

HD Tune Pro manual

version 6.00

copyright (c) 2024 by EFD Software

Table of Contents

1. Introduction.....	3
2. Before you get started.....	4
3. System requirements.....	5
4. Usage.....	6
5. Temperature statistics.....	9
6. Benchmark.....	11
6.1. Transfer rate.....	11
6.2. Access time.....	13
6.3. Burst rate.....	13
6.4. CPU usage.....	13
7. File benchmark.....	14
7.1. Transfer test.....	14
7.2. Block size test.....	15
8. Random access.....	16
9. Extra tests.....	18
10. Info.....	20
11. Health.....	22
12. Error scan.....	25
13. Folder usage.....	28
14. Erase.....	29
15. Disk Monitor.....	31
16. Save options.....	36
17. Command line parameters.....	39
18. Contact information.....	41

1. Introduction

HD Tune Pro is a hard disk / SSD utility which has the following functions:

- Benchmark: measures the low-level performance (read/write)
- File Benchmark: measures the file performance (read/write)
- Random Access: measures the random access performance (read/write)
- Extra Tests: includes several quick tests to show the most important performance parameters (read/write)
- Cache Test
- Info: shows detailed information
- Health: checks the health status by using SMART, data can be logged
- Error Scan: scans the surface for errors
- Erase: securely erases all data from the disk
- Disk Monitor: monitors disk access
- Folder View: shows disk space usage for each folder
- Temperature display
- S.M.A.R.T. Self-test
- check status of all connected drives in a simple overview

HD Tune Pro may also work with other storage devices such as memory cards, USB sticks, iPods, etc.

There are two modules. The first one is the main program **HD Tune Pro**.

The second is **HD Tune Pro Drive Status**. This module can be run separately from the main program.

The main function of HD Tune Pro Drive Status is to quickly check and monitor the status of all connected drives and to perform a quick S.M.A.R.T. Self-test.

To learn more about HD Tune Pro Drive Status please read the HD Tune Pro Drive Status manual.

2. Before you get started

WARNING!

Hard disks and other storage media can fail at any time without any prior warning. Always make sure you have a backup of your important files especially if your hard disk is acting strangely.

Unit of measure

By default HD Tune Pro uses the decimal units to show the speed or capacity where 1 KB equals 1000 bytes.

However in some cases the binary units are used to show file sizes where 1 KiB equals 1024 bytes.

Comparison tables

1 KB	1 000 bytes	0.98 KiB
1 MB	1 000 000 bytes	0.95 MiB
1 GB	1 000 000 000 bytes	0.93 GiB
1 TB	1 000 000 000 000 bytes	0.91 TiB

1 KiB	1 024 bytes	1.02 KB
1 MiB	1 048 576 bytes	1.05 MB
1 GiB	1 073 741 824 bytes	1.07 GB
1 TiB	1 099 511 627 776 bytes	1.10 TB

4 KB Alignment

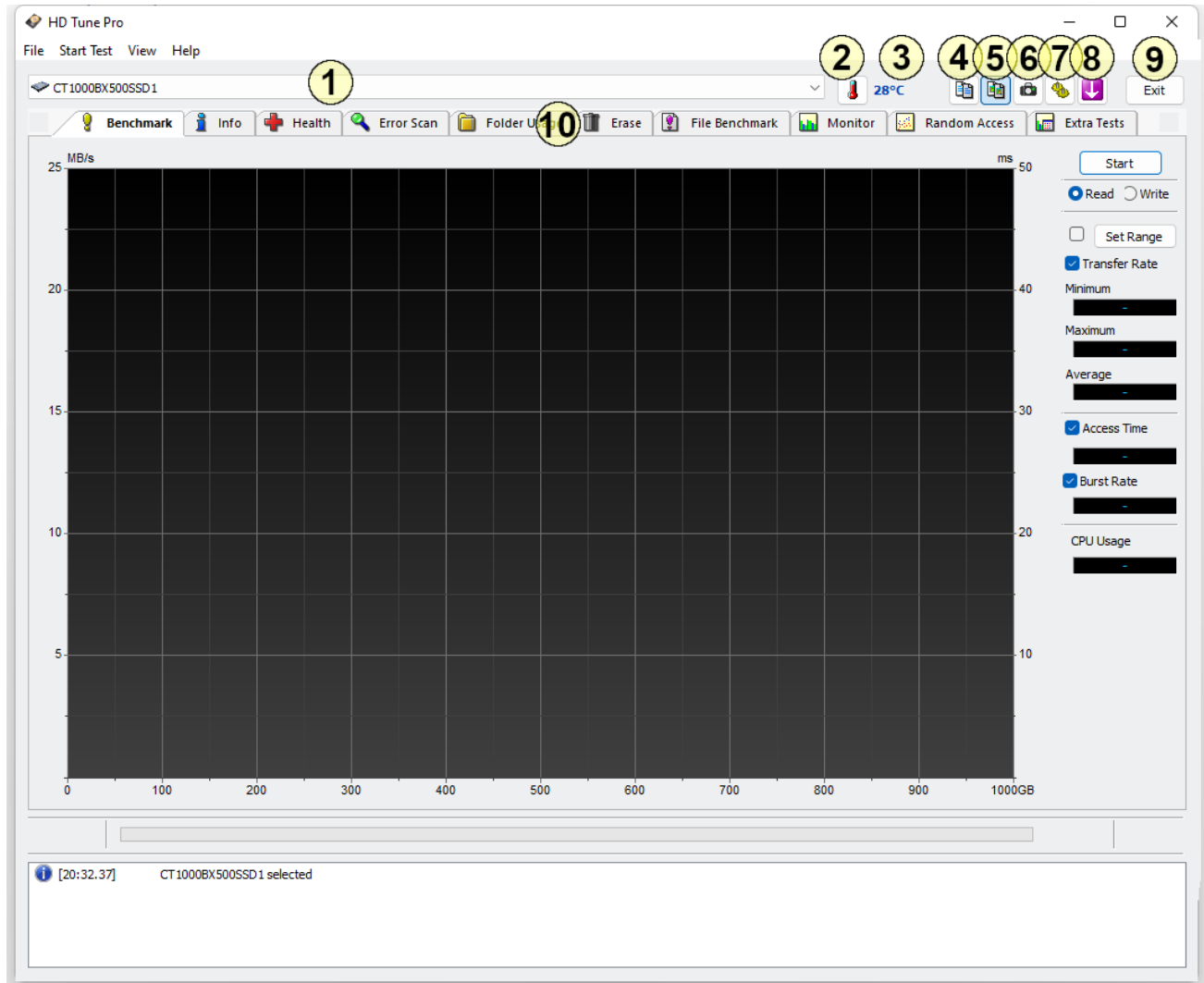
For optimum performance write operations on SSD drives should be done on a 4 KB alignment which is the size of a memory page.

The Random Access and Extra Tests have an option to perform all read and write operations with a 4 KB alignment. Enabling this option will simulate the behaviour on Windows 7 and later systems. Older Windows typically use unaligned partitions which could result in poor performance with certain SSDs. The Info tab shows the alignment for each partition on the disk.

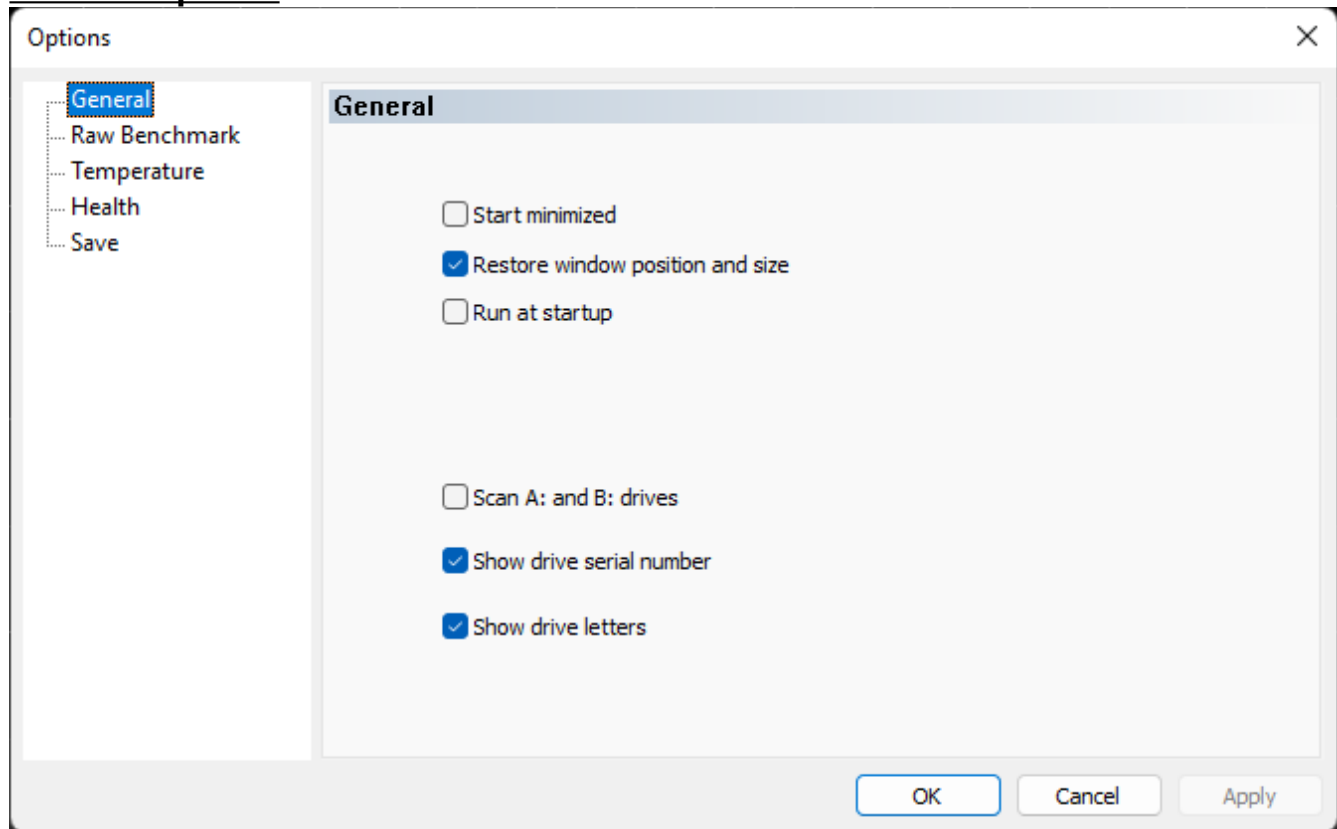
3. System requirements

- Windows 7, Windows 8, Windows 10, Windows 11 (64-bit versions)
- 10 MB of free hard disk space

4. Usage



1. Select hard drive
2. Show temperature statistics
3. Current temperature display
4. Copy results or info to clipboard
5. Copy screenshot to clipboard
6. Save screenshot as png file
7. Options
8. Minimize to tray
9. Exit program
10. Select function

Available options:

Start minimized: minimizes the program to the taskbar.

note: this function only works if the 'Show temperature in taskbar' option is enabled (available in temperature options).

Restore window position and size: uses the same position and size after restarting the program

Run at startup: automatically executes the program each times Windows starts.

Scan A: and B: drives: historically these drive letters were used for floppy drives. It is possible to assign these drive letters to hard drives. Enabling this option allows the program to detect these drives.

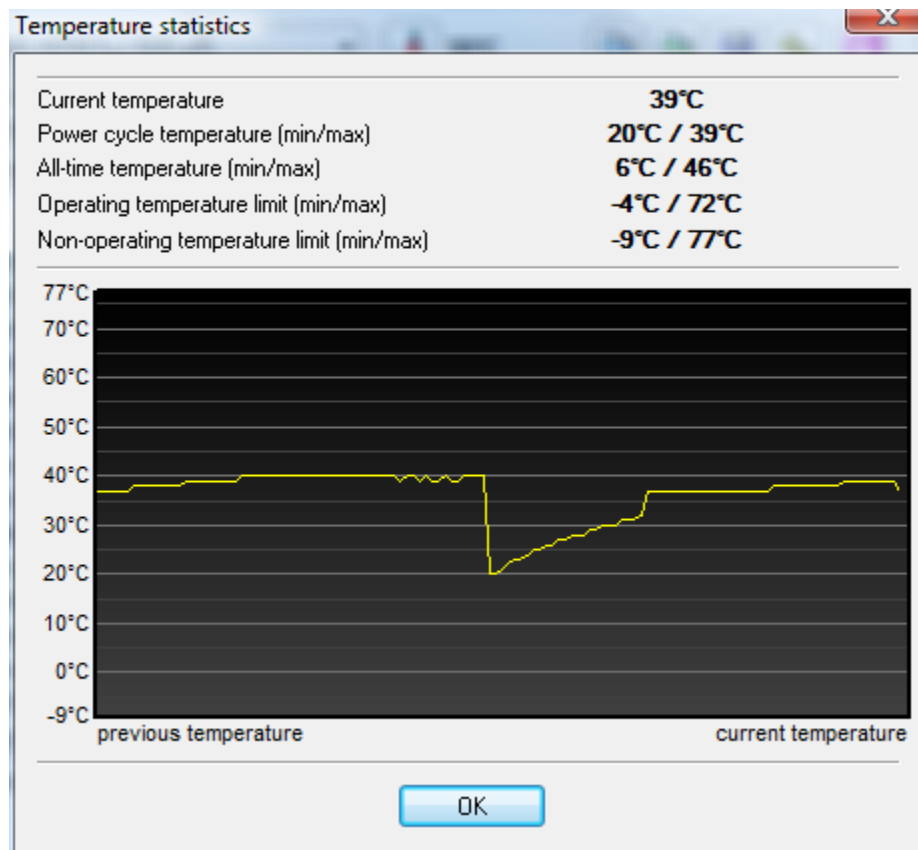
It's recommended to disable this option if these drive letters are not assigned because it will increase the time to start up the program.

