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Using HD Tune to Determine HDD or SSD

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If you've ever taken the time to read any reviews on new storage devices such as hard disk drives (HDD) or solid state drives (SSD), it's more than possible that you will encounter references to the HD Tune benchmarking tool. HD Tune is an application which can measure performance for a storage device, scan for errors, and also check the device status for problems. The website (unsurprisingly) is: www.hdtune.com

As with many tools, there is a free version and a paid version, each having different capabilities. Of course, they want you to purchase the paid version, and provide the free one as a kind of advertising promotion. Here is a short extract from the website which shows the capabilities of both the paid and free versions of HD Tune.

	HD Tune Pro	HD Tune
Low level benchmark	✓	✓
read	✓	✓
write	✓	✗
Detailed drive information	✓	✓
Health (S.M.A.R.T)	✓	✓
log file	✓	✗
Error scan	✓	✓
error log	✓	✗
Folder usage	✓	✗
Secure erase (wipe)	✓	✗
File benchmark	✓	✗
Extra tests	✓	✗
Cache test	✓	✗
Disk monitor	✓	✗
AAM	✓	✗
Command line parameters	✓	✗
Support for external drives (health, temperature)	✓	✗
Temperature statistics	✓	✗
Price	USD 34.95 EUR 24.95 BUY NOW	free for personal use

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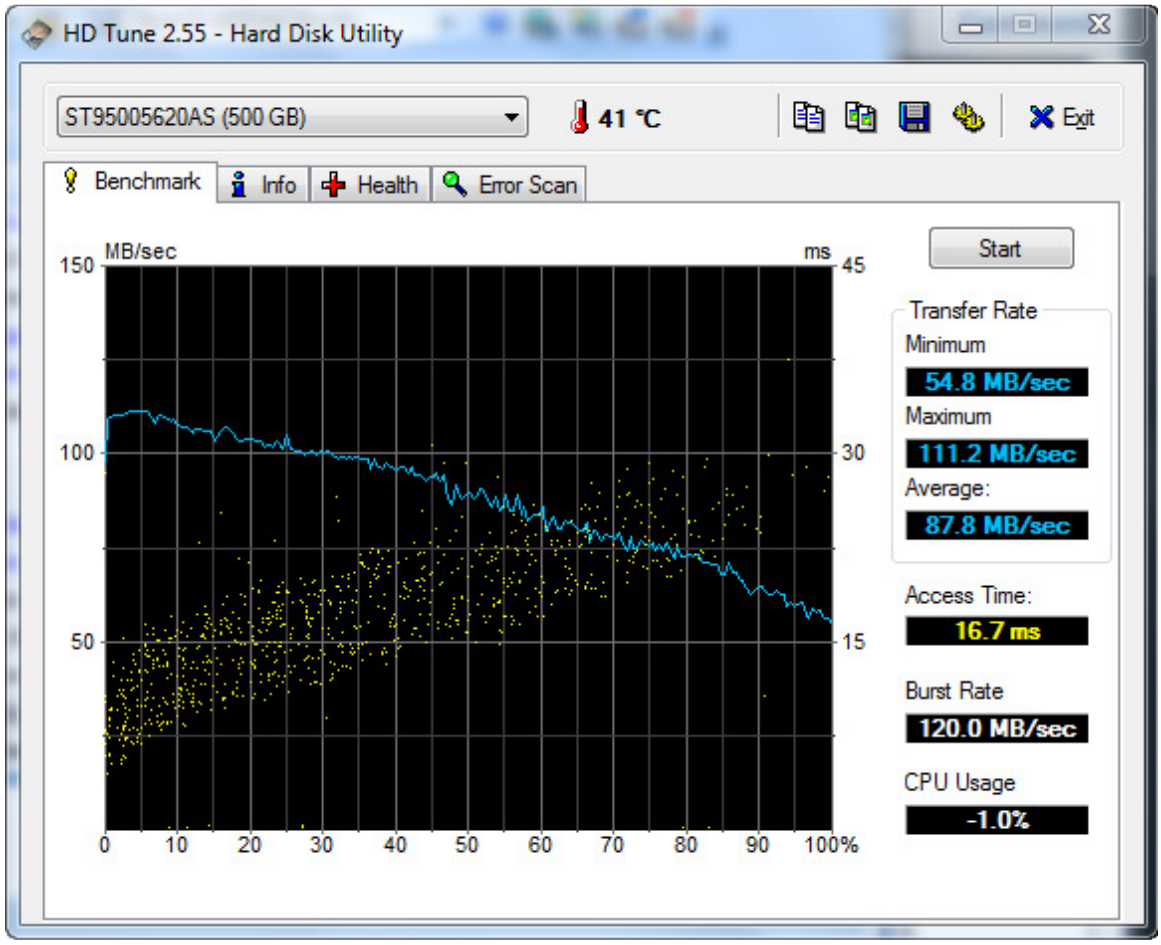
As you can see, much of the cool stuff, like write benchmarking and temperature monitoring, is not for free. However, there are enough goodies in the free version to merit installing and trying it out. And although for purposes of this discussion we will limit ourselves to the free version (HD Tune), the paid version (HD Tune Pro) can be installed and used for a trial period.

