Socket A Shootout

Building an Athlon Speed Demon

By Johan De Gelas – February 2002

We've covered a number of workstations and professional applications lately, so we felt it was time to take a break from such systems and take a look at the Athlon / Socket A platform from the perspective of a do-it-yourself hardware enthusiast. There's a sea of motherboards, CPUs, and memory out there, and different combinations will result in different levels of overclocking potential and stability.

So, what's the best Athlon / Socket A motherboard out there? What can a 166 MHz or higher FSB do for the Athlon XP? Does it pay to invest in the unofficial PC2700 or PC2400 DIMMs? How does an overclocked Athlon XP compare with Intel's overclocked Northwood? These are the questions we'll answer today. Our goal is to build an extremely high-performance (overclocked) Socket A PC, without sacrificing stability and without using out-of-spec voltages or exotic and expensive cooling solutions.

To find the highest-performance Socket A platform, we start by comparing the different chipsets out there. Once we have identified the best chipset, we try to find the most overclockable Socket A motherboard. Overclocking is useless without getting decent stability, so we also take an in depth look into the conditions under which can achieve these goals. By process of elimination, we will find the ultimate Socket A solution!

Choosing the Right Chipset

We know, for most of our readers, the outcome of this test is very obvious. It is very well known that the VIA KT266A and Nvidia nForce are the fastest chipsets currently available for the Socket A platform. But we couldn't resist running a few benchmarks just to see how wide of a performance gap we are dealing with versus the competition...

STREAM

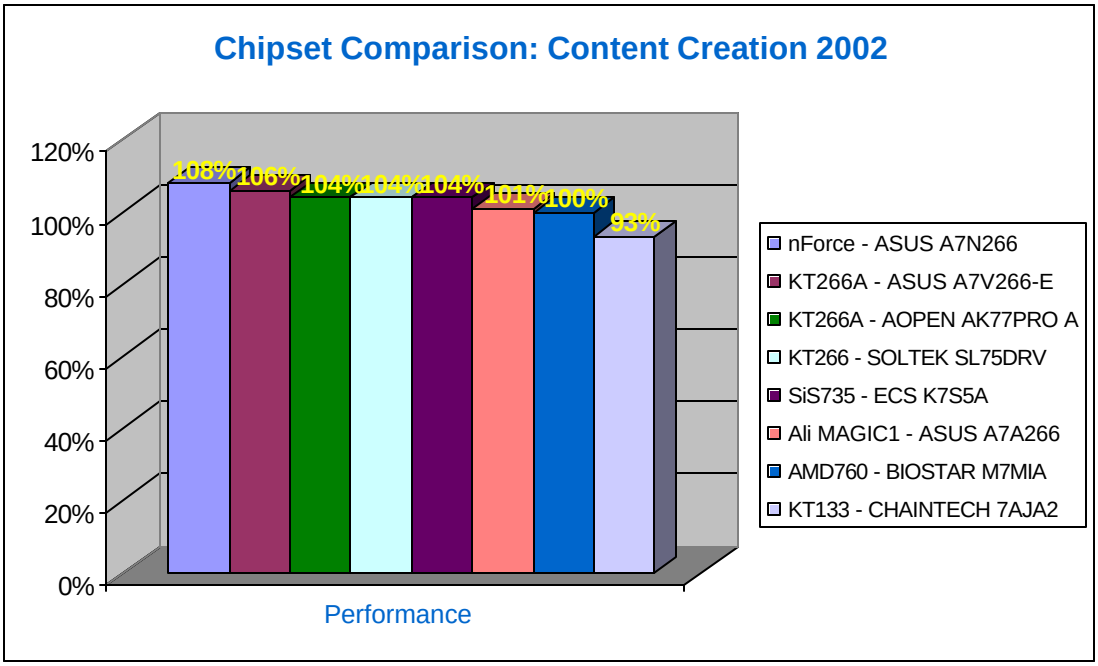
Stream	Athlon XP 2000+ ASUS KT266A	Athlon XP ASUS nForce	Athlon XP ASUS ALI magic 1	Athlon XP AMD760 (Biostar)	Athlon XP KT266 (Soltek)	Athlon XP KT133A (Chaintech)	Pentium 4 ASUS i845D (PC2100)
Copy 32	693	853	613	672	535	507	885
Copy 64	698	863	604	659	633	530	958
Scale	795	944	609	812	851	480	946
ADD	881	970	714	855	850	571	1152
Triad	853	980	714	832	780	534	1141
Average Bandwidth (MB/s)	**784**	**908**	**635**	**749**	**730**	**525**	**1016**

Please note that the ASUS KT266A motherboard was the fastest solution using the VIA KT266A chipset. This is not the case for the Biostar, Chaintech and Soltek boards, so the respective chipsets (AMD760, KT266, KT133A) might perform slightly better with different boards. Nevertheless, our conclusion would remain the same: the nForce and KT266A rule the Socket A world. Let's see some application benchmarks.

Content Creation 2002

ZD eTesting Labs Content Creation 2002 is a multitasking mix of Adobe Photoshop 6.0.1, Adobe Premiere 6.0, Macromedia Director 8.5, Macromedia Dreamweaver UltraDev 4, Microsoft Media Encoder 7.0.1, Netscape Navigator 6/6.01 and Sonic Foundry SoundForge 5.0c. The benchmark stresses the disk and the memory system intensively. As the disk performance depends more on hard disk performance than the southbridge chipset capabilities, chipset differences are not really clear-cut. Content Creation 2002 is not the ideal chipset benchmark, but it gives nevertheless an impression of what creative people may expect to see.

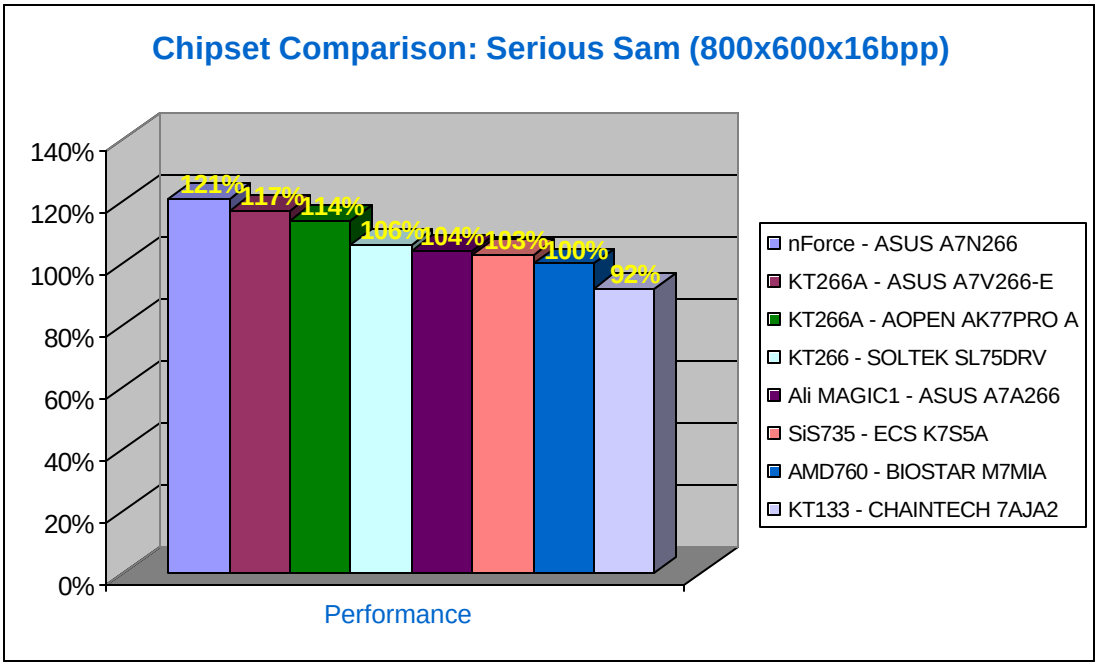
To make the differences more clear, we normalized the performance of the AMD760 chipset to 100%.



NVIDIA's nForce chipset takes the lead, albeit the 2% extra performance we measured is close to the error margin of this benchmark. Notice that the SDRAM based KT133A falls far behind in Content Creation 2002.

Serious Sam

Serious Sam is one of our best chipset benchmarks. This fast-paced OpenGL game needs a fast memory subsystem and clearly shows the differences between the different northbridges.



The nForce wins again by a small margin. If you are still not convinced that the nForce is the fastest chipset, consider that the nForce was 6% faster in a Max Payne benchmark and 5% faster in MPEG-2 encoding. It is clear that we can now narrow our search to the VIA KT266A and Nvidia nForce 420 based motherboards. All other chipsets clearly deliver lower performance, and are therefore eliminated.

Benchmark Configuration

All systems have been tested with NVIDIA's Detonator 21.85 drivers. The VIA-based boards were tested with VIA's 4-in-1 4.37 drivers, while the Intel-based i845D system ran with Intel's latest INF update from December 2001.

As you can see, we have tested with Windows 2000 Service Pack 2. Why not Windows XP? Well, we have continued to run into a lot of trouble with Windows XP. All benchmarks ran well in Windows 2000 SP2, and we believe that most professionals and hardcore hardware enthusiasts prefer the matured Windows 2000 SP2. Windows XP will the OS of our test bed when it receives its first service pack, so long as it is stable...

