Other - "THE" Definitive DFI AMD Overclocking guide! (merged all the overclocking stickies into one guide!)

THE DEFINITIVE
DFI A64 OVERCLOCKING GUIDE

==========
==========

==========
==========

1. Confused by HTT? LDT? FSB? A64??? READ

THIS!

Some, or a lot, of us are very confused with the new AMD Athlon64 processor, especially in the area of overclocking.

Most of us here are very familiar with overclocking what we term a 'normal' cpu, like the Celeron 300A, Intel Pentium4, AMD AthlonXP etc.

AMD64 is really a superior cpu that really performs best when it is overclocked to it's max Mhz...but there is this thing called HTT and it seems to be a giant bogeyman for a lot of us.

Please, take a read below, and it will hit you like a ton of bricks like it has hit a few of us (and I'm sure a few that are too embarrassed to admit that they really didn't 100% understand until reading this).

Basically HTT is your memory controller's communication speed. Look at your motherboard, and you'll see...there's no northbridge! The NB was the memory to cpu communication point on previous motherboards. That is now integrated into the cpu itself with A64's.

HTT is the rate at which incoming memory meets cpu instructions...But if it is not running at optimal speed, then you start wondering why some super clock is not showing the good numbers, or isnt stable, or wont even boot !!

On socket 754 cpu's the stock HTT speed is 1600 .. Its best to keep this between 1200-1800 when overclocking to maintain stability.. On socket 939 cpu's the stock HTT is 2000.. And its best to keep this at or around 2000 when overclocking.. The HTT bus is in no way saturated, so even underclocking this a little to maintain stability is fine ...

Here is a post by RGone explaining how to figure out your HTT speed with a socket 754 cpu..
Quote:

> Originally Posted by **RGone**
> *The default speed of a 3700+ with 1mb L2 cache is 12 x 200 or 2400mhz; real cpu mhz. 12 is the multiplier. 200 is the bus speed AND the speed of the memory when set to 1:1 / 200 in Dram configuration. The HTT bus speed of that 3700+ on the UT250gb if LTD/FSB ratio is set to AUTO is 4 times 200 or 800HTT bus speed times 2 for a DDR rating of 1600 for single channel NF3 boards. If you set the LTD/FSB ratio to X4 the HTT bus speed itself will again be 800x2 or DDR1600 the Default for single channel NF3 chipset boards.*
>
> *Again leaving CPU/FSB Ratio at the default of 12 for your 3700+ and leaving the FSB Bus Frequency at the stock 200 and changing the LTD/FSB Frequency to X3. You will then have a processor running at its default of 2400mhz same as always. The memory*

will still be running at 200 (DDR400) and NOW the HTT bus speed though will be 3 X 200 = 600 HTT bus speed times 2 for a DDR HTT bus speed of 1200 or 400 under the default HTT bus speed. Now that is how that works.

Now that is how the single channel 754 processor works and is in effect how you figure the HTT bus speed which in effect has little to do with an overclock as long as it is not below about 600 or above 900.

Now just to show you that figuring out the HTT is the same with socket 754 and 939 im just going to copy RGone's post and replace it with 939 stuff..
Quote:

Originally Posted by **RGone..Converted to 939 by THunDA..hehe**
The default speed of a 3200+ Venice with 512mb L2 cache is 10 x 200 or 2000mhz; real cpu mhz. 10 is the multiplier. 200 is the bus speed AND the speed of the memory when set to 1:1 / 200 in Dram configuration. The HTT bus speed of that 3200+ on a NF4 if LTD/FSB ratio is set to AUTO is 5 times 200 or 1000HTT bus speed times 2 for a DDR rating of 2000 for Dual channel NF4 boards. If you set the LTD/FSB ratio to x5 the HTT bus speed itself will again be 1000x2 or DDR2000 the Default for Dual channel NF4 chipset boards.

Again leaving CPU/FSB Ratio at the default of 10 for your 3200+ and leaving the FSB Bus Frequency at the stock 200 and changing the LTD/FSB Frequency to X3. You will then have a processor running at its default of 2000mhz same as always. The memory will still be running at 200 (DDR400) and NOW the HTT bus speed though will be 3 X 200 = 600 HTT bus speed times 2 for a DDR HTT bus speed of 1200 or 800 under the default HTT bus speed. Now that is how that works.

Now that is how the Dual channel 939 processor works and is in effect how you figure the HTT bus speed which in effect has little to do with an overclock as long as it is around 2000.

You got it ? (I hope so..lol) The only thing to keep in mind is that the stock HTT for a socket 754 is 1600 and for socket 939 its 2000.. And when overclocking your FSB Bus Frequency you want to lower the LDT multi to keep the HTT within a acceptable range.. (Socket 754=1200-1800 and Socket 939=Around 2000)

Here is some additional HTT info from AG just incase you are still a little confused. Please note that this was written for socket 754 but everything you read applies to 939 also with the exception of the acceptable HTT range..
Quote:

Originally Posted by **Angry**

You guys are so wound up on trying to get crazy clocks out of these and crazy timings that NF2's would even scream in fear at...When you begin to realize that raw cpu speed is really what is more important than anything on these A64's.

They are a superior cpu when it comes to the things you all want them for (mainly gaming). A 2.2Ghz A64 is great, but a 2.6Ghz A64 is HOLY @#@%! great.

You cant really saturate the HTT bus on this cpu (you can however have it cranked too high thereby killing efficiency and thereby ability to get data where it needs to go as quick as it would if done in an efficient manner).

Some of you live and die by memory bandwidth. You should live more by getting your cpu to max fsb @ 1:1 to really give it the boost it needs (while keeping the HTT pipe in a good range). Better yet, you should live by the same rule that you did on the NF2/P4...

==========

This is why we are happy we have the ability to drop the multiplier on the cpu. Many of you guys might be under the impression that A64 clocking just got a lot more complicated with this new-fangled A64 thingy. And it was pretty confusing for me at first too...But listening to RGone ramble on about head-scratchin stuff for so long it hit me one day...

AthlonXP we tried to maximize total cpu speed along with FSB...for max mhz + max memory bandwith.

P4 we did the same thing (and was extremely impressed by those 1200Mhz bus speeds!)

A64...AMD put some damn new number in there that is real confusing if you trying to let it be complex.

The rule was to clock your multiplier up on unlocked cpu's to find a mhz ceiling, then drop the multiplier all the way down and ratchet up your FSB to find your RAM/CPU's max FSB...Then tried to match it up in a most optimal way to get the MOST FSB while getting the MOST Mhz. (this is the part a lot seem to skip the most in-detail testing and fine tuning from this point forward is where you really start finding 'sweet spots' in the setup you are running).

A64 is no different. Some of you might laugh but I was terribly confused by all the new numbers (well only really one haha but it seemed like a lot) on the A64...mainly this thing called HTT...and LDT...

And really...the only thing this little HTT/LDT thing is...is your memory controller's communication speed. Look at your motherboard, and you see...there's no northbridge! Well...not like there was anyway hehe...the NB was the memory to cpu communication point. That is now integrated into the cpu itself.

All that HTT is, is the rate at which incoming memory meets cpu instructions...but if it is not running at optimal speed, then you start wondering why some super clock is not showing the good numbers, or isnt stable, or wont even boot haha.

so we'll break it down a little more ..

You take your NF2 AthlonXP 2500+ unlocked (default of 166x11) to 260x10...2600Mhz...with a bus speed of 520Mhz DDR (260x2). 10 Multi gives us 2600Mhz total.

Now lets take your NF3 A64 2800+ (default of 200x9) to 260x10...well, we can't right off because they won't go higher multiplier, only lower multiplier.

So we'll stick with x9 then, as we want to try and max out mhz along with FSB (which is misleading...FSB is normally used for cpu-to-northbridge speed...but these cpu's have a 'northbridge' built onto them and need no northbridge...So in theory if you had 1800Mhz Ram and 1800Mhz cpu...you get the idea lol).

So lets go 260x9. 2340Mhz or thereabouts. Great. But what is our HTT speed? Why, it is 2080Mhz...or 260Mhz, which is 520Mhz DDR, times 4 as that is the default HTT (LDT) multplier for these cpu's .

260x2 = 520Mhz DDR (just like the NF2!)
520Mhz x4, the cpu's HTT default multiplier, = 2080Mhz.

whoa...much much too high maybe...defintely above that 1800 unwritten limit...might be stable up here, but might not be stable.

so lets say we got some killa RAM and can do 280FSB on both the NF2 and NF3

NF2 would be as follows (which we should all know!)

280FSB x2 = 560Mhz DDR

if we can only reach 2600Mhz, then we have to lower the multi a little on the AthlonXP...so lets lower it to 280x9.5, which still gives us about 2660Mhz...we'll call it stable or we'll drop to 280x9 and live with 2520Mhz (and maybe crank up to 287x9 for a total of 2583Mhz.

AM I LOSING YOU YET?

now what about the A64?

280x2 = 560Mhz DDR times 4x HTT multi = 2240Mhz HTT

280x9 (cpu default mutliplier) = 2520Mhz...no problem...

but

its not stable!

the HTT bus is too high...lets drop it down to 3x HTT...

280x2 = 560Mhz DDR time 3x HTT = 1680Mhz HTT

now we get back in the '1200-1800' range. Much more stable as we know our A64 will max Mhz @ 2660 for example just like the AthlonXP.

so now that HTT speed is within reason, we do the Mhz calculation, just like we do on teh AthlonXP:

280x9 = 2520Mhz. Which is same as above. But this time the HTT is within reason and can function at this HTT speed.

1a. Overclocking the HTT bus.. Is it worth it ??

Below is two quotes from RGone that answer this question so good there really isnt much for me to say ..
Quote:

Originally Posted by **RGone**
Speeding HTT out of spec has about the same significance as 8 cars traveling the same direction on a 16 lane highway and you suddenly make the highway 20 lanes wide. It does not speed up anything. All 8 cars already had their own lane and adding lanes did nothing to speed up anything.