But enough of that, let's have a look at results from the tool. Below is the benchmarking tab of the tool run against a Seagate HDD. Let's focus on two main metrics, the transfer rate (blue) and the access time (yellow). The screenshot presents us with an interesting picture. Let's see if we can interpret what is happening.



The read testing proceeds from the outside of the disk, where the circumference of the disk track is the greatest, to the center of the disk platter, where the track circumference is the smallest. The key consideration is that the inner tracks have fewer sectors on them than the tracks near the outer edge of the HDD. It takes the same amount of time to

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complete a revolution at the inner vs. the outer edge, but a smaller amount of data is transmitted from the inner track when the disk completes a revolution. That's why the blue line slopes downward from left to right.

Next, let's consider the access times. The access time seems to be increasing as we move from the outer edge to the inner edge of the HDD. This is shown by the yellow scatter graph ascending as we move from left to right. This is mostly accounted for because of increasing seek times.

The seek time is the time it takes to move the magnetic read/write head from the outer edge of the HDD where it is housed to the target track which is to be read. As we move further from the starting point, the number of milliseconds (ms) it takes to position the read/write head will increase. This explains the gradually increasing from 5 ms at the left of the scatter graph to about 30 ms at the right side of the scatter graph.

Next, let's look at another screenshot of HT Tune results below.