Athlon XP 2000+, Athlon MP 1900+

- MSI K7T266 Pro 2 (VIAKT266A) bios version 3.3
- ASUS A7V266-E (VIAKT266A) bios version 1.004
- ASUS A7N266 (nForce), bios version 1.001B
- MSI K7N420 Pro (nForce), bios version 2.3
- AOPEN AK77PRO (KT266A), bios version 1.10
- ABIT KR7A (KT266A), bios version 6N
- GIGABYTE GA-7VTXE (KT266A), BIOS version F4
- CHAINTECH 7VJDA (KT266A) bios version 3
- 512 MB Corsair PC2400 DDR-RAM CAS 2

Pentium 4 2A i845 DDR and 2.2 GHz (Northwood)

- ASUS P4B266 (i845 DDR chipset) bios version 1.005
- 512 MB Corsair DDR-RAM CAS 2

Common Hardware

- IBM Deskstar DPTA-373420 ATA/IDE 34.2 GB (7200 rpm, ATA-100)
- ASUS GeForce 3 Ti500 64 MB
- AT 2700 10/100 NIC
- Sound Blaster Live!

Software

- Windows 2000 Service Pack 2
- Nvidia nForce: Unified Nvidia Driver Version 1 (Gart: 2.10)
- VIA KT266A: VIA 4-in-1 Version 4.37
- DirectX 8.1

We'd like to thank the following helpful people for their support and crucial contributions to this review:

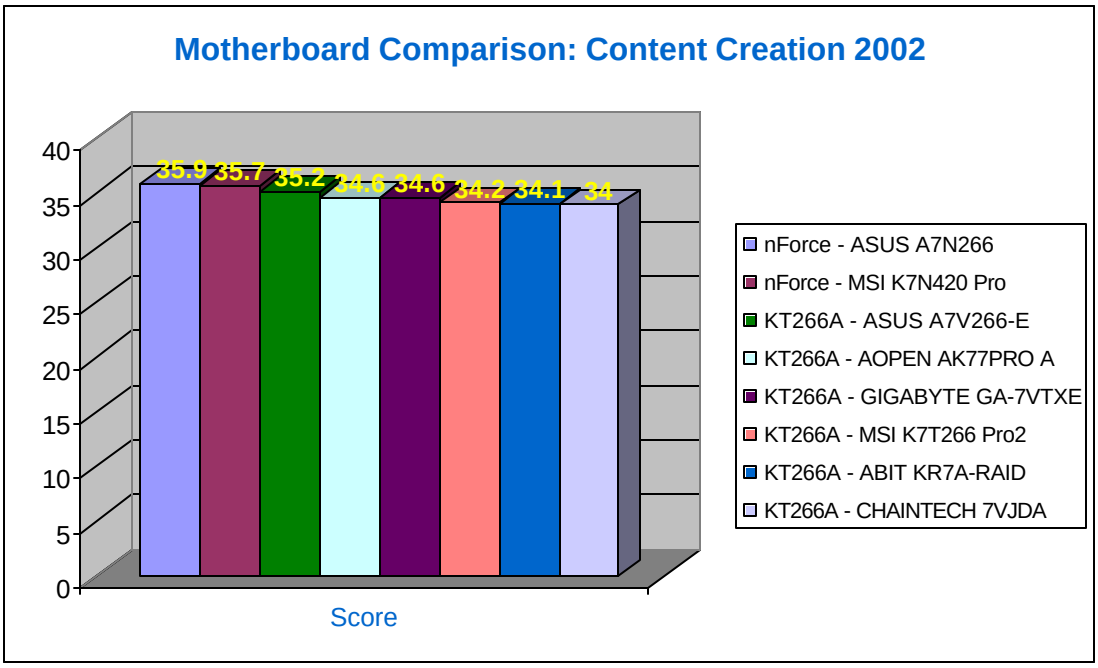
Damon Muzny (AMD) for giving us the chance to test the Athlon XP 2000+ and Athlon MP 1900+.
Robert Pearce of Corsair, provided us with Corsair's PC2100 DDR CAS2 and PC2700XMS DDR.
A Big Thanks to Augustine Chen**,** Carol Chang (ASUS) and Sharon Tan (BAS computers Netherlands) for the ASUS motherboards.
Jamel Tayeb and Jurgen Heymbrechts (Intel), Marieke Leenhouts (MCS) made sure we could test the Pentium 4 2A GHz en 2.2 GHz.
Angelique Berden of MSI provided us with the MSI KT266 Pro-2 and MSI K7N420 Pro.
We also like to thank ZDNet Belgium for sending us the other Socket A boards. Many thanks go to Kevin, David, and Thomas.

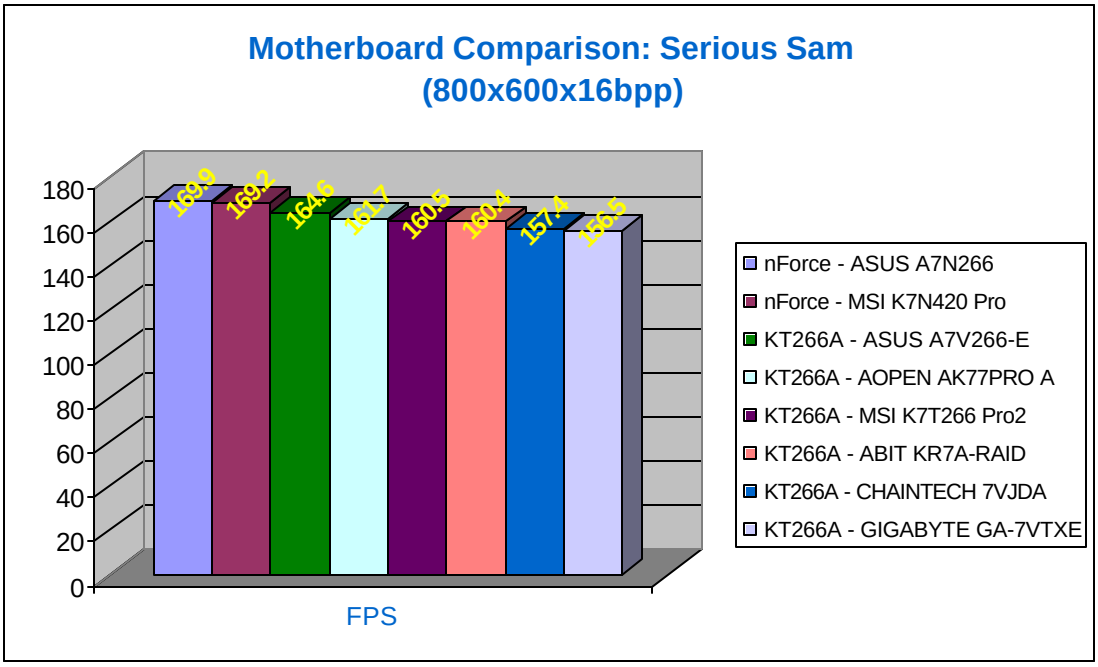
All this industry support is very much appreciated by the Ace's Hardware staff!

Socket A Motherboard Comparison

We assembled two nForce systems and six KT266A systems to make sure we get a proper overview of the various solutions based around these two chipsets. Of course, this overview is far from complete, but remember this is not really a motherboard comparison article. Our goal is to build a high-performance Socket A PC...

To determine the top motherboards at standard settings, we run the same set of benchmarks, this time comparing against nForce and KT266A motherboards. The CPU used for these tests is the Athlon XP 2000+.





The benchmark comparison proves that the nForce is indeed the fastest Socket A chipset. While the difference between the two ASUS boards is small, the nForce boards are between 4 and 8 percent faster than the KT266A

competition. In this overview, the best boards come from AOPEN, MSI and ASUS, but the differences are very small and hardly worth discussing. The overclocking tests will decide...

Socket A Overclocking

Estimating the overclocking potential of a certain motherboard is quite frankly a daunting task. First of all you must make sure that it is the chipset and the board that limits the front side bus speed and not the CPU, RAM, AGP port, or PCI bus.

To make sure the CPU was not limiting our overclocking results, we used an Athlon MP 1900+ with the multiplier at 9 instead of 12. It is not well known, but the AMD's Athlon MP processor has an unlocked multiplier. To be more precise: all Athlon MP processor we have seen so far are unlocked. Our findings have been confirmed by several Taiwanese motherboard manufacturers, but not by AMD.

To make sure that the memory didn't spoil the party, we used Corsair's PC2700 XMS or eXtreme Memory Speed. We'll discuss these overclocking wonders in more detail later, but this kind of RAM is speced to run at 166 MHz CAS2. We were able to run it at 180 MHz CAS2, so there is a lot of headroom there.

An overclocked AGP port is no longer a real problem for overclocking. We tested several video cards at 88 MHz (FSB at 133 MHz) and all tested video cards -- ATI Radeon 7500, 8500, GeForce 2 GTS, GeForce Ti 200, GeForce Ti 500 -- were able to cope with it.

