

RAMDISK Benchmarks

Test system: Nehalem Core i7 950 and 4 GByte RAM

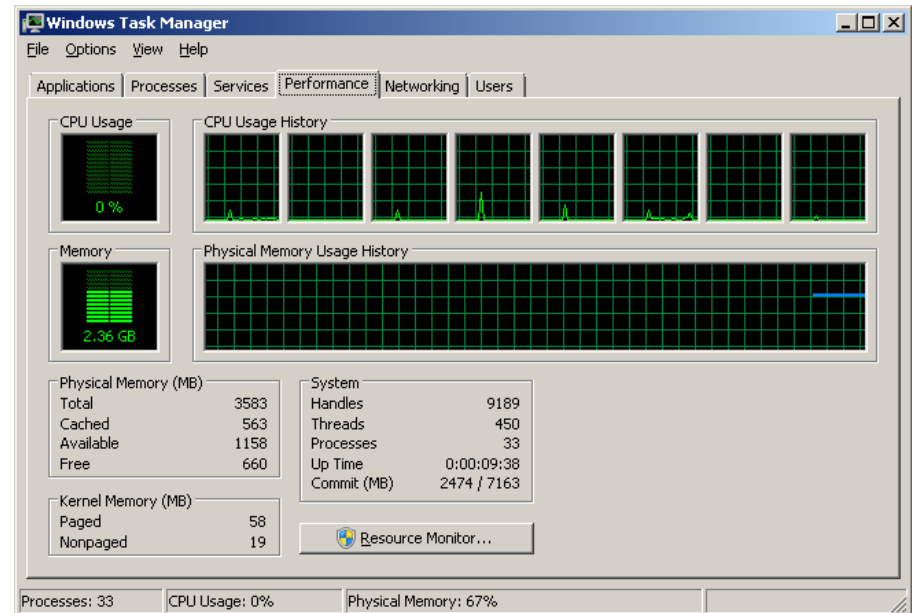
Software OS: WIN7 32-bit (max 4Gbyte RAM)

Setup: 2 GByte RAMDISKs from different software vendors

Hypothesis: RAMDISKs have different performance due to their implementations

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Author: Tobias Kind / FiehnLab 2009 / fiehnlab.ucdavis.edu



Used disk benchmark tools:

CrystalDiskMark	crystalmark.info
HDTach (trial)	www.simplisoftware.com
HDTune (trial)	www.hdtune.com
Atto	www.guru3d.com

- Direct IO Disks**
- can be mounted as virtual disk and can be used with drive letter
 - are **not** seen by Windows Disk Manager or HDTune/HDTach
 - faster than direct disk mode (SCSI)

- Comments:**
- Error may be as high as 20%;
 - Older unsupported tools such as ATTO may have caching issues
 - Direct IO is faster than direct disk mode
 - Two test with two repeats, fastest result taken for table
 - FAT and FAT32 and NTFS results mixed

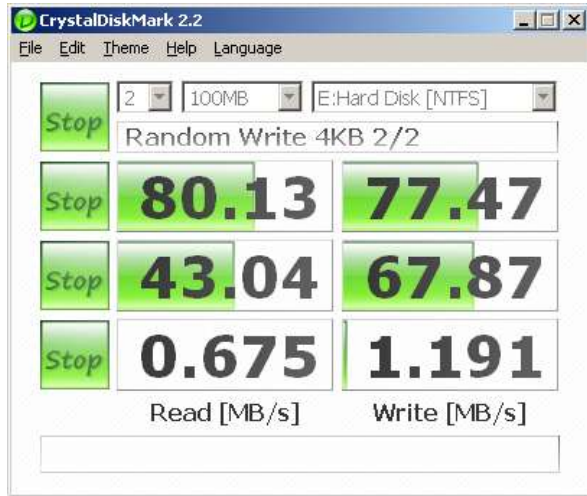
See a collection of other HD benchmark tools at <http://www.benchmarkhq.ru>

Ramdisk performance results for Windows 7

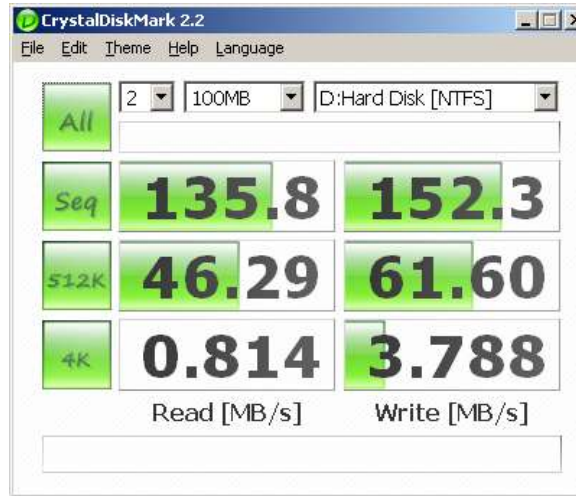
Num	Name	Sequential [MB/s]		Random 512k [MB/s]		Random 4k [MB/s]		Average (ALL)
		Read	Write	Read	Write	Read	Write	Score
1	QSOFT Ramdisk Enterprise	5362	6460	5574	6582	1063	924	4327
2	VSuite Ramdisk (prof.)	4544	5269	4731	5247	1000	795	3598
3	Gili Ramdisk	3684	4684	4213	4857	610	541	3098
4	Virtual Hard Drive 2 Pro	4654	4006	4365	4186	719	623	3092
5	StarPort iSCSI Initiator	4441	5179	3992	4493	186	188	3080
6	SuperSpeed RamDisk Plus	4409	4995	3995	4492	199	193	3047
7	ImDisk Virtual Disk Driver	3923	4500	3176	3556	81	63	2550
8	Cenatek Ramdisk	3215	3573	2902	3054	225	197	2194
9	RamPhantom 7	3414	3835	2717	2871	53	57	2158
10	Gavotte Ramdisk	3314	3531	454	460	4	4	1295
11	Everstrike DiskBoost	NA	NA	NA	NA	NA	NA	NA
12	AR RAM Disk	NA	NA	NA	NA	NA	NA	NA
13	StarWind iSCSI 4.0	NA	NA	NA	NA	NA	NA	NA
14	Moio Systems RAMDisk	NA	NA	NA	NA	NA	NA	NA
15	Cenatek RAMDISK XP	NA	NA	NA	NA	NA	NA	NA
16	ERAM for Windows	NA	NA	NA	NA	NA	NA	NA
17	Microsoft KDMF/DDK	NA	NA	NA	NA	NA	NA	NA
Testsystem: Core i7 @ 3.5GHz; DDR3 RAM; WIN7 32-bit; CrystalDiskmark 2.0; Error +/- 20%								

- A fast Ramdisk or ramdrive can deliver more than 5 GByte/sec seq. throughput
- Good support and signed drivers are important; Backup option is important
- Easy installation and de-installation as well as convenient GUI are a large plus
- CPU penalty for Ramdisk use is one CPU core - due to RAMDISK and FS overhead
- Commercial and free versions can be used (performance is not ultimate measure)

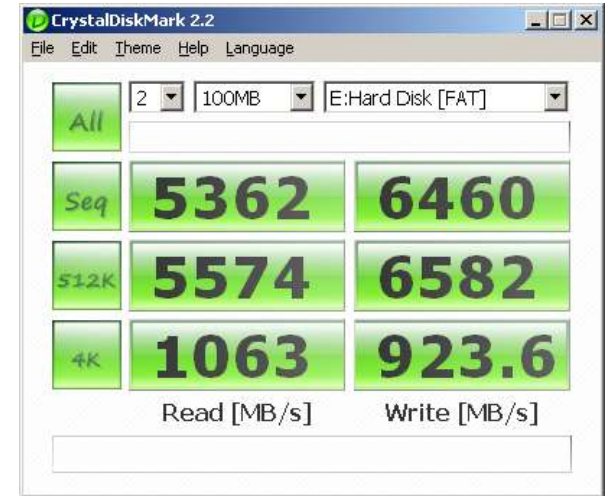
Benchmark of HDs vs. RamDisks vs. SSDs



Single HD
Seagate 750 GByte HD
ST3750528AS



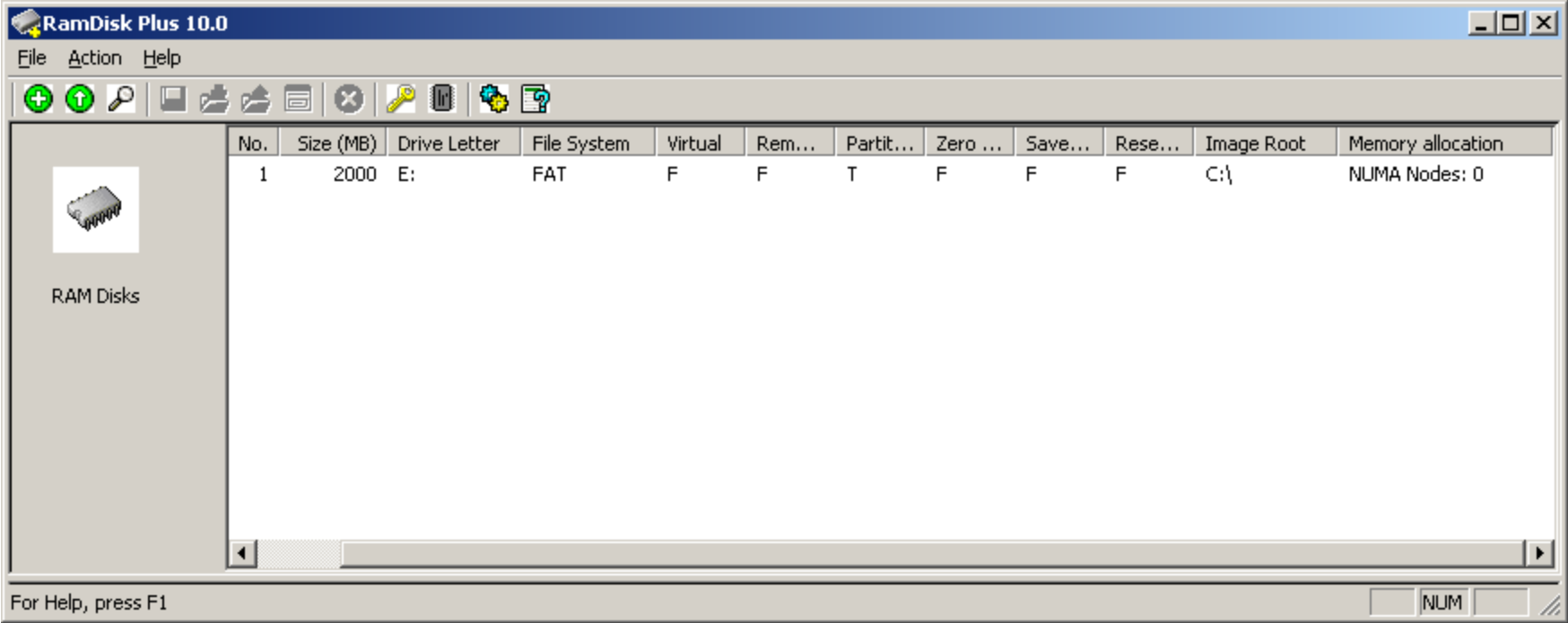
RAID10 (Intel Matrix RAID)
WD RE3 750 GByte HD
WD7502ABYS



Single RamDisk
QSOFT Ramdisk Enterprise

- How about consumer SSDs? They can reach several hundred MByte/sec but not more.
- IOPS for RAMDISKS: 30000-40000 @ 512 bytes and 4 kBytes
- How about external or PCI-X based SSDs like Fusion IO? They can reach 1000 Mbyte/sec.
- Cheapest DDR3 4Gbyte ~ 200 Dollars ; a 64 GByte RAMDISK would cost 3200 Dollar (4RAM)
- A fast SSD or disk RAID array (RAID10 or RAID6) should be used for the production system
- A small RAMDISK with few GBytes can be used when top performance is needed.
- Using a RAMDISK has a penalty of one CPU core in use due to filesystem and ramdisk overhead.

Product name: SuperSpeed RamDisk Plus / RamDisk
Product version: 10.0.1.0
Source: www.superspeed.com (trial)

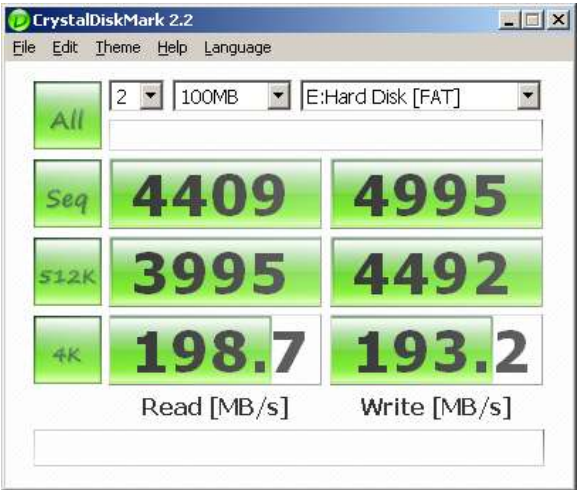


- Utility: Easy to use, no installation issues; single program with Backup; WHQ certified no driver signature required
- Price: RAMDISK plus 64-bit: 99 Dollar

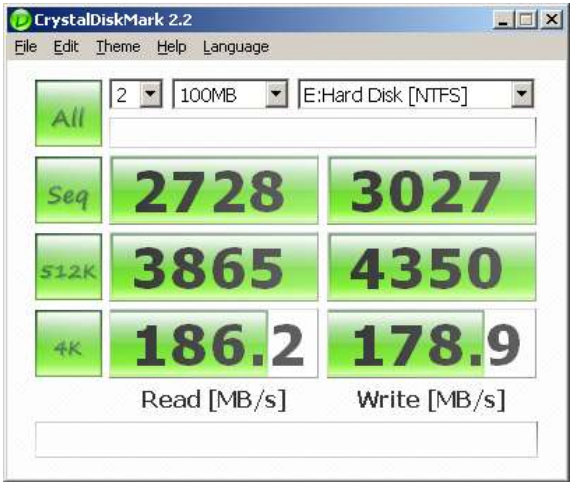
Product name: SuperSpeed RamDisk Plus / RamDisk