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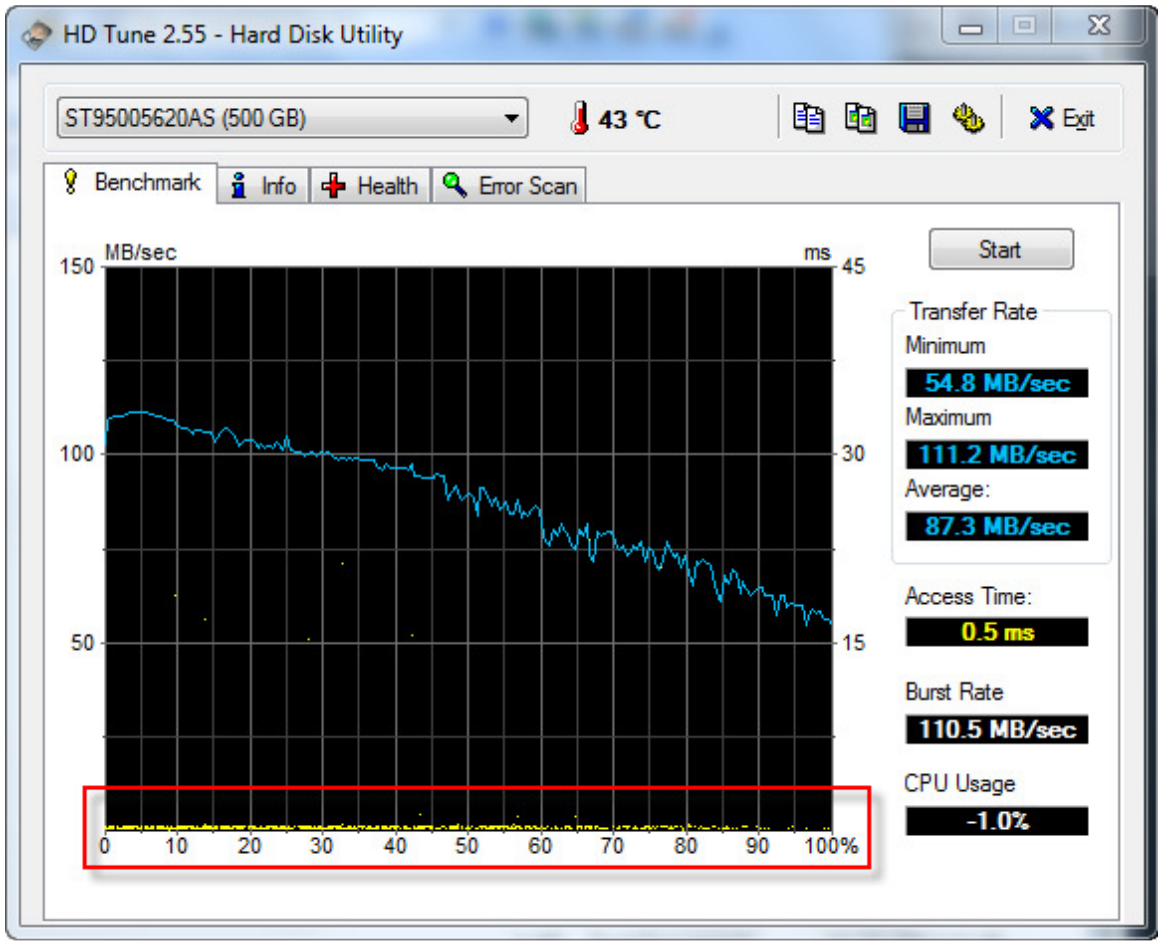
Here we have run HD Tune a second time on the same HDD. We should get the same results, wouldn't you think? But look at the results from the screenshot below.



Something is different. The access time is now 0.5 ms, instead of the former 16.7ms. The difference can be ascribed to a particular feature of the HDD. It includes 4GB of solid state cache, making it what is known as a hybrid drive. The hybrid drive attempts to combine the best of the HDD and SSD characteristics in one device. The best of both in this case being the lower cost and higher capacity of a HDD and the greater speed of an SSD.

So we might interpret the yellow scatter graph along the bottom of the chart (outlined in red) as representing cached data being retrieved from cache vs. from sectors on the HDD. In this case, the typical access time of 16.7 ms has been reduced to 0.5 ms, which is more in line with the characteristics of a solid state drive.