In table below, you'll find three columns describing our experiences:

- **Max. FSB Boot:**
  The maximum speed the board is able to POST at and start the Windows boot.
- **Max. FSB W2000:**
  The maximum speed at which the board is able to boot Windows 2000 and run some non-intensive programs.
- **Max. FSB Stability:**
  The maximum speed at which the board able to run all of our special stability mix of benchmarks. This mix includes the programs that have proven to be very sensitive to slightly unstable hardware. This includes the 3DS Max rendering of the architecture scene, where the 600,000 polygons place a huge load on the FSB and chipset, as well as SpecViewPerf and Content Creation. If an overclocked board survives this test, we are about 95% sure that it will be stable at this speed.

You may be wondering about the lack of game benchmarks in our stability testing. It's interesting to note that, in our experience, most games tend to run at speeds where our stability mix of mostly workstation applications crashes. So, in our humble opinion, they are not as interesting for stability testing. Also note that some of these boards -- the boards from ASUS, MSI and ABIT -- have been tested and used for weeks in these overclocked configurations.

Motherboard - VIA KT266A	Max. FSB Boot	Max. FSB W2000	Max. FSB Stability
ABIT KR7A	185	180	178
AOPEN AK77PRO	150	146	142
ASUS A7V266-E	160	155	155
BIOSTAR M7VIB	160	155	155
CHAINTECH 7VJDA	160	154	150
GIGABYTE GA-7VTXE	164	158	157
MSI K7T266 Pro2	161	160	157
Motherboard - nForce 420D	**Max. FSB Boot**	**Max. FSB W2000**	**Max. FSB Stability**
ASUS A7N266	172	172	165
MSI K7N420 PRO	147	140	140

The ABIT KR7A was a rather mediocre performer at normal speeds, but it lives up to it's reputation -- booting at 185 MHz, and running stable at 178 MHz while most VIA KT266A boards hardly run stable at 155 MHz -- it is simply a breath-taking, hard-core overclocker's motherboard.

Overclocking performance of the new revision of MSI's K7N420 Pro is a bit disappointing, confirming our early findings, back in October 2001. It is not easy to make a nForce board with a lot of headroom. Is this "Game Over" as ABIT's KT266A delivers fantastic overclocking possibilities? No. The first ASUS A7N266 (1.0) boards were not able to do better than 146 MHz, but ASUS was able to improve that considerably. The newest ASUS A7N266 (rev 1.01) updated to the latest BIOS revision surprised us with excellent stability at 165 MHz FSB. In fact, running games at 172 MHz FSB was not out of the question, but 3DS Max rendering froze at this speed. At 167 MHz FSB, the rendering tests would complete successfully most of the time and games would run without a single crash. At 165 MHz, everything ran without incident.

According to ASUS, the primary reason behind the high overclockablity of their nForce board (better than their KT266A board!) is the custom and specially balanced BIOS, as well as close cooperation with NVIDIA. So, there you have it: we have found the two highest performance Socket A boards for the hardware enthusiast. New questions arise: do you need expensive ($130), but high quality Corsair PC2700 XMS before you can push these boards to the maximum? What performance do you get in comparison to non-overclocked Athlon systems and overclocked Northwood systems? Let's find out!

Memory Overclocking

As the ABIT KR7A test showed, Corsair's XMS 2700 can run at 180 MHz CAS 2, and probably 185 MHz if the board could cope with such a high speed. Please note that Corsair's best DDR is called "XMS 2700" (eXtreme Memory Speed) and not PC2700. PC2700 is a new JEDEC standard which will use slightly different chip packaging (FBGA package instead of TSOP), but which can be used in the same DIMM slots as PC2100.

The XMS 2700 parts are the best PC2100 chips that have been tested at 166 MHz DDR CAS2. Two versions exist, one based on Samsung chips (XMS 2700 1.0) and one based on Micron chips (1.1). According to Micron's latest reports, the PC2700 standard is ready, but real PC2700 won't be on the market until manufacturers get decent yields on 6 ns parts. Corsair told us they expect this to happen sometime within the next two months.

The PC2700 XMS DIMMs are very impressive, but do you need such expensive DIMMs ($130-140 for 256 MB) to get the best performance out of your Socket A PC? We investigated the matter with 7 different DIMMs produced in different time frames:

- Corsair XMS 2700 1.1 (Micron) - produced around January 2002
- Corsair PC2700 XMS 1.0 - produced around January 2002
- Corsair PC2400 CAS2 - produced around November 2001
- Corsair PC2100 CAS2 - produced around March 2001
- Crucial PC2100 CAS2 - produced around September 2001
- Crucial PC2100 CAS2 - produced around April 2001
- Nanya PC2100 - Produced around November 2001

The goal of testing these DIMMs is not really to compare the different brands, but to give you an idea of what your options are. It is not really fair to compare a Crucial DIMM of April 2001 with a Corsair of January 2002, of course. But we can imagine that many of you have already bought DDR RAM and would be interested in getting an idea how well it would perform on the most overclockable Socket A motherboards currently on the market: the ABIT KR7A and ASUS A7N266-E

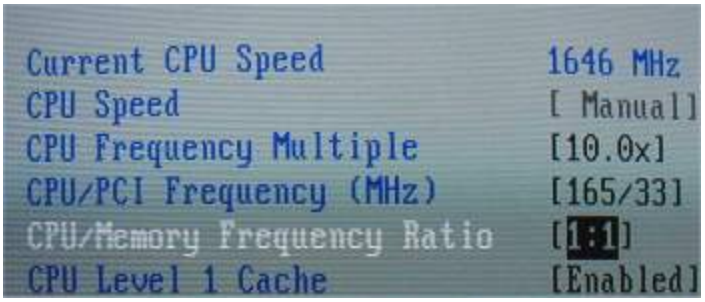
Type of RAM	Max. W2000 Boot	Max. Stability	Voltage
Corsair PC2700 XMS 1.1 (Micron)	185- CAS2	178 - CAS2 174 - CAS2.5	2.75-2.85V
Corsair PC2700XMS 1.0 (Samsung)	185 - CAS2	180 - CAS2	2.65V
Corsair PC2400 CAS2 (Micron 46V16M8 -75A 0140)	166 - CAS2 167 - CAS2.5	164 - CAS2 166 - CAS2.5	2.65V
Corsair PC2100 CAS2 (Samsung K4H280838B-TCB0)	155 - CAS2 165 - CAS2.5	150 - CAS2 160 - CAS2.5	2.65V
Crucial PC2100 CAS2 (old) (Micron 46V16M8 -75Z 0145)	150 - CAS2 165 - CAS2.5	154 CAS2.5	2.65V
Crucial PC2100 CAS2 (new) (Micron 46V16M8 -75 0140)	164 - CAS2.5	157 - CAS2.5	2.65V
Nanya PC2100 CAS2 (Nanya NT5DS16M8T-7K)	147 - CAS2 155 - CAS2.5	147 - CAS2 155 - CAS2.5	2.65V

The Corsair PC2400 modules are a very nice alternative if you do not have deep pockets. Priced at around $80-$90, they had no trouble running at 166 MHz (CAS 2.5) on both the ASUS nForce motherboard and the ABIT KT266A motherboard. Even if you bought Crucial or Corsair CAS2 RAM months ago, you can still get very decent overclocking performance from those old DIMMs.

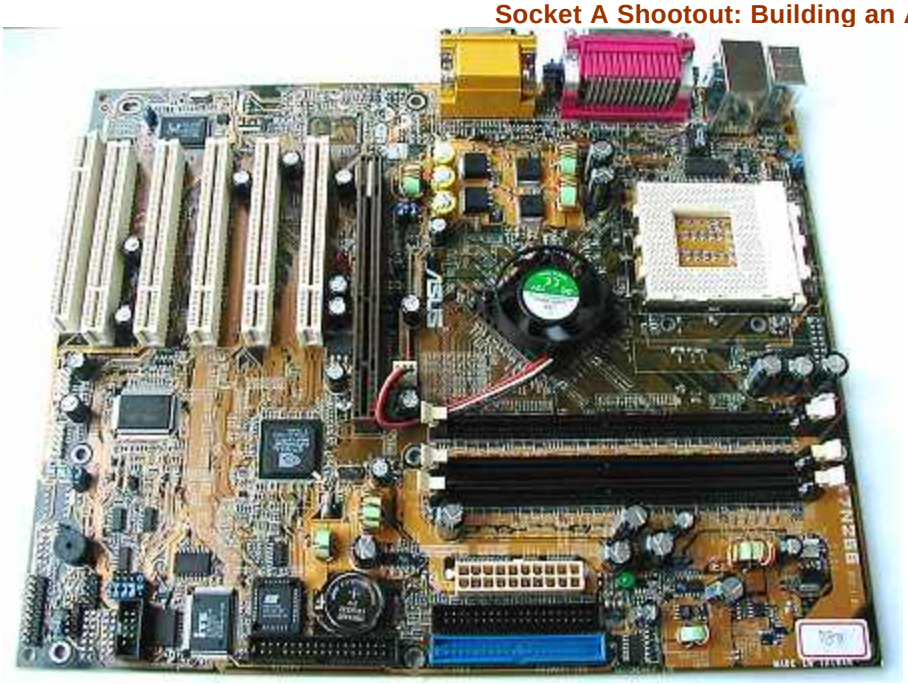
ASUS K7N266-E

The ASUS K7N266-E is a very feature-rich motherboard. It comes with an ACR (the "upside down PCI slot") daughter card that supports S/PDIF, mic-in, line-in, front, rear and center/subwoofer connectors.