Product version: 10.0.1.0

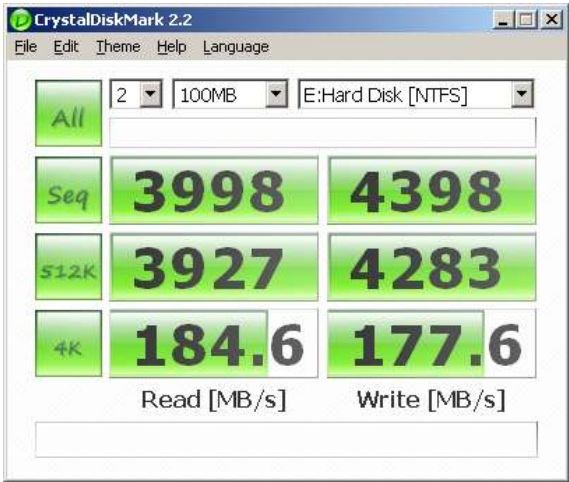
Max CPU utilization (8 logic CPUs): 25%



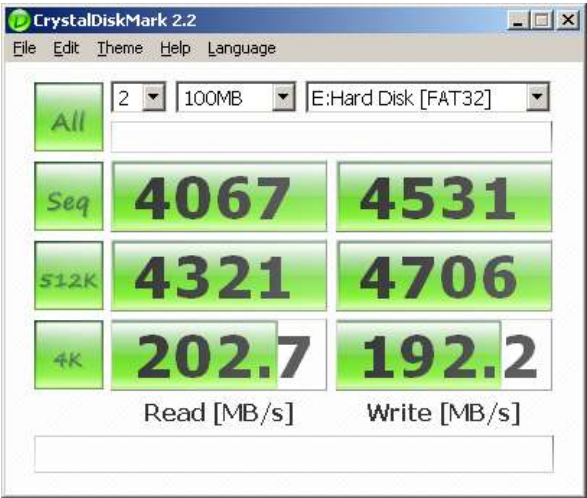
FAT with 32 kByte units



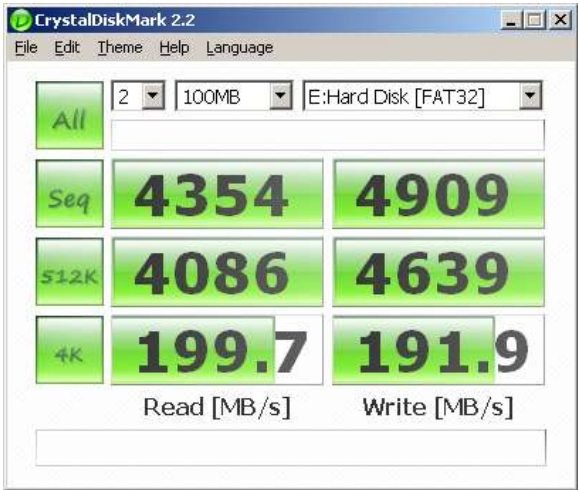
NTFS with 4 kByte units



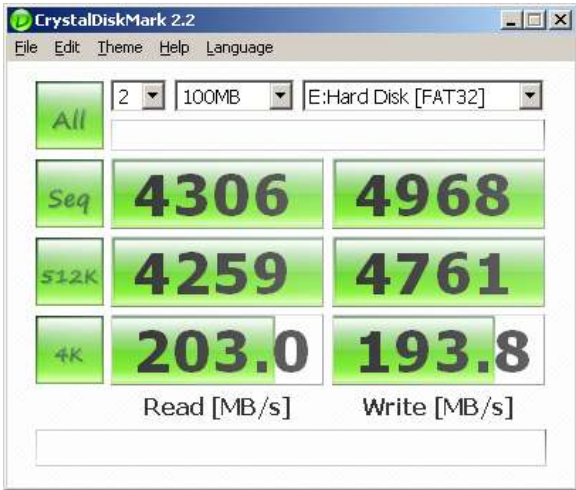
NTFS with 64 kByte units



FAT32 with 512 Byte units



FAT32 with 4 kByte units



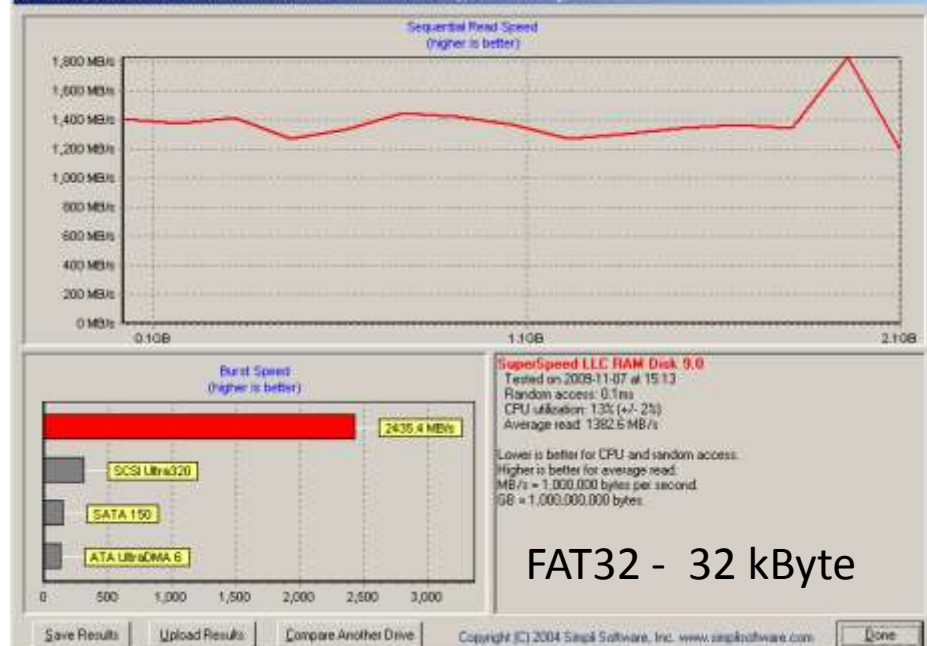
FAT32 with 16 kByte units

SuperSpeed RamDisk Plus with HDTACH READ (QuickBench 8 Mbyte Zones)

HD Tach version 3.0.4.0 - For non-commercial or evaluation use only, see license agreement.



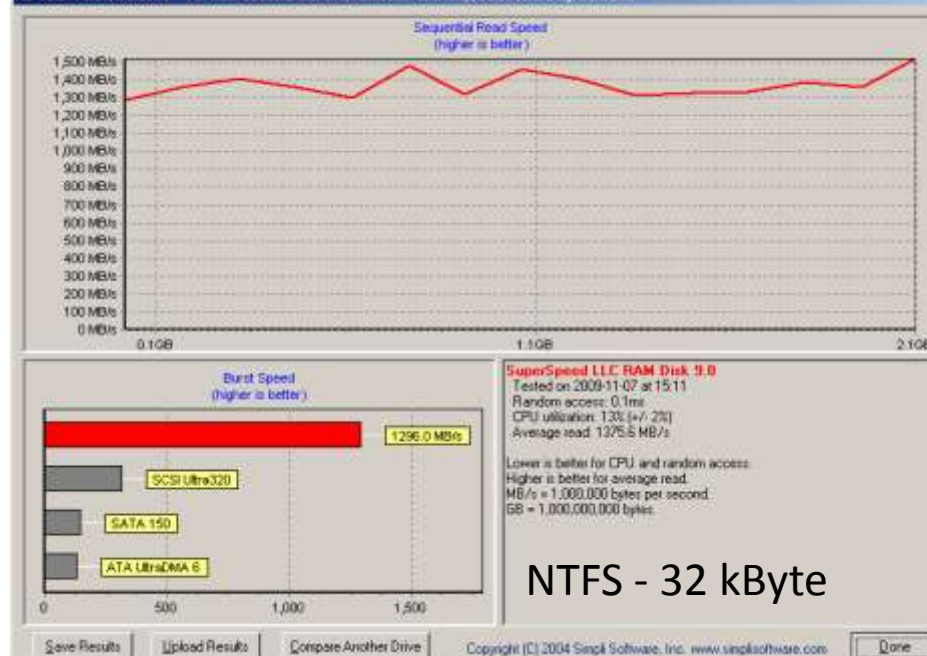
HD Tach version 3.0.4.0 - For non-commercial or evaluation use only, see license agreement.



HD Tach version 3.0.4.0 - For non-commercial or evaluation use only, see license agreement.

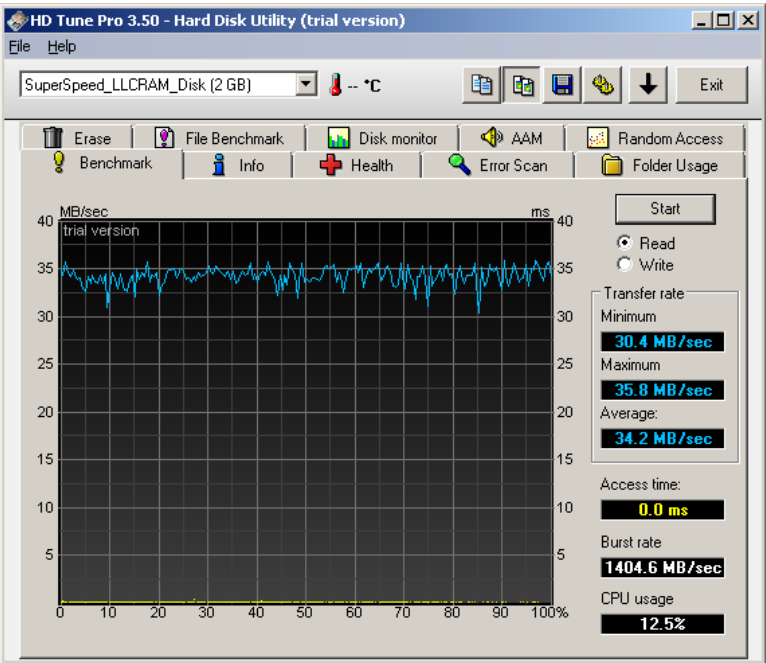
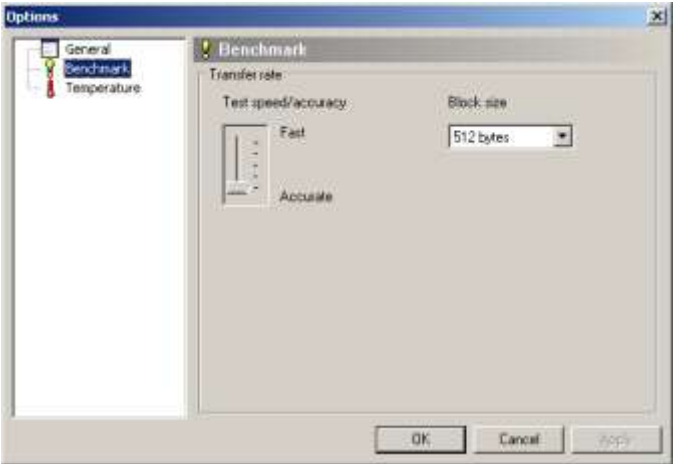


HD Tach version 3.0.4.0 - For non-commercial or evaluation use only, see license agreement.

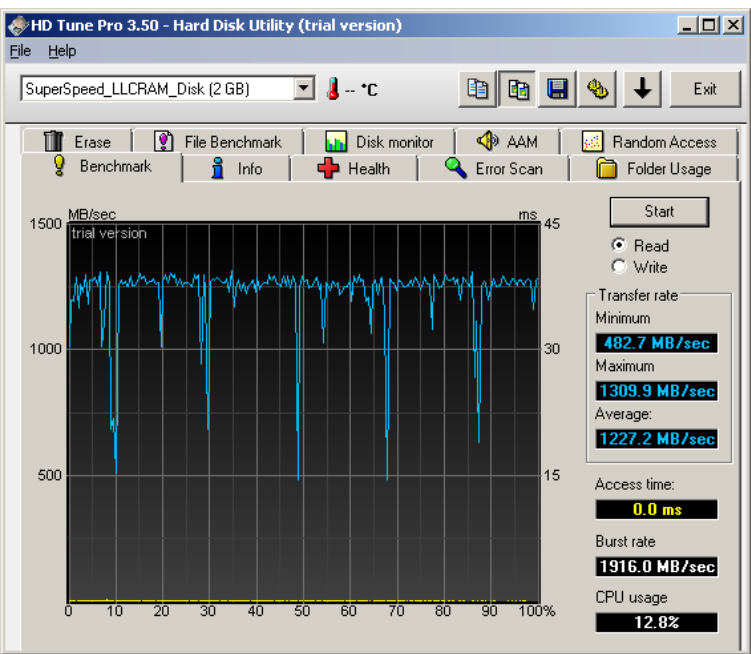


SuperSpeed RamDisk Plus

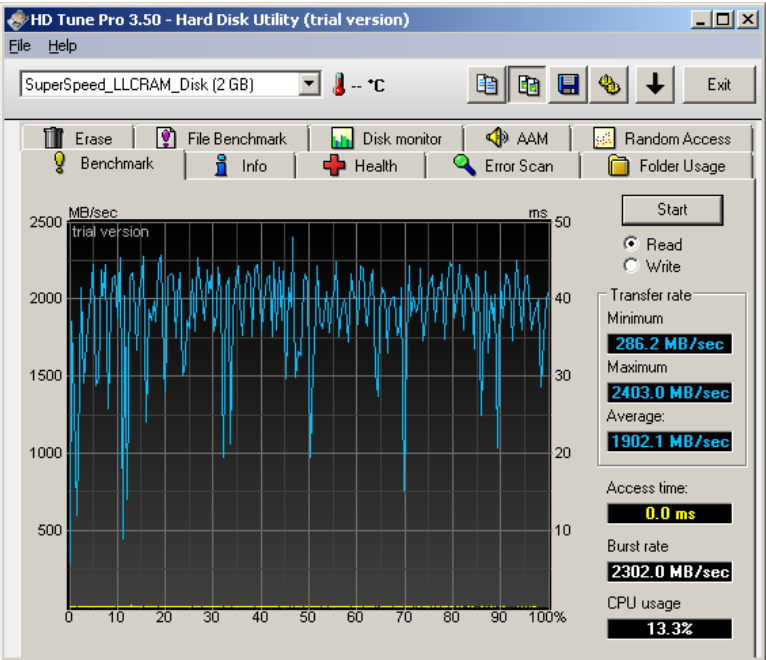
HDTune READ block size selection



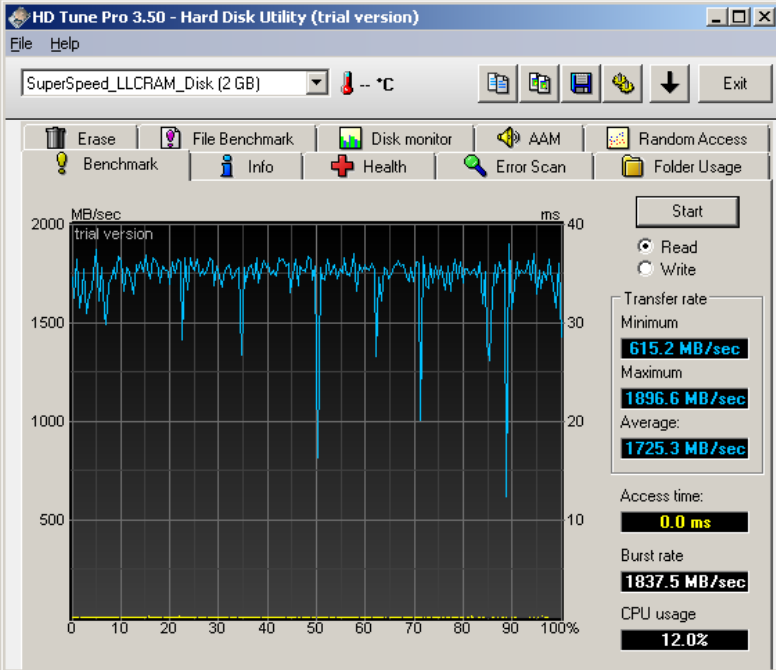
512 byte
in HDTUNE



32 kbyte in HDTUNE

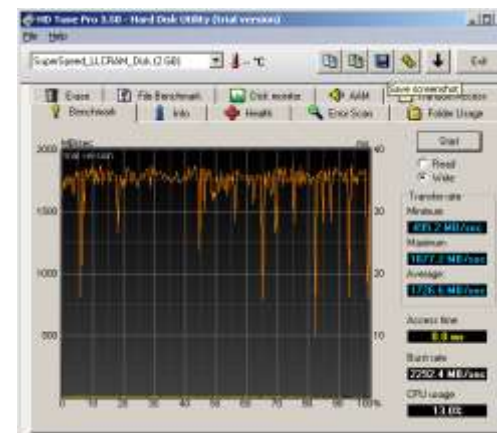


8 Mbyte in HDTUNE

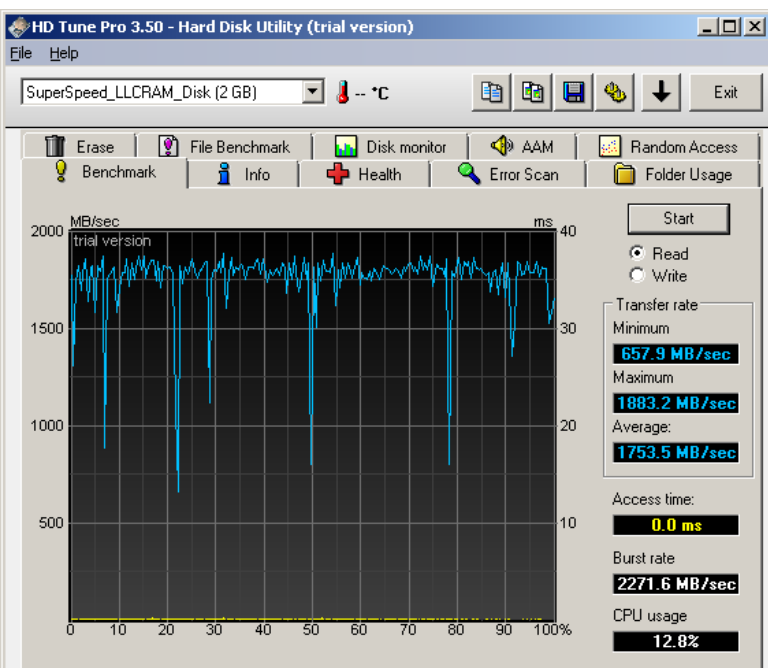


Read test
FAT32 - 4k

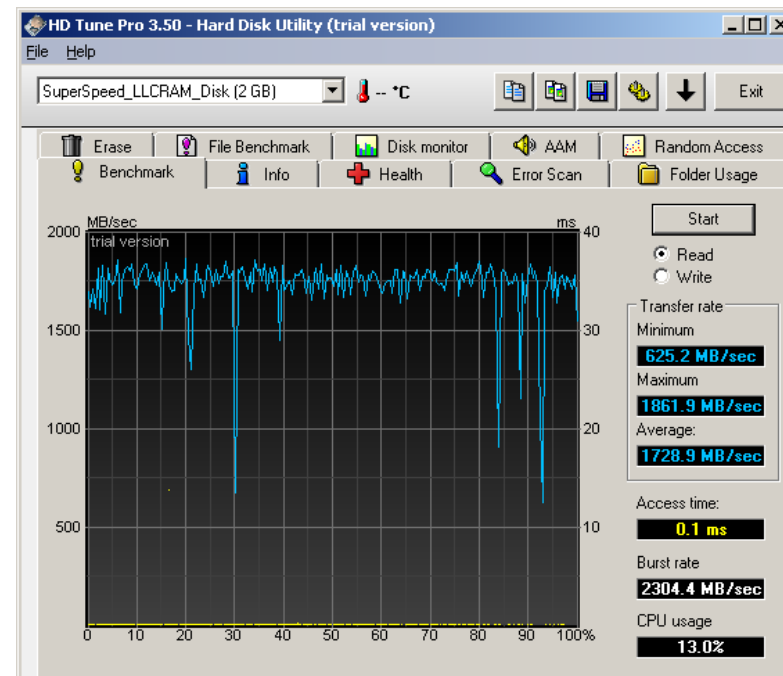
SuperSpeed RamDisk Plus TEST with HDTune block size 64k



