



RAM GUY TECH NOTE



TWINX4000 FAQ

How fast are TWINX4000 modules?

Many, if not most, platforms popular with enthusiasts today are designed for dual memory channels. Our lab testing revealed to us that modules that run at 500 MHz as individual DIMMs will not necessarily run at 500 MHz when configured as pairs in dual channel systems. XMS4000 modules are tested at 500 MHz, in pairs, in Intel® 875P-based dual channel motherboards, but will run significantly faster as a single module.

So, how fast will my TWINX4000 module run as a pair, and how fast will it run single?

These modules are fast! TWINX4000 modules are tested as pairs at the following settings:

- 250 MHz (DDR500)
- Latency settings: 3-4-4-8
- Voltage: 2.75 volts

Individual TWINX4000 modules have been verified in the lab to typically perform at the following settings:

- 258 MHz (DDR516)
- Latency settings: 3-4-4-8
- Voltage: 2.75 volts

Or, if you prefer to tweak down the latency settings,

- 255 MHz (DDR510)
- Latency settings: 2.5-4-3-6
- Voltage: 2.65 volts

But, regardless of latency settings, singles are definitely faster than twins.

I'm a little surprised that dual channel slows things down. I thought the channels on the 875P were completely independent!

Frankly, we were surprised too! The channels are, in fact, completely electrically independent, so the second module does not present any additional loading. But, we confirmed it again and again, in controlled experiments, with different motherboards and memory.

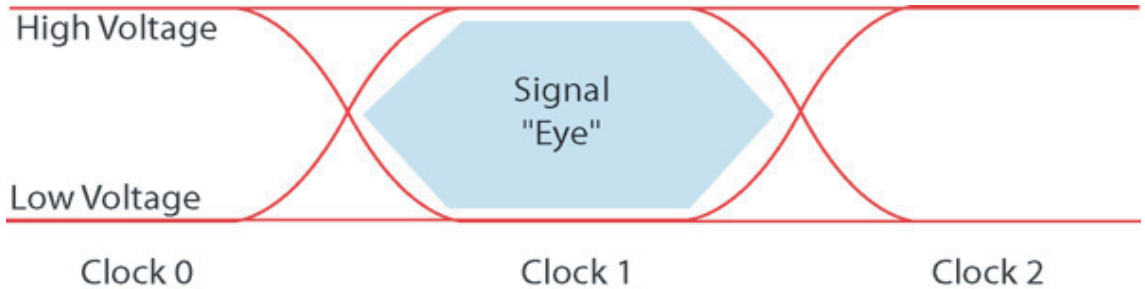
Did you figure out why this is?

We went straight to the source for answers on this one. And the explanation is going to require me to nerd out for a minute here. So bear with me.

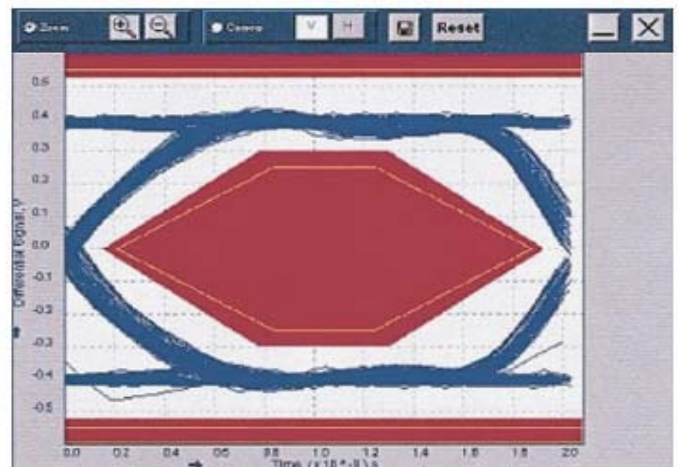
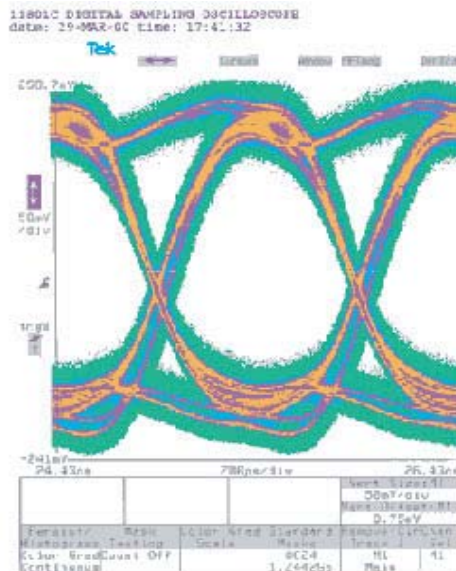
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The first illustration below shows a greatly simplified "Eye Diagram". The "eye" refers to the period of time where the signal is in a valid state and is ready to be used.