Quote:

Originally Posted by **RGone**
HTT which is a data bus has no problems toting the amount of data it is called on to tote. So it does not matter really how slow or fast you run it except that it will not bootup if too high or too low.

The memory does NOT transfer thru or over that bus so it has no bearing on Sandra memory bandwidth testing either. The memory talks directly to the cpu as the memory controller is there in the cpu. So for all practical purposes any discussion of HTT at the level of the 754 or 939 is mute and only needs be in a 'range' and that range must include enough to boot and not so high it does not boot.

---

2. Which bios is best for me?

This question is asked many times in forums and there is ONLY one correct answer..
Here is a quote from Angry_Games to answer this question..
Quote:

Originally Posted by **Angry_Games**

There is no best bios. There is only a best bios for YOU.

You want to overclock? You had better be prepared with the right hardware, and even more, the right frame of mind. Overclocking is not just popping a rig together and cranking out 2750Mhz instantly.

Overclocking is a process that takes me (AG) anywhere from 3 days to 10 days to complete and verify that it is right and stable. I reboot my overclocking rigs about 500 times during this phase because I have a single (or multiple) setting(s) wrong and it has to be changed.

The worst part is when you finally get about 3-4 hours Prime95 stable, and then it fails...and you have to go back again and again and fiddle with one setting that you THINK might or might not be the cause of the problem, and then wait 3-4 seconds to find out it isn't Prime stable, or wait another 3-4 hours to find out that it is or is not.

The moral of this story is very clear.

Overclocking is not easy. Some of you might jump right in here and claim its the easiest thing in the world.

The thing is, I don't see but a couple of entries in the OC Database..and sure your rig might be overclocked and stable and you might not give a crap about the OC Database...but really, until you can pass all of those tests to where you have a legit entry for it, you aren't really stable.

And those entries I myself have put in there have required about a weeks worth of work on each one. Tweaking, rebooting, flashing, tweaking, rebooting, testing, rebooting, tweaking, testing testing testing testing.

RG and I sometimes shake our heads when we see guys that post about trying the new bios, and then post again an hour or two later claiming it just isn't stable...how can you possibly know if it is stable in an hour or two? How can you know if it is stable in a day even?

Honestly...you cannot.

Remember our saying that RG and I tell just about everyone that is new around here?

Just because your hardware worked on your last rig DOES NOT mean it will work like it did (if at all) on this new DFI rig

Well, overclocking follows that same rule...

Just because you could do 280x10 @ 2.5-3-7-4 on your previous bios does NOT mean you will find stability at those exact same settings on a different bios

That should be logical, since a bios changes settings within the bios....or else there wouldn't really be a need for a new bios right?

I think some of you guys are just impatient, and give us that 'i paid $2000 for this stuff and i expect it to be stable @ 2900Mhz right out of the box' and that just doesn't fly.

You paid $2000 or whatever for your hardware, but that doesn't mean you have an inkling of what it is capable of, nor how to get there 'right out of the box'.

RG and I have been doing this day in and day out for a couple of years (on DFI overclocking boards), and longer (just not as a job lol). When we got the new NF4, it took us...2 or 3 months to really figure out exactly what we had in our hands. And we are pretty experienced at this, and get to talk directly with Oskar and the engineers in Taiwan...so why would YOU expect to know everything possible about how these board perform and react right out of the box within the first day or two that you have them in your hands?

I have no doubt there are a lot of you that are much smarter and possibly better overclockers that Rgone and I...but that doesn't really mean diddly-squat when it comes to a new board like this that has an incredible amount of options and really has to be tweaked and tweaked and tweaked and tweaked to find what it likes...

A little patience is something that most are lacking, and I sincerely hope that if you ARE going to overclock, you have the foresight to take our bits of advice to heart:

Patience, logic, and then some more patience combined with hard work.

Rgone and I try very hard to show you guys the initial path to success...but it isn't up to us whether you succeed or not. It is up to you. We are here to guide you, and sometimes hold your hand...but beyond some guidance and a little hand holding, you are really on your own because your machine is yours, and even if we have the exact same hardware down to the exact same stepping/serial #'s, that doesn't mean we are going to get the same exact results as you, even if we supply you with the exact settings we used to achieve it.

I also want to clear up any confusion that anyone has with the different bios

versions that are out ..(I.E.. -1,-2 and -3)

-1 versions use romsip tables from the 3/26/05 bios
-2 versions use romsip tables from the 3/16/05 bios
-3 versions use romsip tables from the 3/10/05 bios

A romsip table is internal timings that are built into a bios.. Some configurations favor one romsip more then the other and this is why we have newer bios versions that use different romsips..

Rgone and Angry_Games have found that -2 versions are the best all-around bioses for all types of memory.. I also prefer the -2 versions whether im running bh5 or tcc5..

****Please Note****
If your using a revE cpu then you should be using bios 510 or newer to fully support your cpu.. Most boards are still shipping with 310 which will allow you to boot up and flash to a newer bios.. But before you start overclocking its recommended to update to one that will fully support your cpu.

---

3. A64 Overclocking

First we are gonna go over most of the basic settings that you will find in an A64 motherboard BIOS. It's possible that different manufacturers might have things named differently, but they should be similar for the most part. If you are unsure of a setting then be sure to ask. After this we will explain how to find the max of each component separately which is the most important and overlooked part of overclocking.

In this next section you are going to be pushing your hardware to its max.. There may be times that you will try to get into windows and not make it..lol.. and\or get a lovely BSOD (Blue Screen Of Death).. So I highly recommend that during this testing you have nothing important on your hardrive, because there is a chance you could corrupt it during these tests and loose data.. I have a spare drive that I hook up just so I dont loose any important data when clocking.. But once you finish you should have a stable system and wont have to worry about this..

FSB/HTT Bus Frequency

This is what most of us know as Front side bus (FSB) but now with a64's it is called HyperTransport Bus Frequency (HTT)..
Quote:

> Originally Posted by **Wildstyle**

HTT effectively equals FSB, but in actual fact there is no FSB. Current CPUs (except the A64) use an FSB. This is a 64-bit or 128bit wide path transferring data between the CPU to the memory controller. The memory controller is housed in the NorthBridge on non A64 mobo's and data gets transferred between the mem controller and CPU via this 64bit/128bit "lane." 64bit is single channel, and 128bit is dual channel.. where an extra "lane" is opened, but that's another topic.

The A64's memory controller is built into the CPU itself - it is on-die. The benefit of this on-die memory controller is that the data no longer needs to visit the NorthBridge. This reduces latency and access time, and so on an Athlon 64 the data can be transferred without wait. That is essentially why the A64 is faster.

The A64's architecture depends on clock speed to make use of memory bandwidth. The higher HTT scales with clock speed, but does next to nothing on its own.

LDT/FSB Frequency Ratio

LDT is just like your CPU multiplier but it's the multiplier that makes up your total HTT speed. Here is something I'll quote from Wild that shows how to get your total HTT frequency..

Quote:

Originally Posted by **Wildstyle**

HTT is your "FSB." LDT is the HTT Multiplier (LDT = Lightning Data Transport)

So for example on your system we could use..

*200 (HTT) * 5 (LDT) = 1000 (HyperTransport freq.)*

*HTT * LDT = HyperTransport Bus Frequency.*

Quote:

Originally Posted by **Angry_Games**

On the DFI NF4 Lanparty motherboards, Oskar has designed the HTT/LDT Multiplier to Auto Adjust according to your clock speeds. You can still manually adjust the LDT multiplier, but we have always been able to leave it on Auto, even @ DDR600 speeds.

HOWEVER

On the DFI NF4 DAGF/Infinity and the DFI NF3 250Gb Lanparty, you MUST adjust the LDT Multiplier accordingly as it is not designed to Auto Adjust

CPU/FSB Frequency Ratio

This is your CPU multiplier.. This times your HTT\FSB is how you get your CPU frequency..

Important note*
On all a64 systems it is not recommended to use half multipliers (i.e. 8.5,9.5,10.5) because this will put your ram on a ratio which means it will be running slower then you think and not the same as you have your HTT\FSB set to no matter what..

A quote here from Wild shows what happens to your ram speed when using half multis…
Quote:

> Originally Posted by **Wildstyle**
> *(DRAM frequency) X (RAM divider) = CPU frequency*
>
> *Dividers are all whole numbers, so if you use a half multiplier your memory speed is calculated by using the next highest whole number.*
>
> *An example...*
>
> *200X10 = 200/10 (divider) = 200MHz*
>
> *200x10.5 = 2100/11 (next highest divider) = 190MHz (effective memory frequency.)*

CPU VID StartUp Value
This is the voltage that is applied to your cpu before the Vid and special are applied during post.. I havent found this to be a very important setting but normally I just leave it at 1.5v .. I also ran this using the Startup setting and it didnt seem to effect anything in a bad or good way.. So from my personal experience its not really a vital setting..

CPU VID Control
This is your vcore which is your CPU's voltage setting ..

CPU VID Special Control
This may be named different depending on the motherboard but it normally has options that look like this..

104%, 110%, 113%, 123%, 126%, 133%, 136%

What this does is let you add more vcore to your CPU when your regular vcore options are not enough.. What you do is multiply your CPU VID Control with your CPU VID Special Control to get your actual vcore. Here is an example of using the VID Special..

CPU VID Control = 1.50
CPU VID Special = 110%

1.50 x 110% = 1.65v

So with this setting your giving your CPU 1.65 vcore.

And for you lazy people..
This says its for the DFI 250gb mobo but it will work for any mobo that lets you add % to the vcore..