Write test



Read test - FAT 32k

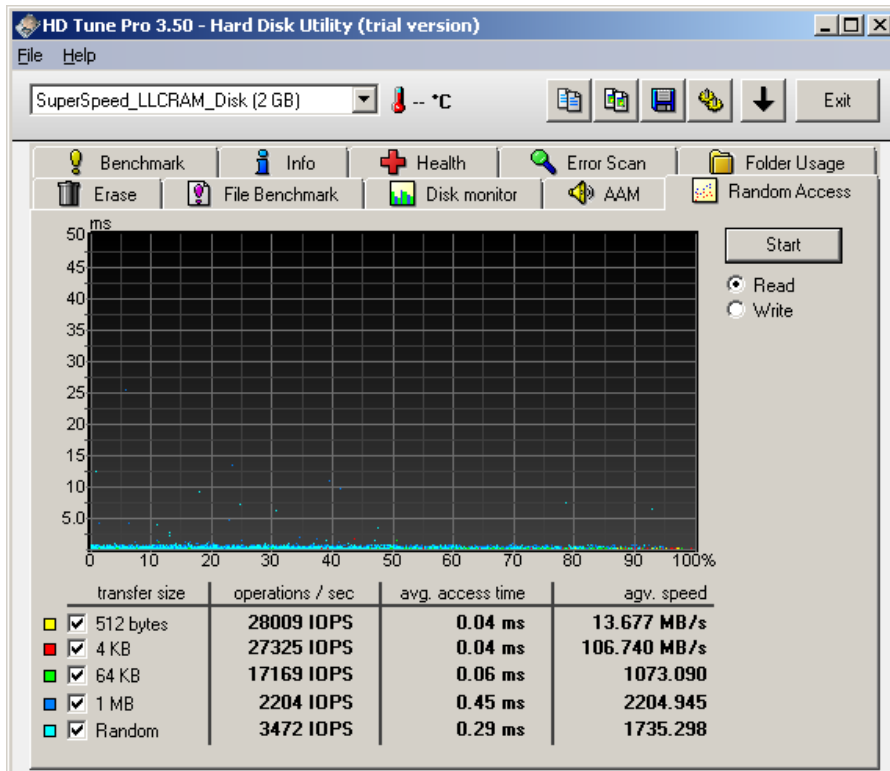


Read test - NTFS - 4k

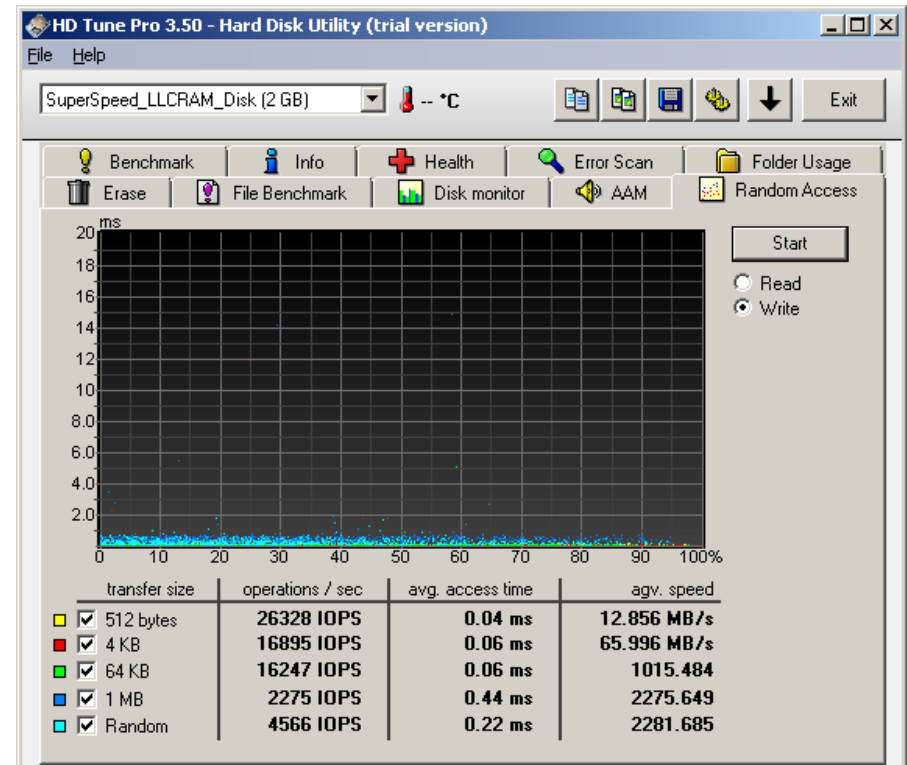
SuperSpeed RamDisk Plus

HDTune IOPS

IOPS Read



IOPS Write



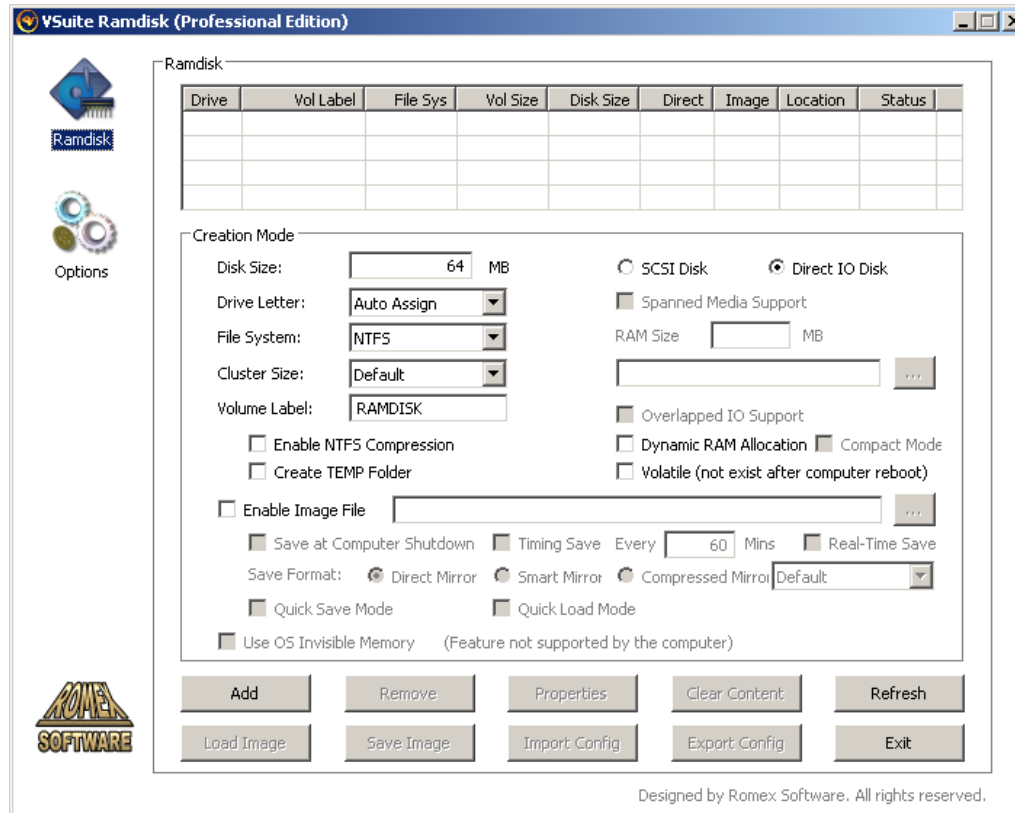
Read/write performance: RAMDISK 28,174 IOPS @ 4K || SSDs have around 10k-20k @ 4k
Read/write performance: 2 GByte RAM = 30 Dollars → 933 IOPS per dollar @ 4k

Product name: VSuite RamDisk

Product version: 4.1

Source: www.romexsoftware.com (trial and free version)

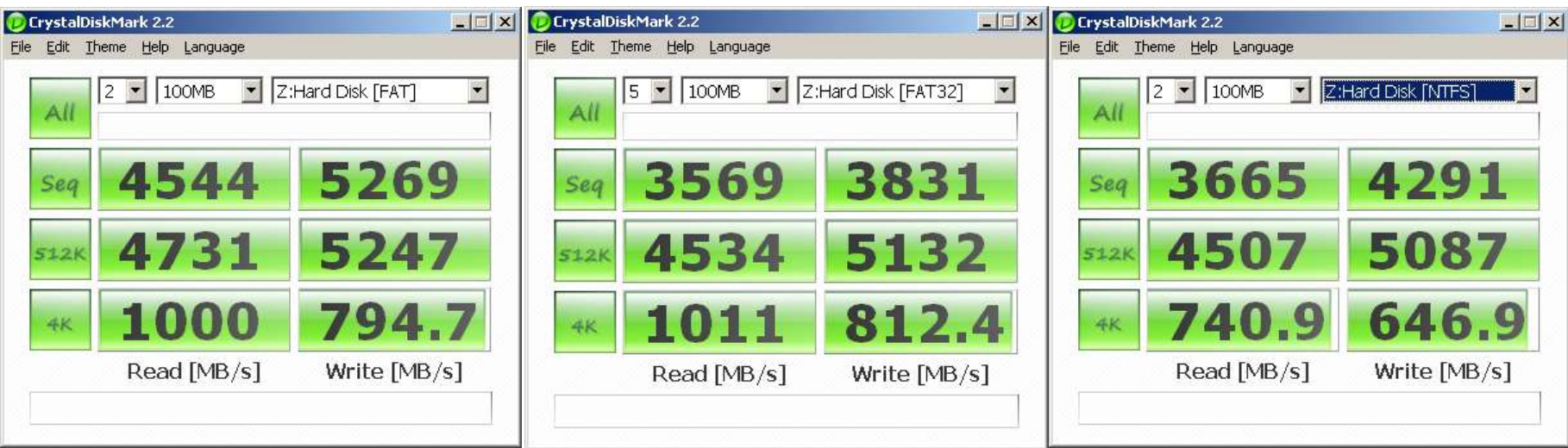
CN = SmartSource Shanghai Electronic Technology Co. Ltd



Utility: Easy to use, no installation issues; single program with Backup/Image file; Self signed certificate; Direct IO and SCSI disk

Price: RAMDISK plus 64-bit: 99 Dollar and free version available

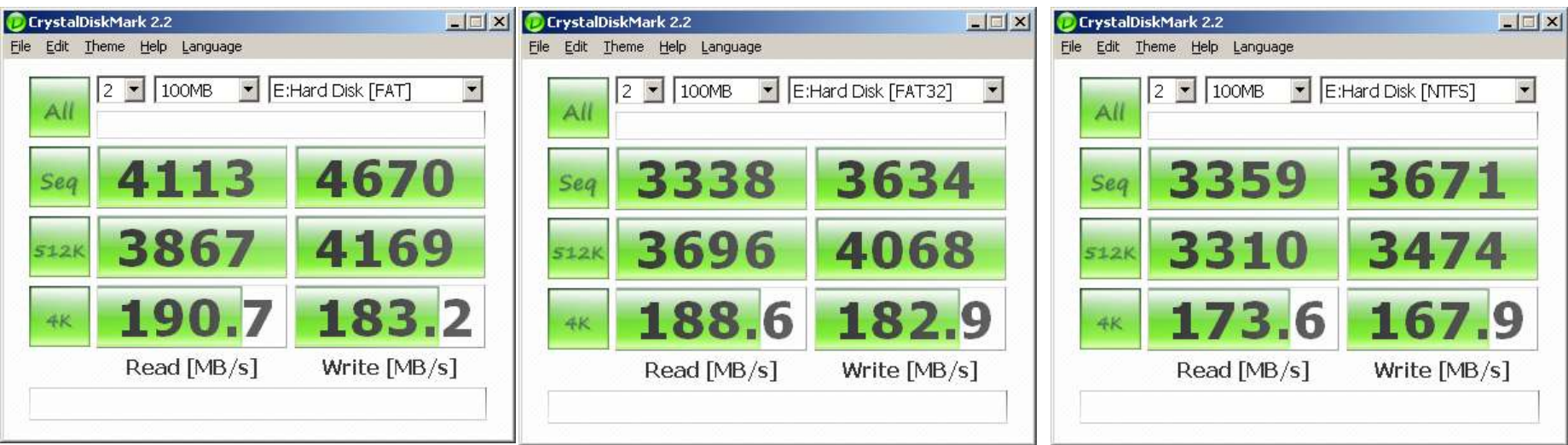
VSuite Ramdisk Professional; Direct IO and SCSI Disk



FAT formatted (Direct IO)

FAT32 formatted (Direct IO)

NTFS formatted (Direct IO)

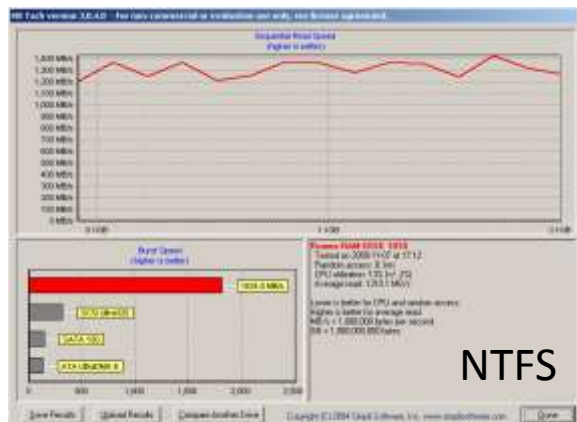


FAT formatted (SCSI)

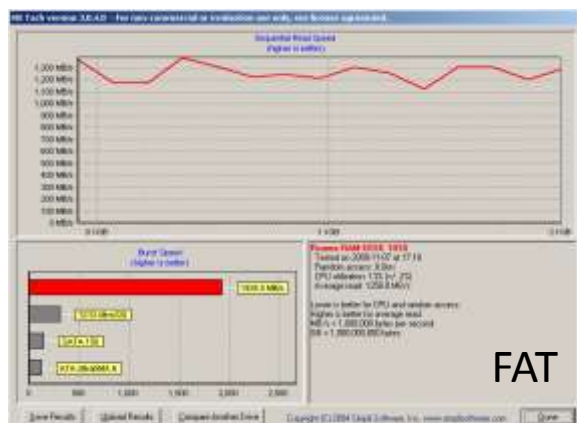
FAT32 formatted (SCSI)

NTFS formatted (SCSI)