Show drive serial number: by checking this option the serial number of the drive is shown next to the drive name. This may be convenient to differentiate identical drive models.

Show drive letters: by checking this option all drive letters which are assigned to the drive are shown on the drive selector.

5. Temperature statistics

The current temperature can be shown on the main screen next to the drive selector, in the task bar and on the health page. Detailed temperature statistics can be shown by pressing the temperature button next to the drive selector.



The graph shows the temperature progress per minute. The current temperature is shown at the right position.

Current temperature: current drive temperature

Power cycle temperature: lowest and highest temperatures measured since start up

All-time temperature: lowest and highest temperature ever measured with this drive

Operating temperature limit: minimum and maximum temperature allowed when the drive is active. Exceeding these limit may cause damage to the drive.

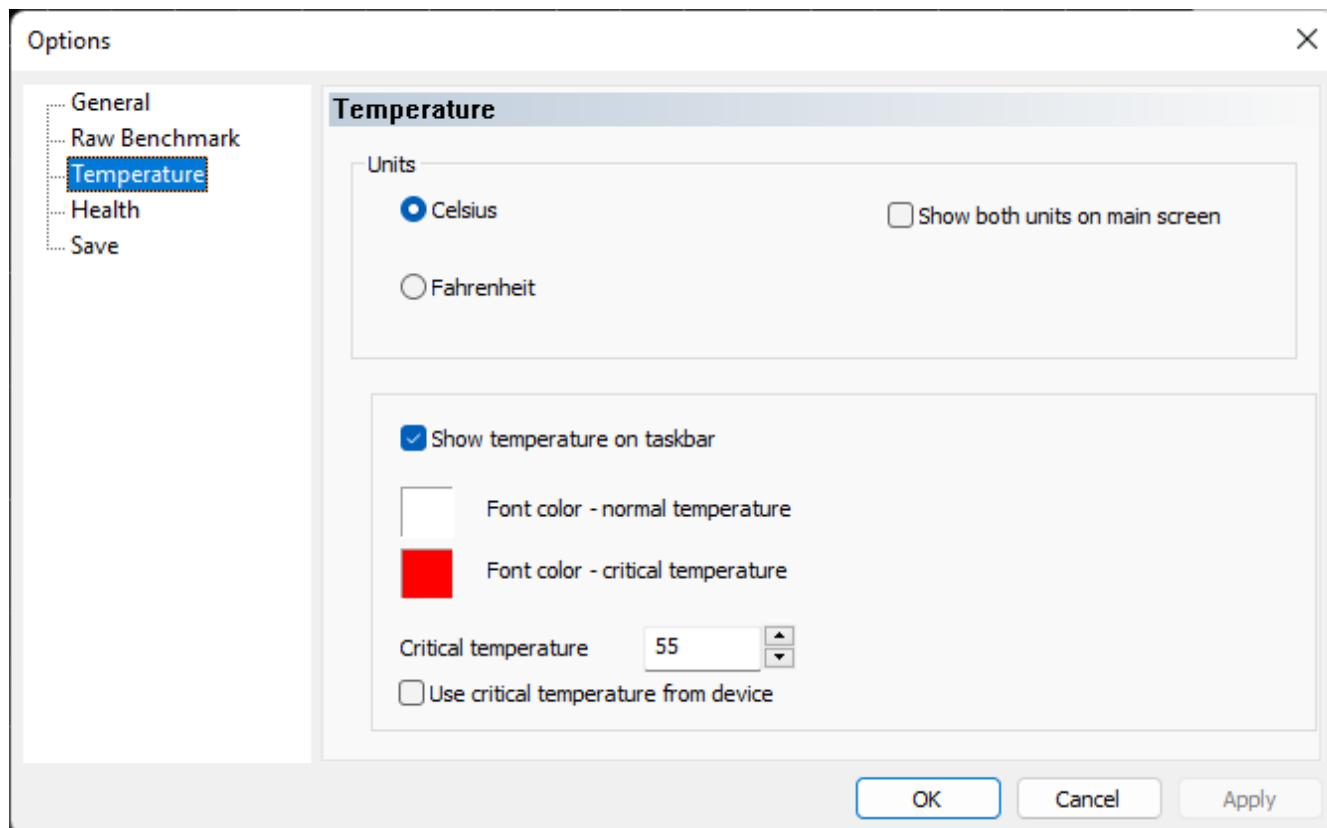
Non-operating temperature limit: absolute temperature limits. Exceeding these limit may cause damage to the drive.

Notes:

1. not all drives can report temperature statistics

2. some drives cannot report minimum temperatures

Available temperature options:



Units: select between Celsius and Fahrenheit.

Show both units on main screen: temperature will be shown in both Celsius and Fahrenheit on the main screen.

Show temperature in taskbar: temperature will be shown on the taskbar. If the temperature exceeds the specified limit a warning message will show up here.

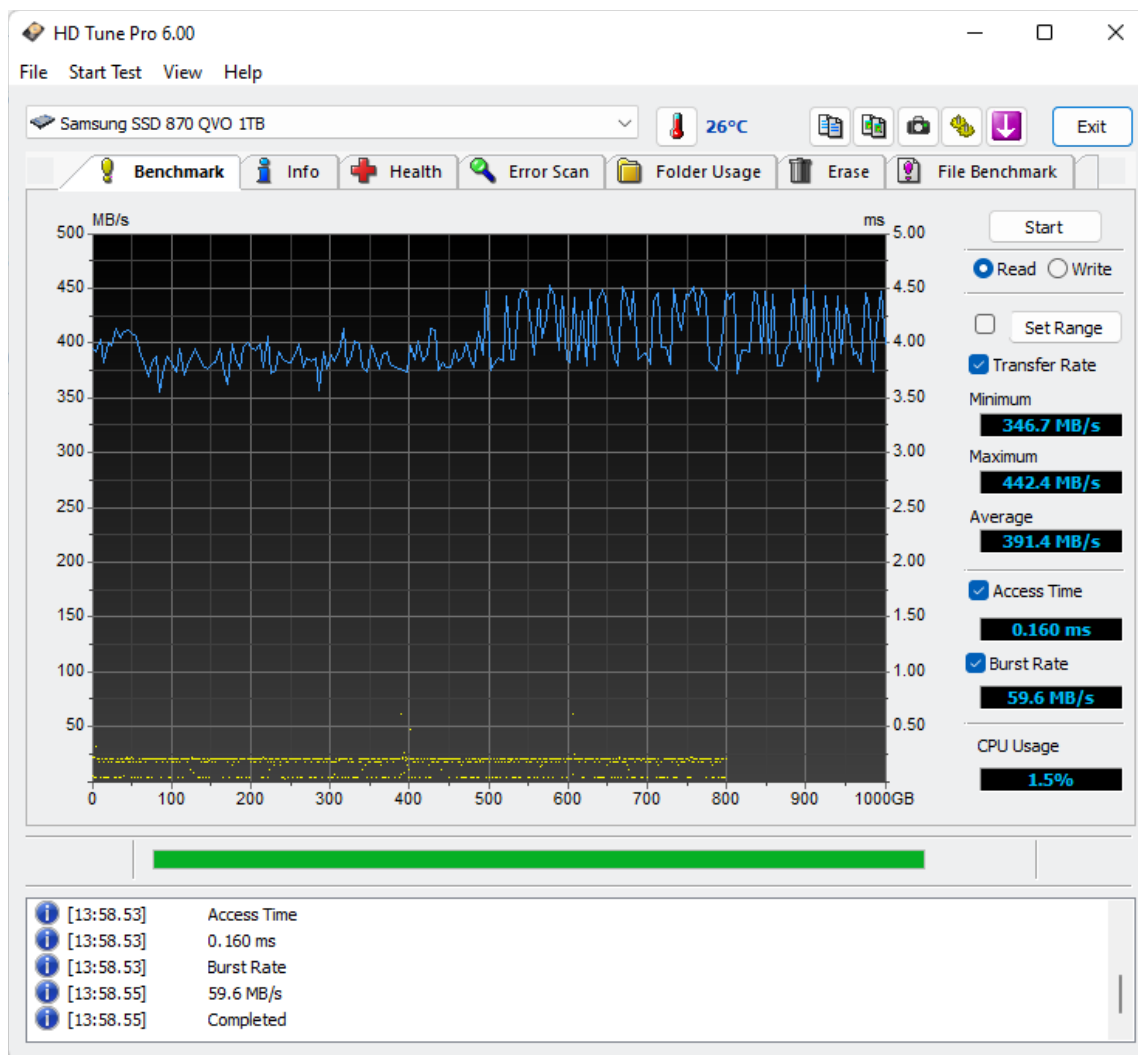
Font color - normal temperature: color of the temperature display when the temperature is below the critical value.

Font color - critical temperature: color of the temperature display when the temperature is equal to or higher than the critical value.

Critical temperature: a warning will show up if the temperature equals or exceeds this value.

Use critical temperature from device: some drives can report the maximum allowed temperature. When checked this value will be used. You can check if your drive supports this by clicking on the temperature icon on the main screen.

6. Benchmark



The benchmark function offers four different tests:

6.1. Transfer rate

The data transfer rate is measured across the entire disk surface (default) or across the selected capacity.

The test range can be set by clicking the Set Range button and checking the checkbox next to it.

The X-axis shows the position in gigabytes (GB). The Y-axis shows the transfer speed in megabytes per second (MB/s).

Both read and write transfer rate can be measured. To prevent accidental data loss, the write test can only be performed on a disk with no partitions.

To remove all partitions go to **Control Panel -> Administrative Tools -> Computer Management -> Disk Management**, right-click on the partitions on the hard disk you want to test and select delete partition.

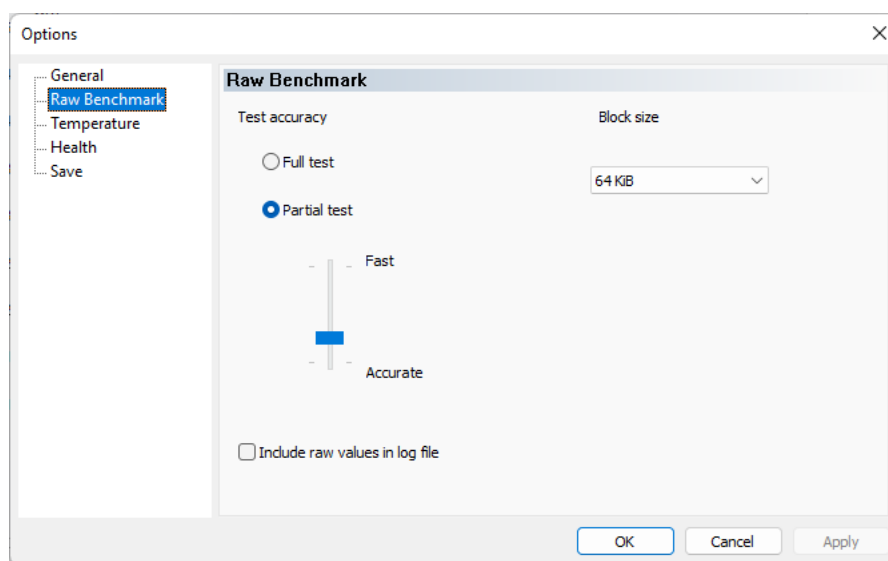
A newly bought hard disk usually doesn't have any partitions yet so this step is not necessary to run the write test.

Note: the data density at the outer tracks of a hard drive is higher than at the inner tracks.

Reading or writing at the outer tracks will be done at a higher speed because the rotation speed is constant.

A hard drive starts reading and writing at the outer tracks and moves to the inner tracks. This can be seen in the transfer rate graph where the speed is the highest at the start of the test and decreases towards the end of the test. This does not apply to SSDs and other storage media

Available options:



Test accuracy: the full test will read or write every sector on the disk. This will give the most accurate results but the test time will be very long. By choosing the partial test the transfer speed is sampled across the disk surface. The test time and accuracy can be chosen by moving the slider.

Block size: block size which is used during the transfer rate test.