DFI NF3 250GB UT VOLTAGES							
	CPU VID SPECIAL						
CPU VID	104%	110%	113%	123%	126%	133%	136%
0.800	0.832	0.880	0.904	0.984	1.008	1.064	1.088
0.825	0.858	0.908	0.932	1.015	1.040	1.097	1.122
0.850	0.884	0.935	0.961	1.046	1.071	1.131	1.156
0.875	0.910	0.963	0.989	1.076	1.103	1.164	1.190
0.900	0.936	0.990	1.017	1.107	1.134	1.197	1.224
0.925	0.962	1.018	1.045	1.138	1.166	1.230	1.258
0.950	0.988	1.045	1.074	1.169	1.197	1.264	1.292
0.975	1.014	1.073	1.102	1.199	1.229	1.297	1.326
1.000	1.040	1.100	1.130	1.230	1.260	1.330	1.360
1.025	1.066	1.128	1.158	1.261	1.292	1.363	1.394
1.050	1.092	1.155	1.187	1.292	1.323	1.397	1.428
1.075	1.118	1.183	1.215	1.322	1.355	1.430	1.462
1.100	1.144	1.210	1.243	1.353	1.386	1.463	1.496
1.125	1.170	1.238	1.271	1.384	1.418	1.496	1.530
1.150	1.196	1.265	1.300	1.415	1.449	1.530	1.564
1.175	1.222	1.293	1.328	1.445	1.481	1.563	1.598
1.200	1.248	1.320	1.356	1.476	1.512	1.596	1.632
1.225	1.274	1.348	1.384	1.507	1.544	1.629	1.666
1.250	1.300	1.375	1.413	1.538	1.575	1.663	1.700
1.275	1.326	1.403	1.441	1.568	1.607	1.696	1.734
1.300	1.352	1.430	1.469	1.599	1.638	1.729	1.768
1.325	1.378	1.458	1.497	1.630	1.670	1.762	1.802
1.350	1.404	1.485	1.526	1.661	1.701	1.796	1.836
1.375	1.430	1.513	1.554	1.691	1.733	1.829	1.870
1.400	1.456	1.540	1.582	1.722	1.764	1.862	1.904
1.425	1.482	1.568	1.610	1.753	1.796	1.895	1.938
1.450	1.508	1.595	1.639	1.784	1.827	1.929	1.972
1.475	1.534	1.623	1.667	1.814	1.859	1.962	2.006
1.500	1.560	1.650	1.695	1.845	1.890	1.995	2.040
1.525	1.586	1.678	1.723	1.876	1.922	2.028	2.074
1.550	1.612	1.705	1.752	1.907	1.953	2.062	2.108

Chipset Voltage Control

This is the voltage applied to your motherboard chipset. The stock voltage for my chipset is 1.5v, but currently I'm running mine at 1.7v just to make sure its getting enough juice since it runs pretty cool for me anyway. I haven't noticed much of an improvement in stability with upping this voltage as I did when I had a nforce2 motherboard but I like to up it a little anyways.

AGP Voltage Control

This is the voltage applied to your AGP slot... Sometimes upping this will help a little

with stability in 3d benchmarks or games when you're overclocking a lot. Some of you with PCI-E boards like my self will not see this as an option in bios.

AGP Frequency\ PCI-E Frequency
This is the bus frequency of your AGP\PCI-E slot. You wanna treat this very much like AGP voltage because it doesn't really help a lot with stability, but sometimes it may help a little to bump it up a FEW MHz.

Dram Voltage Control or Vdimm
This is your RAM voltage. Setting this will vary a lot depending on what type of ram you use and more importantly what IC's are on your ram sticks. Some ram will like a lot and then there is some ram that will be less stable with too much.

For more info on RAM, check this thread out:
http://forums.guru3d.com/showthread...&threadid=95128

K8 Cool 'n' Quiet Support
This option, when enabled automatically lowers your vcore and CPU multiplier when the system is idle. It's highly recommended to disable this setting when overclocking.

FSB Frequency Ratio

This is your Dram ratio option. This is another one that might be listed different depending on what board you have. The options might look something like this though…

100(Mhz)(1/02), 120(Mhz)(3/05), 133(Mhz)(2/03), 140(Mhz)(7/10), 150(Mhz)(3/04), 166(Mhz)(5/06), 180(Mhz)(9/10), 200(Mhz)(1/01).

When this option is set to 200(1/01) it means your ram is running the same speed as your FSB\HTT. If you lower it then it puts your ram on a ratio which would make it run slower then your FSB\HTT setting. You might want to do this if you have poor overclocking RAM, but still want to overclock your CPU. You can still see good gains in performance from overclocking on a divider.

This formula was posted at Ocforum by deeppow and sharp helped me break it down a little and understand it better.. Please note that your memory speed will change when using different cpu multi's and memory dividers other then 1:1..
Quote:

> Originally Posted by **Sharp**
> ***How to calculate your memory frequency***
>
> *Memory Frequency = (FSB x (CPU ratio)) /] ((CPU ratio) x (FSB : DRAM ratio)) [*
>
> *Ceiling function is shown with][,*
> *eg*
> *]10.1[= 11*

]10.2[= 11
]-6.2[= -6
]-8.9[= -8

For positive numbers always round up to the nearest whole number.
For negative numbers always round down (its actually still up) to the nearest whole number.

Big example
FSB = 290
CPU ratio = 7
DRAM:FSB ratio = 5:6, re-arrange to 6:5 (FSB : DRAM)

Using the formula,
Memory Frequency = (FSB x (CPU ratio)) /] ((CPU rato) x (FSB : DRAM ratio)) [

Memory Frequency = (290 x (7)) /] ((7) x (6/5)) [

Work this bit out first
] ((7) x (6/5)) [

6/5 = 1.2

and that becomes
] (7) x (1.2) [

7 x 1.2 = 8.4

Now remember the ceiling function,][

]8.4[= 9

Put that back into the main formula

Memory Frequency = (290 x (7)) / 9

So
Memory Frequency = (290 x 7) / 9
= 225.5Mhz.

Here is a great little program made by goddh0r called "A64MemFreq 1.1".. With this program you just enter your multi,mem divider,htt and it will tell you what speed your ram is running at without having to do all of the above..

A64MemFreq 1.1

Now we are getting closer to the fun part of overclocking.. !!

But first I'm gonna list some programs that you will **NEED** with links to download for testing stability. Everyone has their favorite program for testing but these are my favorites lately:

Memtest86+ ver1.65
http://www.memtest.org/

Prime95 ver. 24.14
http://www.mersenne.org/freesoft.htm

SuperPi
http://superpi.radeonx.com/

OCCT
ftp://ftp2.ocbase.com/ocbase3/OpenBeta/OCCTv0.91.exe

3dMark01, 3dMark03, 3dMark05
01 = http://downloads.guru3d.com/download.php?det=320
03 = http://downloads.guru3d.com/download.php?det=576
05 = http://downloads.guru3d.com/download.php?det=874

Here are some other programs I like to use.. These are not required but do come in handy..
EVEREST Home Edition v2.20
http://www.lavalys.com/products/dow...p?pid=1&lang=en

CPU-Z 1.30
http://www.cpuid.org/download/cpu-z-130.zip

Important note*
You will NEED some type of temperature monitoring program to watch your temps. Most motherboards come with a utility for this or you may be able to download it from the manufacturer's site. Sometimes these temp programs are not the most accurate and I would really recommend to check around from others that use your mobo\CPU combo and find out if they are at least close.

Here is a link to a thread by Soundx98, with a config file for motherboard monitor that he was nice enough to make which works great with **DFI** NF3 and **DFI** NF4 mobo's..
http://www.dfi-street.com/forum/showthread.php?t=6798

Important note*
One other thing to do before we start overclocking is to check your voltage rails.. The

best and only accurate way is with a Digital Multimeter.. The reason for this is to find out if your rails are fluctuating when at idle and\or load.. If they are fluctuating already before you even overclock then you should look into a better or more powerfull psu.. Of course if you dont have a digital multimeter then this is not required, but it is HIGHLY recommended and might save you alot of headaches later on if you experience instability..

Here is a great link that was given to me by davidhammock200 which explains how to check your rails with a DMM..
http://forums.extremeoverclocking.c...072&postcount=1

Finding the max of your CPU\RAM

Finding the max of each component is very important in overclocking. Many people think they can just up the HTT and be done with it, but that's not true most of the time because then you might get instability and not know what the source is. To me, not finding the max of each component is like fighting a group of people at once when you have the option to fight them one at a time. The first thing I like to do is find the max of my CPU and then my ram.

To find the max of your CPU you want to take out your other components as variables, so this is what I do:

CPU/FSB Frequency Ratio (CPU Multi) to default. Do NOT use the auto setting! Manually set it to whatever your default multi is.

LDT/FSB Frequency Ratio (LDT Multi) to 2.5x or 3x.
Setting this lower right now will make sure that your total HTT speed doesn't cause instability.
Quote:

> Originally Posted by **Wildstyle**
> *You are freely able to lower this value and not lose performance because even with a HyperTransport Bus frequency of 200MHz (LDT = 1x), due to the nature of the HT architecture, there is still enough bandwidth available to transfer data between CPU/RAM/HDD without bottlenecking; and at 200MHz the theoretical bandwidth limit is still higher than that of AGP 8X, so video card performance is not affected either.*

LDT/FSB Frequency Ratio (Ram Ratio) to 100(Mhz)(1/02)
This is much lower then you should ever set this but it will make sure your ram is running way under spec and wont be causing you any problems at this point..

CPU VID (Voltage Identification) Control (CPU Vcore)
This is a tricky one.. Its gonna depend on how good your temps are and how far your willing to take it. For 90nm cores (i.e. Sandiego, Venice, x2, Winnies) its best to stick around 1.6v-1.65v MAX, For 130nm cores (i.e. Clawhammer, newcastles) you can go a little higher to 1.7v-1.75v but always make sure temps are good. If you have extreme

cooling like water or phase then you can take the voltages higher. You could also try to see how far you will get on stock vcore first or just bump it up from the start. This is totally up to you and what you feel comfortable with. Some A64 CPU's actually overclock better with less voltage that's why its good to start off lower to find the max of that and if your unhappy or want more then you up it from there.

*****Important Note*****
Load is when your CPU usage is at 100%. This will happen while playing games and also when running the stability testing programs I listed above, especially OCCT and Prime as they will make your CPU usage 100% for sure. Load temps for CPU's should always stay at or below 50c, a little over 50c wont hurt either but lower is always better.. If your temps are exceeding 50c by a lot then you either need to upgrade the cooling or lower your voltages and\or clocks.