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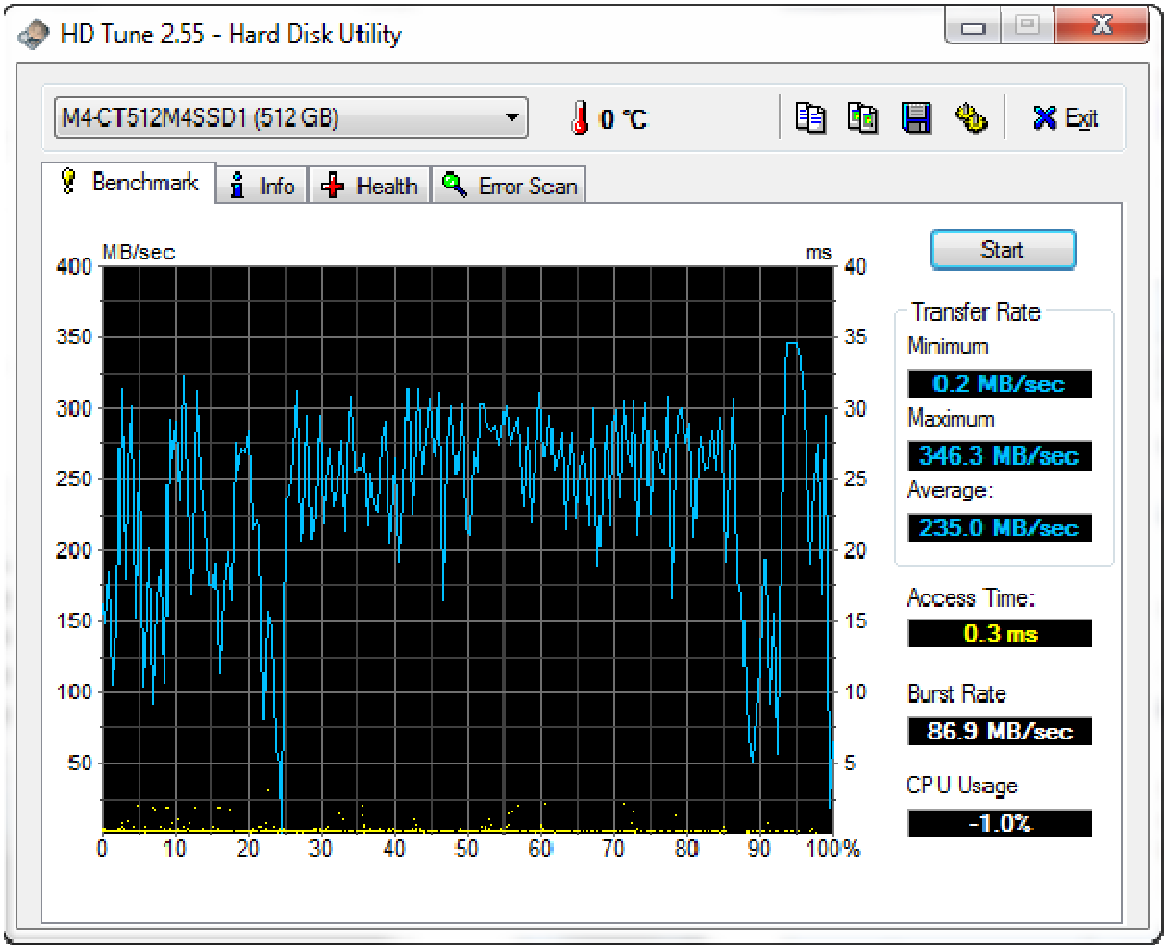
The next device we will benchmark is the Crucial M4 SSD. Now we can get some data on a purely solid state device, with no mechanical delays as with the HDD. Let's compare the screenshot below with the first one we looked at. First, the transfer rate is markedly higher, with an average of 346 MB/sec vs. 87.8 MB/s. This is almost 4X faster than what a HDD provides, quite significant.

The next area to compare is the access time, with 0.3ms on the SSD with 16.7ms for the HDD. If one divides the first number into the second, the result is that access time of the SSD is more than 55X faster than the HDD. We can say that this clearly shows the value of having no moving parts in a SSD vs. the spinning platters in a HDD.



Before moving on to another device type, let's first take a brief look at other features of HD Tune.