VSuite Ramdisk Professional; SCSI disk



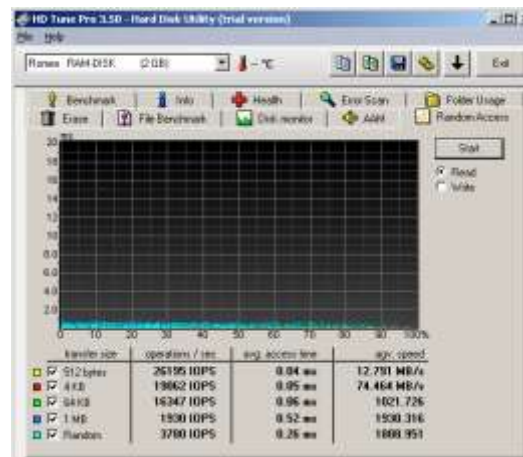
NTFS



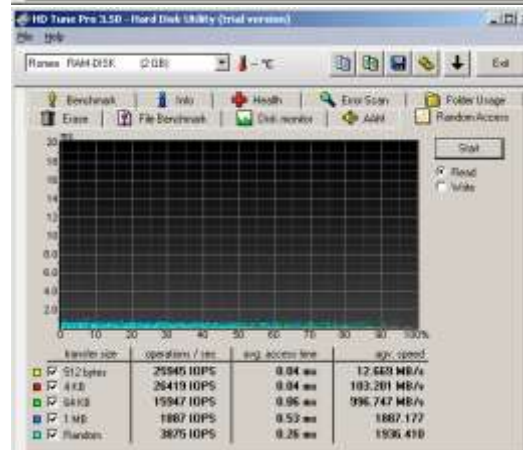
FAT



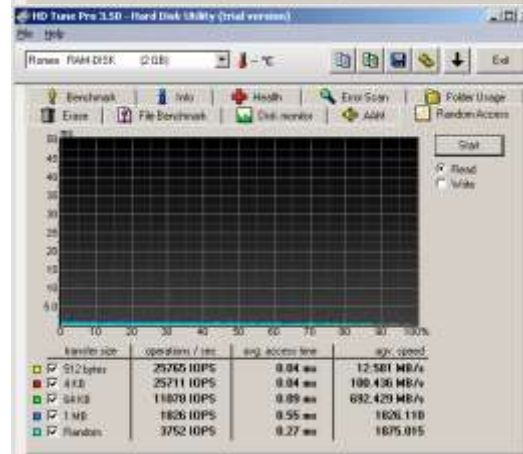
FAT32



NTFS

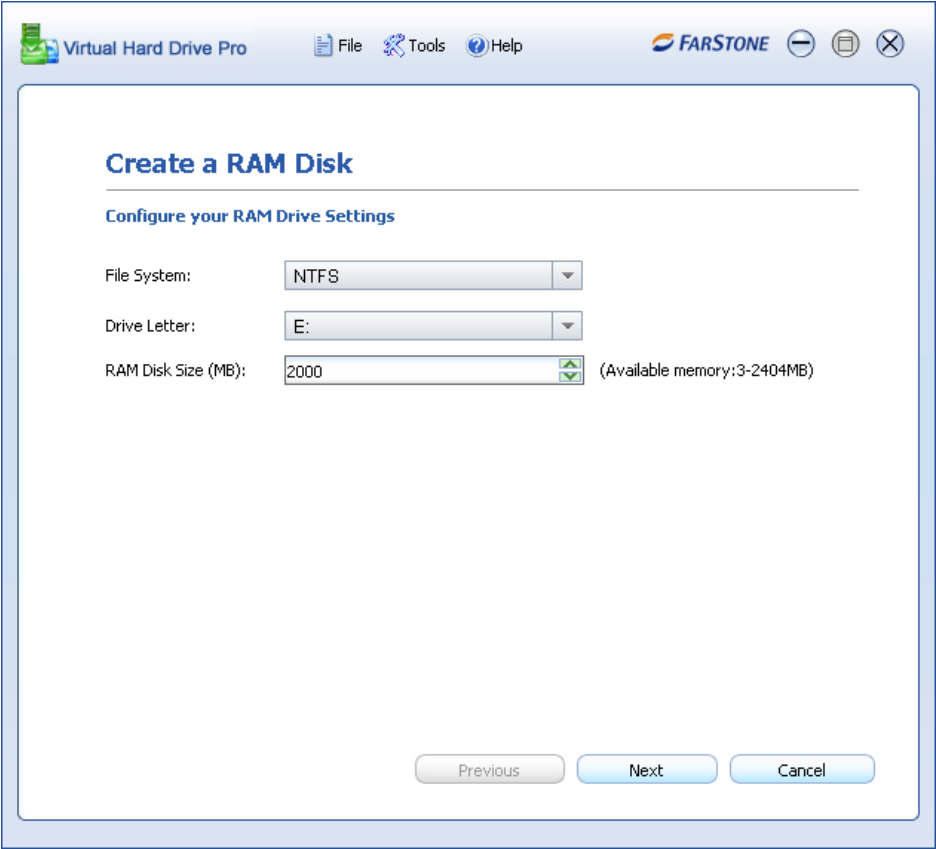
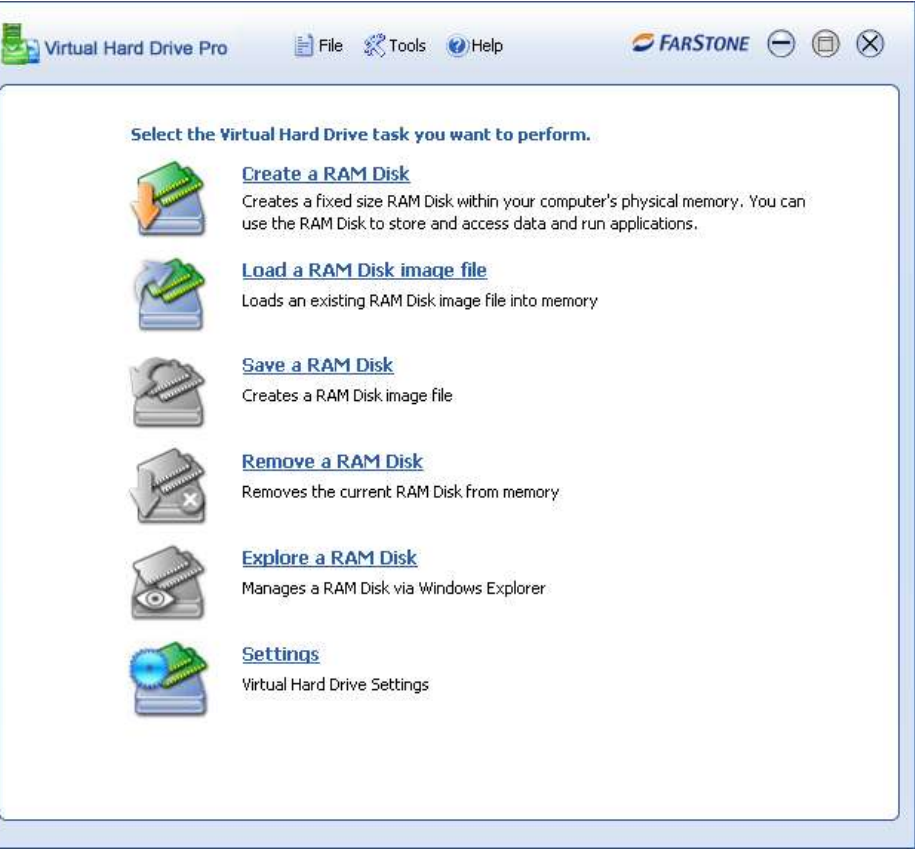


FAT



FAT32

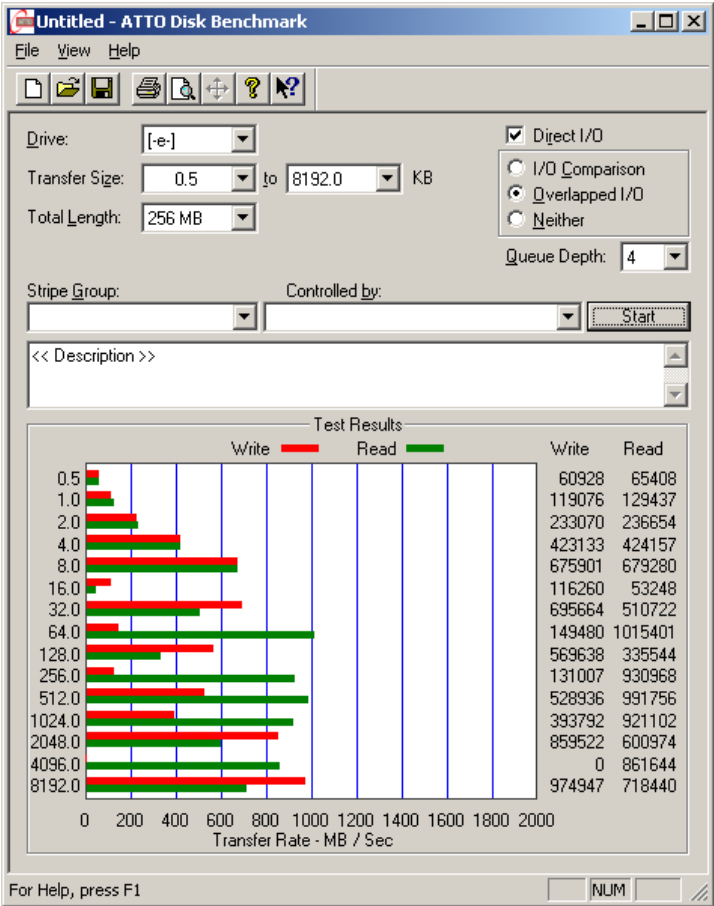
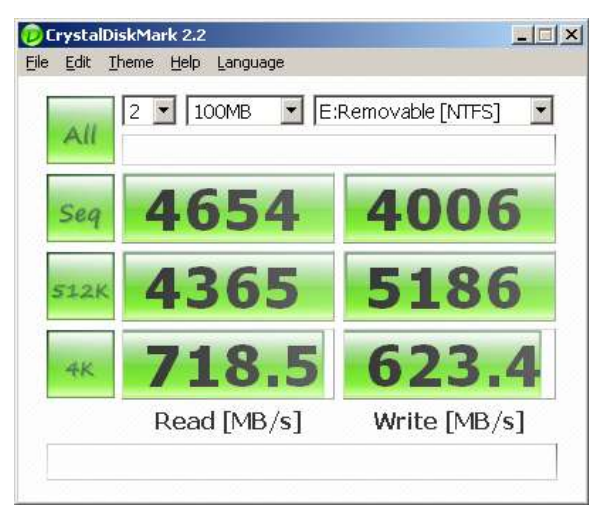
Product name: **Virtual Hard Drive 2 Pro**
Product version: 2.0
Source: <http://www.farstone.com> (*trial version*)
CN = Farstone Technology Inc



Utility: Easy to use, no installation issues; single program with Backup/Image file;
 Self signed certificate; Requires Reboot; Direct IO (no HDTUNE/HDTACH)
Price: 29 Dollars

Product name: **Virtual Hard Drive 2 Pro**

Direct IO (no HDTUNE/HDTACH)

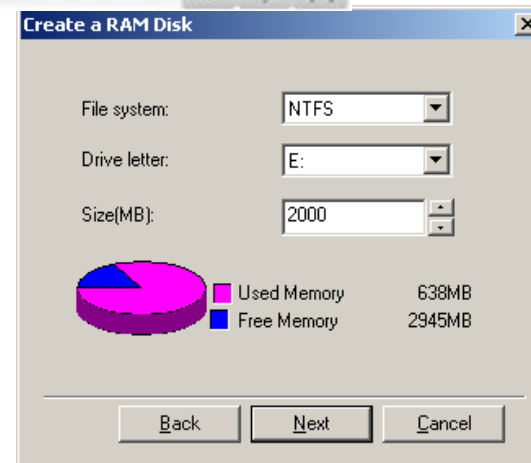
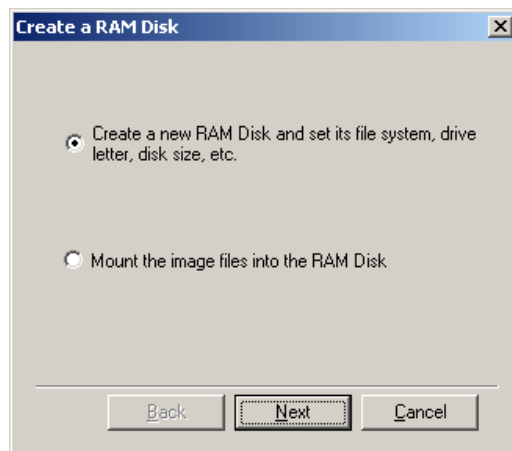


Product name: **Gili Ramdisk**

Product version: 3.2

Source: <http://www.gilisoft.com> (trial version)

CN = Pepstyle International Limited

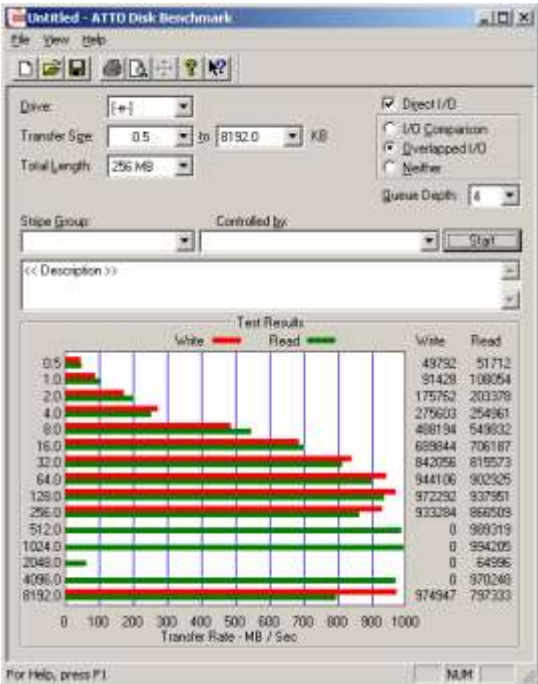
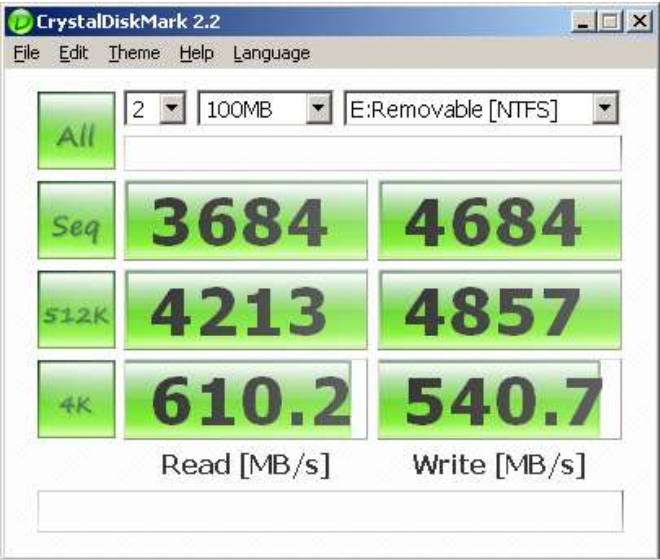


Utility: Easy to use, no installation issues; single program with Backup/Image file;
No certificate; Direct IO (no HDTUNE/HDTACH)

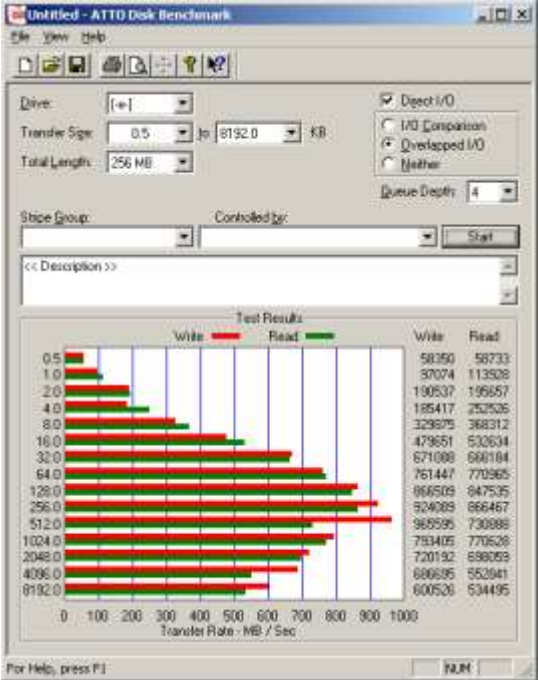
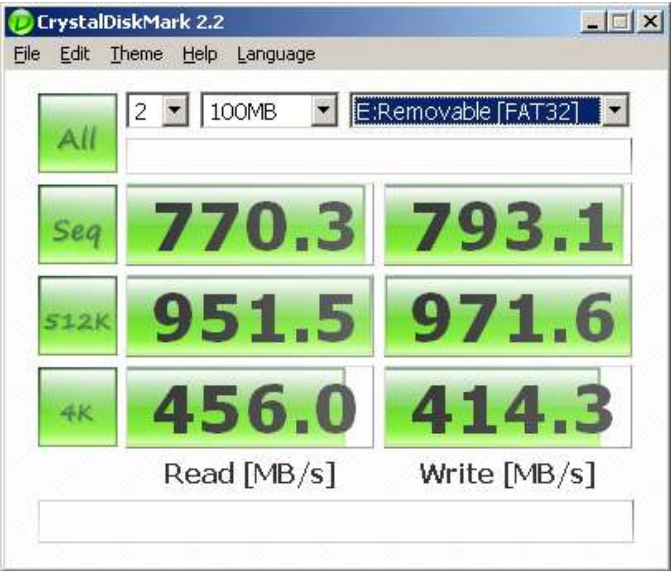
Price: 25 Dollars