Ok.. now that you lowered the LDT multi, put your ram on a ratio, set your default CPU multi manually and decided what vcore you want to start with its time to start testing..

You want to start raising your HTT\FSB in 10-15mhz increments and in between each move you want to boot into windows and run the SuperPi 32m test. It will take about 30-45 mins normally. If it passes that then keep upping the HTT until SuperPi gives an error then back it down a few MHz (1 or 2) at a time until its stable again...

****Remember to monitor temps****

Once you find the highest spot where SuperPi is happy you want to run the OCCT 30min test (Not the torture option.) This test is a little tougher then SuperPi and if OCCT fails then lower your HTT\FSB 1 or 2mhz until you can pass OCCT..

****Remember to monitor temps****

At this point you can run each 3dmark bench to see if they complete without a crash or error. Don't worry about the scores being low, this is because we slowed everything else down except the CPU.. If they all pass then we are off to Prime time.. hehe. This is the last thing you will run to test the stability of your CPU . Many people are going to have their own amount of time they like to run prime. Personally I run it for 8-10 hours but some like to run it 24 hours before they consider their system stable. I can understand running it for 24 hours when you're comparing between peoples stable clocks to make sure they are all stable with the same guide lines but I never felt the need to run it that long for my rig to be stable for ME..

If prime fails then back off on the HTT/FSB some until it passes at least 8 hours without errors.

CONGRATULATIONS !!
You just found the max mhz of your cpu..

Next thing we are gonna work on is finding the max of your ram.. Here is how you are gonna setup for that:

CPU/FSB Frequency Ratio (CPU Multi) This we are going to lower to the 7x multi.

LDT/FSB Frequency Ratio (LDT Multi) Keep this at 2.5x or 3x just like it was when testing the CPU..

LDT/FSB Frequency Ratio (Ram Ratio) Put this at 200 (1/01) so it will be running the same speed as your HTT now.

CPU VID Control (CPU Vcore) You can leave this at the same setting you decided to leave it at during your CPU testing.

Now you have the CPU vcore like it was during the CPU testing, the CPU Multi to 7x, the LDT Multi to 2.5x or 3x, and the RAM ratio set to 200 1/01..

There is only one more thing that you need to do before testing the ram: Learn about timings!! I'm not gonna go deep into this but I'm gonna suggest what timings are popular with some known types of ram chips. Before you go ANY further I highly suggest you read this ram guide by johnrr6 at DFI Street..

http://www.dfi-street.com/forum/sho...179&postcount=4

Its also a good idea to do some research to find out what type of chips your ram use.. It will give you a better idea where to start off with timings and voltages.. Here is a link that might help you find what chips are on your sticks of ram..

http://xtremesystems.org/forums/showthread.php?t=50010

Here are some timings I can recommend without getting deep into the full page of memory timings that my DFI board has.. hehe

TCCD
CPC- Enabled (1T)
Cas- 2.5
tRCD- 3 or 4 for more stability
tRP- 3
tRAS- 8

BH5,BH6,VX,UTT
CPC- Enabled (1T)
Cas- 2
tRCD- 2
tRP- 2
tRAS- 8

No matter what ram you have timings are never written in stone. They NEED to be tweaked, period ! Always remember that just cuz “Joe Overclocker” says his TCCD runs at 300htt with 8-3-3-2.5 timings doesn’t mean yours will even if it’s the same ram brand, model, revision, production week.

Time to start testing your RAM !!

With the above settings you want to start raising the HTT\FSB 5-10mhz, and in between each raise you are going to run about 25 passes of memtest (Test #5 only for now) Once you get errors there are a few things you can do here:

1- Lower the HTT\FSB until its stable.
2- Raise the Vdimm (RAM Voltage) to see if that makes it stable, but remember some RAM doesn’t like a lot of vdimm and it could damage them.
3- Loosen the timings to make it more stable.

Which option you choose is pretty much up to you and how much you know about overclocking RAM. I can’t stress it enough to read all you can about overclocking because there is so much info out on the net between guides and forums alone.

Now once you decide what option you are taking, continue testing with memtest #5 until you’re at your max for the ram without errors. Then I would suggest running all the tests in memtest overnight - 8-10 hours.

If it passes the long test then you want to leave those settings like they are and boot into windows. It might not be stable in windows even if it passes memtest though. I’ve noticed with a64’s that I could pass hours of memtest sometimes but have instability in windows. If you aren’t stable then you need to either give more vdimm, loosen the timings or back off the HTT\FSB some.

If you do make it into windows I would run 32m SuperPi, 30min OCCT, 3dMarks and then Prime95 overnight, just like we did to finalize the CPU’s max. If it fails any of these you have a few options…

1- Lower the HTT\FSB until its stable.
2- Raise the Vdimm (Ram Voltage) to see if that makes it stable.. But remember some ram doesn’t like a lot of vdimm and it could damage them.
3- Loosen the timings to make it more stable.
4- Settle with what you have so far.

If you decide to go with one of the options from 1-3 then keep repeating the tests until you are happy and stable.

CONGRATULATIONS !!

You just found the max MHz of your ram..

Now that you found the max of your CPU and ram it should be a little easier to clock it together..

Lets say your CPU maxed out at 2800mhz with its default multi of 12x.. But your ram maxes out at 250mhz..

12x 250 = 3000mhz.. That won't work ..lol..

11x 250 = 2750mhz .. That will work but your cheating yourself 50mhz of CPU power.

12x 233 = 2796MHz .. That will work and get you closer to the max of your CPU. And running the ram little slower then the max you found before to achieve the higher CPU MHz might also allow you to tighten up the ram timings a little.

Now there is always the option to use a divider for your ram which will get you closer to your CPU and RAM's max....

10(CPU multi) x 278(HTT) = 2780mhz (CPU speed)

If you use a 9\10 divider with this config…

278 \ 10 x 9 = 250mhz (mem speed)

Whatever you decide there really isn't a right or wrong way to do it. The only way to find out which way is best for you to run is **test test test!!** Run benchies with different configs and see which performs the best.

This is just a small portion of overclocking.. There is much more to learn but I hope this helps some of you get a better grip on where to start with your A64 system. It took me a lot of time to figure it out myself, it just takes patience.

_____

This guide was written by johnrr6 with the help of the people he lists below..
So in no way do I take ANY credit for this awsome guide other then copy and pasting..

4. DFI NF4 BIOS Memory Guide

The purpose of this thread is to give you some kind of explanation and a good "start point" to the blizzard of available settings (especially memory) available on Oskar Wu's fabulous NForce 4 motherboards from DFI. Especially to those who are new to the fun and excitement of overclocking. (I just love it when I can get my $200 chip to outperform a $500 chip). Unfortunately the manuals that are available for the board do a very poor job in this area, and we are all very leery of just doing a certain setting without some type of background information behind what the setting is/does. Having said that----some of these setting are VERY obscure and trying to find information on what they actually do is extremely difficult. Also, some of the below "explanations" may be totally unintelligible for the normal user (I know some were for me). Be that as it may, I'm a firm believer that SOME information is better than NO information. You may have to just dive in with some settings and use the time honored tradition of "try it before you buy it."

BIG CAVEAT!!:

Please understand that this information and suggested settings may or may not work for you. Every user will usually have a different experience based upon his own equipment. The attempt here is to provide knowledge-----and hopefully get you in the ballpark! Also, my personal results were with Corsair BH-5 memory----there will be differences in how TCCD based memory should be set. There are definitely timing and voltage differences. Please always feel free to send me updated information to add to, or edit this thread!!

Very little of this information was created by me. I am simply acting as a "compiler and editor." I will attempt to give credit to everyone whom I'm "borrowing" material from. If you are a contributor and are displeased by how I have used your materials just PM me and I will make amends.

Special Thanks to:

Adrian Wong and his RojakPot BIOS Explanation site
Adrian also has a fabulous BIOS book: Breaking Through the Bios Barrier
Lost Circuits
Tom's Hardware Guide
AnandTech
Jess1313 and Samurai Jack, members of many forums, whose excellent guide I used as a true basis for this guide.

As well as the following contributors:
ABXZone: Sierra, Blue078, Eldonko, Xgman, Eva2000, HiJon89 (all members of many forums)

DFI-Street: RGone, AngryGames, masterwoot, Aurhinius

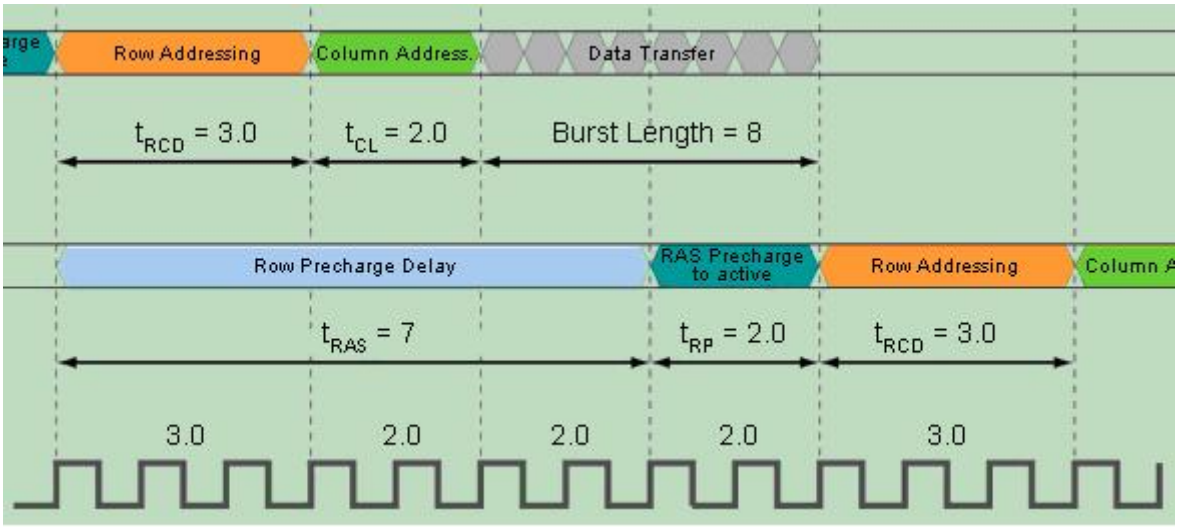
Xtrememsystems: kakaroto

Jess1313, Samurai Jack, Travis, bigtoe----who are also all members of many forums

Anand Tech: Wes Fink

First: A Very Brief Tutorial on RAM

Paraphrased from Tom's Hardware guide:http://www.tomshardware.com/index.html
"To better understand how timing parameters affect memory performance, you should know about everything involved in accessing modern Random Access Memory (RAM). The "RAM Timings" chart below will give you an overview of how it works. The bottom line is a read process is initiated when the controller in the motherboard chipset selects the memory module that contains the data. (A64's include the memory controller onboard). The controller addresses the right chip on the module and the data it holds. The cells of the chip are arranged in a matrix and are addressed using the row and column addresses. Each intersection represents one memory bit.