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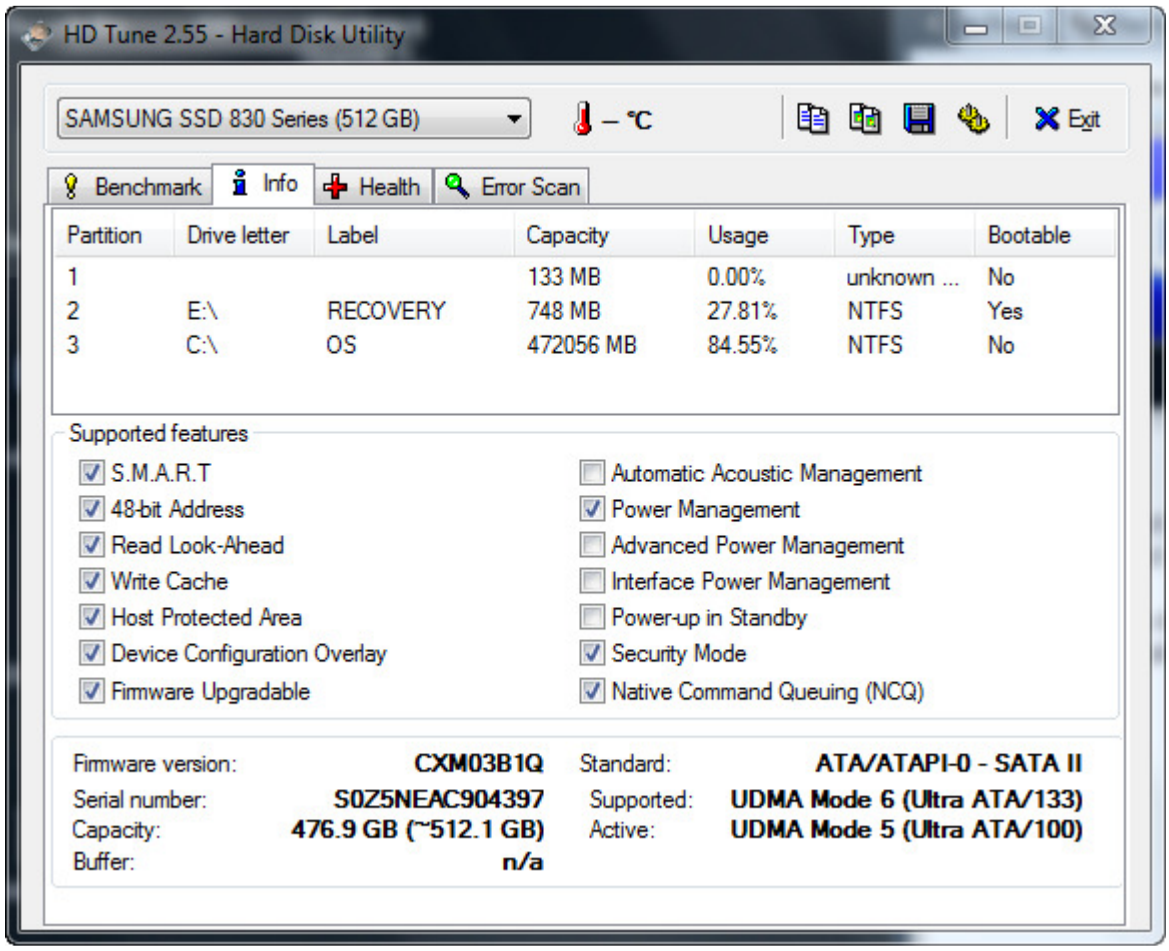
In this next screen shot, we have both a new device (Samsung SSD) and a new tab displayed from HD Tune. The Info tab gives a large variety of information about the device selected. Partition sizes, supported features, and other information specific to the device are displayed. All of this can be quite useful to have available.



The next screen shot shows the Health tab of HD Tune. Let's look at that now.