While ASUS makes full use of the nForce APU, it does not use the integrated LAN, but a Realtek 8139 RTL LAN controller. The board also comes with two additional USB headers and an AGP Pro slot. The ASUS A7N266-E is a bit old-fashioned when it comes to overclocking. To raise the RAM and CPU voltages you have to set jumpers just like in the good old days. The CPU voltages can be set from 1.075V to 1.85V in steps of 0.025V. RAM voltage can be set to 2.5, 2.6 and 2.7V. Only the FSB speed and multiplier can be set in the BIOS.



As for memory settings, only the CAS latency can be adjusted in the BIOS, as all other settings are not available. The layout is not ideal, as the CPU socket is very close to the edge of the board, and the ACR slot makes the PCI slot next to it useless. As the ASUS A7N266-E has no stereo output on the back panel, anybody who wants sound output needs to install the ACR daughter card. Note that the CMEDIA sound chip is not present on the ASUS A7N266-E -- see the empty solder pads on the PCB above the first PCI slot and the AGP slot. This is important, as we advise you to get the A7N266-E, which uses the nForce's integrated sound instead of the ASUS A7N266, which uses the CMEDIA chip. The nForce APU delivers better quality and better performance than the CMEDIA chip.



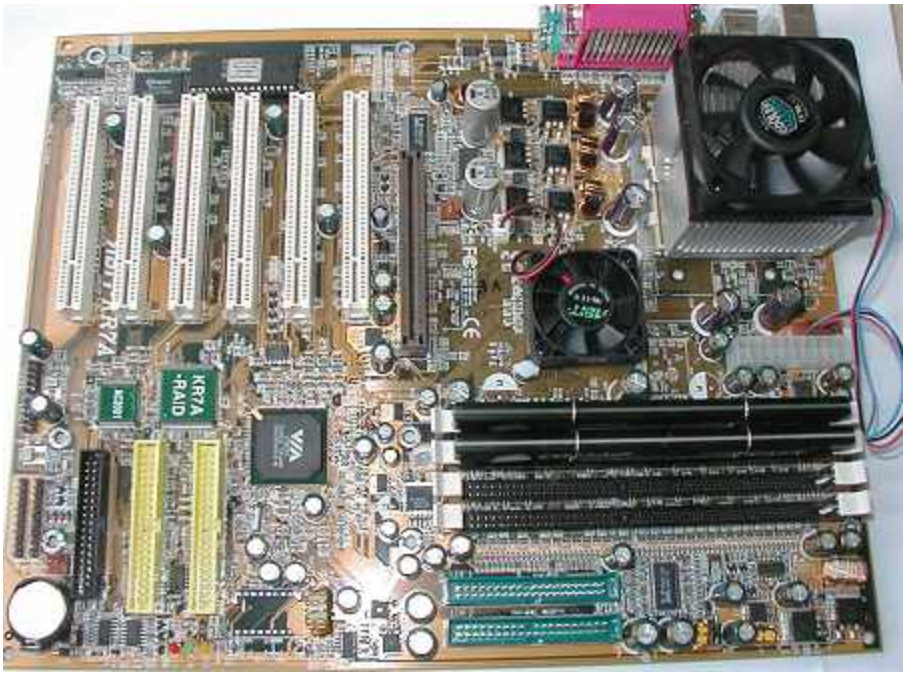
Let's zoom in on the board to take a look at what makes the A7N266-E so stable at high FSB speeds.

It looks like ASUS uses two-phase circuitry. That seems a bit odd, as most quality motherboards use a three-phase power setup to keep those fast CPUs happy. The power circuitry contains voltage regulators, which step the input voltage down to the CPU's core voltage and maintain that voltage within set tolerances. It is especially important for the circuitry to be able to react very quickly, particularly if you want to overclock your CPU, as a voltage dip can halt your CPU (the signal is not clean enough) and a voltage spike can overheat or damage the CPU, which is probably already working at rather high core voltages as it is. As the voltage input is not perfect, but has ripples, the task of the voltage regulators is to turn these voltage ripples into dissipated heat, so that your CPU gets fed with a steady voltage. A two-phase circuit burns these ripples away in two steps, while a three-phase circuit does it in three. This kind of dissipation does not happen statically but by switching extremely fast. According to LostCircuits, ASUS uses now an ON Semi CS5322 chip which allows faster switching and reacting to voltage dips/rises with a two phase setup than other designs with a three-phase setup.

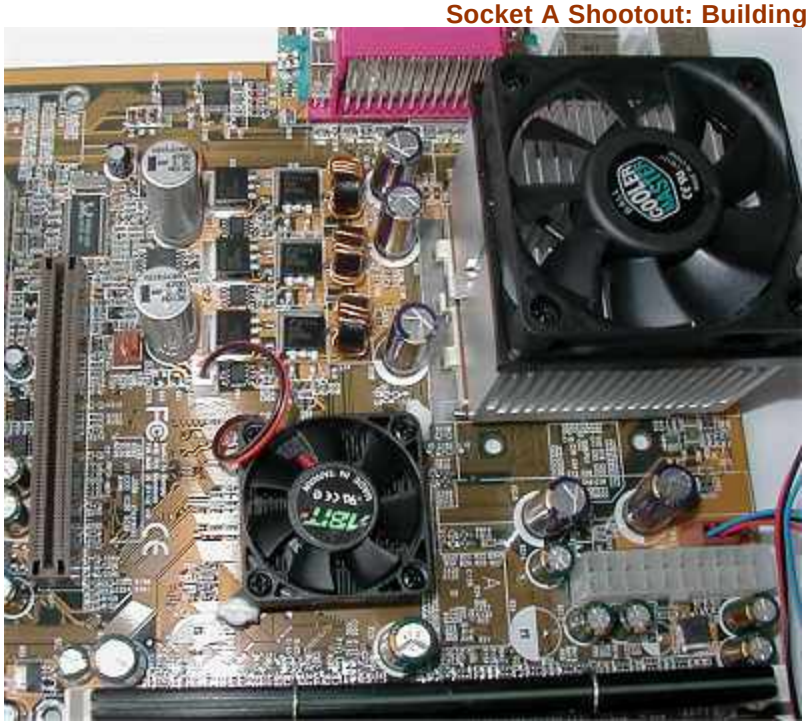
The second reason why the ASUS A7N266-E is able to run at 165-167 MHz without incident is due to the fact that the PCI clock is fixed at 33 MHz, regardless of how high the FSB frequency is set. Running peripherals out of spec is a quick path to an unstable system, so it's easy to see why this feature is so important to overclockers.

ABIT KR7A-RAID

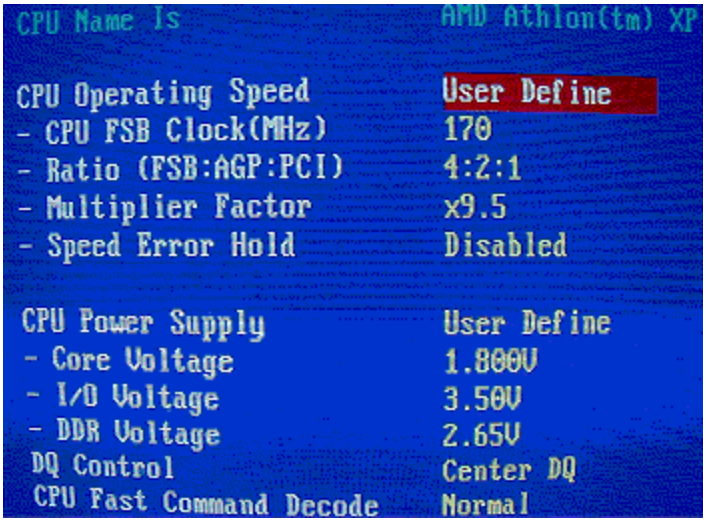
The ABIT KR7A-RAID comes with a quite a few extras such as an excellent ATA-133 Highpoint HPT372 IDE RAID chip and an extra USB bracket. There is no onboard sound, however, though many enthusiasts prefer separate sound cards anyway.



The board supports up to four 1 GB DIMMs for a total memory capacity of 4 GB, but only if you use registered (buffered) DDR modules. Registered modules carry a price premium, though at such module densities, it is not overly significant in our opinion. Crucial currently sells 512 MB PC2100 registered ECC modules for about $15 more than the equivalent unbuffered, non-parity modules. When using strictly unbuffered modules, the KR7A-RAID is limited to 3 GB.