Optimizing the timing parameters will speed up the processes involved in accessing RAM. The memory controller first determines the row address of the storage cell it intends to address. The column address is communicated once the time tRCD has transpired. The time tCL then passes while the data is transferred to the output register. The process can start all over again after waiting tRAS plus tRP."

Here is a fabulous **online multimedia explanation** of RAM from Corsair:
http://www.corsairmemory.com/memory...3707/index.html

That is a very brief explanation----below is the guide….

But before you get started, here's a blank chart I made up to help your overclocking, or to just get stable settings on the NF4 boards----should apply for all versions. Got the idea from masterwoot. I edited his and made an updated version----thanks masterwoot!! Prints fine off of IE----set your margins to .5 inch both sides in page setup before you print----leave in "Portrait" mode. It may take a few seconds to load...
NF4 Memory & Voltages Bios Settings Chart

Additional Information on TCCD

A great Guide **for TCCD memory only:**
Kakaroto's TCCD Memory Guide

BIOS Optomization Guide for DFI NForce4 Motherboards:

Dram Frequency Set(Mhz)

Settings = 100(Mhz)(1/02), 120(Mhz)(3/05), 133(Mhz)(2/03), 140(Mhz)(7/10), 150(Mhz)(3/04), 166(Mhz)(5/06), 180(Mhz)(9/10), 200(Mhz)(1/01)

This is your “Divider” settings-----most people will argue that the best results come from Synchronous setup or 1:1, or in DFIs case, 1/01. All other settings are Asynchronous. You can use the little App called memFreq 1.1 to compute your memory speed using a divider. With a 1/01 ratio (Synchronous)----the formula with any 400 mghtz RAM is simple FSB (HTT) x 2 so if I you are running your FSB (HTT) at 240-----your DDR speed would actually be DDR480. You would possibly use a divider if you have weaker RAM to allow a higher CPU overclock.

Here’s another chart to help explain it from Travis at Vr-Zone who I believe had Oskar Wu’s help to develop it:

FSB Frequency	DDR266 (FSB:MEM=3:2)	DDR333 (FSB:MEM=5:4)	DDR400 (FSB:MEM=1:1)
200 MHz	133 MHz (DDR266)	160 MHz (DDR320)	200 MHz (DDR400)
210 MHz	140 MHz (DDR280)	168 MHz (DDR336)	210 MHz (DDR420)
220 MHz	147 MHz (DDR293)	176 MHz (DDR352)	220 MHz (DDR440)
230 MHz	153 MHz (DDR306)	184 MHz (DDR368)	230 MHz (DDR460)
240 MHz	160 MHz (DDR320)	192 MHz (DDR384)	240 MHz (DDR480)
250 MHz	167 MHz (DDR333)	200 MHz (DDR400)	250 MHz (DDR500)
260 MHz	173 MHz (DDR346)	208 MHz (DDR416)	260 MHz (DDR520)
270 MHz	180 MHz (DDR360)	216 MHz (DDR432)	270 MHz (DDR540)
280 MHz	187 MHz (DDR373)	224 MHz (DDR448)	280 MHz (DDR560)
290 MHz	193 MHz (DDR386)	232 MHz (DDR464)	290 MHz (DDR580)
300 MHz	200 MHz (DDR400)	240 MHz (DDR480)	300 MHz (DDR600)

Large Influence on Bandwidth----can be for Stability if using cheaper RAM that is maxed out at a 1:1 setting.

Suggested Setting for DFI: 200(Mhz)(1/01)

Command Per Clock(CPC)

Settings: Auto, Enable(1T), Disable(2T)

Command Per Clock(CPC) is also called Command Rate. It may be best in some instances to Disable (2T) w/ 2x512 RAM modules. It has a large Influence on Bandwidth/Stability.

From Adrian Wong's site: http://www.rojakpot.com/
"This BIOS feature allows you to select the delay between the assertion of the Chip Select signal till the time the memory controller starts sending commands to the memory bank. The lower the value, the sooner the memory controller can send commands out to the activated memory bank. When this feature is enabled, the memory controller will only insert a command delay of one clock cycle or 1T. When this feature is disabled, the memory controller will insert a command delay of two clock cycles or 2T. The Auto option allows the memory controller to use the memory module's SPD value for command delay. If the SDRAM command delay is too long, it can reduce performance by unnecessarily preventing the memory controller from issuing the commands sooner. However, if the SDRAM command delay is too short, the memory controller may not be able to translate the addresses in time and the "bad commands" that result will cause data loss and corruption. It is recommended that you try enabling SDRAM 1T Command for better memory performance. But if you face stability issues, disable this BIOS feature."

Large Influence on Bandwidth/Stability.

Suggested Setting for DFI: Enable 1T whenever possible

CAS Latency Control(tCL)

Settings = Auto, 1, 1.5, 2, 2.5 3, 3.5, 4, 4.5.

This is the first timing that most ram companies rate their ram with. For example, you might see RAM rated at 3-4-4-8 @275mhz. this is the 3, in that situation. 2 yields the best performance, CAS 3 usually gives better stability. Please note; if you have Winbond-BH-5/6, you may not be able to use CAS3.

From Lost Circuits: http://www.lostcircuits.com/
"CAS is Column Address Strobe or Column Address Select. CAS controls the amount of time (in cycles (2, 2.5,& 3) between receiving a command and acting on that command. Since CAS primarily controls the location of HEX addresses, or memory columns, within the memory matrix, this is the most important timing to set as low as your system will stably accept it. There are both rows and columns inside a memory matrix. When the request is first electronically set on the memory pins, the first triggered response is tRAS (Active to Precharge Delay). Data requested electronically is precharge, and the memory actually going to initiate RAS is activation. Once tRAS is active, RAS, or Row Address Strobe begins to find one half of the address for the required data. Once the row is located, tRCD is initiated, cycles out, and then the exact HEX location of the data required is accessed via CAS. The time between CAS start and CAS end is the CAS latency. Since CAS is the last stage in actually finding the proper data, it's the most important step of memory timing."

From Adrian Wong's site: http://www.rojakpot.com/
"This BIOS feature controls the delay (in clock cycles) between the assertion of the CAS signal and the availability of the data from the target memory cell. It also determines the number of clock cycles required for the completion of the first part of a burst transfer. In other words, the lower the CAS latency, the faster memory reads or writes can occur. Please note that some memory modules may not be able to handle the lower latency and may lose data. Therefore, while it is recommended that you reduce the SDRAM CAS Latency Time to 2 or 2.5 clock cycles for better memory performance, you should increase it if your system becomes unstable. Interestingly, increasing the CAS latency time will often allow the memory module to run at a higher clock speed. So, if you hit a snag while overclocking your SDRAM modules, try increasing the CAS latency time."

Slight Influence on Bandwidth / Large Influence on Stability.

Suggested Settings for DFI: 1.5, 2, 2.5, and 3. (Lower = Faster)

RAS# to CAS# Delay(tRCD)

Settings = Auto, 0, 1, 2, 3, 4, 5, 6, 7.

This is the second timing that most ram companies rate there ram with. For example, you might see ram rated at 3-4-4-8@275mhz. This is the first 4, in that situation.

From Adrian Wong's site: http://www.rojakpot.com/
"This BIOS feature allows you to set the delay between the RAS and CAS signals. The appropriate delay for your memory module is reflected in its rated timings. In JEDEC specifications, it is the second number in the three or four number sequence. Because this delay occurs whenever the row is refreshed or a new row is activated, reducing the delay improves performance. Therefore, it is recommended that you reduce the delay to 3 or 2 for better memory performance. Please note that if you use a value that is too low for your memory module, this can cause the system to be unstable. If your system becomes unstable after you reduce the RAS-to-CAS delay, you should increase the delay or reset it to the rated delay. Interestingly, increasing the RAS-to-CAS delay may allow the memory module to run at a higher clock speed. So, if you hit a snag while overclocking your SDRAM modules, you can try increasing the RAS-to-CAS delay."

Large Influence on Bandwidth/ Stability.

Suggested Settings for DFI: 2-5 ----2 yields the best performance, and 4-5 yields the best over clock (5 is usually overkill). Usually cheaper RAM will not be able to use 2, and reach their max OC. (Lower = Faster)

Min RAS# Active Timing(tRAS)

Settings = Auto, 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15.

This is the fourth timing that most ram companies rate there ram with. For example, you might see ram rated at 3-4-4-8 @275mhz. this is the 8, in that situation.

From Adrian Wong's site: http://www.rojakpot.com/
"This BIOS feature controls the memory bank's minimum row active time (tRAS). This constitutes the time when a row is activated until the time the same row can be deactivated. If the tRAS period is too long, it can reduce performance by unnecessarily delaying the deactivation of active rows. Reducing the tRAS period allows the active row to be deactivated earlier. However, if the tRAS period is too short, there may not be enough time to complete a burst transfer. This reduces performance and data may be lost or corrupted. For optimal performance, use the lowest value you can. Usually, this should be CAS latency + tRCD + 2 clock cycles. For example, if you set the CAS latency to 2 clock cycles and the tRCD to 3 clock cycles, the optimum tRAS value would be 7 clock cycles. But if you start getting memory errors or system crashes, increase the tRAS value

one clock cycle at a time until your system becomes stable."