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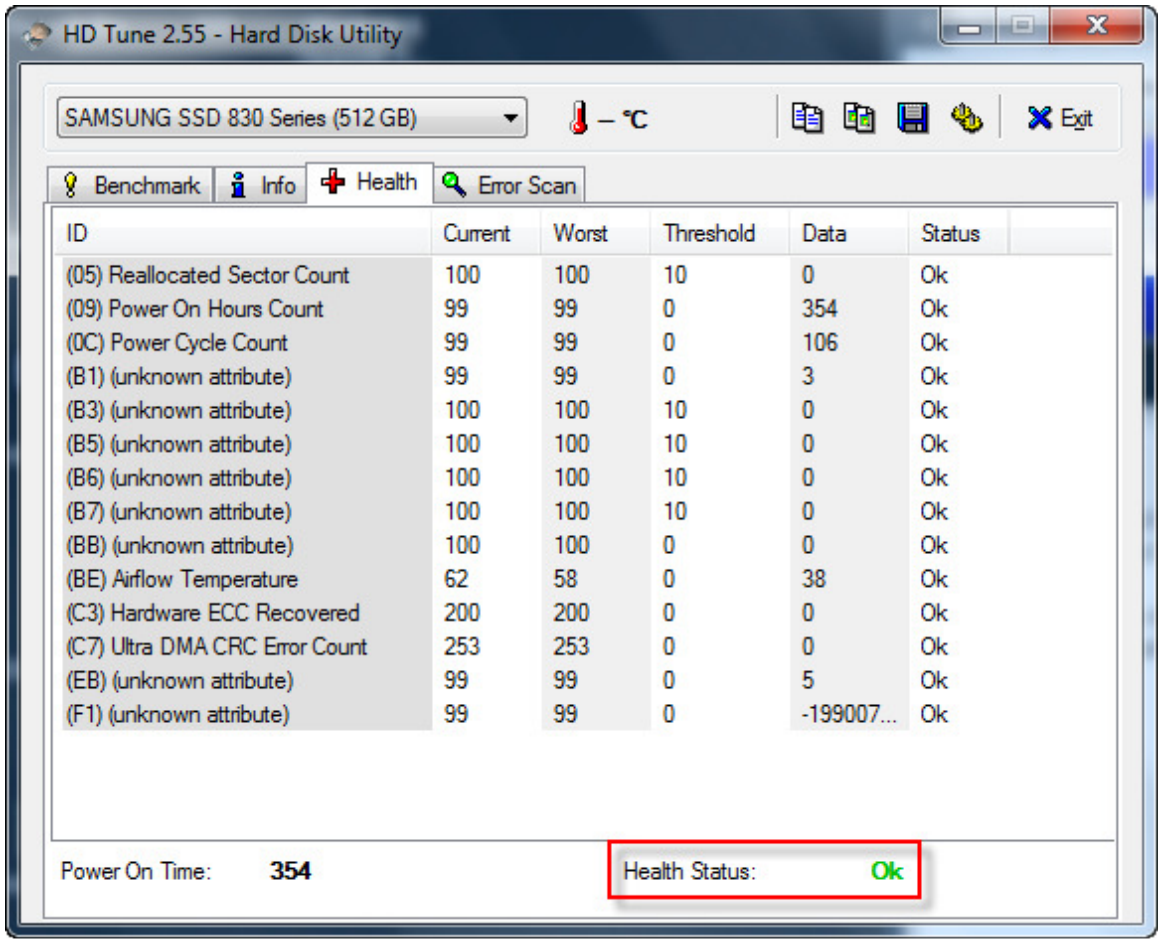
For the more technically inclined, the health tab provides a variety of indicators, while also providing status with a simple English OK (or not). I will leave it to the reader to research the meaning of any particular indicator listed below.



ID	Current	Worst	Threshold	Data	Status
(05) Reallocated Sector Count	100	100	10	0	Ok
(09) Power On Hours Count	99	99	0	354	Ok
(0C) Power Cycle Count	99	99	0	106	Ok
(B1) (unknown attribute)	99	99	0	3	Ok
(B3) (unknown attribute)	100	100	10	0	Ok
(B5) (unknown attribute)	100	100	10	0	Ok
(B6) (unknown attribute)	100	100	10	0	Ok
(B7) (unknown attribute)	100	100	10	0	Ok
(BB) (unknown attribute)	100	100	0	0	Ok
(BE) Airflow Temperature	62	58	0	38	Ok
(C3) Hardware ECC Recovered	200	200	0	0	Ok
(C7) Ultra DMA CRC Error Count	253	253	0	0	Ok
(EB) (unknown attribute)	99	99	0	5	Ok
(F1) (unknown attribute)	99	99	0	-199007...	Ok

The last tab provided by HD Tune, which is Error Scan, allows us to actually scan the device for bad sectors. This is shown in the next screen shot.