Lower values may give lower test results. The default value is 64 KiB.

Note: RAID configurations and SSDs may require a higher block size to achieve their maximum

performance.

Include raw graph values in log file: by enabling this option the graph values will be saved in the log file which can be imported in a spreadsheet.

6.2. Access time

The average access time is measured and displayed in milliseconds (ms). The measured access times are shown on the graph as the yellow dots.

6.3. Burst rate

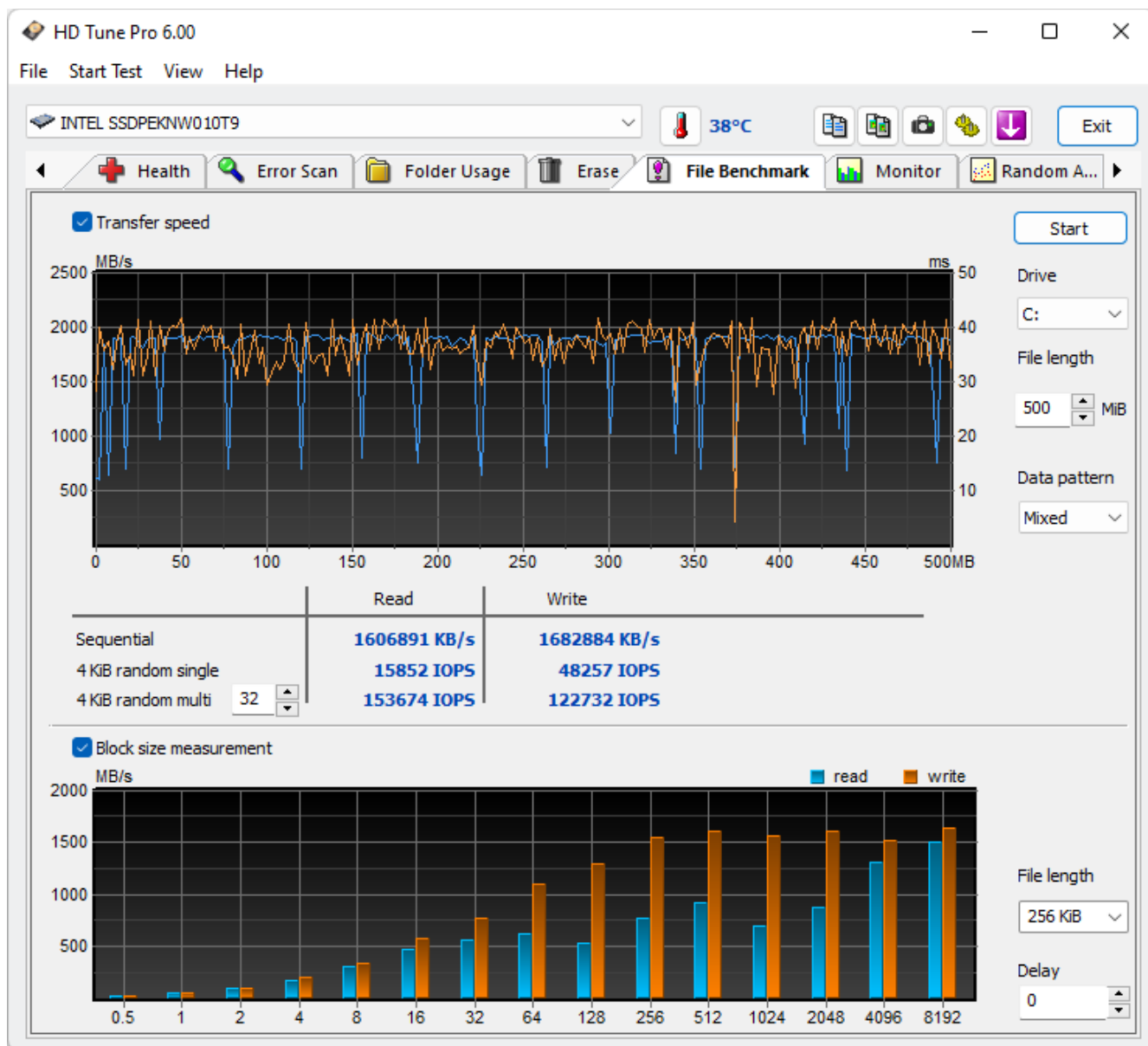
The burst rate is the highest speed (in megabytes per second) at which data can be transferred from the drive interface (IDE, SATA, SCSI, USB,...) to the operating system.

6.4. CPU usage

The CPU usage shows how much CPU time (in %) the system needs to transfer data from the hard disk.

Warning! When performing write tests with SSDs it should be noted that the number of write cycles on these devices is limited therefore it's not recommended to run lengthy write tests on these devices.

7. File benchmark



The file benchmark consists of two parts: the transfer speed test and block size test.

7.1. Transfer test

The transfer rate test measures three different parameters for both reading and writing:
Sequential: the sequential speed is measured and shown on the graph. Ideally the transfer

speed line should be straight and smooth. When the test is completed the average transfer speed is shown.

4 KB random single: this test measures the performance of I/O operations of 4096 byte blocks. This is the most common I/O operation on a typical system. Especially the 4 KB write speed is an important indication of general system performance.

4 KB random multi: this test is similar to the 4 KB random single test except that multiple requests are sent simultaneously to the device. The number of operations can be specified and can be a value between 2 and 64.

The transfer rate test is performed on a file which is created on the selected partition.

A larger test file size will give more accurate results.

Warning! When performing write tests with SSDs it should be noted that the number of write cycles on these devices is limited therefore it's not recommended to run lengthy write tests on these devices.

The data pattern which will be used during the write process can be specified.

The choices are: zero, random and mixed which is a combination of zeroes and random data. For most devices this option does not have any effect on the test results. However, certain SSDs use a compression technique which improves performance when compressible data is used.

For these devices the results will be highest when writing zeroes and lowest when writing random data.

7.2. Block size test

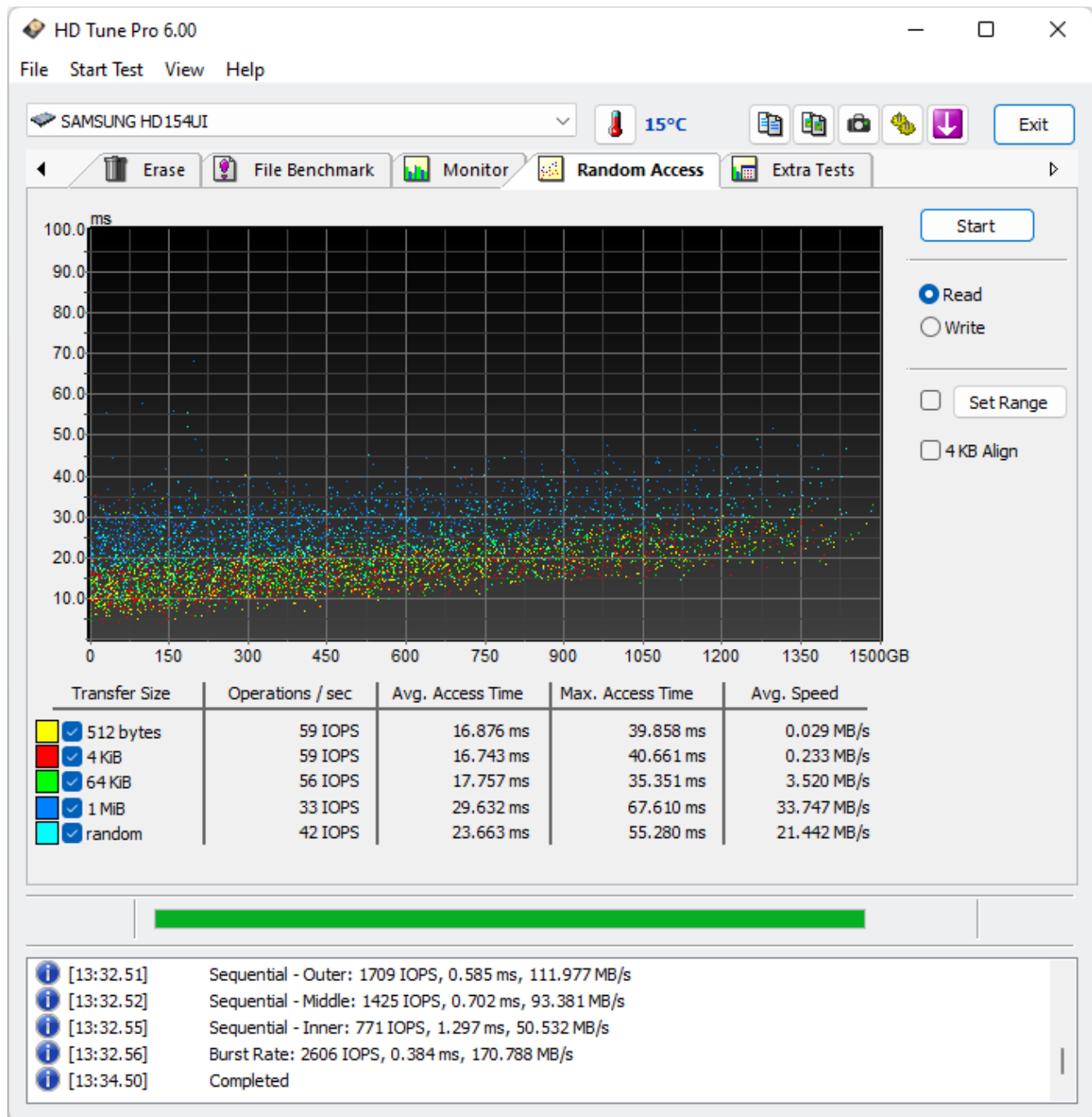
The file benchmark measures the performance for reading and writing files to the selected drive partition with different block sizes ranging from 0.5 KiB to 8192 KiB (x-axis).

The length of the test files can be set. For accurate results a large size is recommended. If the file length is too small the drive may be able to cache the entire file. In that case the cache speed will be measured instead of the drive's throughput.

On some configurations it may be necessary to add a delay between the write and read test to make sure all data is written to the drive before the read test is executed.

This test is non-destructive but requires a partition with a drive letter associated.

8. Random access



The Random Access test measures the performance of random read or write operations. The amount of data which will be transferred varies from 512 bytes to 1 MB.

The random test uses transfer size between 512 bytes and 1 MiB.

You can choose which tests will be performed by clicking on the check boxes next to the transfer size.

Results are shown in three different units:

Operations per seconds (IOPS): number of completed read or write requests per second. Higher is better.

Avg. access time (in milliseconds or ms): average amount of time it takes to perform a single read or write operation. Lower is better.

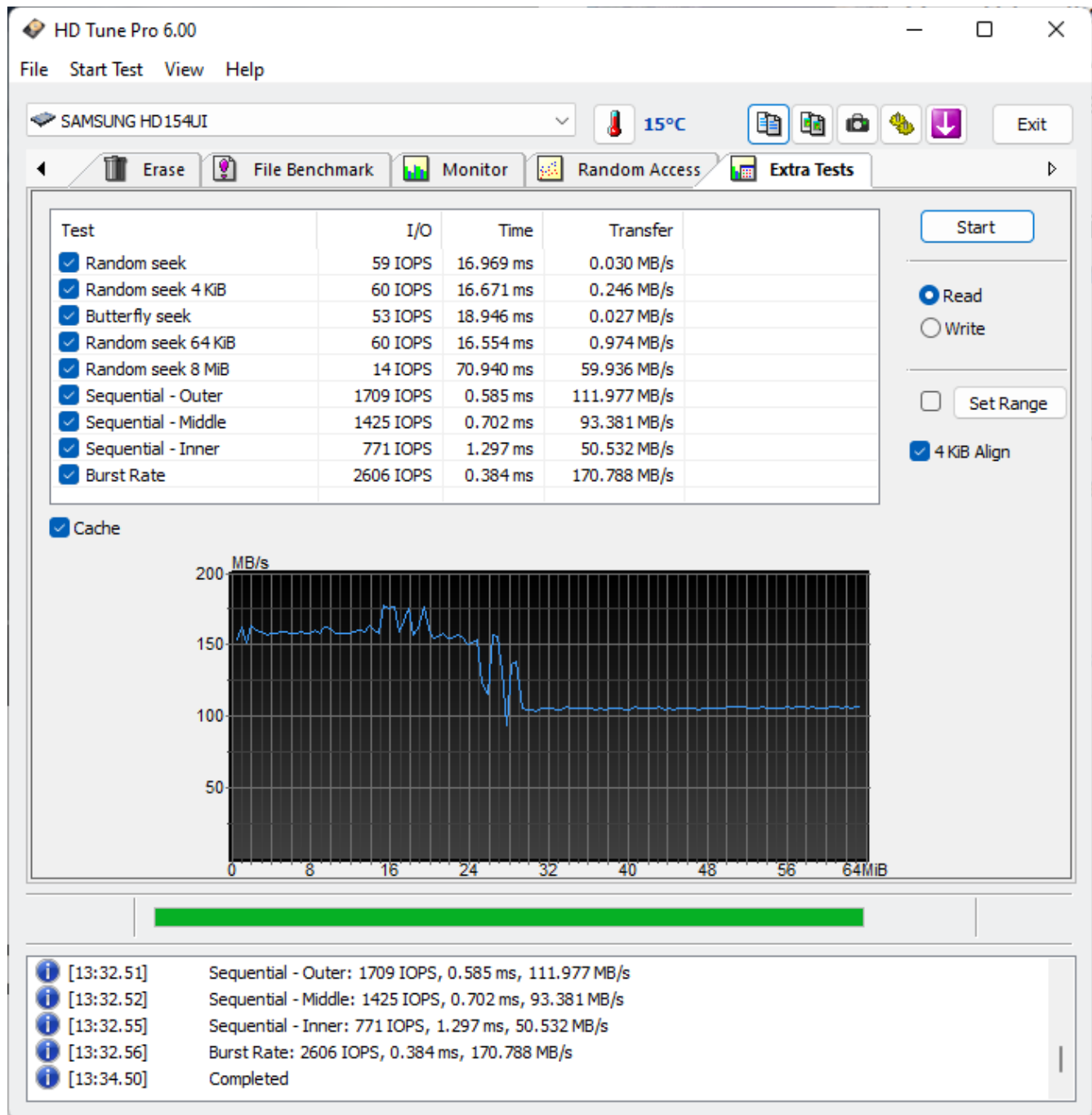
Max. access time (in milliseconds or ms): highest access time measured during the test. Lower is better.

