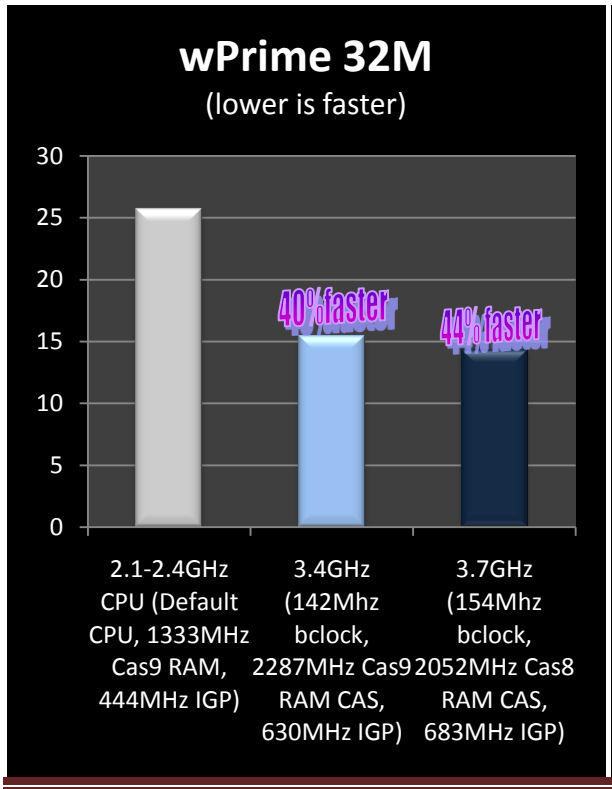
Key parameters to overclock A-Series AMD platforms are bclock, CPU and memory frequencies. They further require voltage tuning via VCORE, VDDP, VCORE NB and VDIMM. 1GHz increase from stock CPU frequency seems to be a good all round system overclock which increases performance by 48% on average.

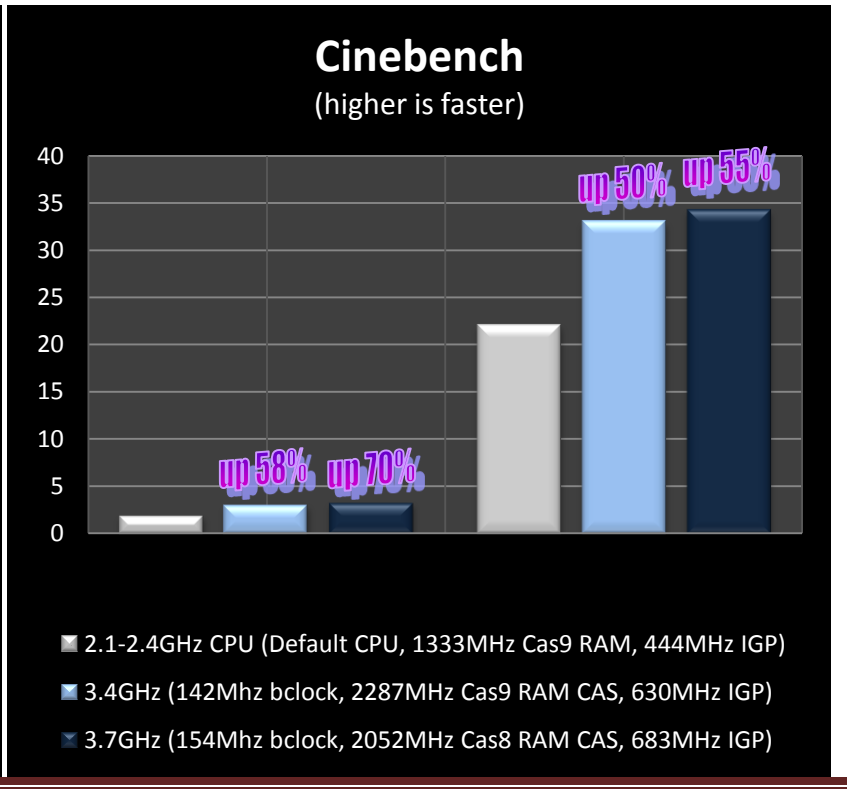
Final overclocking results charts provided below show stock, 3.4Ghz and 3.7Ghz results. Memory was tuned to 2287Mhz at 3.4Ghz and 2052Mhz at 3.7Ghz as they were the max stable frequencies at each of the CPU frequencies. The average increase in performance was higher than CPU frequency increase alone suggesting having a good motherboard capable of overclocking memory high will provide better overall system performance. 3.4Ghz average performance increase was 48% yet CPU OC was only 42%. This would be an ideal 24/7 OC which uses slight voltage increases and keeps APU cool.