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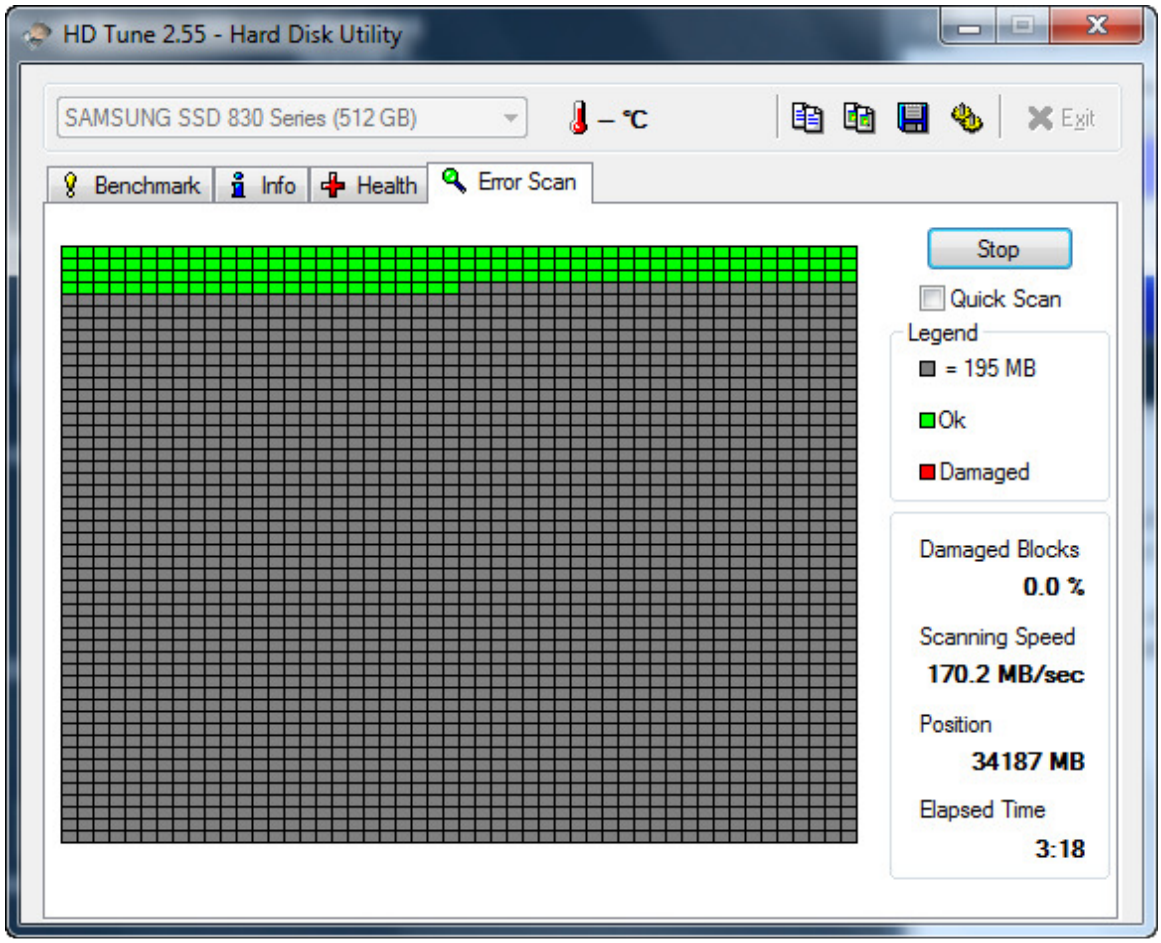
In order to scan the device for problems, click Start and wait until the scan is finished. This can take awhile, and a Quick Scan option is also available. If there is any question about the integrity of the device, running this check can provide some useful information.



The last screen shot will be the results of profiling a Samsung SSD. Let's see what we find from running the benchmark.