Avg. speed (in megabytes per second or MB/s): average transfer speed for a completed read or write operation. Higher is better.

This test is a low level test and the write test can only be performed on a drive with no partitions (see the benchmark topic for more information).

The random access performance can be measured on a partial section of the drive by using the range setting options.

9. Extra tests



The extra test tab offers a variety of small tests which can be used to quickly determine the most important performance parameters of the drive.

Range options are available for a partial test.

Explanation of the extra tests:

Random seek: performs random seek operations across the disk surface

Random seek 4 KiB: performs random seek operations and reads 4 KiB across the disk surface

Butterfly seek: performs seek operations moving from the outer tracks to the inner tracks and back

Random seek / size 64 KiB: performs random read/write seek operations with a random block size (max. 64 KiB).

Random seek / size 8 MiB: performs random read/write seek operations with a random block size (max. 8 MiB)

Sequential outer: measures the transfer rate at the outer tracks

Sequential middle: measures the transfer rate at the center of the drive

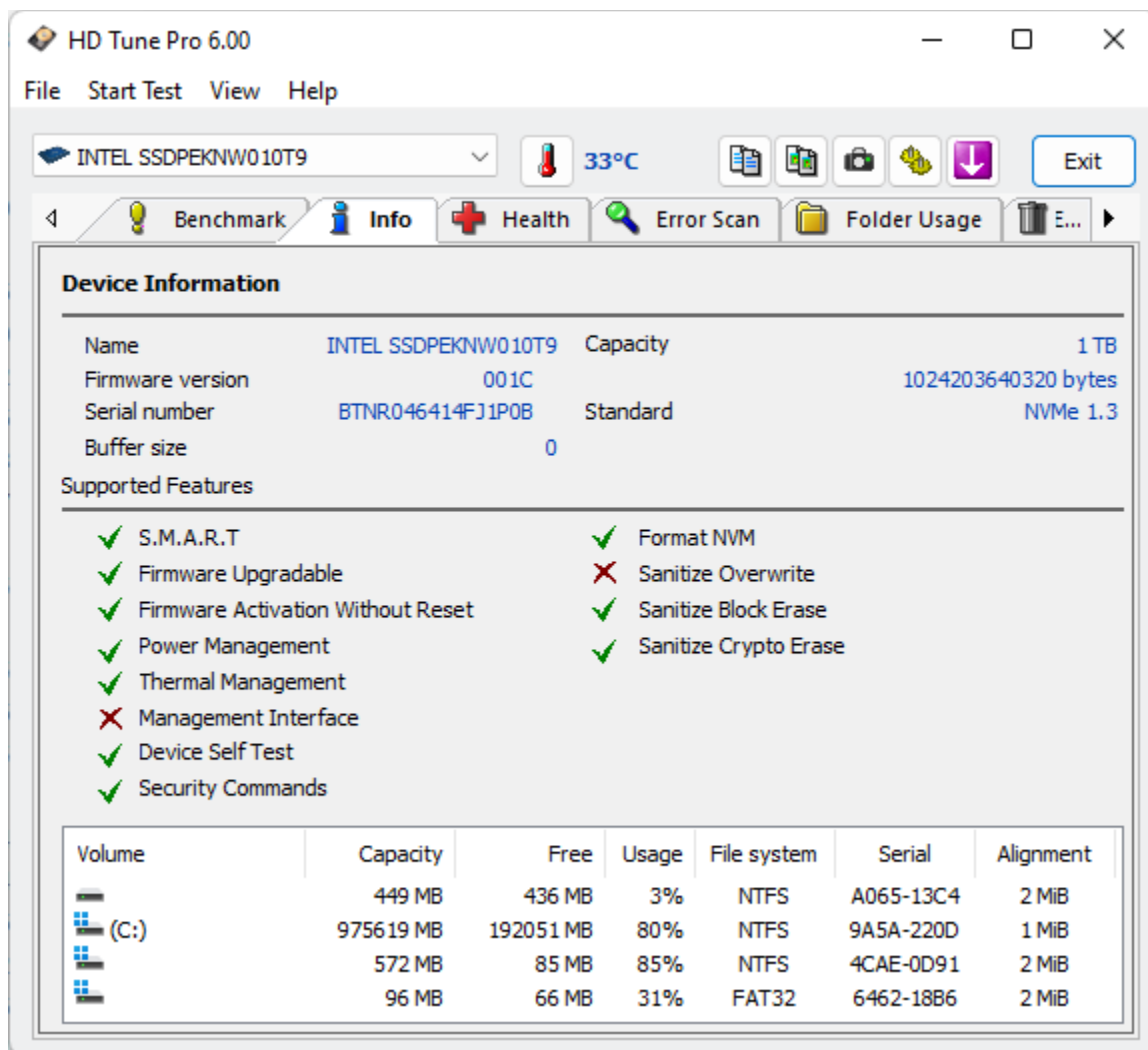
Sequential inner: measures the transfer rate at the inner tracks

Burst rate: measures the highest possible transfer speed between the drive and the interface

Cache test: measures the transfer speed from the buffer of the drive and shows it graphically.

Usually the buffer capacity of the drive can be determined by checking the position where the speed drops sharply. The screenshot shows a buffer capacity of 24 MiB.

10. Info



The upper part of the screen shows basic information:

Firmware version

Serial number

Capacity as it is marketed by the manufacturer; defining 1 KB as 1000 bytes. The capacity is also shown in bytes.

Buffer size: buffer capacity of the drive. Note: due to limitations of the (S)ATA specifications only buffer capacities below 32 MiB are reported. To determine the actual usable buffer capacity the cache test from the extra tests tab can be used.

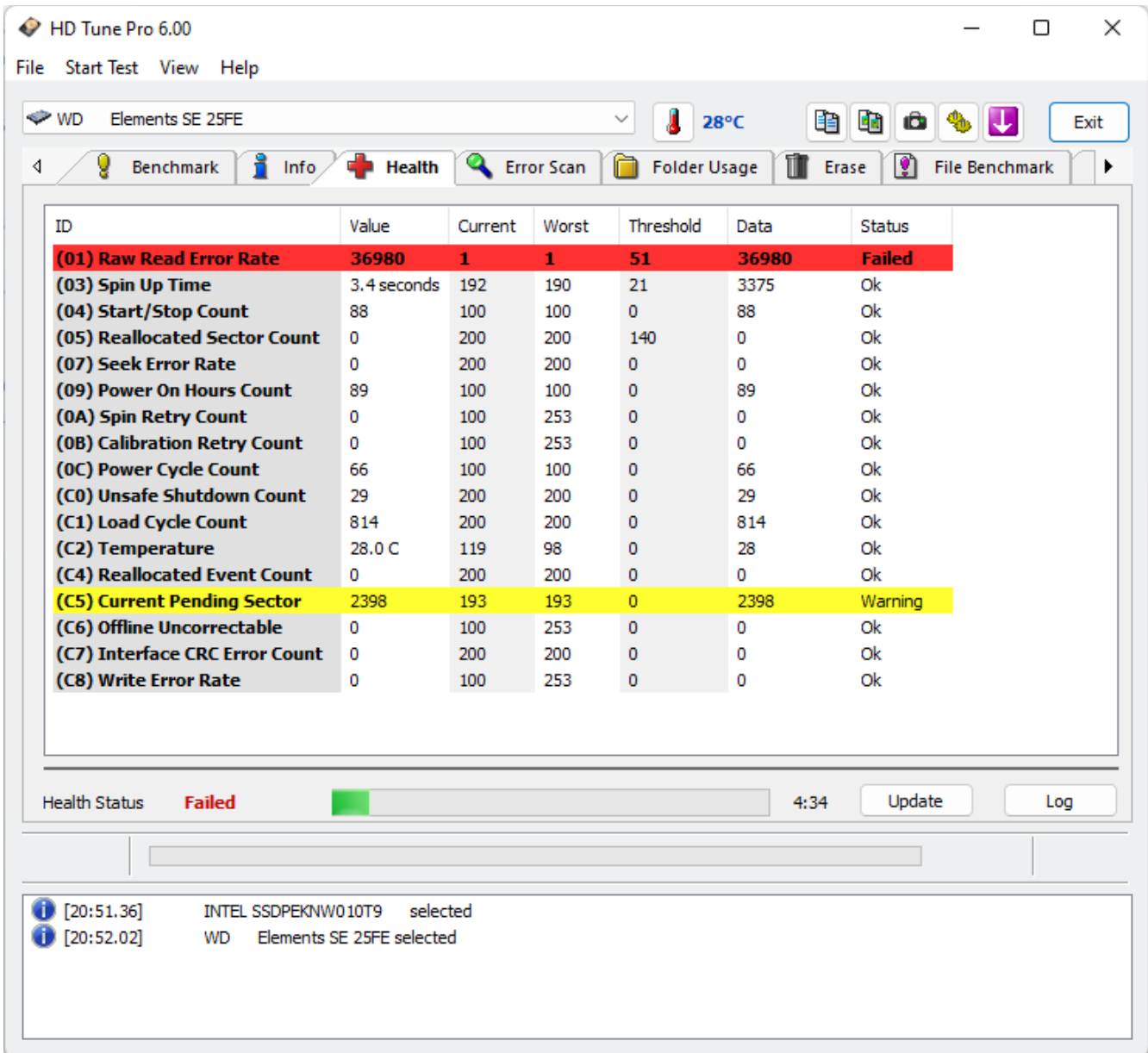
Interface standard

Maximum transfer mode and active transfer mode

The second part shows which features are supported.

The lower part of the screen shows detailed information about each partition on the hard disk.

11. Health



WD Elements SE 25FE 28°C

Benchmark Info **Health** Error Scan Folder Usage Erase File Benchmark

ID	Value	Current	Worst	Threshold	Data	Status
(01) Raw Read Error Rate	36980	1	1	51	36980	Failed
(03) Spin Up Time	3.4 seconds	192	190	21	3375	Ok
(04) Start/Stop Count	88	100	100	0	88	Ok
(05) Reallocated Sector Count	0	200	200	140	0	Ok
(07) Seek Error Rate	0	200	200	0	0	Ok
(09) Power On Hours Count	89	100	100	0	89	Ok
(0A) Spin Retry Count	0	100	253	0	0	Ok
(0B) Calibration Retry Count	0	100	253	0	0	Ok
(0C) Power Cycle Count	66	100	100	0	66	Ok
(C0) Unsafe Shutdown Count	29	200	200	0	29	Ok
(C1) Load Cycle Count	814	200	200	0	814	Ok
(C2) Temperature	28.0 C	119	98	0	28	Ok
(C4) Reallocated Event Count	0	200	200	0	0	Ok
(C5) Current Pending Sector	2398	193	193	0	2398	Warning
(C6) Offline Uncorrectable	0	100	253	0	0	Ok
(C7) Interface CRC Error Count	0	200	200	0	0	Ok
(C8) Write Error Rate	0	100	253	0	0	Ok

Health Status **Failed** 4:34 Update Log

[20:51.36] INTEL SSDPEKNW010T9 selected
[20:52.02] WD Elements SE 25FE selected

This function uses S.M.A.R.T. (Self-Monitoring Analysis and Reporting Technology) to get information about the health of the hard disk.