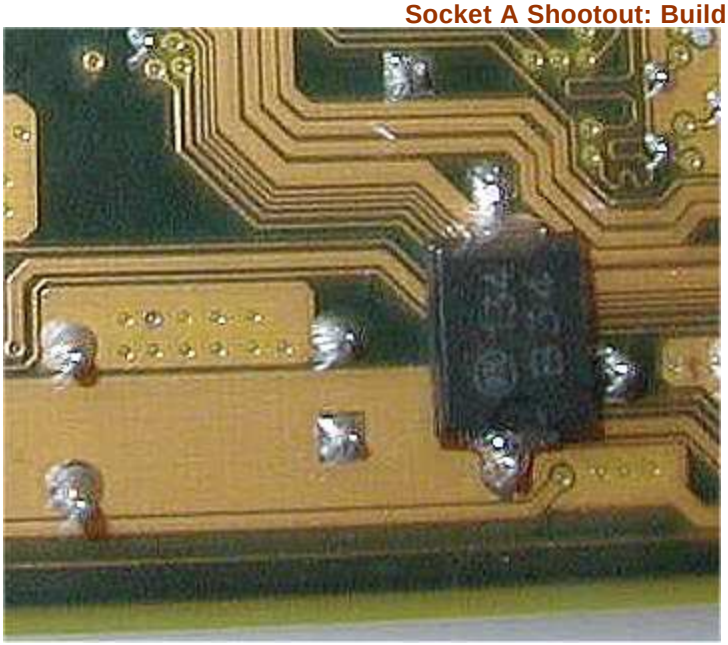


ABIT's engineers have clearly spent a lot of time on the KR7A-RAID's very high quality power circuitry, consisting of a well-designed three-phase power setup and cream of the crop 4700 mF capacitors to finish it off. It is no wonder that this was the only board in our test that was able to push the FSB speed to 178-180 MHz. ABIT's CPU SoftMenu III is still a superior tweaking tool. The FSB can be set from 100-200 MHz in 1 MHz steps, the I/O voltage can be set at 3.5 and 3.65V and the DDR voltage to 2.55, 2.65, 2.75 and 2.85V.

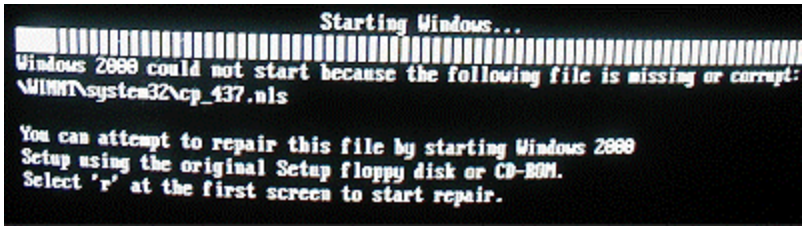


The ABIT KR7A-RAID impressed us a great deal, but this board has some strange quirks. It is not a board for novices, we can tell you that. Once we put the board in a case, it gave no sign of life. Closer inspection revealed that the board was short-circuited. We tried it in another case, and got the same result. We have tested about twenty boards in this case, and no other board had any insulation problems. When we mounted the ABIT KT7A (VIAKT133A) we got the same result, the board was sometimes short-circuited and wouldn't boot. We contacted ABIT about this, but received no answer.

When we looked at the backside of the PCB, we noticed that there is a component on the backside, which is a bit odd and it might be the reason why it refuses to work with some cases.



Another minor weak point is the fact that the FSB/AGP/PCI ratio can only be set to 4/2/1 or 3/2/1. This means that when the FSB is running at 180MHz, the PCI bus is running at 45 MHz and there are still several hard disks that do not like these kinds of overclocked IDE speeds. After a few days of testing, Windows 2000 refused to start up and many files were corrupted.

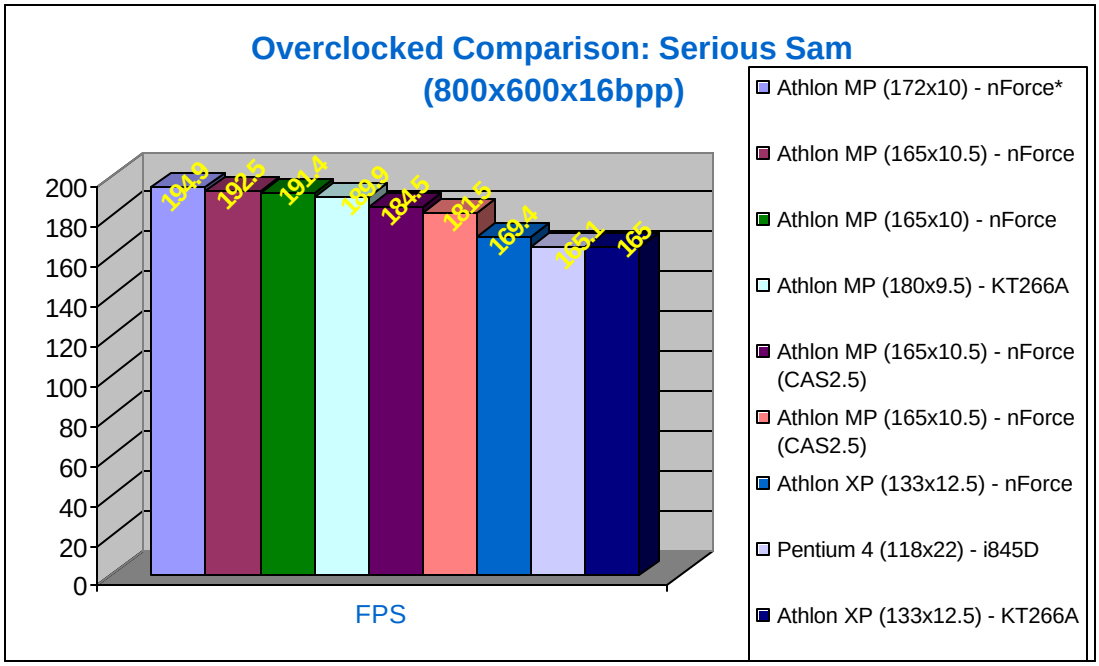


Automatic repair didn't help, only a fresh installation of the OS repaired the damage. Of course, this may depend on the hard disk. We did not test with other hard disks, but we prefer the ASUS solution: keep the PCI bus at 33 MHz.

Overclocking Athlon XP versus Northwood

AMD's Athlon XP is the most popular CPU among our typical readers, but the huge overclocking potential of Intel's Northwood may just change that. So, how well does an Athlon XP (in our case an Athlon MP 1900+) do when it is running at 165-180 MHz FSB? Very well! We compared with a 2.2 GHz Northwood overclocked to 22 x 118 or 2.6 GHz.

At Ace's Hardware, we are relatively conservative overclockers. We do not want to pay $100 or more for cooling solutions, and voltages that may ruin your components within weeks are unacceptable. So we used a simple and affordable GlobalWin DP5-6I11A cooler with a 4800 RPM fan. The CPU voltage was set at 1.775-1.8V, the I/O voltage at 3.5V, and the DDR voltage at 2.65V, all well in spec. The 2.2 GHz Pentium 4 was running with a voltage of 1.7V, which is slightly out of spec (1.65V), but not immediately life threatening.



** Not rock stable in other benchmarks*

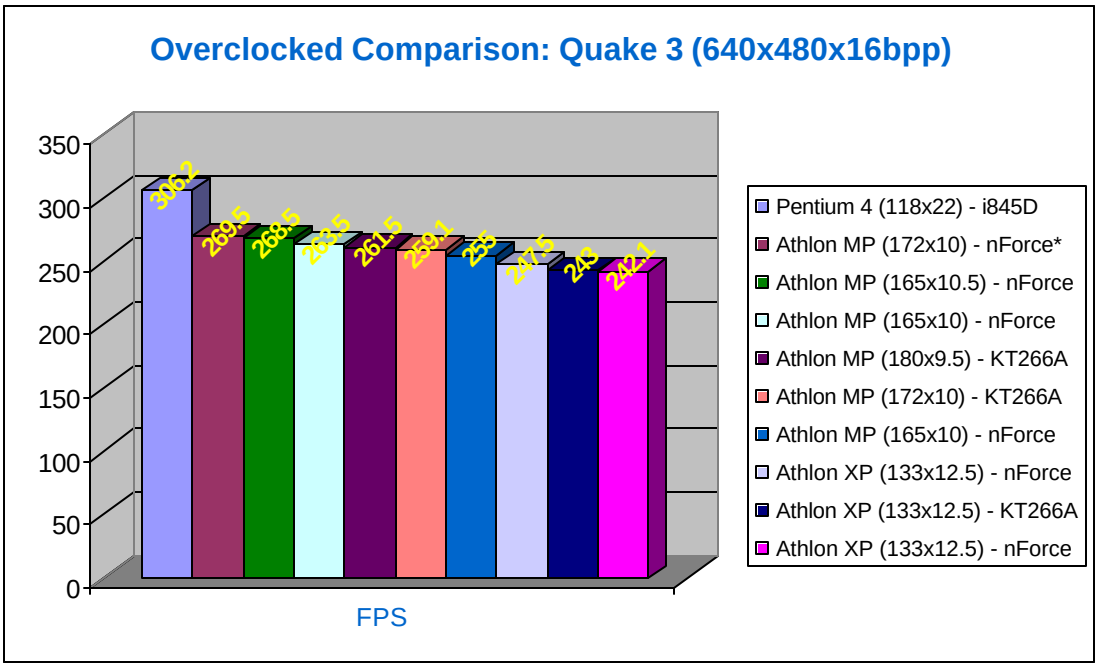
This benchmark is clearly a testimony to the fact that the highest megahertz numbers do not automatically translate into the best performance. The 1650 MHz Athlon MP, supported by the nForce, beats the 1710 MHz Athlon MP with the KT266A chipset. The Pentium 4 2.6 GHz is capable of beating the Athlon 1667 MHz, but only when a 133 MHz bus limits it. A 165 MHz FSB makes the Athlon XP (MP) fly away! We doubt very much that any of those insanely overclocked 3 GHz Northwoods (running at voltages that can kill the chip within days/weeks) can beat our affordable, "everybody-can-do-it" ASUS nForce + Athlon XP 1900+ combination.