Product name: **Gili Ramdisk**

Direct IO (no HDTUNE/HDTACH)



NTFS



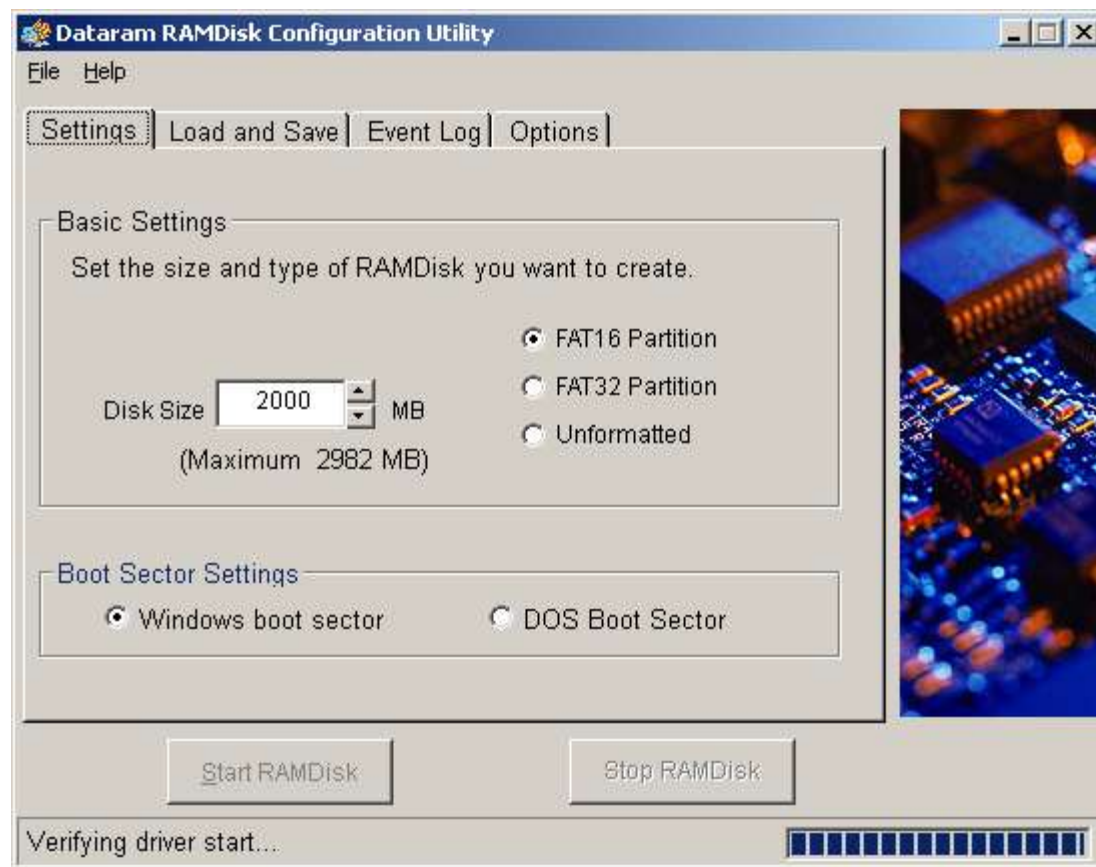
FAT32

Product name: **Cenattek Ramdisk (now Dataram)**

Product version: V3.5

Source: <http://memory.dataram.com> (*free version*)

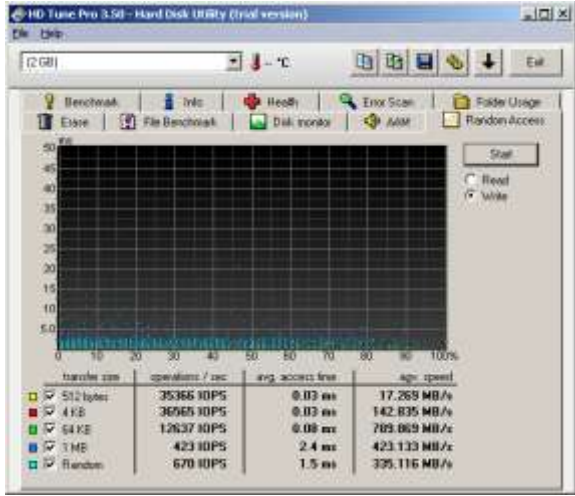
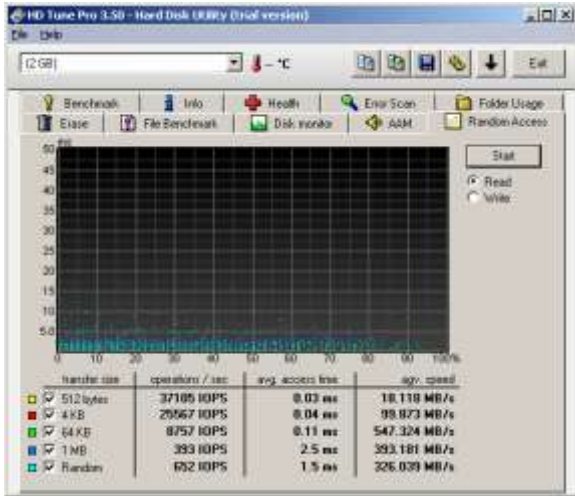
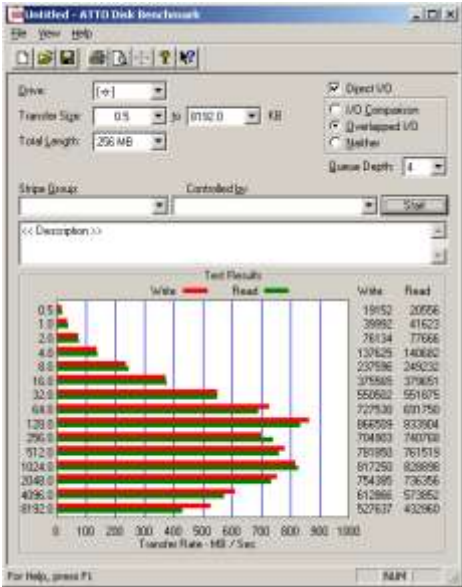
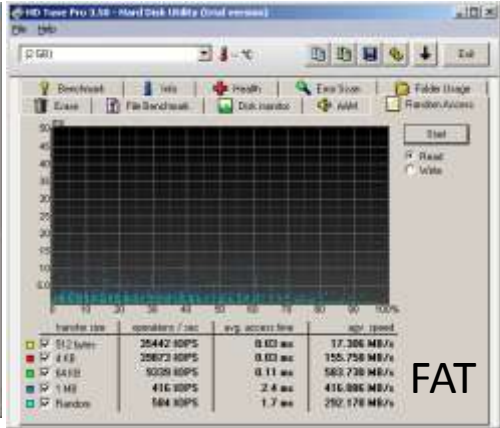
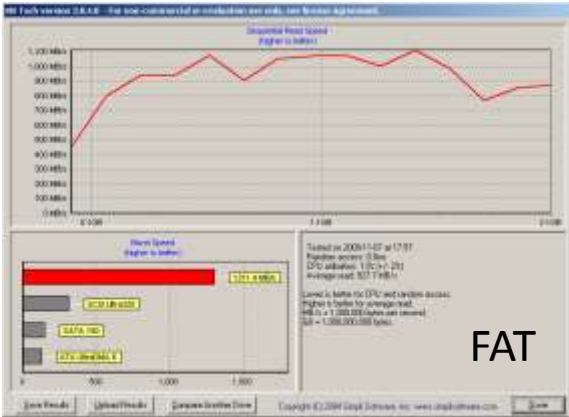
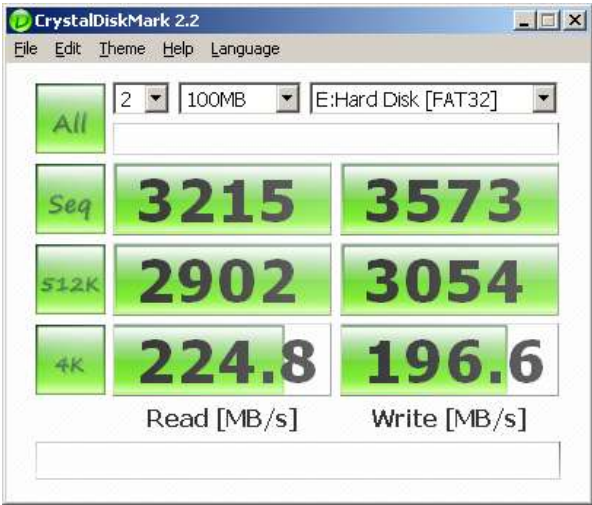
CN = Dataram; self signed



Utility: Easy to use, no installation issues; single program with Backup/Image file;
Self signed certificate;

Price: Free version; For larger than 4GByte free registration req.;
PopUp to 18004memory.com

Product name: **Cenatek Ramdisk (now Dataram)**



ATTO NTFS

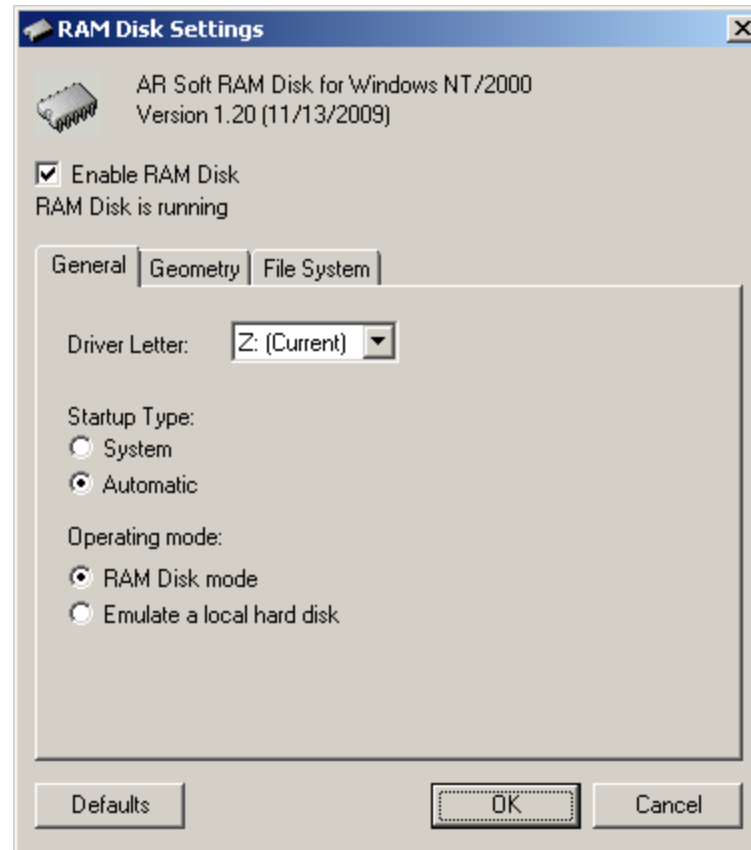
Read IOPS

Write IOPS

Product name: **AR RAM Disk**

Product version:

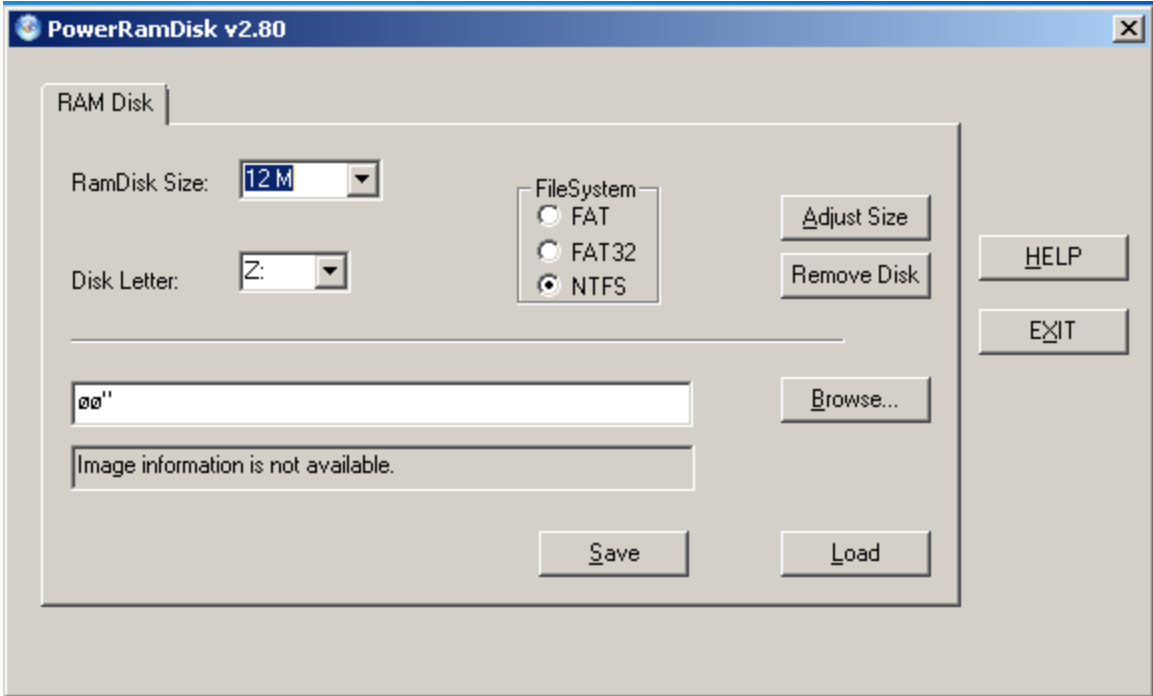
Source: <http://www.arsoft-online.com>



Utility: Easy to use; does not mount under WIN7

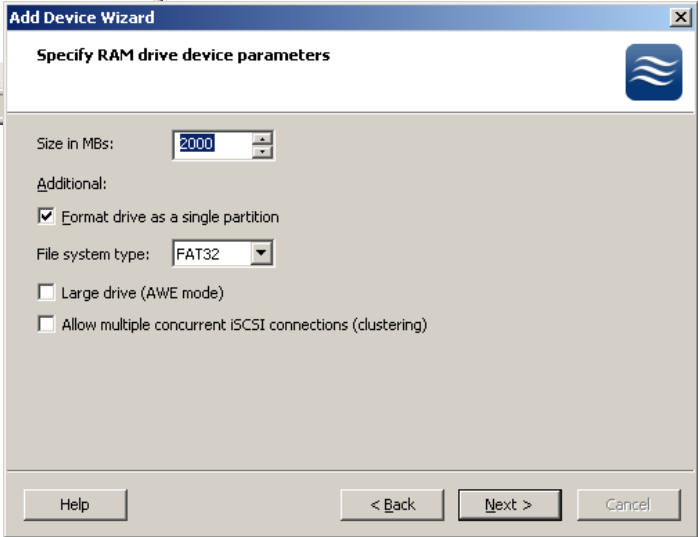
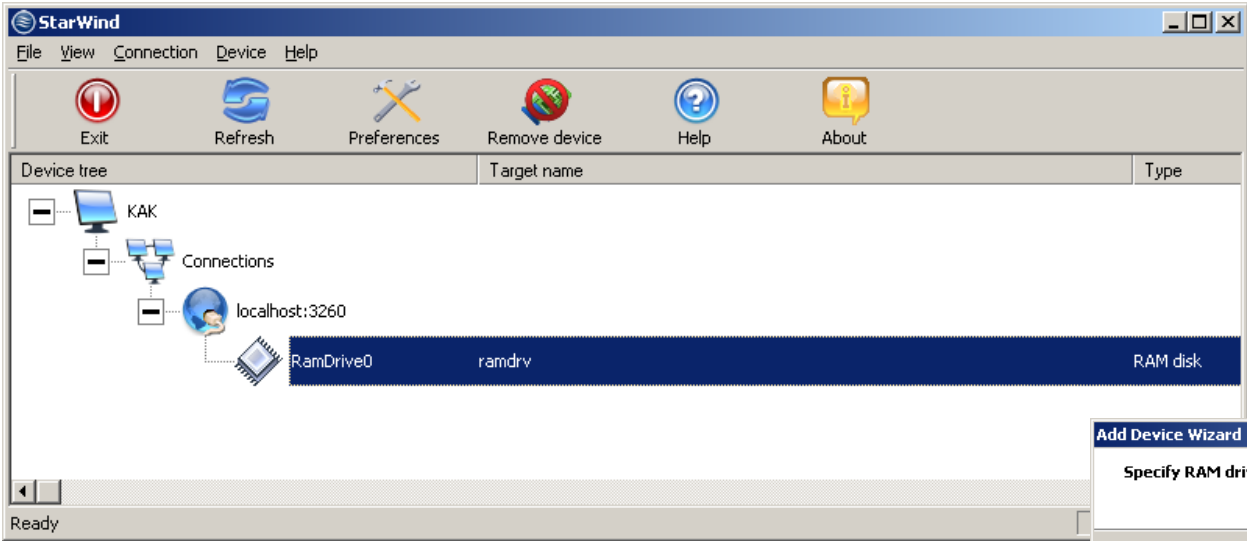
Price: free