The table shows the following parameters:

ID: parameter which is being measured

Current: current value

Worst: the worst value which has been recorded since the hard disk was first used

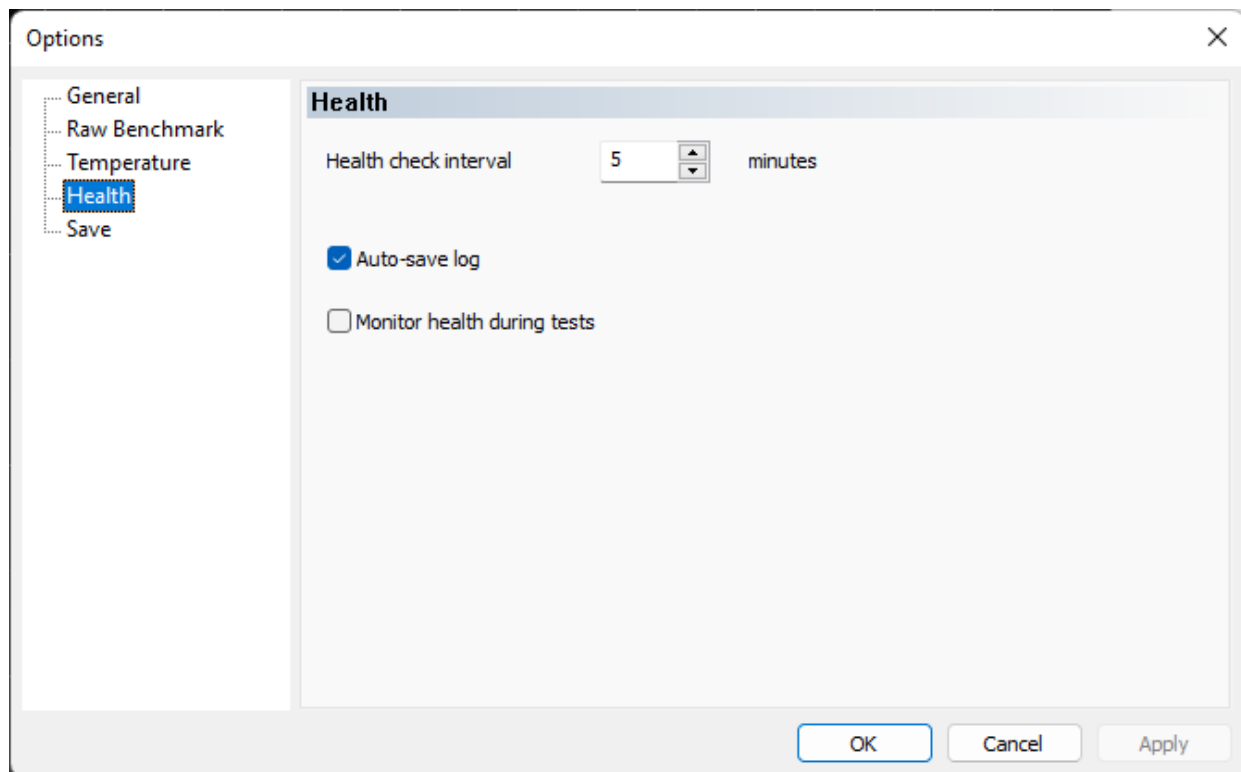
Threshold: the value of any of the parameters should never get below the threshold

Data: shows the usable data which belongs to the ID

Status: status of the parameter (OK, warning or failed)

The progress bar shows when the next update of the status will occur. The status can be manually updated by pressing the update button.

Available options:



Health check interval: time in minutes between status updates.

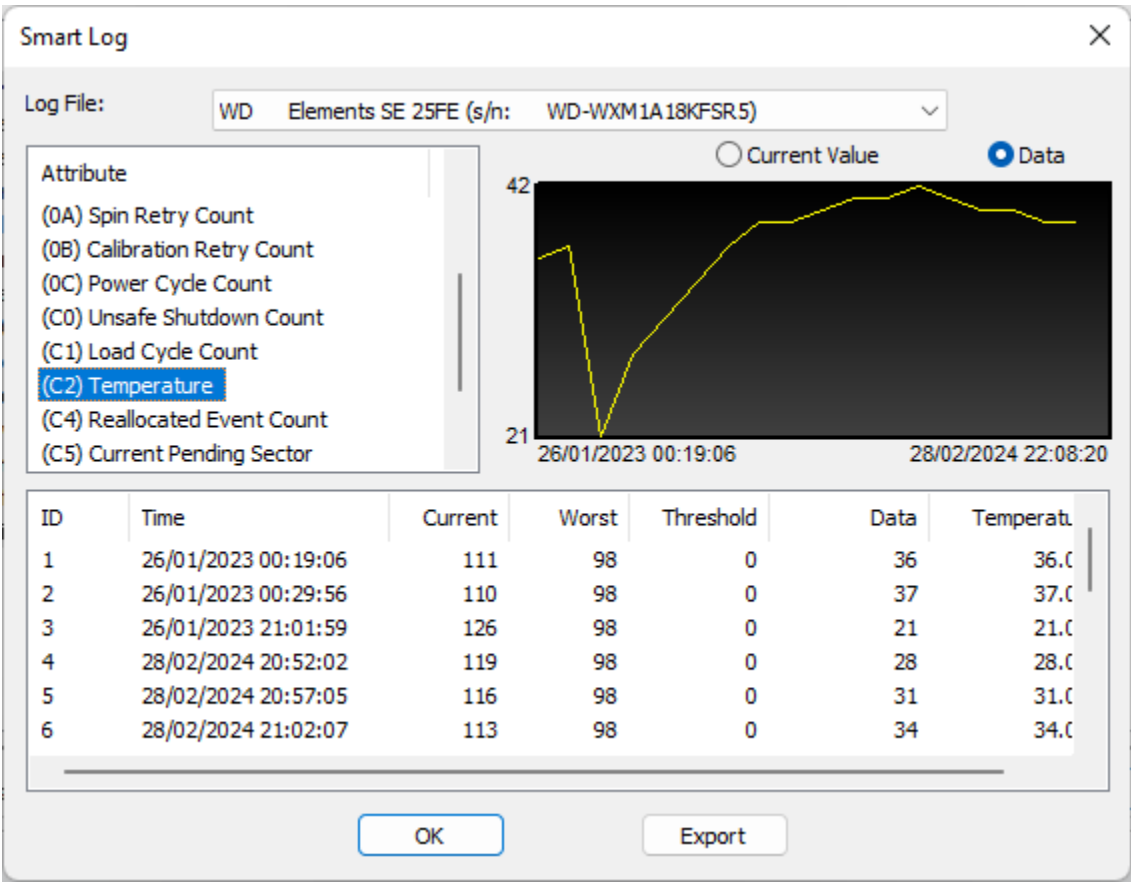
Auto save log: saves the health status to a log file

Monitor health during test: enabling this option will update the health status during performance tests. This may cause lower results.

Log

By pressing the log button a new screen will pop up which shows a history of the S.M.A.R.T. status.

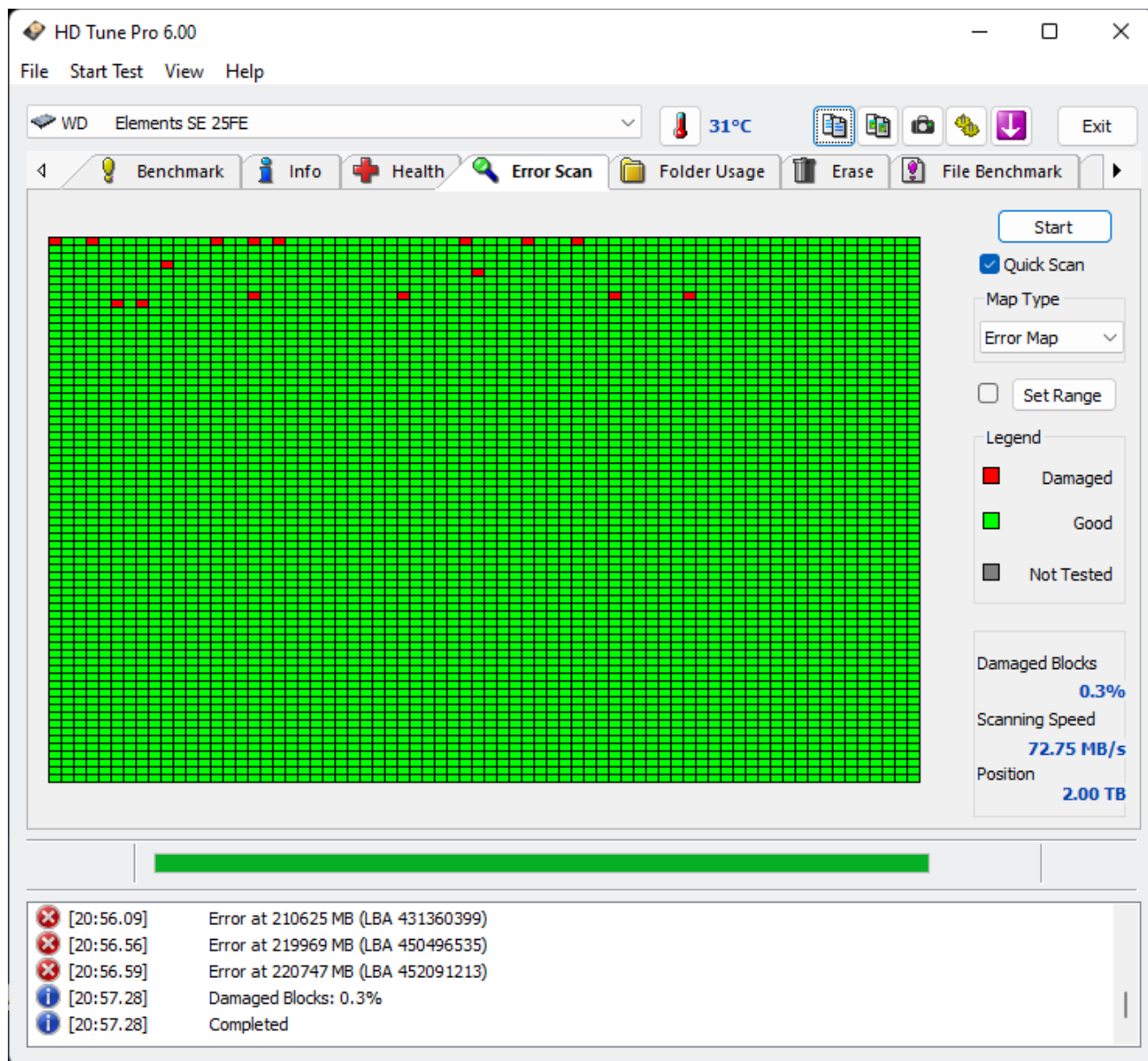
Note: the 'Auto save log' option must be enabled for this function!



If you have multiple hard drives you can select the log file you want to inspect. Select an attribute to view its history. This will be shown graphically and numerically. You can choose between the current value or the data field which may be more useful.

The log data can be exported to a text file which can be opened by a spreadsheet for further analysis.

12. Error scan



The Error Scan scans the entire drive's surface for errors. Defects will show up as red blocks. The exact location of these defects are shown in the list below the graph.