It appears throughout the web that this is a much debated timing. Some may argue that 00, 05, or 10 is the faster/most stable. There probably isn't a right answer for this one, it all depends on your ram. If you need a good starting point, usually most/all ram can achieve their max OC on 10 tRAS, even if one of the other settings is faster.

Slight Influence on Bandwidth/Stability.

Suggested Settings for DFI: Suggest you use only 00, and 5-10. I'd start with 8 and play around from there. (Lower = Faster)

Row Precharge Timing(tRP)

Settings = Auto, 0, 1, 2, 3, 4, 5, 6, 7

This is the third timing that most ram companies rate there ram with. For example, you might see ram rated at 3-4-4-8 @275mhz. this is the second 4, in that situation.

From Adrian Wong's site: http://www.rojakpot.com/
"This BIOS feature specifies the minimum amount of time between successive ACTIVATE commands to the same DDR device. The shorter the delay, the faster the next bank can be activated for read or write operations. However, because row activation requires a lot of current, using a short delay may cause excessive current surges. For desktop PCs, a delay of 2 cycles is recommended as current surges aren't really important. The performance benefit of using the shorter 2 cycles delay is of far greater interest. The shorter delay means every back-to-back bank activation will take one clock cycle less to perform. This improves the DDR device's read and write performance. Switch to 3 cycles only when there are stability problems with the 2 cycles setting."

Large Influence on Bandwidth/Stability.

Suggested Settings for DFI: 2-4 ----2 yields the best performance, and 4-5 yields the best stability when overclocking (5 is usually overkill). A lot of RAM will not be able to use 2, and reach their max OC. (Lower = Faster)

Row Cycle Time(tRC)

Settings = Auto, 7-22 in 1.0 increments.

From Adrian Wong's site: http://www.rojakpot.com/
"This BIOS feature controls the memory module's Row Cycle Time or tRC. The row cycle time determines the minimum number of clock cycles a memory row takes to complete a full cycle, from row activation up to the precharging of the active row.

Formula-wise, the row cycle time (tRC) = minimum row active time (tRAS) + row precharge time (tRP). Therefore, it is important to find out what the tRAS and tRP parameters are before setting the row cycle time. If the row cycle time is too long, it can reduce performance by unnecessarily delaying the activation of a new row after a completed cycle. Reducing the row cycle time allows a new cycle to begin earlier. However, if the row cycle time is too short, a new cycle may be initiated before the active row is sufficiently precharged. When this happens, there may be data loss or corruption. For optimal performance, use the lowest value you can, according to the tRC = tRAS + tRP formula. For example, if your memory module's tRAS is 7 clock cycles and its tRP is 4 clock cycles, then the row cycle time or tRC should be 11 clock cycles. However, if the row cycle time is too short, a new cycle may be initiated before the active row is sufficiently precharged. When this happens, there may be data loss or corruption."

Large Influence on Bandwidth/Stability.

Suggested Settings for DFI: 7 yields the best performance, 15-17 yields the best stability/over clock. 22 is way overkill. Start at 16, and work your way down from there. 7 is usually much too tight for most average ram. Remember the tRC = tRAS + tRP formula. (Lower = Faster)

Row Refresh Cycle Time(tRFC)

Settings = Auto, 9-24 in 1.0 increments.

From the DFI BIOS: "This bios setting represents time to refresh a single row on the same bank of memory. This value is also the time interval between a refresh (REF command) to another REF command to different rows of the same bank. The tRFC value is higher than tRC as column access gates are not turned on during it's issue."

Large Influence on Bandwidth/Stability.

Suggested Settings for DFI: 9 is usually unreachable and 10 yields the best performance. 17-19 yields the best stability/over clock with 19 probably overkill. Start at 17 and work your way down. Most stable timing is usually set to 2-4 clocks higher than tRC. (Lower = Faster)

Row to Row Delay(also called RAS to RAS delay)(tRRD)

Settings = Auto, 0-7 in 1.0 increments.

From Adrian Wong's site: http://www.rojakpot.com/
"This BIOS feature specifies the minimum amount of time between successive ACTIVATE commands to the same DDR device. The shorter the delay, the faster the next bank can be activated for read or write operations. However, because row activation

requires a lot of current, using a short delay may cause excessive current surges. For desktop PCs, a delay of 2 cycles is recommended as current surges aren't really important. The performance benefit of using the shorter 2 cycles delay is of far greater interest. The shorter delay means every back-to-back bank activation will take one clock cycle less to perform. This improves the DDR device's read and write performance. Switch to 3 cycles or higher only when there are stability problems with the 2 cycles setting."

Slight Influence on Bandwidth/Stability.

Suggested Settings for DFI: 00 yields the best performance and 4 yields the best stability/over clock (anything above 4 is probably overkill). 2 is probably your best bet. 00 sounds odd, but it has worked well for others, even at 260 MHz. (Lower = Faster)

Write Recovery Time(tWR)

Settings = Auto, 2, 3.

From Adrian Wong's site: http://www.rojakpot.com/
"This BIOS feature controls the Write Recovery Time (tWR) of the memory modules. It specifies the amount of delay (in clock cycles) that must elapse after the completion of a valid write operation, before an active bank can be precharged. This delay is required to guarantee that data in the write buffers can be written to the memory cells before precharge occurs. The shorter the delay, the earlier the bank can be precharged for another read/write operation. This improves performance but runs the risk of corrupting data written to the memory cells. It is recommended that you select 2 Cycles if you are using DDR200 or DDR266 memory modules and 3 Cycles if you are using DDR333 or DDR 400 memory modules. You can try using a shorter delay for better memory performance but if you face stability issues, revert to the specified delay to correct the problem."

Slight Influence on Bandwidth/Stability.

Suggested Settings for DFI: 2 yields better performance, and 3 yields better stability/over clock. (Lower = Faster)

Write to Read Delay(tWTR)

Settings: Auto, 1, 2

From Adrian Wong's site: http://www.rojakpot.com/
"This BIOS feature controls the Write Data In to Read Command Delay (tWTR) memory timing. This constitutes the minimum number of clock cycles that must occur between

the last valid write operation and the next read command to the same internal bank of the DDR device. The 1 Cycle option naturally offers faster switching from writes to reads and consequently better read performance. The 2 Cycles option reduces read performance but it will improve stability, especially at higher clock speeds. It may also allow the memory chips to run at a higher speed. In other words, increasing this delay may allow you to overclock the memory module higher than is normally possible. It is recommended that you select the 1 Cycle option for better memory read performance if you are using DDR266 or DDR333 memory modules. You can also try using the 1 Cycle option with DDR400 memory modules. But if you face stability issues, revert to the default setting of 2 Cycles."

From the DFI BIOS: "This Bios setting specifies the write to read delay. Samsung calls this TCDLR (last data in to read command). It is measured from the rising edge and following the last non-mask data strobe to the rising edge of the next read command. JDEC usually specifies this as one clock."

Slight Influence on Bandwidth/Stability.

Suggested Settings for DFI: 1 yields better performance, and 2 yields better stability/over clock. (Lower = Faster)

Read to Write Delay(tRTW)

Settings = Auto, 1-8 in 1.0 increments.

Paraphrased From Adrian Wong's site: http://www.rojakpot.com/
"When the memory controller receives a write command immediately after a read command, an additional period of delay is normally introduced before the write command is actually initiated. As its name suggests, this BIOS feature allows you to skip (or raise) that delay. This improves the write performance of the memory subsystem. Therefore, it is recommended that you enable this feature for faster read-to-write turn-arounds. However, not all memory modules can work with the tighter read-to-write turn-around. If your memory modules cannot handle the faster turn-around, the data that was written to the memory module may be lost or become corrupted. So, when you face stability issues, disable (or raise the value) of this feature to correct the problem."

From the DFI BIOS: "This field specifies the read to write delay. This is not a DRAM specified timing parameter, but must be considered due to the routing latencies on the clock forwarded bus. It is counted from the first address bus slot which was not associated with part of the read burst."

Slight Influence on Bandwidth/Stability.

Suggested Settings for DFI: 1 yields better performance, and 4 yields better stability/over clock (4 is overkill). Recommend try 1 and move to 2 if unstable.

(Lower = Faster)

Refresh Period(tREF)

Settings = Auto, 0032-4708 in variable increments.

1552= 100mhz(?.?us)
2064= 133mhz(?.?us)
2592= 166mhz(?.?us)
3120= 200mhz(?.?us)(seems to be a/ Bh-5,6 sweet spot at 250+mhz)

3632= 100mhz(?.?us)
4128= 133mhz(?.?us)
4672= 166mhz(?.?us)
0064= 200mhz(?.?us)

0776= 100mhz(?.?us)
1032= 133mhz(?.?us)
1296= 166mhz(?.?us)
1560= 200mhz(?.?us)

1816= 100mhz(?.?us)
2064= 133mhz(?.?us)
2336= 166mhz(?.?us)
0032= 200mhz(?.?us)

0388= 100mhz(15.6us)
0516= 133mhz(15.6us)
0648= 166mhz(15.6us)
0780= 200mhz(15.6us)

0908= 100mhz(7.8us)
1032= 133mhz(7.8us)
1168= 166mhz(7.8us)
0016= 200mhz(7.8us)

1536= 100mhz(3.9us)
2048= 133mhz(3.9us)
2560= 166mhz(3.9us)
3072= 200mhz(3.9us)

3684= 100mhz(1.95us)
4196= 133mhz(1.95us)
4708= 166mhz(1.95us)
0128= 200mhz(1.95us)

Paraphrased From Adrian Wong's site: http://www.rojakpot.com/
"This BIOS feature allows you to set the refresh interval of the memory chips. There are (several) different settings as well as an Auto option. If the Auto option is selected, the BIOS will query the memory modules' SPD chips and use the lowest setting found for maximum compatibility. For better performance, you should consider increasing the Refresh Interval from the default values (15.6 µsec for 128Mbit or smaller memory chips and 7.8 µsec for 256Mbit or larger memory chips) up to 128 µsec. Please note that if you increase the Refresh Interval too much, the memory cells may lose their contents. Therefore, you should start with small increases in the Refresh Interval and test your system after each hike before increasing it further. If you face stability problems upon increasing the refresh interval, reduce the refresh interval step by step until the system is stable.