Product name: **Moio Systems Power RAMDisk**
Product version: 2009.3.8. Power RAMDisk v2.80 (trial)
Source: <http://www.moiosystems.com/>



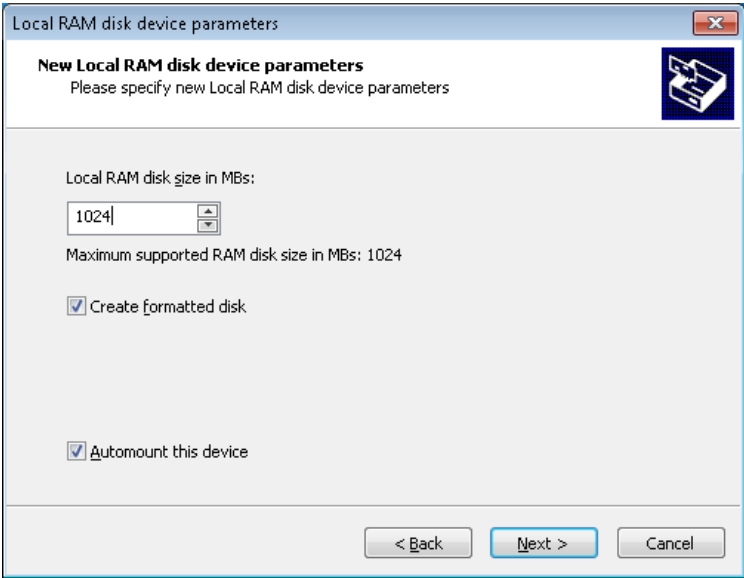
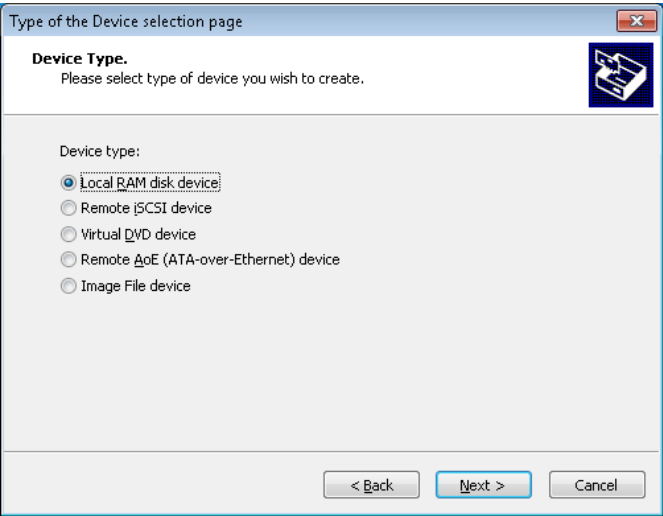
Utility: Not signed, version 2.8 does not mount under WIN7;
new version available (not tested)
Price: 10 Dollars

Product name: **StarWind iSCSI**
Product version: **StarWind 4.0 (trial)**
Source: www.starwindsoftware.com
CN- Rocket Division Software LTD



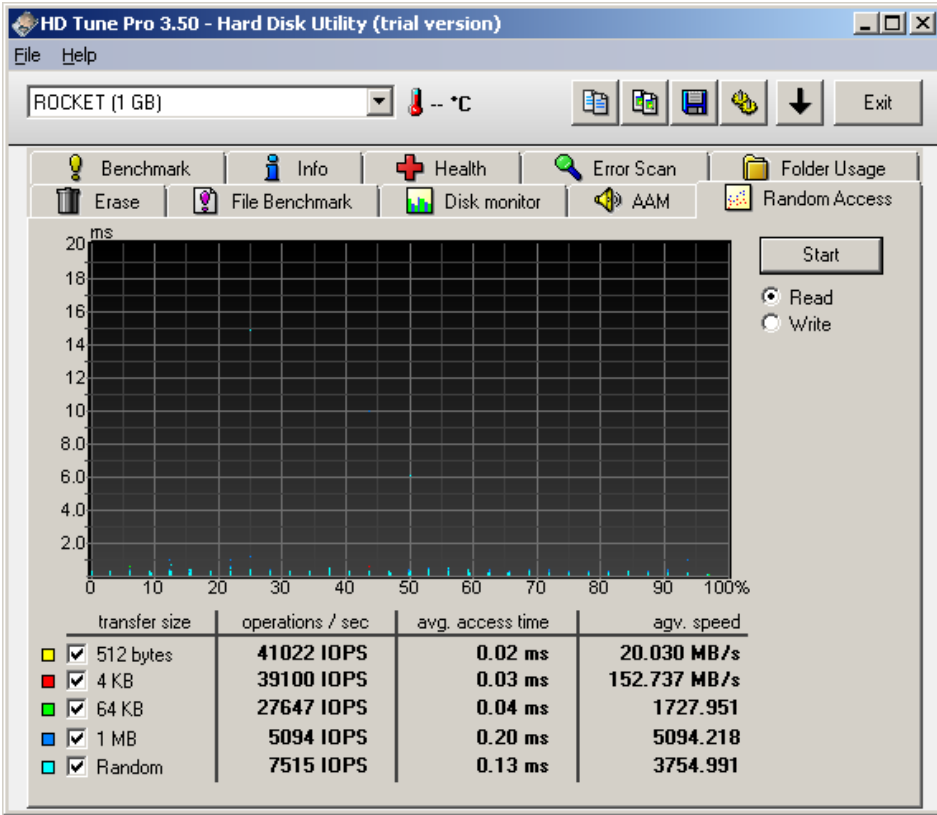
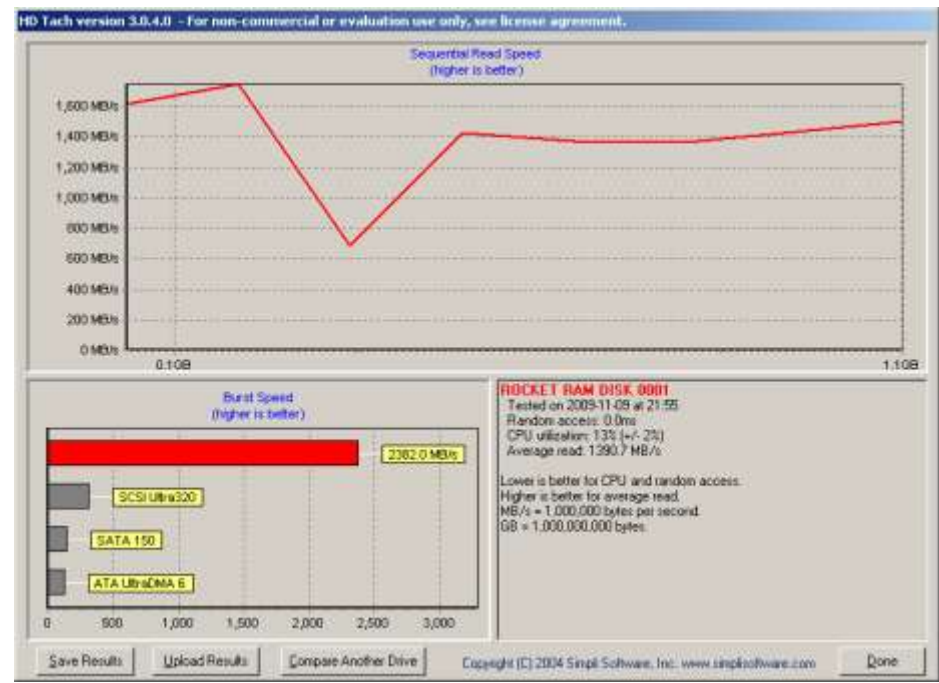
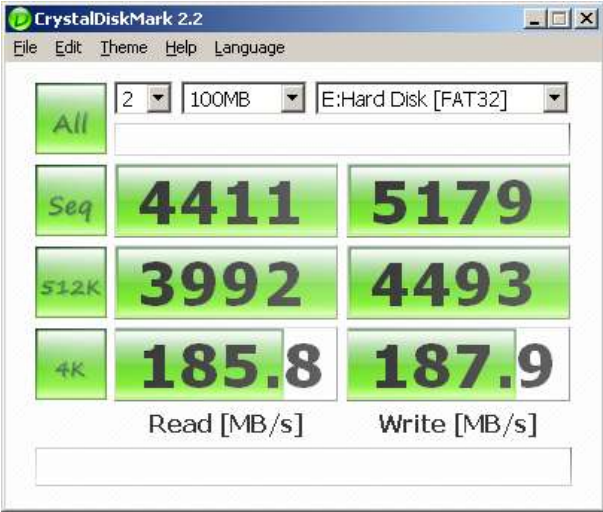
Utility: Use for net (TCPIP) access
Price: free or 395 Dollars (basic)
Problem: v4.0 does not mount under WIN7; new v5 available (not tested)

Product name: **StarPort iSCSI Initiator**
Product version: **StarPort 3.6.3** (*trial*)
Source: www.starwindsoftware.com



Utility: Use for net (TCPIP) access, Maximum 1024 Mbyte; NTFS, FAT and FAT32
Price: Free for personal use

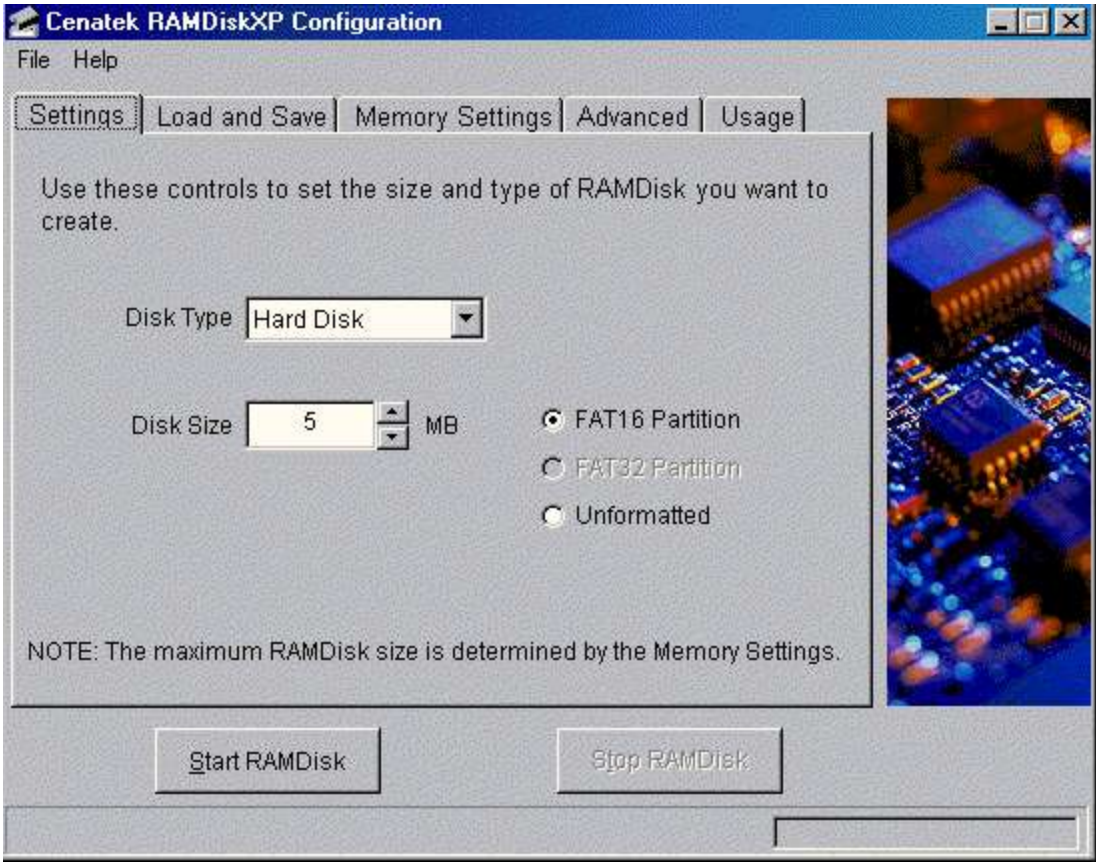
Product name: **StarPort iSCSI Initiator**



Product name: **Cenatek RAMDISK XP**

Product version: Any

Source: www.cenatek.com



Utility: Only runs under WINXP see Dataram (former Cenatek) version for WIN7

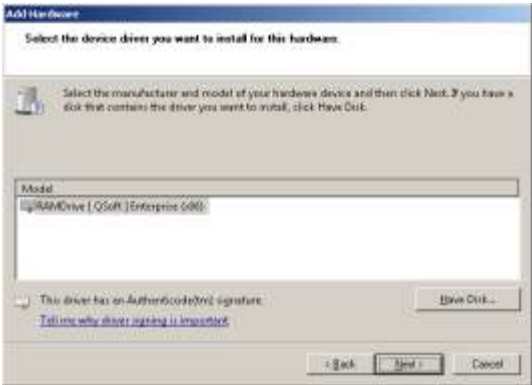
Price: Free for personal use (from Dataram, former Cenatek)

Product name: **QSOFT Ramdisk Enterprise**

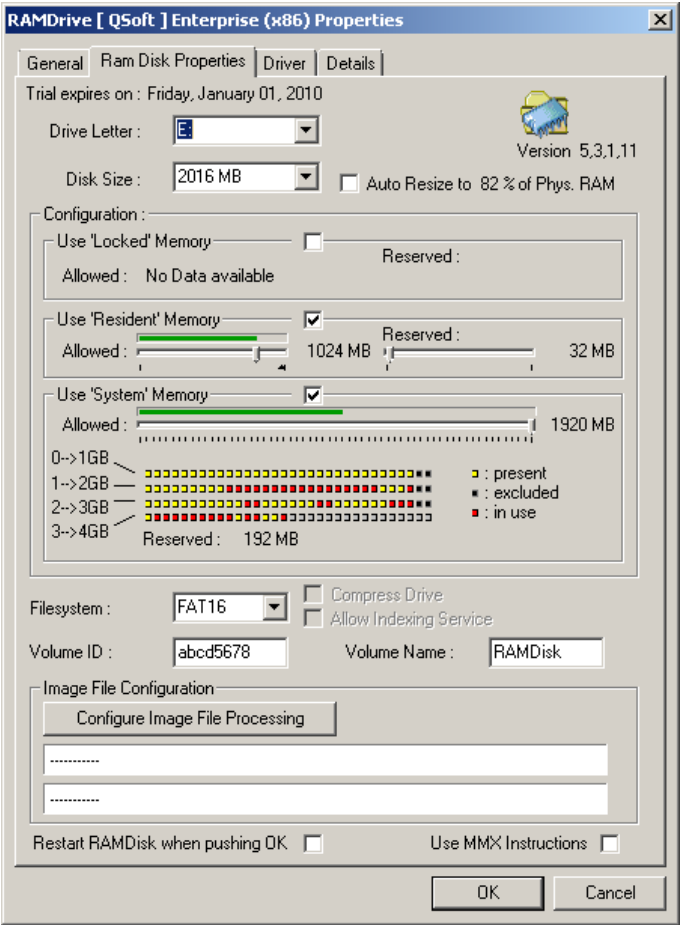
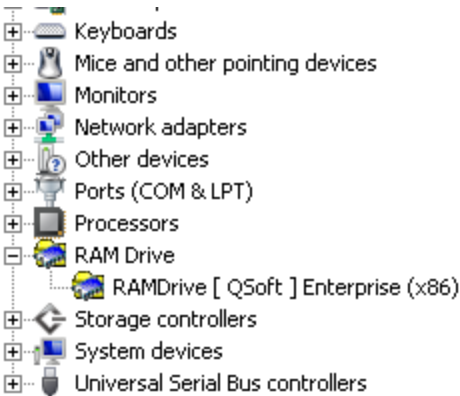
Product version: 5.3.1.11 (trial)