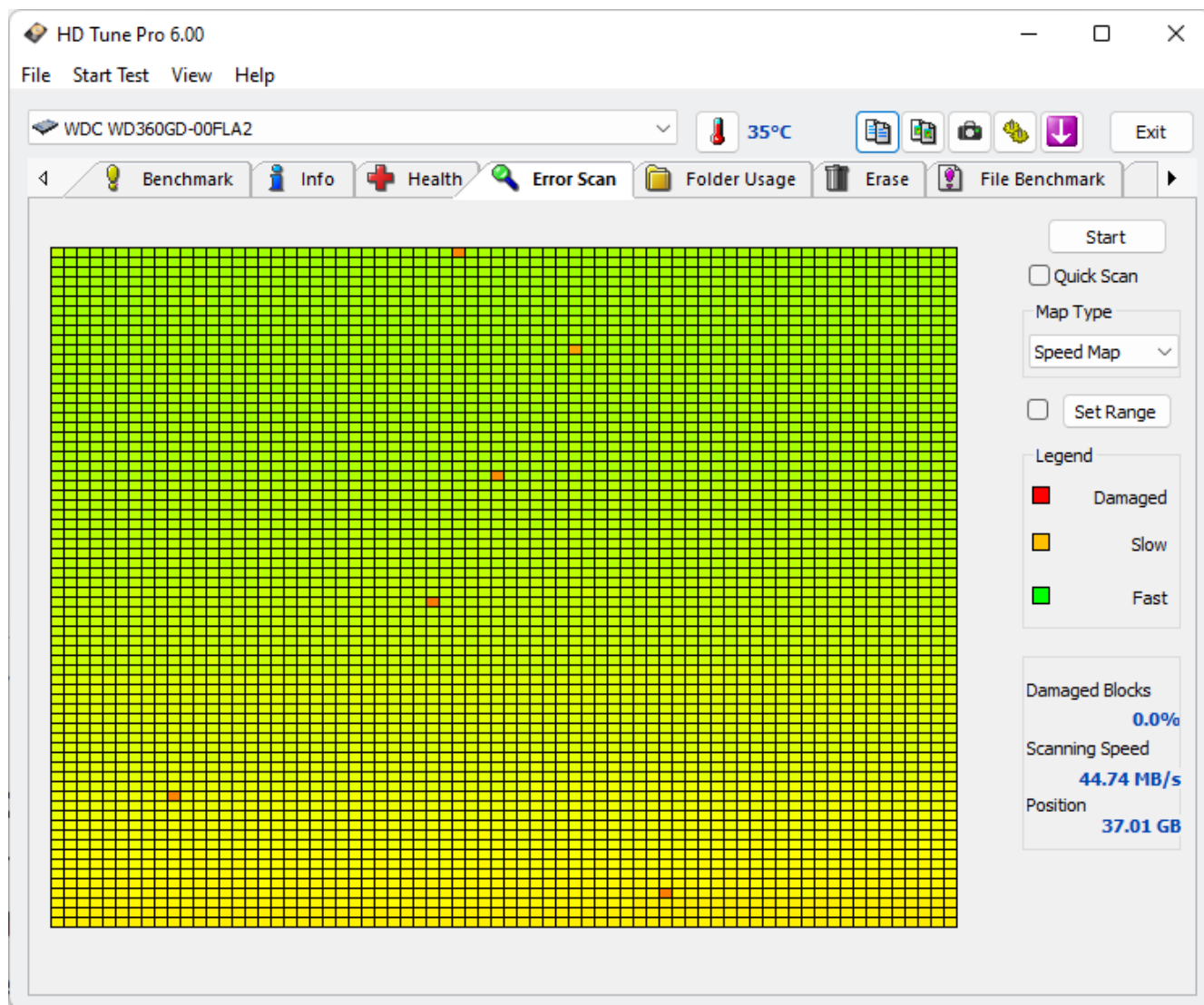
This test only performs read operations and is non-destructive.

For a short test the quick scan option can be set. With this option enabled only certain parts across the drive's surface will be tested.

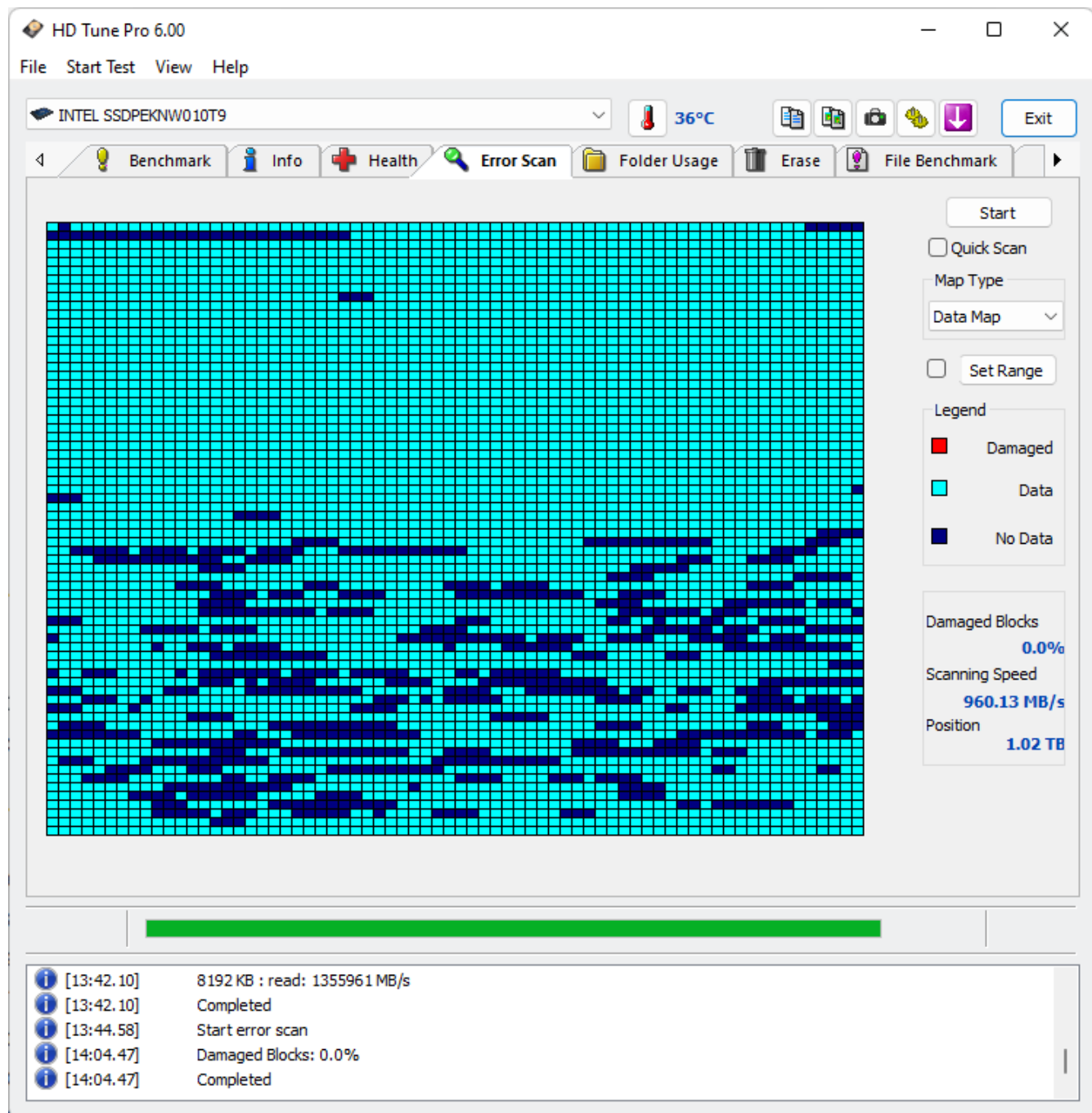
Map Type

Error Map: shows good blocks in green and bad blocks in red.

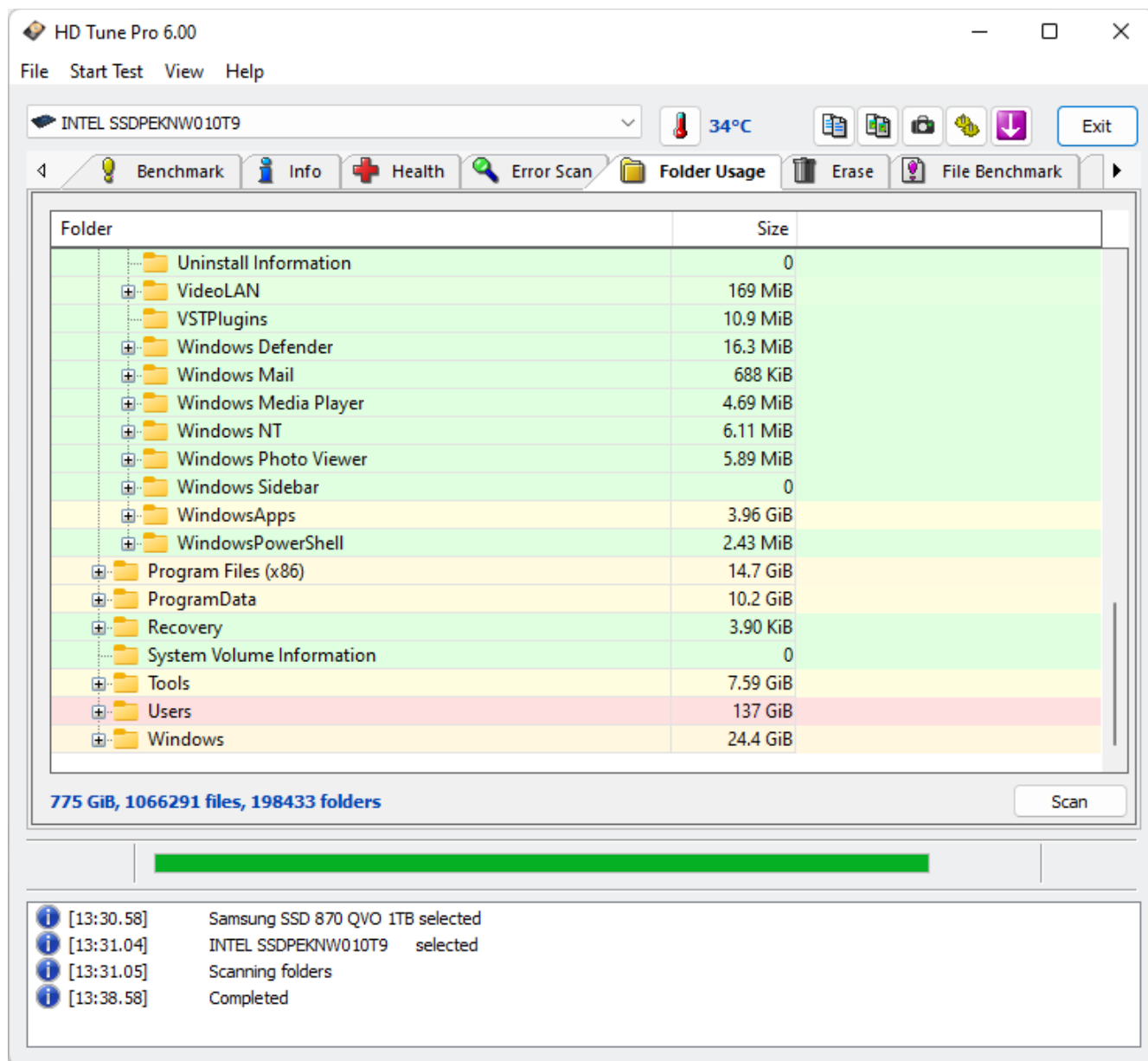
Speed Map: Shows the read performance of the scan. The highest performance will be shown as green blocks, slower performance is shown in a yellow and orange color. Unreadable blocks are shown in red.



Data Map: Shows a light blue color when data is found and dark blue when no data is found (all zeroes). Unreadable blocks are shown in red.



13. Folder usage



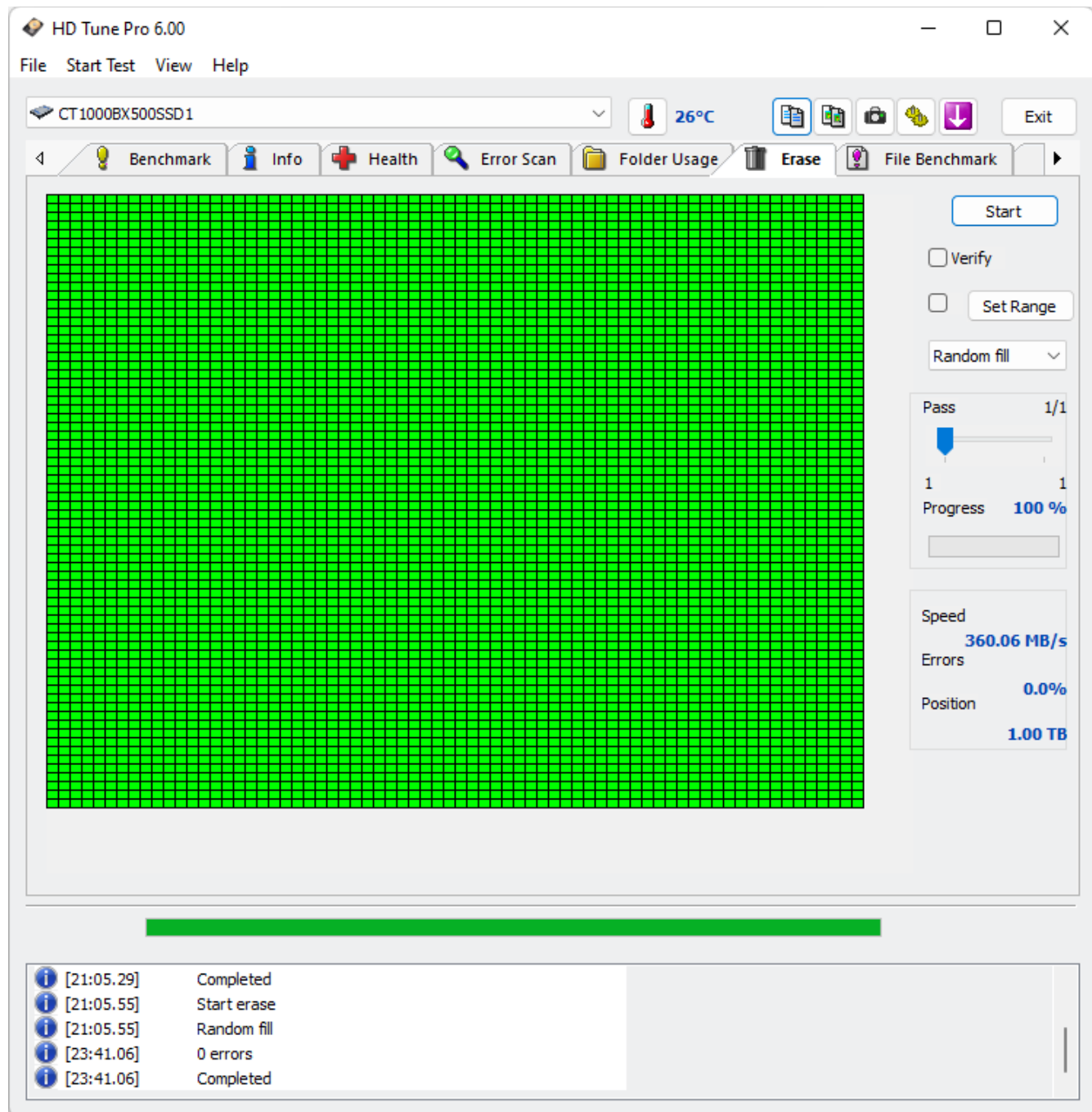
With this function you can easily see how much space each folder on the hard disk is using. Each line in the folder list is colored according to the disk space.