From Sierra at ABXzone: The information below is taken from an old RAM guide. In a nutshell a memory module is made up of electrical cells. The refresh process recharges these cells, which are arranged on the chips in rows. The refresh cycle refers to the number of rows that must be refreshed.

"Periodically the charge stored in each bit must be refreshed or the charge will decay and the value of the bit of data will be lost. DRAM (Dynamic Random Access Memory) is really just a bunch of capacitors that can store energy in an array of bits. The array of bits can be accessed randomly. However, the capacitors can only store this energy for a short time before it discharges it. Therefore DRAM must be refreshed (re-energizing of the capacitors) every 15.6µs (a microsecond equals 10-6 seconds) per row. Each time the capacitors are refreshed the memory is re-written. For this reason DRAM is also called volatile memory. Using the RAS-ONLY refresh (ROR) method, the refresh is done is a systematic manner, each column is refreshed row by row in sequence. In a typical EDO module each row takes 15.6µs to refresh. Therefore in a 2K module the refresh time per column would be 15.6µs x 2048 rows = 32ms (1 millisecond equals 10-6 seconds). This value is called the tREF. It refers to the refresh interval of the entire array."

Here is an interesting discussion of tREF on the DFI forum: http://www.dfi-street.com/forum/showthread.php?t=10411

Slight Influence on Stability/Bandwidth.

Suggested Settings for DFI: It appears that tREF, like the tRAS, is not an exact science. It also seems that the 15.6us, and 3.9us settings work well, and that the 1.95us settings give lower bandwidth. The unknown (?.?us) are shots in the dark. A lot of users are finding setting 3120= 200mhz(?.?us) gives the best balance of performance, and stability, but this will probably vary greatly from one type of RAM to another.

Write CAS# Latency(tWCL)

Settings = Auto, 1-8

Paraphrased from Lost Circuits: http://www.lostcircuits.com/
”Variable Write CAS Latency (tWCL): Conventional SDRAM including DDR I uses random accesses as the name implies. This means that the controller is free to write to any location within the physical memory space, which, in most cases, means that it will write to whichever page is open and to the column address closest to the (CAS) strobe. The result is a write latency of 1T, as opposed to read or CAS-Latency values of 2, 2.5 or 3. (This setting should almost) always be set to 1 unless using DDRII.”

Large Influence on Stability/ Unknown Influence on bandwidth.

Suggested Settings for DFI: Most people can only post using Auto or 1. RGone over at DFI-Street says that #5 in this setting works on his board with “any” brand or size and speed of memory! Recommend try 1.

DRAM Bank Interleave

Settings = Enable, Disable

Paraphrased from Adrian Wong’s site: http://www.rojakpot.com/
”This BIOS feature enables you to set the interleave mode of the SDRAM interface. Interleaving allows banks of SDRAM to alternate their refresh and access cycles. One bank will undergo its refresh cycle while another is being accessed. This improves memory performance by masking the refresh cycles of each memory bank. A close examination will reveal that since the refresh cycles of all the memory banks are staggered, this produces a kind of pipelining effect. However, bank interleaving only works if the addresses requested consecutively are not in the same bank. If they are in the same memory bank, then the data transactions behave as if the banks were not interleaved. The processor will have to wait until the first data transaction clears and that memory bank refreshes before it can send another address to that bank. All current SDRAM modules support bank interleaving. It is recommended to enable this feature whenever possible.”

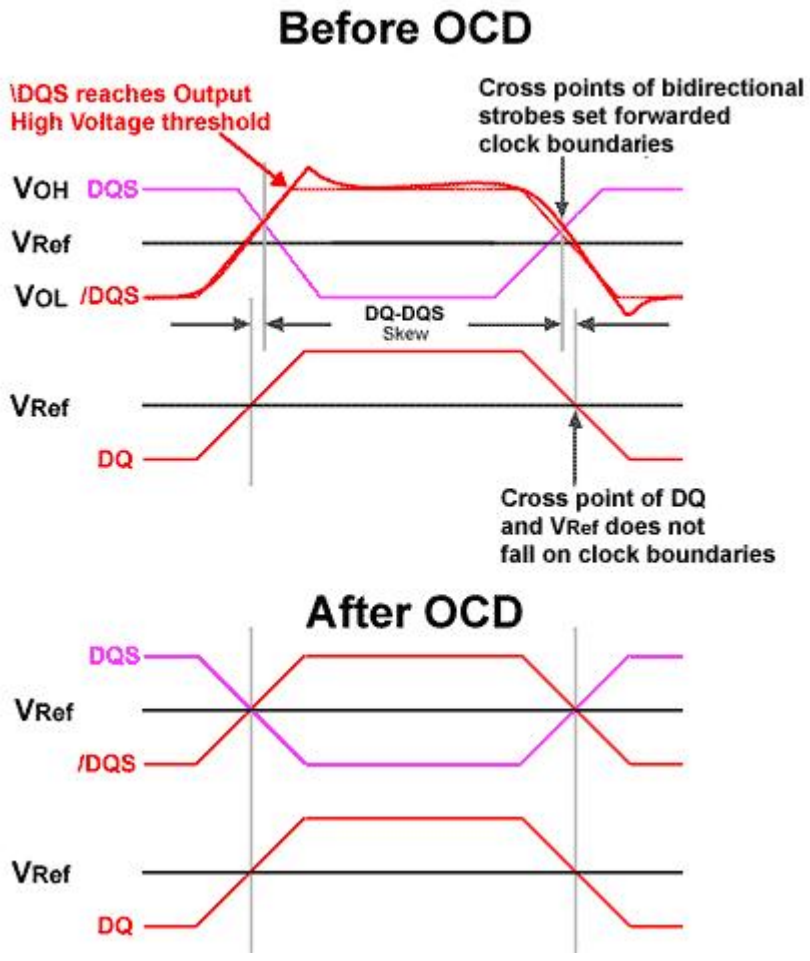
Large Influence on Bandwidth/Stability

Suggested Settings for DFI: Set to Enable whenever possible----it is a fairly influential setting for improving bandwidth. Disable for stability and a corresponding loss in bandwidth. (Enable = Faster)

DQS Skew Control

Settings = Auto, Increase Skew, Decrease Skew

From Lost Circuits: http://www.lostcircuits.com/
"It is true that lower voltage swings enable higher frequencies but after a certain point, the ramping of the voltages will show a significant skew. The skew can be reduced by increased drive strength, however, with the drawback of a voltage overshoot / undershoot at the rising and falling edges, respectively. One additional problem with high frequency signaling is the phenomenon of trace delays. The solution in DDR was to add clock forwarding in form of a simple data strobe. DDR II takes things further by introducing a bidirectional, differential I/O buffer strobe consisting of DQS and /DQS as pull-up and pull-down signals. Differential means that the two signals are measured against each other instead of using a simple strobe signal and a reference point. In theory the pull-up and pull-down signals should be mirror-symmetric to each other but reality shows otherwise. That means that there will be skew-induced delays to reaching the output high and low voltages (VOH and VOL) and the cross points between DQS and /DQS used for clock forwarding will not necessarily coincide with the DQ crossing the reference voltage (Vref) or even be consistent from one clock to the next. The mismatch between clock and data reference points is referred to as the DQ-DQS skew."



Slight Influence on Bandwidth/Stability.

Suggested Settings for DFI: Increase for performance, and Decrease for Stability. Recommend try Increase. (Increase = Faster, Decrease = Slower)

DQS Skew Value

Settings = Auto, 0-255 in 1.0 increments.

This is the value that is Increased or Decreased when you set the DQS skew control. It does not appear to be a very sensitive timing.

Slight Influence on Bandwidth/Stability.

Suggested Settings for DFI: This does not appear to be a very sensitive timing. Try 50-255 with "Increase Skew" set in the above timing. (Higher = Faster)

DRAM Drive Strength

Settings = Auto, 1-8 in 1.0 increments.

Paraphrased From Adrian Wong's site:http://www.rojakpot.com/ "Sometimes called driving strength. This feature allows you to control the memory data bus' signal strength. Increasing the drive strength of the memory bus can increase stability during overclocking. DRAM drive strength refers to the signal strength of the memory data line. A higher number means a stronger signal and is generally recommended for an overclocked module to improve stability. Supposedly TCCD works better with weak drive strength while just about everything else prefers a stronger signal."

From bigtoe: "If you leave the option at Auto this will set a weak drive strength, this is good for TCCD based modules but bad for anything else. From testing and debugging the board I have concluded the following. Options 1 3 5 7 are all weak, as is Auto, setting. 1 is actually the weakest option with 7 being as close to the normal weak setting DFI will allow us. Options 2 4 6 8 are the Normal settings, with 8 being the highest strength setting. If you are using TCCD you may want to try 3 5 or 7 as the drive settings as they usually seem to allow the modules to clock well. If you are using VX, or the new BH Gold, or any other modules from the OCZ range you may want to try 8 or 6."

Large Influence on Stability.

Suggested Settings for DFI: From bigtoe: "If you are using TCCD you may want to try 3 5 or 7 as the drive settings as they usually seem to allow the modules to clock well. If you are using VX, or the new BH Gold, or any other modules from the OCZ range you may want to try 8 or 6."

DRAM Data Drive Strength

Settings = Levels 1-4 in 1.0 increments.