Source: <http://members.fortunecity.com/ramdisk>

CN= Christiaan Ghijselinck



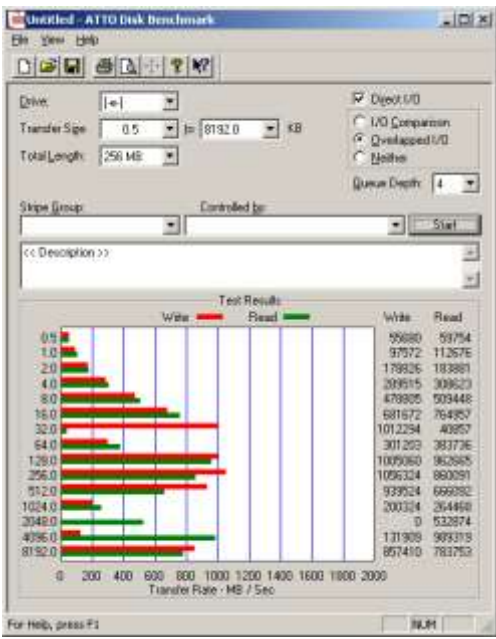
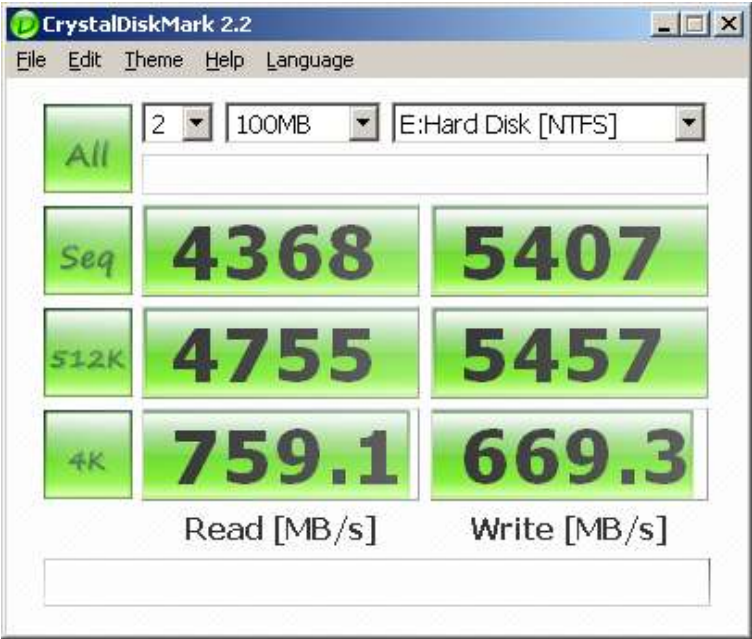
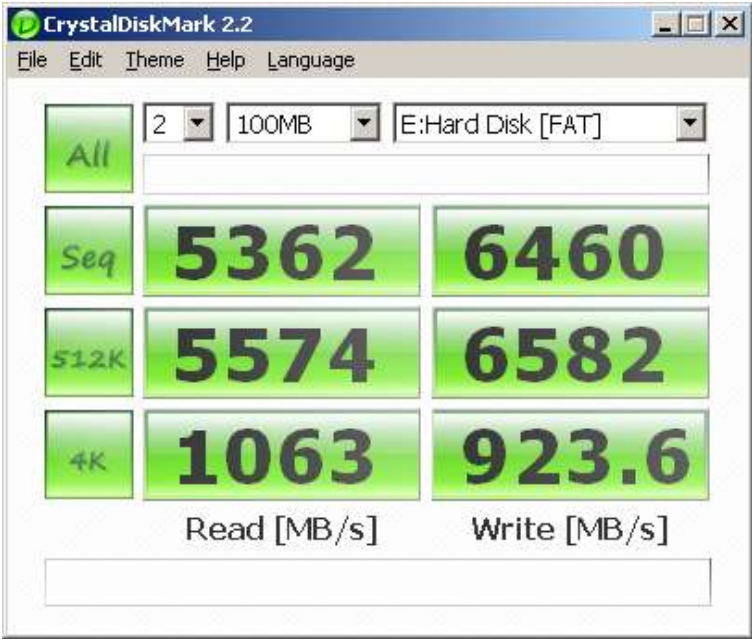
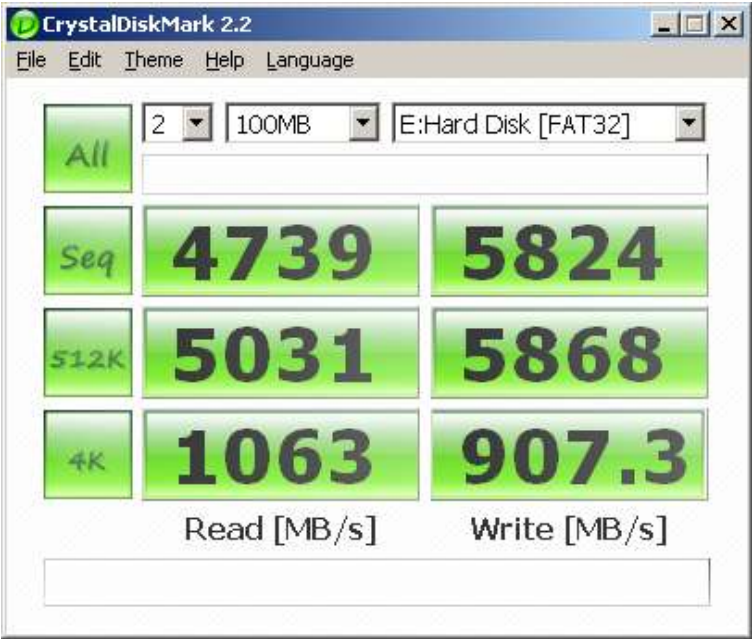
Access via device manager



Utility: Not easy to install; in WIN7 use **hdwwiz** ; however no installation issues
Self signed certificate; Direct IO (no HDTUNE/HDTACH)

Price: 25 Dollars (enterprise)

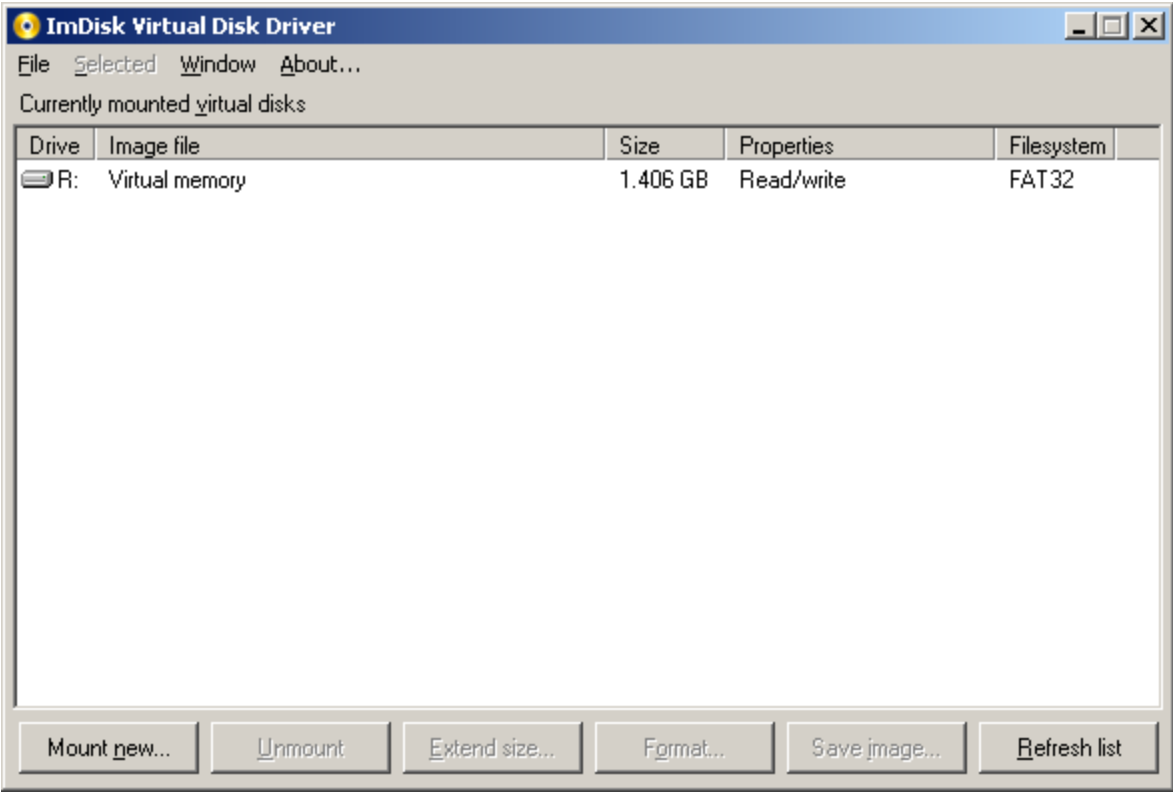
Product name: QSOFT Ramdisk Enterprise



Product name: **ImDisk Virtual Disk Driver**
Product version: 1.1.4
Source: <http://www.ltr-data.se/opencode.html>

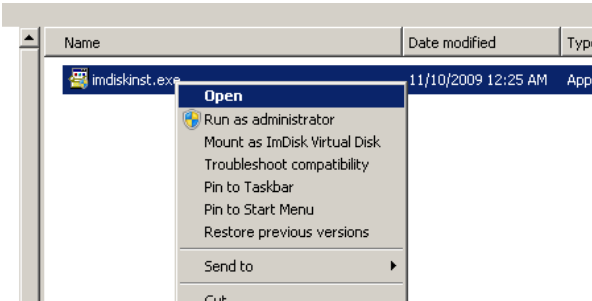
Win7 Control Panel

- Desktop Gadgets
- Display
- Fonts
- ImDisk Virtual Disk Driver
- Keyboard
- Network and Sharing Center











Utility: Very hard to install and to remove; in WIN7 follow HOWTO (next page)
Direct IO (no HDTUNE/HDTACH)
Price: Free/open source

Product name: ImDisk Virtual Disk Driver



1) Explorer → Run as administrator

	HomeGroup Listener	Makes local...	Manual	Local System	
	HomeGroup Provider	Performs n...	Manual	Local Service	
	Human Interface D...	Enables ge...	Manual	Local System	
	IKE and AuthIP IPS...	The IKEEX...	Manual	Local System	
	ImDisk Virtual Disk ...	Helper ser...	Started	Local System	
	Interactive Service...	Enables us...	Manual	Local System	
	Internet Connectio...	Provides n...	Disabled	Local System	
	IP Helper	Provides tu...	Started	Automatic	Local System

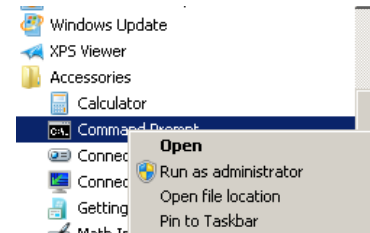
2) System → Start Imdisk Service



3) Control Panel



4) Install certificate

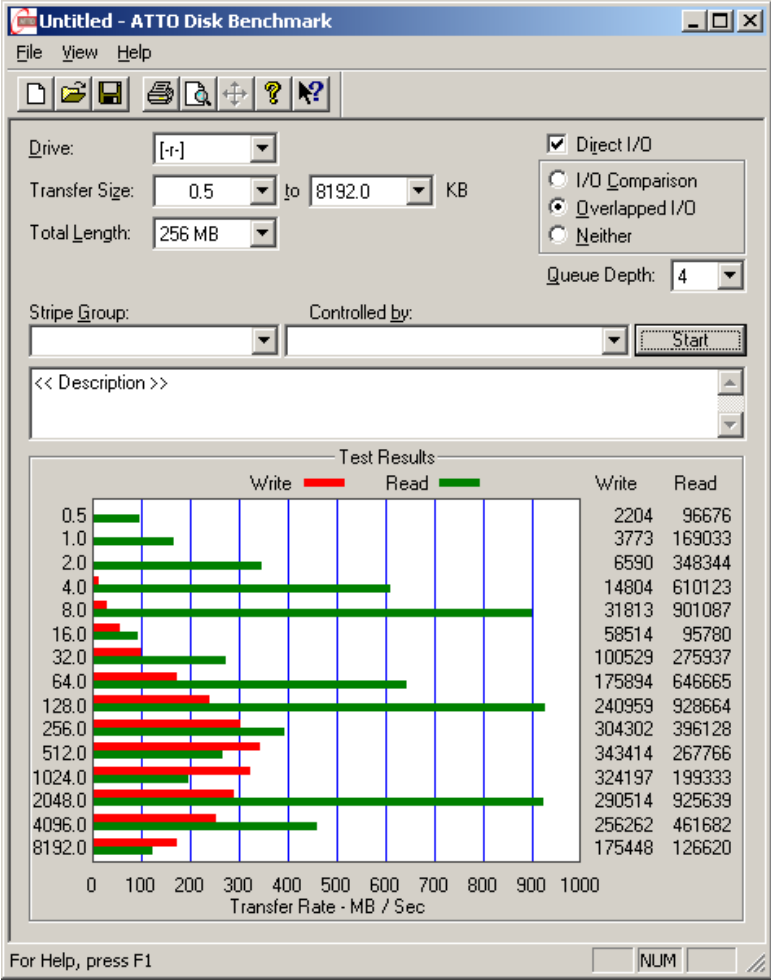
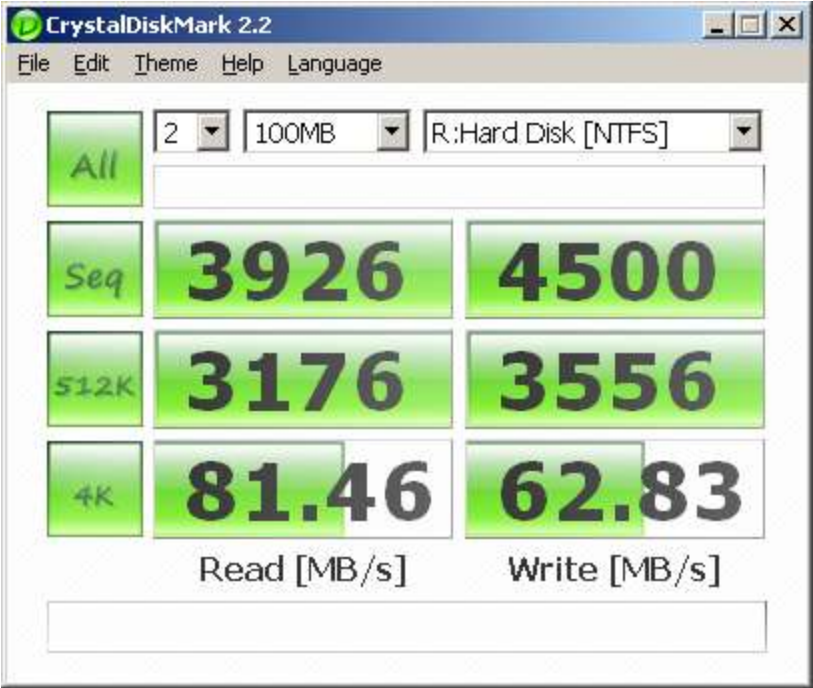


5) Open cmd as Administrator(!)

```
C:\Windows\system32>imdisk.exe -a -t vm -m R: -o rw,fix,hd -s 1440M -p "/fs:ntfs
/q /c /v:RAMDISK /y"
The ImDisk Virtual Disk Driver was loaded into the kernel.
Created device 0: R: -> VM image
The type of the file system is RAW.
The new file system is NTFS.
QuickFormatting 1440M
Creating file system structures.
Format complete.
1.4 GB total disk space.
1.4 GB are available.
C:\Windows\system32>_
```

6) Enter at command line (thanks to dossi@bootland):
imdisk.exe -a -t vm -m R: -o rw,fix,hd -s 1440M -p "/fs:ntfs /q /c /v:RAMDISK /y"