Comparing the nForce + Athlon 1650 MHz (165 MHz FSB) and nForce + Athlon 1666 MHz (133 MHz FSB) is also very interesting. It shows that the Athlon would get a 13% increase in performance when running with PC2700 and 166 MHz FSB.

As all the CAS 2 readings have been done with Corsair's PC2700 XMS, we also included CAS 2.5 benchmarks, which were performed with the more affordable PC2400 XMS modules. A 3-4% performance loss seems very acceptable.

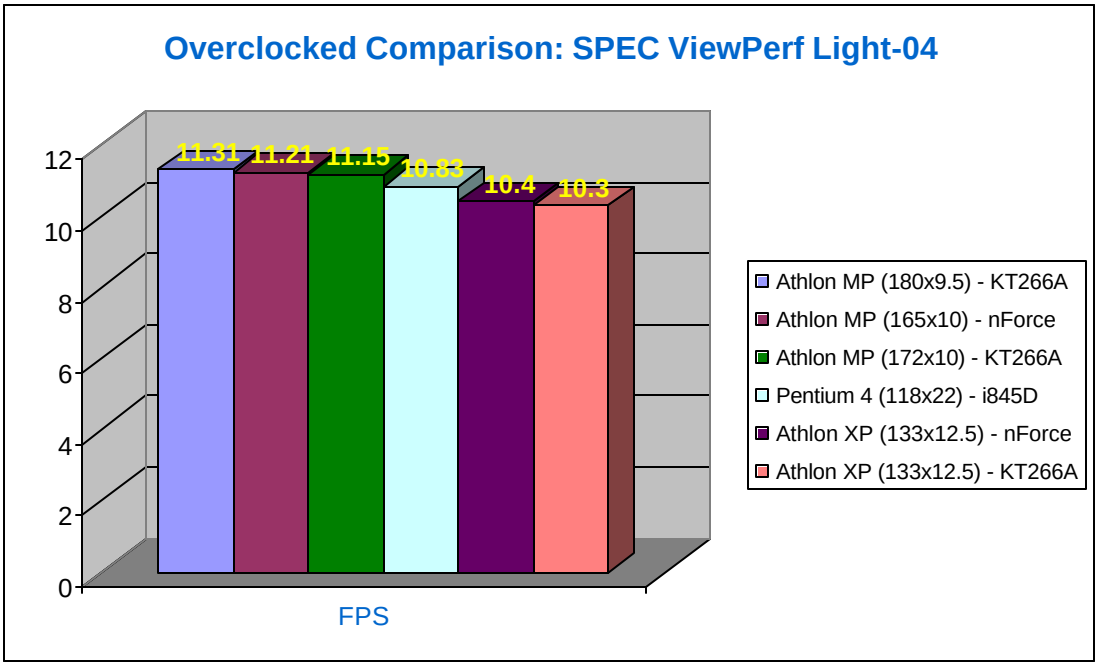
Quake 3

Quake 3 is quite old and is not a part of our normal benchmark suite, but it has been included here strictly for comparison purposes since there are many other benchmark efforts on the web still using this game as, in often cases, the cornerstone of their benchmark suites. We used the Demo001 of Quake 3 version 1.17 and ran the Demo001 timedemo at 640x480x16bpp with "Normal" detail settings. The command line included these parameters: *"+set cd_nocd 1 +set s_initsound 0."*



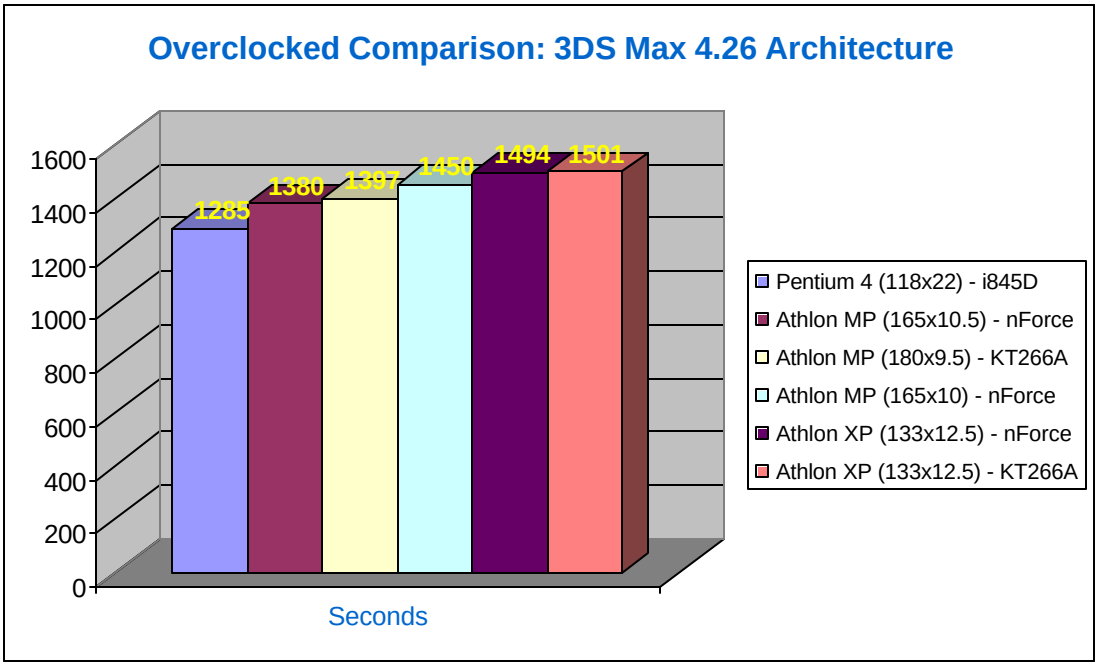
** Not rock stable in other benchmarks*

No real surprises, the Pentium 4 is still the boss in Quake 3. The Athlon gets a 7% boost from the 166 MHz FSB. Now let's take a look at a non-gaming benchmark: SPEC ViewPerf. Specifically, this is the Light-04 subtest running at 1024x768x32bpp.

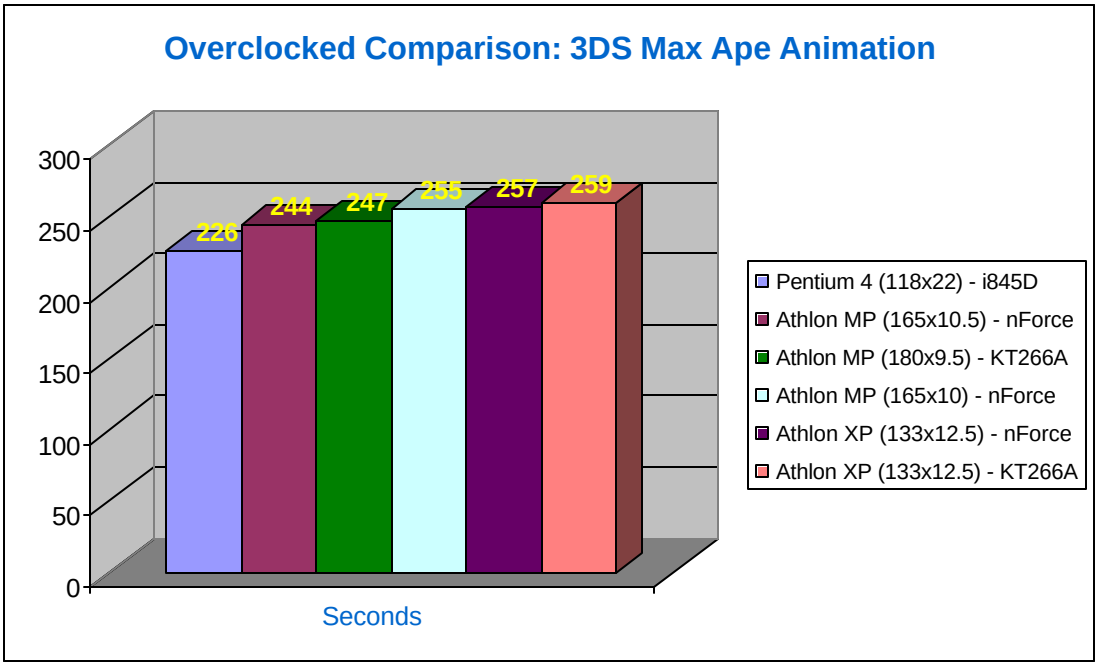


Our overclocked FSB Athlon XP does very well again. Leaving the 2.6 GHz Pentium 4 behind at all but stock configurations, it delivers an impressive performance. The ABIT KT266A motherboard is able to push the Athlon ahead slightly beyond the ASUS nForce system.