From Adrian Wong's site: http://www.rojakpot.com/
"The MD Driving Strength determines the signal strength of the memory data line. The higher the value, the stronger the signal. It is mainly used to boost the DRAM driving capability with heavier DRAM loads (multiple and/or double-sided DIMMs). So, if you are using a heavy DRAM load, you should set this function to Hi or High. Due to the nature of this BIOS option, it's possible to use it as an aid in overclocking the memory bus. Your SDRAM DIMM may not overclock as well as you wanted it to. But by raising the signal strength of the memory data line, it is possible to improve its stability at overclocked speeds. But this is not a surefire way of overclocking the memory bus. In addition, increasing the memory bus signal strength will not improve the performance of the SDRAM DIMMs. So, it's advisable to leave the MD Driving Strength at Lo/Low unless you have a high DRAM load or if you are trying to stabilize an overclocked DIMM."

Large Influence on Stability.

Suggested Settings for DFI: Many have suggested using Level 1 or 3, if you have CPC enabled. With CPC, anything above level 1 gives some users extreme instability. Some users like level 3 with CPC enabled. Some others have had success with using level 2-4 if CPC is disabled. I had good luck with CPC enabled and Level 4. (Higher = Faster)

Max Async Latency

Settings = Auto, 0-15 in 1.0 increments.

I could not find anything on this particular setting and am not sure what portion of RAM functions it affects. If you have information on this setting, please post and I will update this section. **From HiJon89:** "The Max Async Latency setting will show its biggest difference in the Everest Latency Test. Going from 8ns to 7ns on my BH-6 made a 1ns difference in Everest Latency. Going from 7ns to 6ns dropped it another 2ns."

Slight Influence on Bandwidth/Stability.

Suggested Settings for DFI: 7ns is the default----Suggest you start at 7ns and work from there trying 5.0-10.0. From HiJon89: "6ns is very tight, I would recommend running 6ns for UTT or BH-5 but not TCCD. 7ns is looser, good for getting higher clocks on UTT or BH-5. 8ns is pretty loose for UTT or BH-5, but its just right for hitting DDR600 with TCCD. 9ns is very loose even for TCCD and should really only be used to try to hit DDR640+." (Lower = Faster)

Read Preamble Time

Settings = Auto, 2.0-9.5 nanoseconds, in 0.5 increments.

From the DFI BIOS: "This BIOS setting specifies the time prior to the max-read DQS return. It shows when the DQS should be turned on." From an old Samsung memory guide: "Preamble of DQS on reads: DDR SGRAM uses a data strobe signal(s),DQS, to increase performance. The DQS signal is bidirectional which toggles when there is any data transfer from DDR SGRAM to graphic controller or from graphic controller to DDR SGRAM. Prior to a burst of read data, DQS signal transitions from Hi-Z to a valid logic low. This is referred to as the data strobe preamble. This transition from Hi-Z to logic low nominally happens one clock cycle prior to the first edge of valid data."

Slight Influence on Bandwidth/Stability.

Suggested Settings for DFI: 5.0 ns is the default when set to Auto----suggest starting at 5.0 and then working within this range (4.0-7.0) depending on ram. (Lower = Faster)

Idle Cycle Limit

Settings = Auto, 0-256 in varied increments.

From the DFI BIOS: "This BIOS setting specifies the number of memclocks before forcibly closing (pre-charging) an open page." It appears that this setting is the maximum number of tries allowed for a page of memory to be read before arbitration kicks in and forces pre-charge once again for that page.

Slight Influence on Bandwidth/Larger Influence on Stability.

Suggested Settings for DFI: The Auto setting defaults to 256 clocks which seems to be overkill. If your RAM is lower grade----then I would stay with Auto. If your RAM is a step up, I would try 16-32 clocks. I had good luck with 16 clocks on BH-5. (Lower = Faster)

Dynamic Counter

Settings = Auto, Enable, Disable.

From the DFI BIOS: "This BIOS setting specifies dynamic idle cycle counter to enable or disable. If enabled, it forces each entry in the page table to dynamically adjust the idle cycle limit based on page conflict/page miss (PC/PM) traffic." It appears that this setting

is directly related to Idle Cycle Limit and if enabled, would override the existing clock settings for Idle Cycle Limit and force that setting to dynamically adjust based upon conflicts occurring.

Slight Influence on Bandwidth/Stability for some----- Large Influence on Bandwidth/Stability for others.

Suggested Settings for DFI: Auto usually disables this setting. Enable for performance increase. Disable for stability increase. This setting can have a fairly large difference----I noticed immediate crashes when set to Enable until I had adjusted other settings. I also noticed an improvement in bandwidth once I found other settings which allowed me to enable this one. Aurhinius has reported that disabling IMPROVED his memory bandwidth by 50 points using TCCD. This is just one of thoses settings that definitely depends on the BIOS version and type of memory being used. (Enable = Faster = Maybe)

R/W Queue Bypass

Settings = Auto, 2x, 4x, 8x, 16x.

From the DFI BIOS: "This BIOS setting specifies the number of times the oldest operation in the DCI (Device Control Interface) read/write queue can be bypassed before the arbiter is overwritten and the oldest operation is chosen." Similar to Idle Cycle Limit except that this arbiter affects the Read/Write que of the memory page.

Slight Influence on Bandwidth/Larger Influence on Stability.

Suggested Settings for DFI: 16x is the default and I would stay with that unless you are having stability problems. If unstable, suggest using 8x or even 2x or 4x for max OC. (Larger = Faster----Smaller = More Stable)

Bypass Max

Settings = Auto, 0x-7x in 1.0 increments.

From the DFI BIOS: "This BIOS setting specifies the number of times the oldest entry in DCQ (Dependence Chain Que?) can be bypassed in arbitration before the arbiter choice is vetoed." I looked all over for this one and I believe it has to do with the memory's link to the CPU memory controller. If you find other information please feel free to post it and I will update this.

Slight Influence on Bandwidth/Stability.

Suggested Settings for DFI: The default is 7X. Suggest 4x-7x for max

performance/stability. Bypass max from 0X - 7X, 7X being the most agressive giving the highest bandwidth. Low latency dimms suit 7X with higher latency and high FSB needing 4X to 6X to work well.Suggest trying 5X and work up to 7X checking stability.

32 Byte Granulation

Settings = Auto, Disable (8burst), Enable (4burst).

From the DFI BIOS: "This BIOS setting specifies if the burst counter should be chosen to optimize data bus bandwidth for 32 byte accesses." Disabling allows for the best performance (largest size of burst).

Slight Influence on Bandwidth/Larger Influence onStability.

Suggested Settings for DFI: Auto selects Disable (8burst) as the default in most cases. Try Disable (8burst) for more bandwidth. Try enabling 4 burst for more stability. (Disable = Faster)

Important Links

The location of the PWM IC on the NF4 mobo
+ vdimm,vcore and chipset voltage read points.. (w/ pictures)
http://www.dfi-street.com/forum/sho...740&postcount=2

NF2 and NF4 bios flash CD + utilities..
http://www.dfi-street.com/forum/showthread.php?t=22031

A64 Heatsink Selection & Mounting Guide..
http://www.dfi-street.com/forum/showthread.php?t=23259

NF4 - Plug ALL FOUR power connectors in (w/ pictures)..
http://www.dfi-street.com/forum/sho...734&postcount=3

NF4 LanParty - initial build (w/pictures)..
http://www.dfi-street.com/forum/showthread.php?t=20832

Overclocking Database..
http://www.dfi-street.com/forum/forumdisplay.php?f=28

NF4 raid setup guide - (w\ pictures)..
http://www.angrygames.com/nf4raid-1.htm

NF4 power supply guide..
http://www.dfi-street.com/forum/showthread.php?t=10854

How to read the NF4 diagnostic LED's..
http://www.dfi-street.com/forum/sho...705&postcount=4

Current List of AMD64 Processor Specs, Info, FAQs, And More..
http://forums.extremeoverclocking.c...ad.php?t=107925

The Somewhat Complete A64 Memory Timings/Settings guide..
http://forums.extremeoverclocking.c...ad.php?t=170999

A64 Ram Divider Training Guide and overclocking tips..
http://forums.extremeoverclocking.c...ad.php?t=149717

Cleaning your NF4 Chipset fan and replacing with AS5 (or other thermal material!)..
http://www.dfi-street.com/forum/showthread.php?t=20827

Mod the DFI Ultra-D to SLI..

http://www.dfi-street.com/forum/showthread.php?t=10736

Mod the DFI NF4-D to SataII and SLI..
http://www.dfi-street.com/forum/showthread.php?t=11400

AMD Athlon 64 General Overclocking Guides..

http://www.madshrimps.be/?action=gethowto&howtoID=58

http://i4memory.com/showthread.php?t=327

http://www.tomshardware.com/cpu/19970102/

Credits

Confused by HTT? LDT? FSB? A64??? READ THIS!
Most of this info was pulled from a thread were RGone and Angry_Games explained to someone what HTT and LDT really was... I did a little rewording of it to fit both 754 and 939, but a big thanks goes to RGone and Angry_Games for this one.. Even after I thought I knew what HTT and LDT was this helped a ton and made me truely understand what they are..
The original thread can be found here.

Which bios is best for you?
This is from another thread were RGone and Angry_Games tackled one of the most common questions.. "Which bios is best for me..?" They did a great job of explaining that you really need to try different versions and see which works best for YOUR rig..
The original thread can be found here.

A64 Overclocking
I wrote this myself with some help from WildStyle a mod at guru3d.com.. Overclocking is not an exact science and some people might have different ways to find their max overclocks..But this is the way I found to work the best .. Once you get more experienced in overclocking there might be some short cuts you are able to take but its always best to not rush.. Patience is the key to a successful overclock ..
The original thread can be found here.

DFI NF4 BIOS Memory Guide

One of the biggest differences in DFI motherboards compared to the average motherboard is all the bios options.. When I got my first DFI that was the one thing that made me feel like a complete idiot..lol.. But thanks to johnrr6 for putting together this guide it helps to make sense of alot of these options.. Also a big thank you to everyone that contributed info for him to use, which he gives credit for in his guide..
The original thread can be found here.

Conclusion..

Well by now your spending sleepless nights tweaking your rig or maybe playing BF2 till all hours of the night.. Or maybe you love DFI-Street so much and spend all night posting ..lol.. Either way you should end up knowing alot more about Overclocking a DFI A64 rig and thats the main objective of this guide..