Green = low disk space usage

Yellow = average disk space usage

Red = high disk space usage

14. Erase



When files are deleted from a hard disk, the data is not actually erased. Only the references to those files are deleted.

By using recovery software it will be possible to recover many or all files after the files have

been deleted or even after a full format. So if you sell, return or give away your hard disk someone may be able to recover sensitive data from the disk.

The erase function securely erases the disc by overwriting the entire contents of the disk with a specified pattern.

There are four different delete methods:

Zero fill (1 pass), random fill (1 pass), DoD 5220.22M (7 passes), Guttman (35 passes).

The zero and random fill should be sufficient for most purposes. For more securely deleting data you can use the other two methods.

Completely erasing the hard disk may take several hours. If you're using one of the multi-pass delete methods you can select at which pass the erasing should begin.

During the erase process write errors will be reported in a similar way as in the Error Scan function.

To prevent accidental data loss, the write test can only be performed on a disk with no partitions (see the benchmark topic for more information).

By clicking the verify option the erased disk will be read and the contents will be verified.

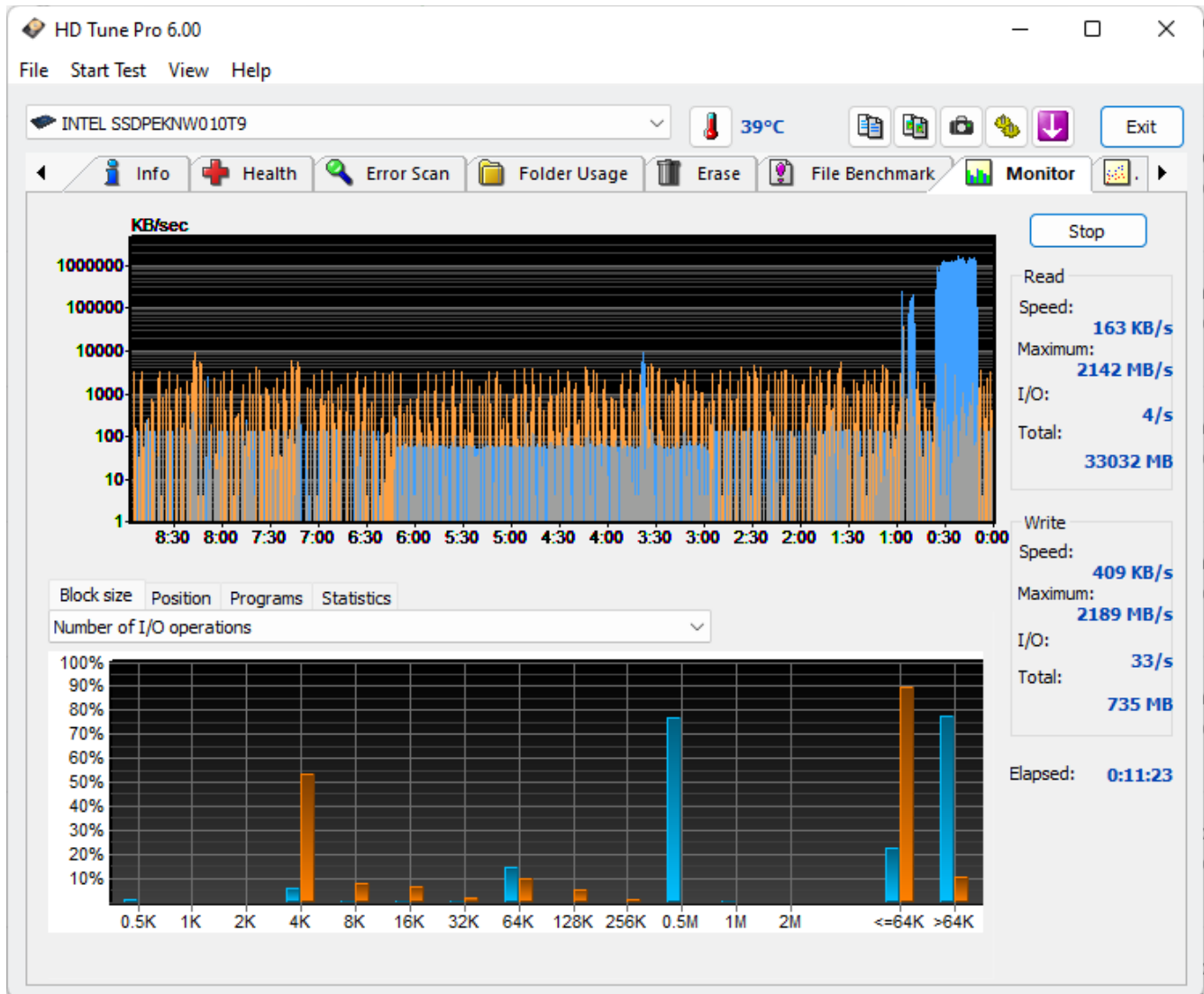
A green block shows the sector is readable and contains the expected data (ie. all 0's for the Zero Fill method).

A red block indicates the sector is either unreadable or the data does not match the expected data.

You can choose which area of the drive you want to test by using the set range functions. This is especially convenient if you want to erase large drives.

15. Monitor

The Monitor function monitors the drive activity from the selected drive.



The top graph shows the read and write transfer speed for each second.

On the bottom half of the screen, the disk activity can be analyzed in detail by selecting one of the four options:

Block size

Number of I/O operations: shows the occurrences in % for each block size (512 bytes to 64 KiB)

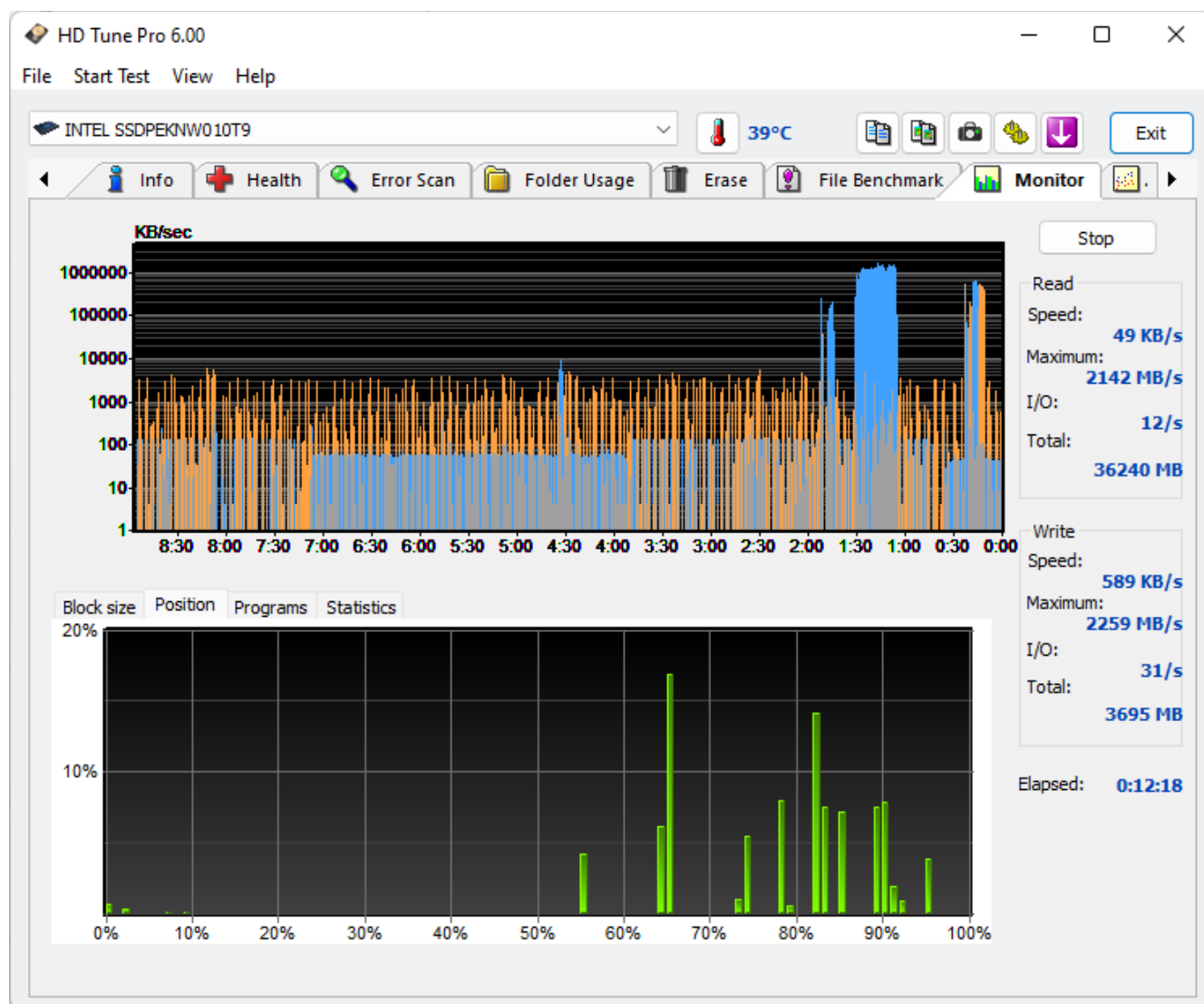
Maximum speed: shows the maximum speed in MB/s for each block size

Median speed: shows the most often occurred speed in MB/s for each block size

512 – 2MiB performance: shows the frequency distribution of the performance for the selected block size

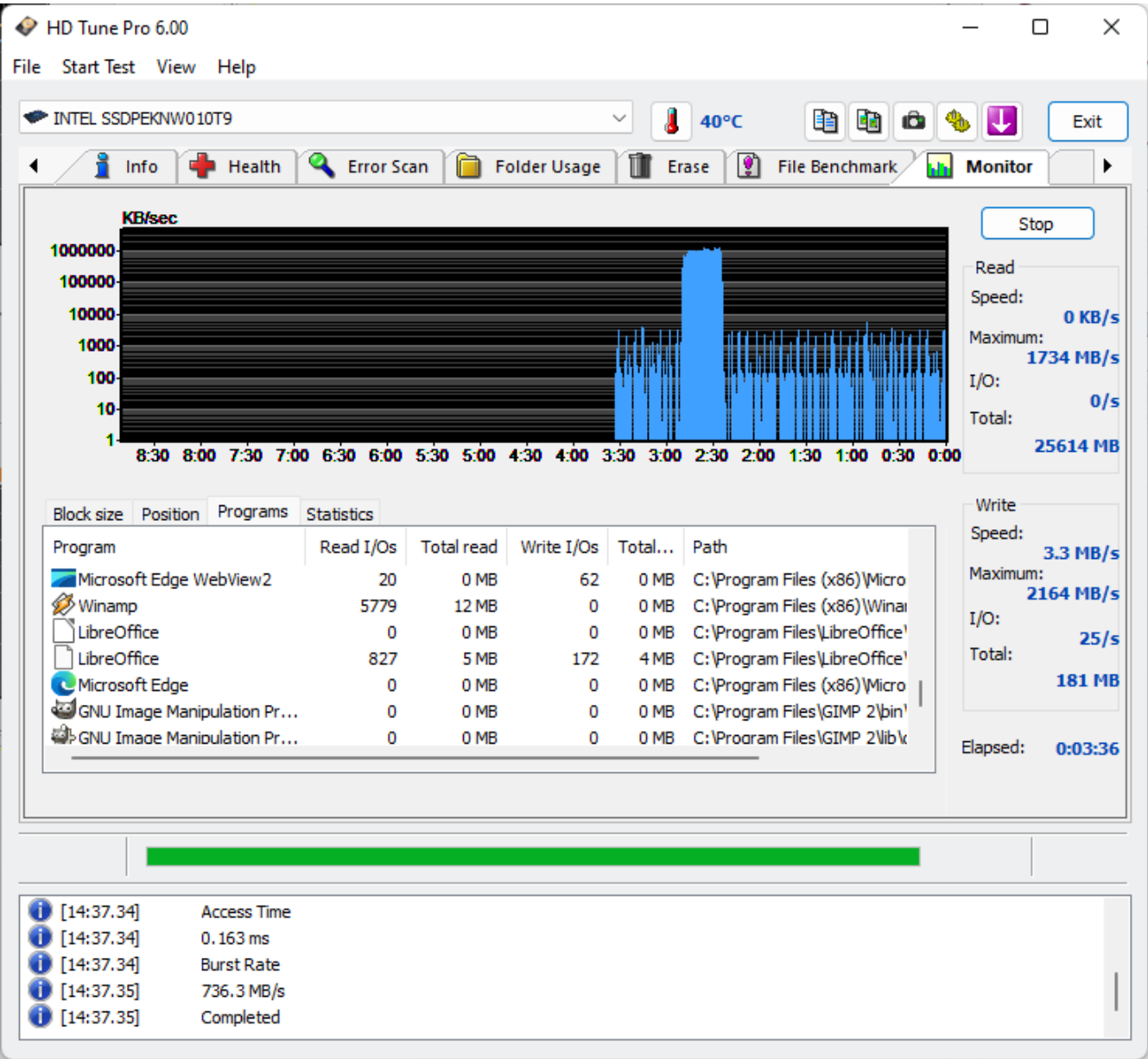
Position

This graph shows the frequency distribution of the positions (in %) on the drive where the I/O activity took place.