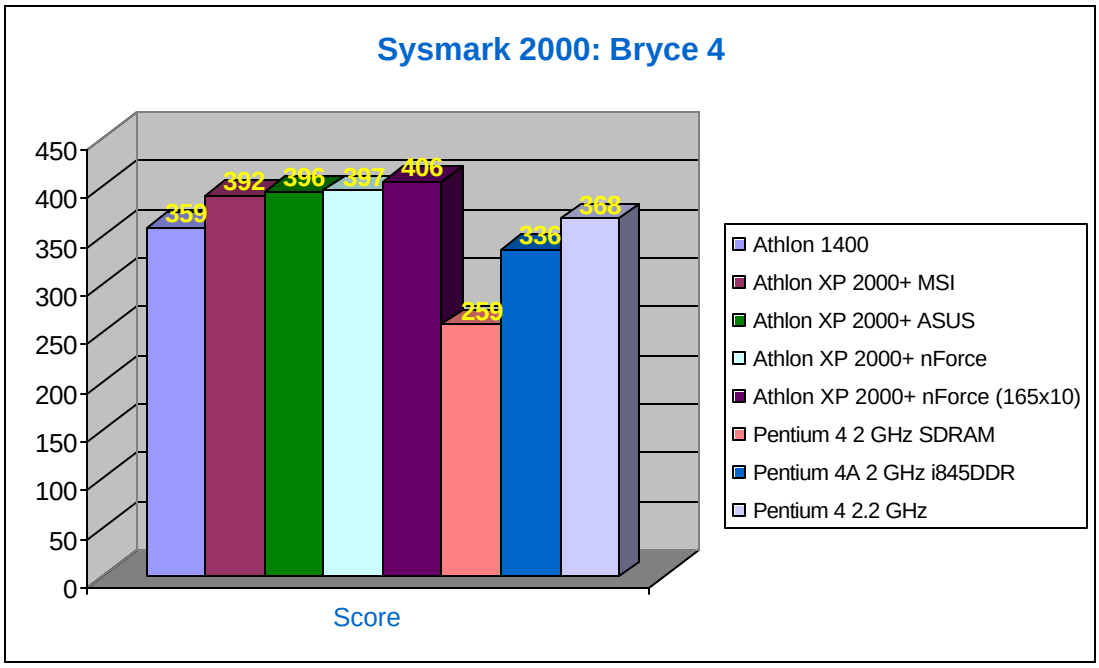
The 7% boost that the Athlon XP gets from a 166 MHz FSB is nothing to sneeze at. Maybe AMD should make some 166 MHz FSB Thoroughbreds?



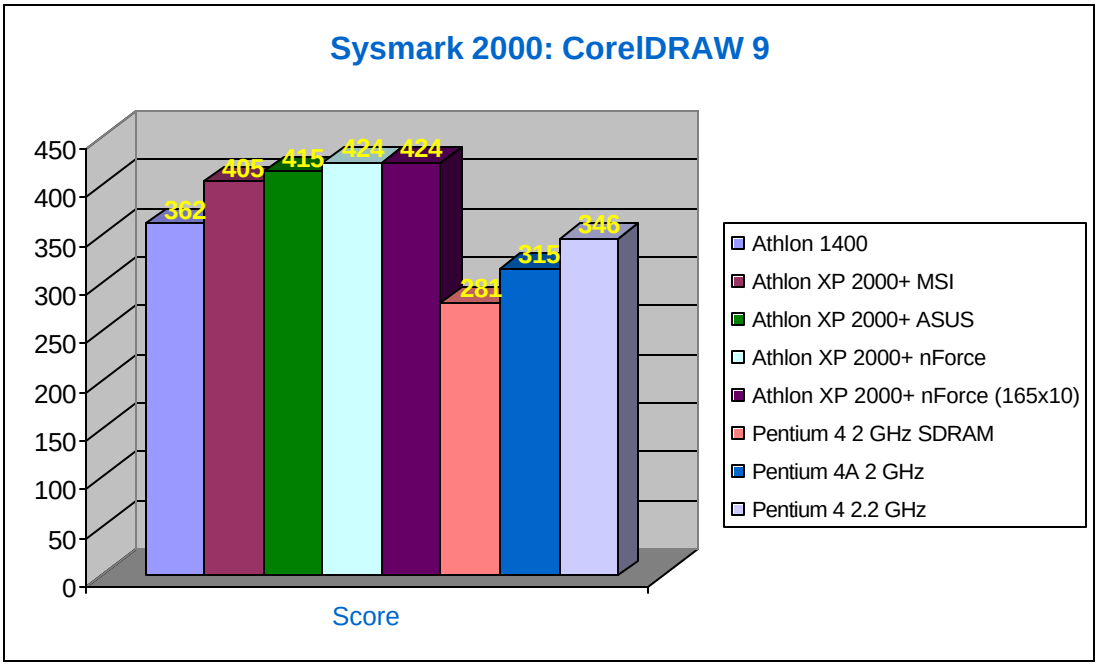
Now we move on to 3D Studio Max. Keep in mind that for this benchmark, the results are presented in seconds, meaning lower is better. The 2.6 GHz Pentium 4 is the clear victor in this benchmark. We conclude from the relatively humble boost that the Athlon gets from the 166 MHz FSB, that 3DS Max prefers a larger cache, and is not really limited by memory bandwidth.



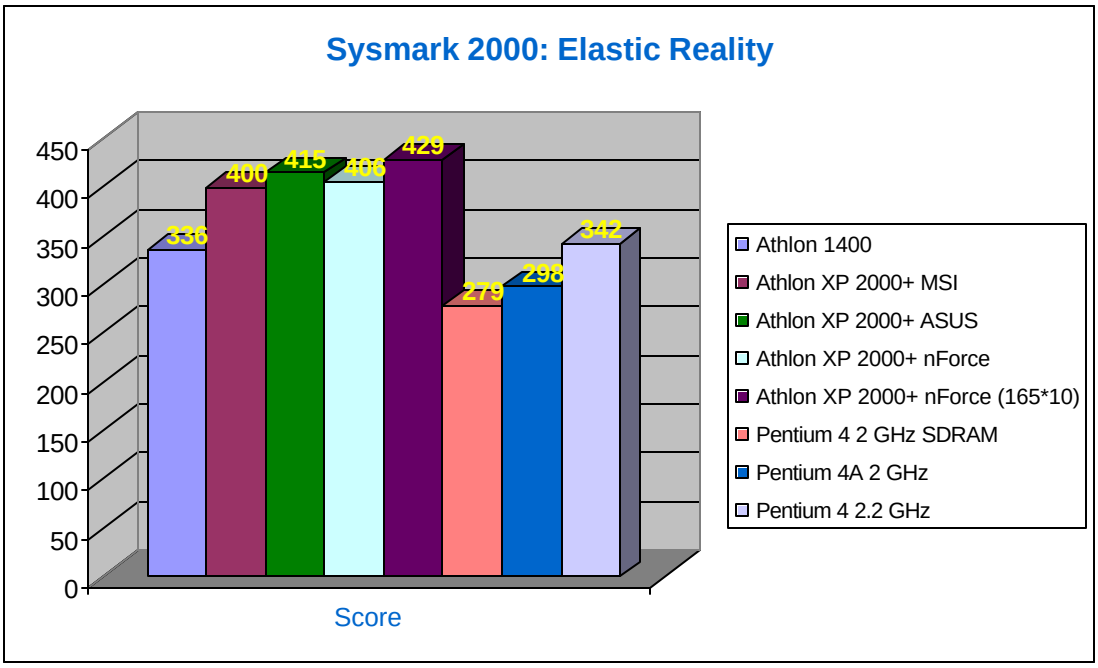
Even when the polygon count is much lower, the results stay the same: 3DS Max does not benefit much from a faster FSB. So far we have seen that a FSB at 166 MHz DDR can improve the Athlon's performance by 7-13%. So, we decided to investigate the effects of the 166 MHz DDR FSB a bit closer with Sysmark 2000:



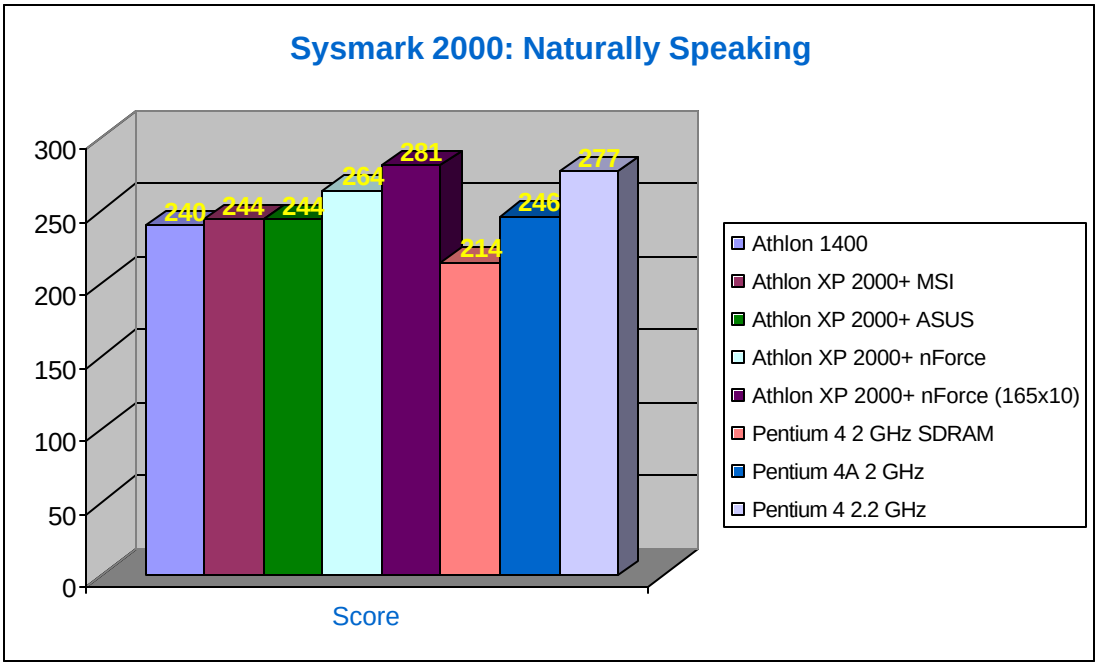
Our first benchmark in the Sysmark 2000 suite is Bryce 4, a 3D landscape rendering application. Of particular interest here are the two nForce results, one configured at the stock FSB of 133 MHz and the other set to 166 MHz. As you can see, the 166 MHz FSB system has a slight edge over the default 133 MHz configuration, though it is not overly significant in this benchmark. The performance difference between these two is roughly 2 percent.