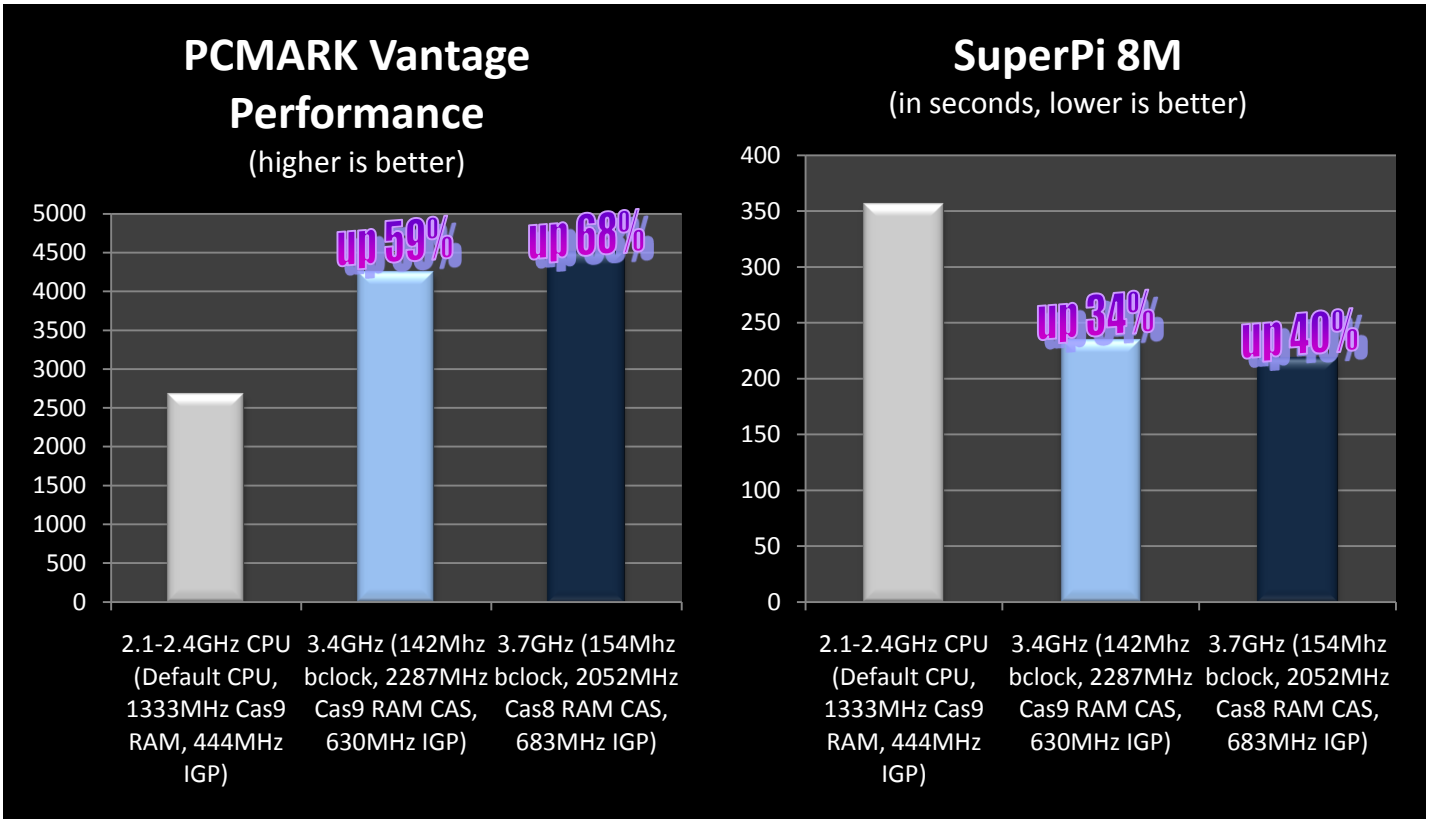
Percentage increase in performance as a result of overclocking APU and memory



Benchmark results (stock vs 3.4GHz vs 3.7GHz)







Dino Strkljevic (dinos22)

GIGABYTE Australia