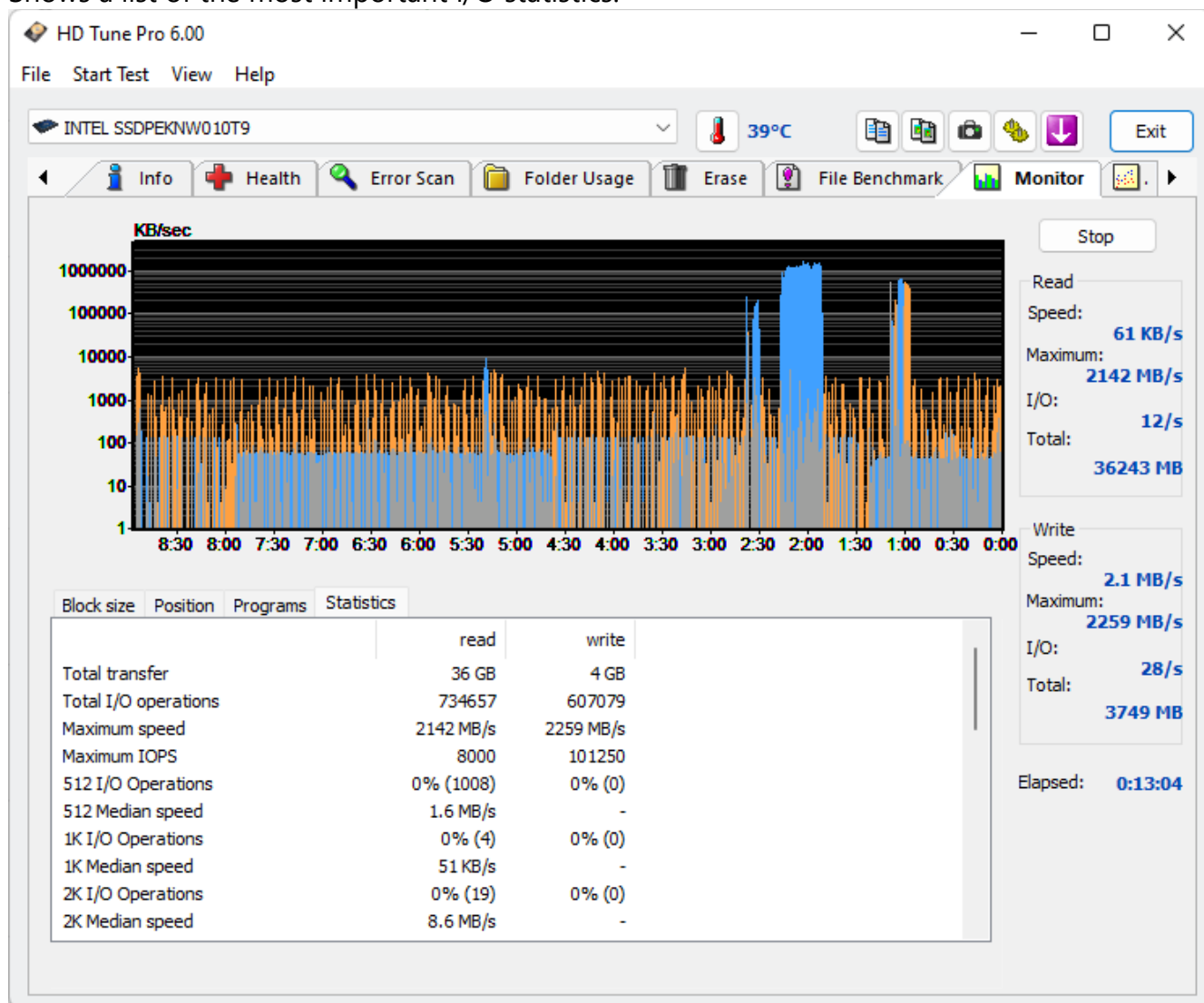
Programs

Shows a list of programs/processes which generate disk I/O activity. The number of read/write operations and total read/write size are shown for each process.



Statistics

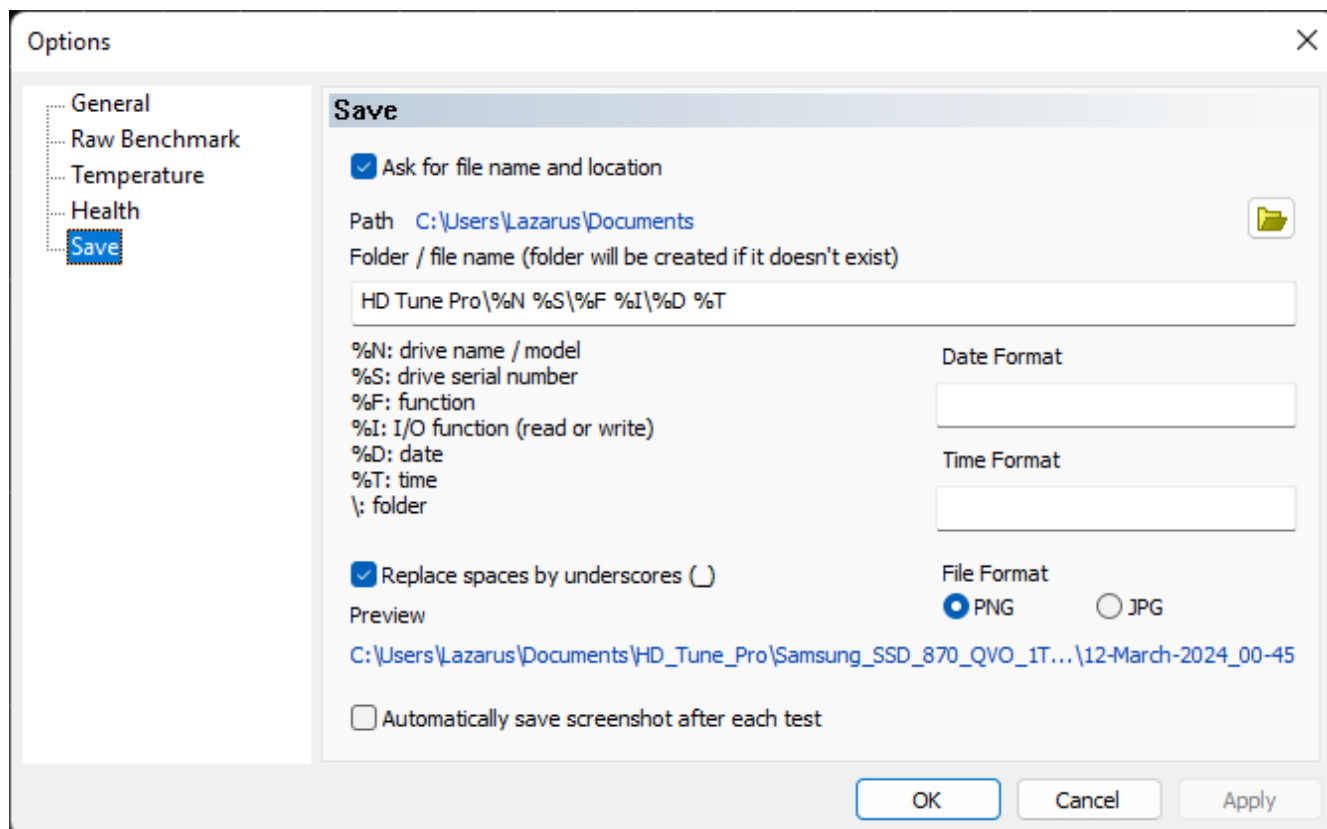
Shows a list of the most important I/O statistics.



Note: the I/O transfers include cached operations. These cached operations usually exceed the maximum performance of the device.

16. Save options

The save options apply to the screenshot save function. To change the save settings go to the Options menu and click on the Save entry.



Ask for file name and location:

When this option is checked you can manually specify the destination folder and file name. When this option is enabled the two options below are ignored.

Path: click on the folder button to select the destination folder.

Folder / file name:

Specify the filter to generate the folder and file name. If the folder does not exist it will be created.

%N: drive name / model
%S: drive serial number
%F: function
%I: I/O function (read or write)
%D: date
%T: time
\\: folder

Date format:

The date format can be specified by using these format types:

d: day of the month without leading zero (eg. 7)
dd: day of the month with leading zero (eg. 07)
ddd: abbreviated day of the week (eg. sat)
dddd: day of the week (eg. saturday)
m: month without leading zero (eg. 3)
mm: month with leading zero (eg. 03)
y: last digit of the year (eg. 5)
yy: two last digits of the year (eg. 15)
yyyy: year (eg. 2015)
g: era (eg. A.D.)

examples:

d-m-yy: 7-3-15

dddd-dd-mm-yyyy: saturday-7-03-2015

Time format:

The time format can be specified by using these format types:

h: hours without leading zero, 12-hour clock (eg. 2)
hh: hours with leading zero, 12 hour clock (eg. 02)
H: hours without leading zero, 24-hour clock (eg. 14)
HH: hours with leading zero, 24 hour clock (eg. 14)
m: minutes without leading zero (eg. 4)
mm: minutes with leading zero (eg. 04)
s: seconds without leading zero (eg. 7)
ss: seconds with leading zero (eg. 07)

t: time marker, one character (eg. A or P)

tt: time marker, multicharacter (eg. AM or PM)

examples:

h-m-s tt: 5-20-8 PM

HH-mm-ss: 17-20-08

File format:

Choose between the png and jpeg file format.

For HD Tune Pro screenshots png is preferred because it delivers higher quality with a smaller file size. The jpeg format may be convenient if your system doesn't support png files.

Replace spaces with underscores: check this option to replace all spaces with underscores (_)

Automatically save screenshot after each test: when this option is checked a screenshot with test results is saved automatically saved to the specified folder.

This option applies to the following functions: Benchmark, File benchmark, Random Access, Extra Tests, Error Scan and Erase.

17. Command line parameters

The following command line parameters can be used:

/DRIVE:x

Selects drive

x = drive number (0 = first drive)

/FUNCTION:x

Selects function

Possible values:

Benchmark, Info, Errorscan, Health, Folderusage, Erase, Filebenchmark, Diskmonitor, AAM, Accesstest, Extratests.

/QUICKSCAN

Quick scan will be performed with the Error Scan function.

Used in combination with /FUNCTION>ErrorScan.

/LOG:x

Saves information or test results to the specified file

x = full path to file.

/START

Starts selected function automatically

Can be used for Benchmark, Error Scan, Disk Monitor and File Benchmark

/WRITE

Selects the write test. If omitted the read test will be executed.

Can be used for Benchmark, Access Test and Extra Tests.

/MINIMIZE

Minimizes the program

/QUIT

Quits the program after the specified task has been executed

`/LIST`

Shows a list of all available devices

`/SAFE [+] [-]x`

Certain advanced detection functions will be disabled when specifying this option to troubleshoot incompatibility issues with certain drivers.

`/SAFE` without extra parameters will disable all of these functions and will restore the windows size to the default size.

For more information please contact support.

Parameters are not case sensitive.

Examples:

`/DISK:1 /FUNCTION:benchmark /START /LOG:c:\benchmark.txt`

This command line performs the benchmark functions on the second disk and saves the results to the file `c:\benchmark.txt`

`/FUNCTION:info /LOG:c:\info.txt /QUIT`

This command line saves the information from the Info tab to the file `c:\info.txt` and then exits the program.

No disk is specified so the information will be gathered from the first disk.

18. Contact information

Support and sales questions: support@hdtune.com

For the latest information and program updates please visit <https://www.hdtune.com>