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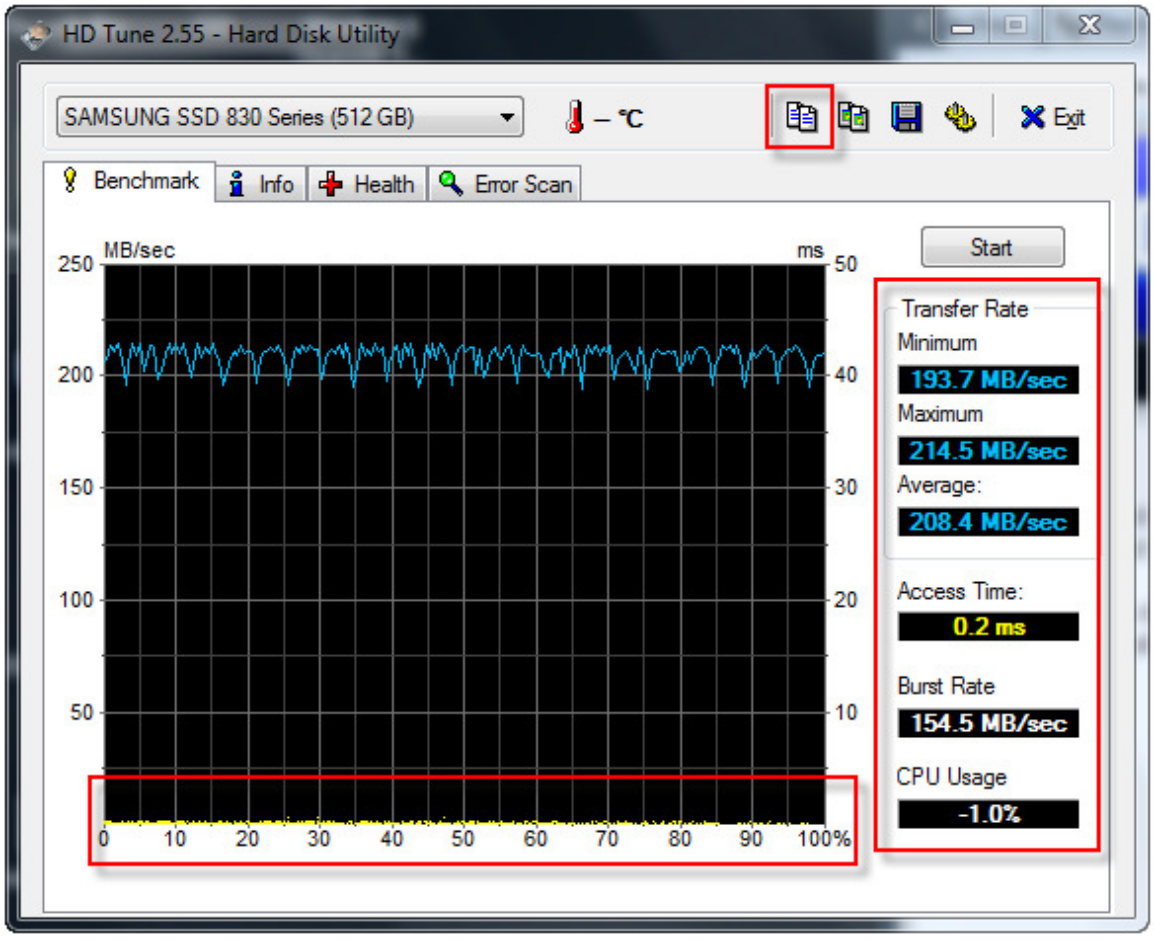
We can comment first of all that the Samsung numbers below are pretty much in line with the Crucial device previously profiled. It looks like the Crucial SSD was benchmarked when it was active, while the Samsung SSD was benchmarked when it was quiescent. But no matter, both the transfer rates and the access times are similar with what we would expect for a SSD vs. a HDD.

One additional feature of HD Tune that we point out here is the ability to save the results of a benchmark. Results can be saved to a file, clipboard, etc. In this case, we saved the results to the clipboard, and pasted them below this screenshot.



The pasted results can be seen next:

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HD Tune: SAMSUNG SSD 830 Series Benchmark

Transfer Rate Minimum : 193.7 MB/sec
Transfer Rate Maximum : 214.5 MB/sec
Transfer Rate Average : 208.4 MB/sec
Access Time : 0.2 ms
Burst Rate : 154.5 MB/sec
CPU Usage : -1.0%

Of course, these results correspond to what is shown in the statistics outlined in red in HD Tune screen shot above. This is a convenient way to copy and paste the results into a document if some number of benchmarks is being run, either on the same, or on different devices.

So, in summing up, HT Tune provides a wealth of useful and interesting information about the storage device in your computer. We've only begun to explore what it has to offer here – the intent is to provide an introduction, not an in-depth survey.

And, if you want to see the full range of features, you can download the full version for the trial period. Whichever version you choose, HD Tune, or HD Tune Pro, I think you will find the results from using it to be enlightening.