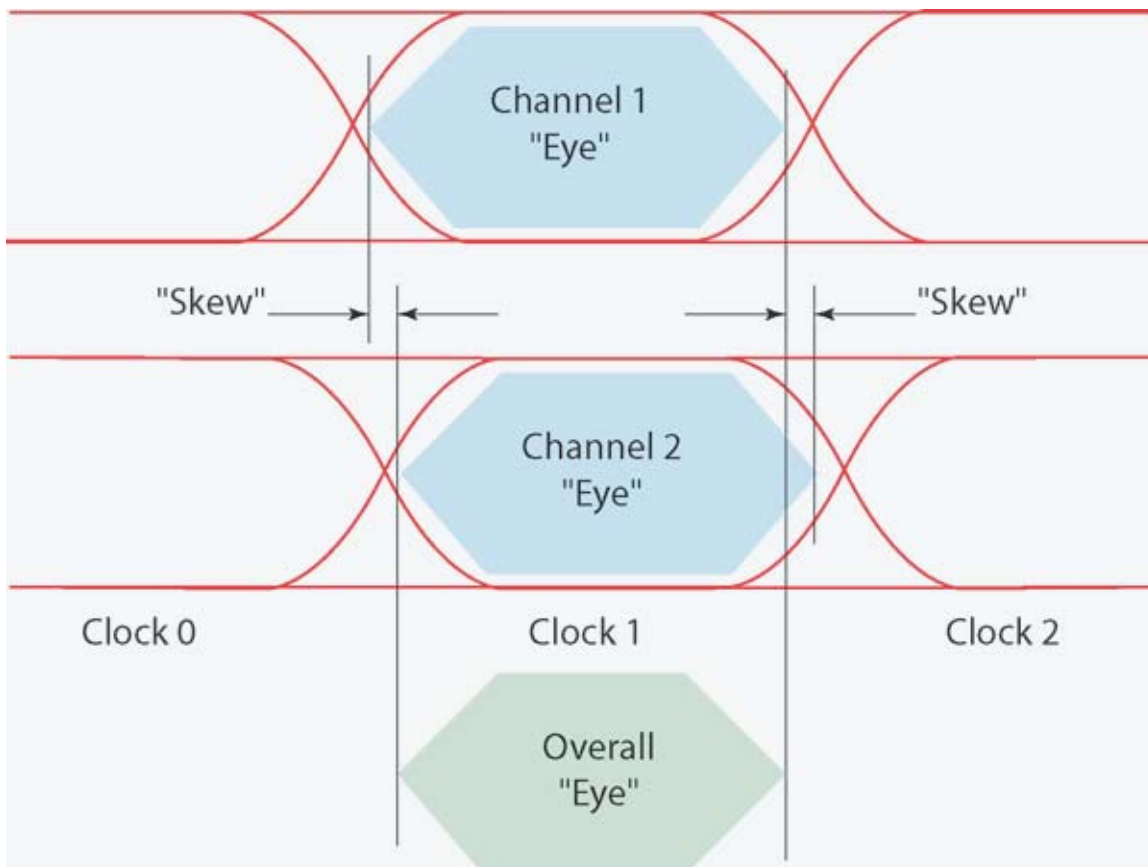
Countless hours of design, simulation, and testing are performed at the chipset vendor, major memory IC vendors, and even at Corsair, to ensure that this "eye" is as large, and as electrically free of noise, as possible. Here are some samples of genuine eye diagrams, for your entertainment...



The next illustration shows a simplified (and exaggerated) data signal eye diagram for the chipset running in both single and dual channel mode. As you can see, each memory channel has an eye diagram associated with it. The overall eye, however, is the period that both data signals are valid. Due to motherboard layout, there is "skew" between these data eyes. This results in a smaller overall data eye, which in turn translates into slightly slower memory bus.

So, the skew makes things a little slower. How much?

Our testing found that, at the very high speeds of TWINX4000, the difference between a pair of modules, one in each channel, and a single module running at identical memory settings, was about eight megahertz. In other words, a TWINX4000 pair is spec'd to run at 250MHz, 3-4-4-8, at 2.75 volts. When running as single modules, the single module should run at approximately 258 MHz, 3-4-4-8, 2.75 volts.



Does this mean I should run my system in single channel mode?

In general, the great increase in bandwidth that you get by going dual-channel more than compensates for the slightly slower bus speed. This is particularly true on the 875P chip set, where dual channel bandwidth is substantially higher than single channel. We have measured an average of more than 40% increase in our score on common memory bandwidth benchmarks when using dual channel as opposed to single channel.

How is the SPD configured on these modules?

The SPD on TWINX4000 parts is based on a variation of the JEDEC standard PC3200 SPD. Latencies will be configured as per the test specification (3-4-4-8). Other timing values are configured for optimum compatibility with popular motherboards. The part number in the SPD will be CMX512-4000.

What about voltage?

We test these modules at a supply voltage of 2.75 volts. Most 875P-based motherboards default to 2.65 volts. Our qualification lab found that the extra voltage kick really improved system stability at 250 MHz. We don't recommend going much higher, though. Running above 2.9 volts may seriously shorten the life of your memory, doesn't seem to make a huge difference in operation, and will void the warranty on the module.

Any other tips for maximizing performance?

When running your system this fast, good thermal performance is a must. We strongly encourage putting a fan on your Northbridge, and make sure there is good airflow throughout your case. At 250 MHz, things get pretty toasty!

Email ramguy@corsairmemory.com with topic suggestions for other Ram Guy Tech Notes.