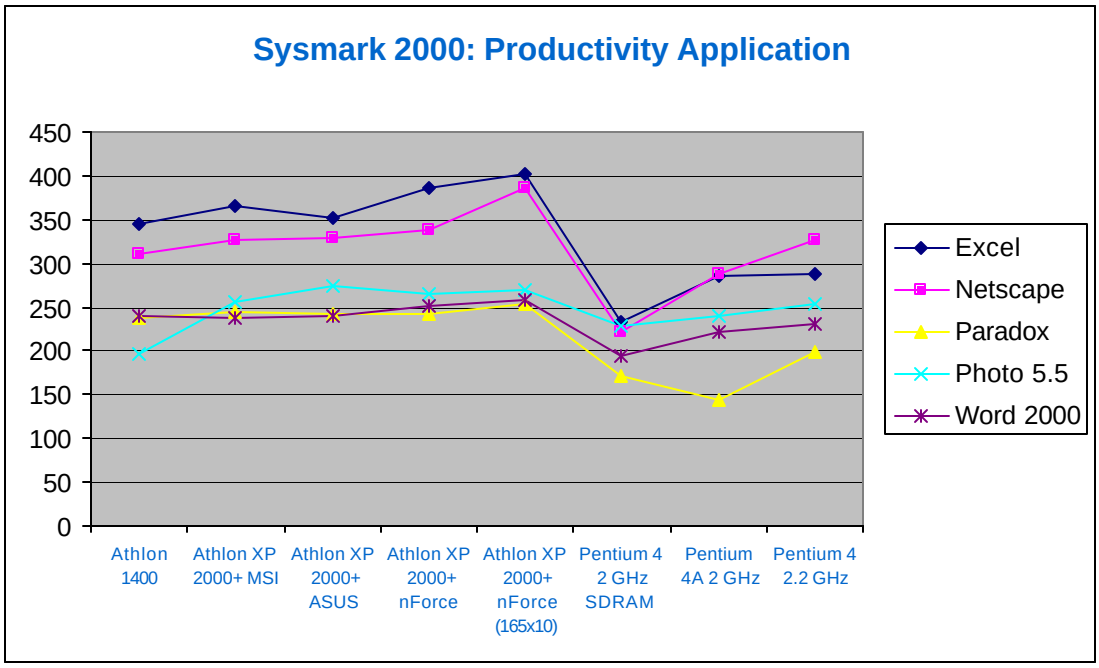
Moving on to CorelDRAW 9, we see that the performance advantage of the 166 MHz FSB has completely evaporated, as the two nForce results are identical. The Pentium 4's 400 MHz FSB is of little help as well, though you can see that the Northwood (Pentium 4A) has a good lead over the SDRAM-based Willamette Pentium 4 system.



Next up is the 3D modeler Elastic Reality, and as you can see, the 166 MHz FSB has a somewhat stronger showing here. In this benchmark, the 166 MHz FSB results in a 6% performance increase over the 133 MHz configuration.

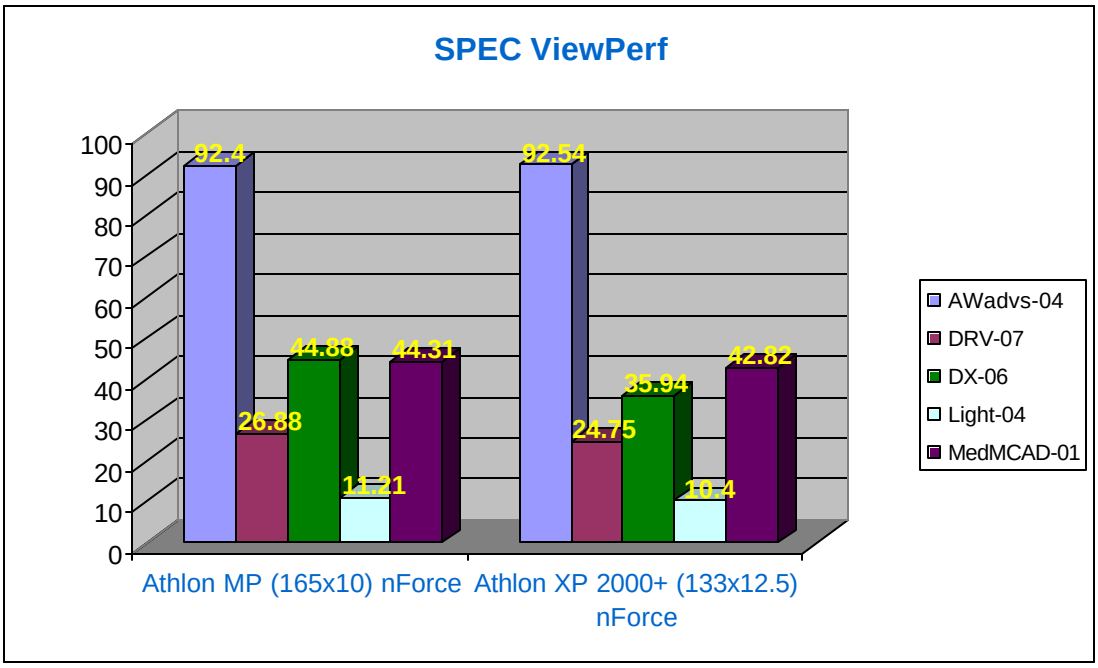


As seen previously in Elastic Reality, the 166 MHz FSB delivers another 6% performance boost here. Unlike some of the other benchmarks in the suite, the Pentium 4 is quite strong here – particularly the Northwood Pentium 4A and its 512 KB L2 cache – as only the Athlon XP 2000+ with 166 MHz FSB can top the 2 GHz Pentium 4A here.



Finally, wrapping up our Sysmark 2000 results, we have benchmarks for a number of office productivity applications, including Word, Excel, Paradox, Netscape, and Photoshop 5.5. The nForce systems are generally in the lead, with the exception of Photoshop, where the Athlon XP 2000+ on the KT266A-based ASUS A7V266-E tops the rest (273 versus 269 for the 166 MHz FSB nForce). The performance increase associated with the 166 MHz FSB is rather small in most cases, ranging from 2 percent in Photoshop to 5 percent in Paradox. The only application where we see a substantial boost from the higher FSB is Netscape, which gains a 14 percent lead over the stock 133 MHz nForce.

Overall, these results indicate that the Athlon still benefits from a higher FSB frequency in office productivity applications, though to a lesser degree than seen in most gaming benchmarks. Resultantly, the gains can be minimal in many cases.



This is a direct comparison between the Athlon MP/XP on the nForce platform clocked at 133 x 12.5 (stock) and 165 x 10.0. Here we can see the direct result of a 166 MHz FSB on the Athlon/nForce platform in SPEC ViewPerf. Once again, the improvements are rather slight in some cases, though the DX-06 benchmark seems to benefit the most.

Conclusion

It is possible to build a stable, overclocked, and high-performance Socket A PC without resorting to expensive cooling or dangerous voltage settings. An unlocked Athlon XP (or an Athlon MP) performs very well with an overclocked FSB on the nForce-based ASUS A7N266-E. As we used relatively humble cooling and a slightly older Athlon MP 1900+ (AGKGA - AGOGA probably does much better), we are confident that our readers will be able to push their Athlons higher than we did.

Thanks to the impressive overclocking performance of the ASUS A7N266-E and the Corsair PC2400/2700 XMS it is possible to run the Athlon XP at 166 MHz FSB without sacrificing stability. We are looking forward to the ASUS A7N266-C, which will be based on NVIDIA's less-expensive 415 chipset (no integrated video).

The ABIT KR7A-RAID is another impressive overclocker from a long line of overclocking-friendly motherboards. ABIT's CPU SoftMenu III makes overclocking easy and the KT266A-based board is quite capable of reaching very high FSB settings. The robust three-phase power setup is also appreciated. As was mentioned earlier, this motherboard could definitely have benefited from a fixed 33 MHz PCI bus clock to prevent any stability issues resulting from overclocked PCI devices (like the IDE controller). We have not been able to confirm the shorting problem with ABIT at this time, but that may be something to look out for when installing this motherboard in your system case. The KR7A-RAID does not have all the bells and whistles found in many other boards (namely integrated sound), but it does feature 4 DIMM sockets for a maximum memory capacity of 4 GB of registered DDR SDRAM and, of course, RAID support. Overall it is a solution targeted at hardware enthusiasts, and we think they will like it.