Product name: **ImDisk Virtual Disk Driver**



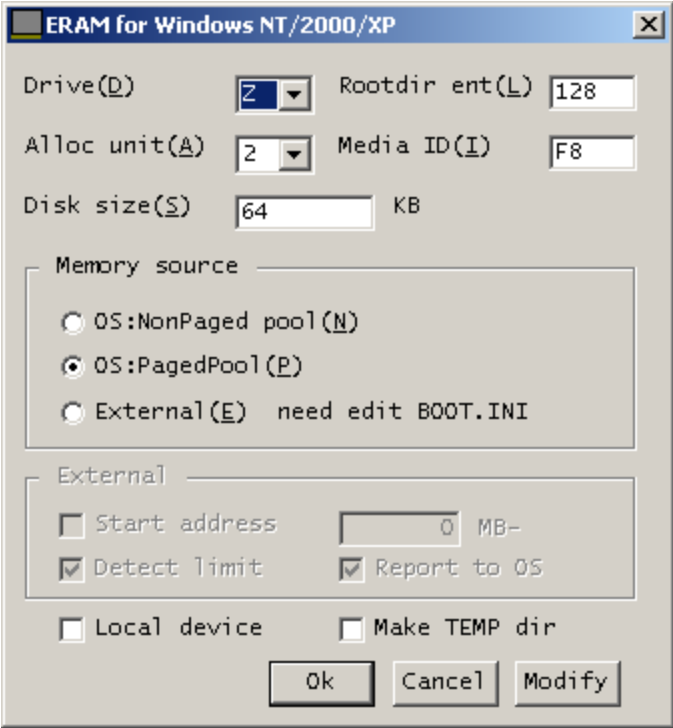
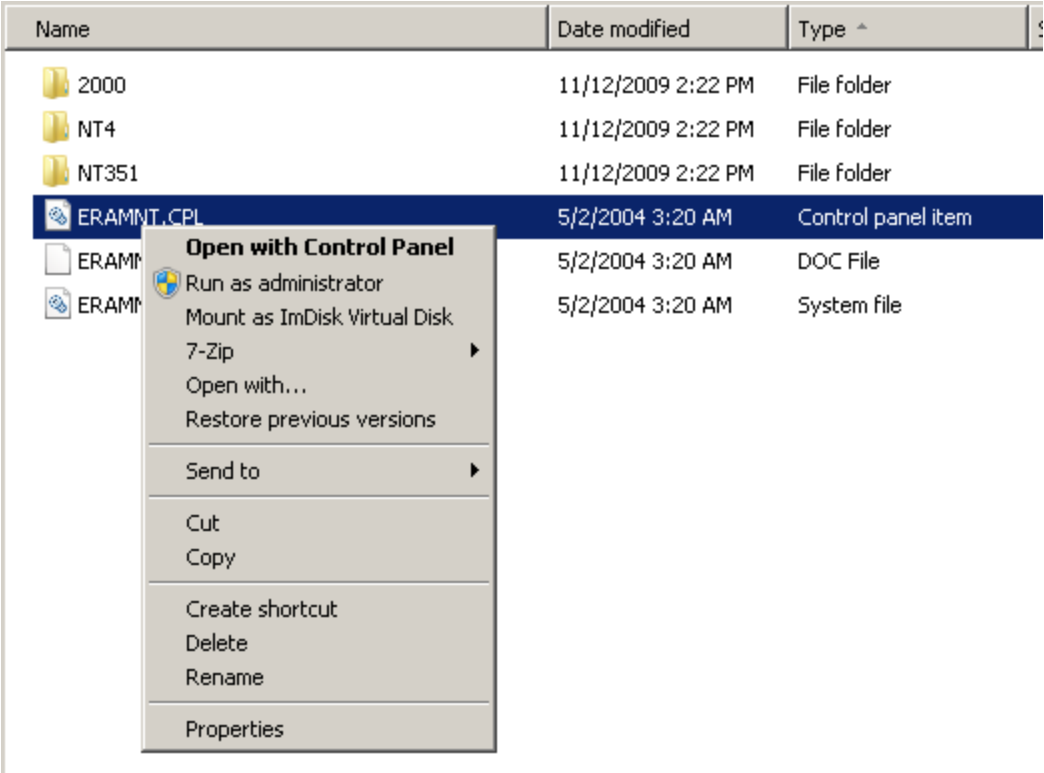
Comment: To remove ImDisk type (use admin command): `imdisk -d -u 0`

Product name: **ERAM for Windows**

Product version: 2.20

Source: <http://hp.vector.co.jp/authors/VA000363/index.htm>

CN= Not available



Utility: No mount under WIN7; requires reboot;

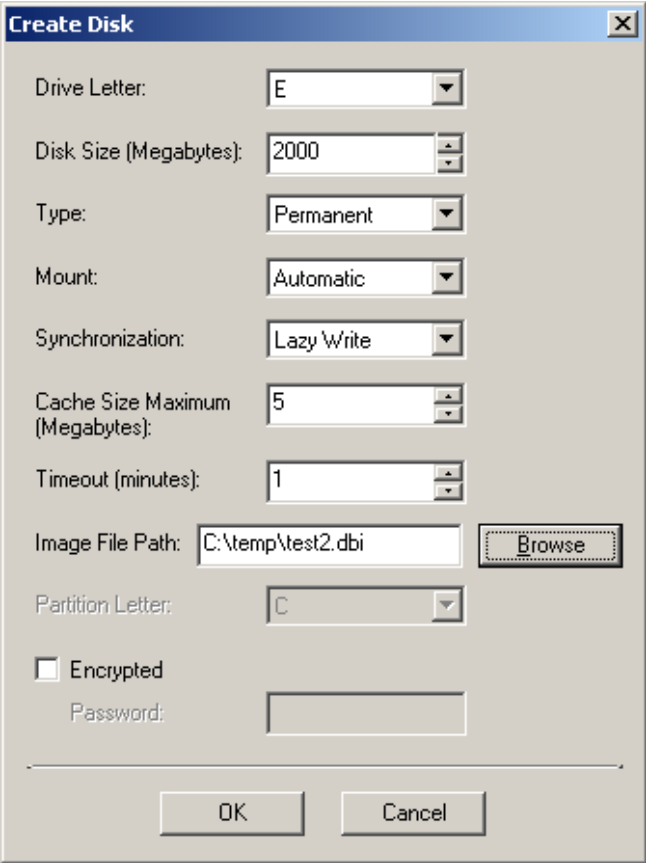
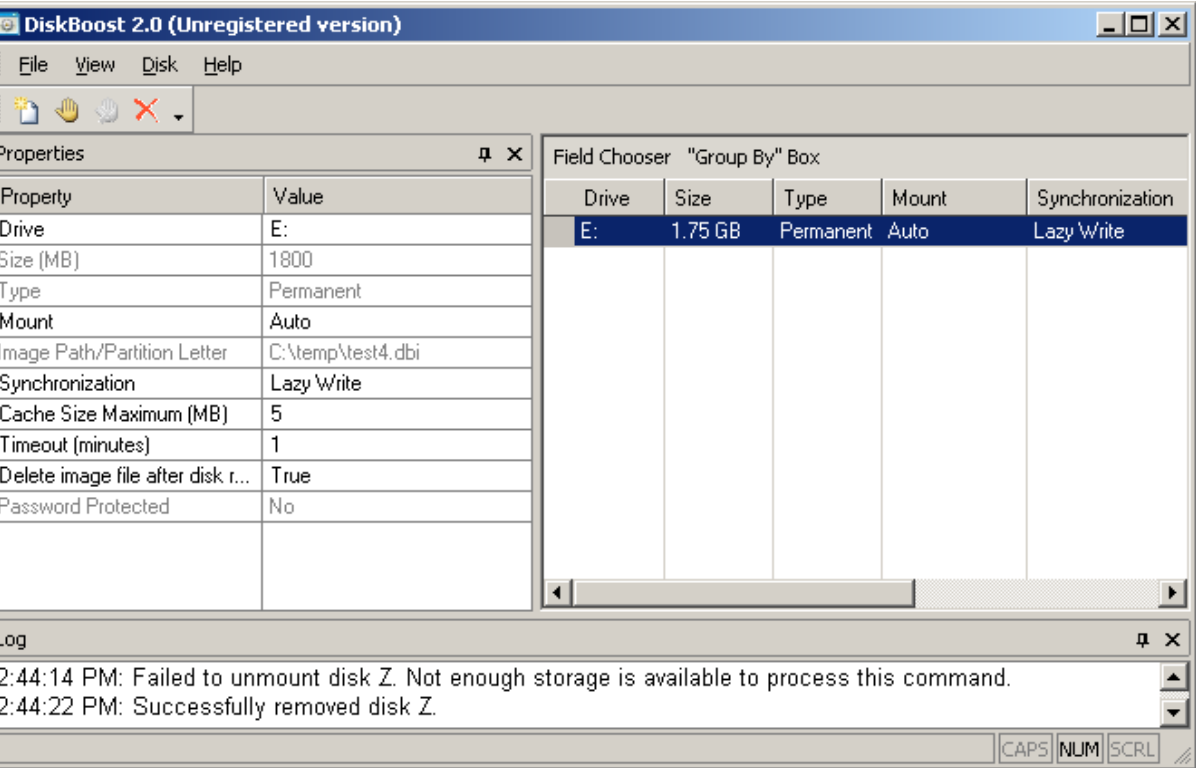
Price: Free/open source

Product name: **Everstrike DiskBoost for Windows Vista/XP/2003/2000**

Product version: 2.0 (trial)

Source: <http://www.everstrike.com/ramdisk>

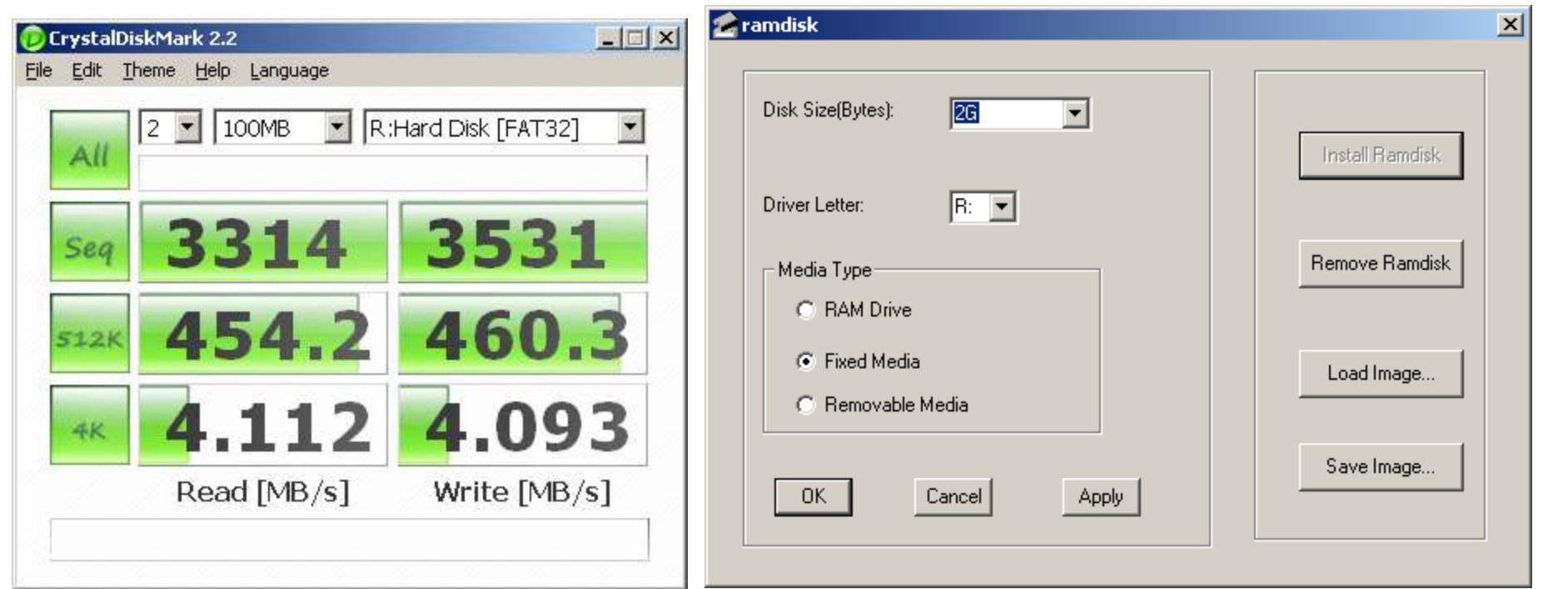
CN= Not available



Utility: Easy to install, current version not written for WIN7 (no drive actually mounted)

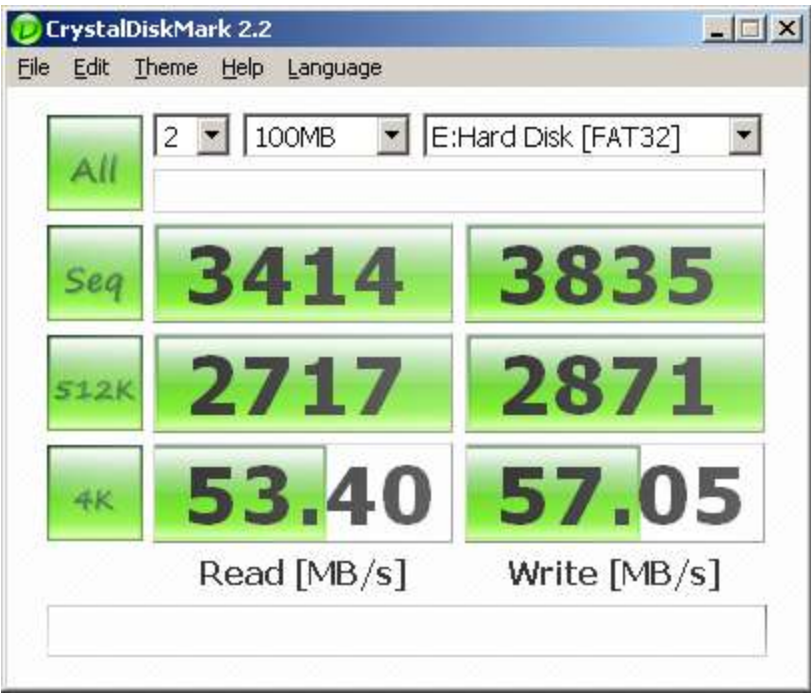
Price: 69 Dollar (business)

Product name: **Gavotte Ramdisk**
Product version: 01.01.2008
Source: <http://www.chweng.idv.tw/swintro/ramdisk.php>



Utility: Easy to install and to use; no certificate; run as Administrator for install
Price: free

Product name: **RamPhantom 7**
Product version: v7 free
Source: <http://www.iodata.jp/>
CN: IO Data



RamPhantom7 32 FREE???

全般 | バージョン情報

RamPhantom7 32 FREEの状態

項目	値
RAMディスク	E:
RAMディスク容	128MB
使用メモリ	??????????
バックアップ	??????????

Windowsの状態

項目	値
????????????(C:)	116956MB
システムメモリ	3583MB
システム空きメモリ	2958MB
OS管理外メモリ	0MB
合計利用可能メモリ	2958MB

◆RamPhantom7 32 製品版なら...

- ・2GBオーバーの大容量RAMディスクがご利用できます。
- ・OS管理外領域メモリを無制限でご利用できます。

RamPhantom7 32 製品版のご購入は「アイオープラザ」で！

?????(P) ?????(D) ご購入はこちら

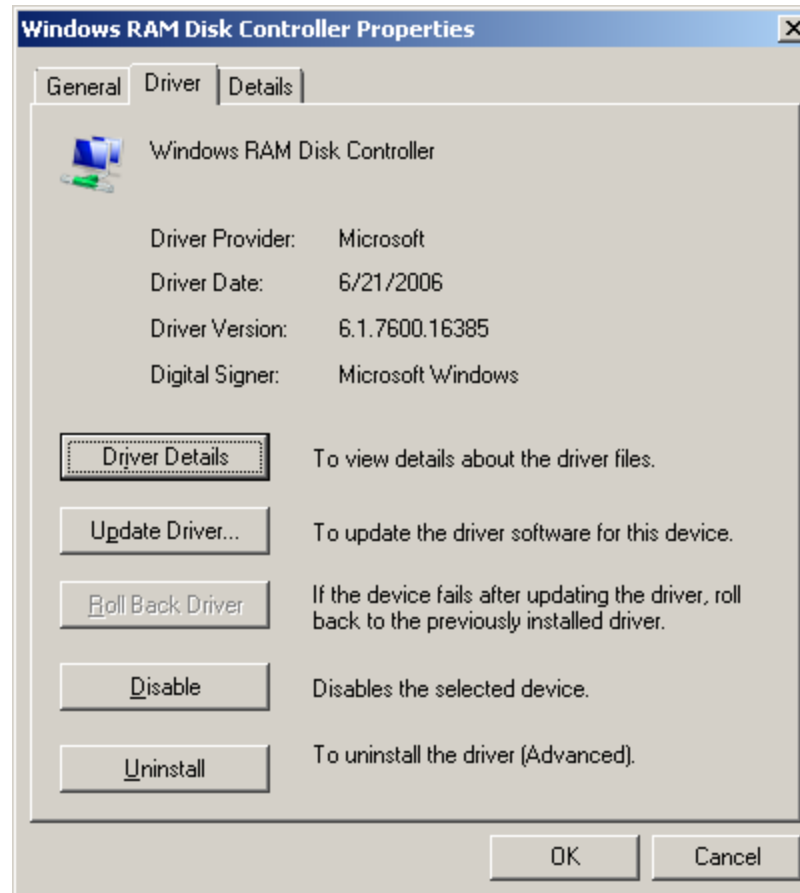
???[C]

Utility: Install ok under WIN7; requires reboot; Free version 256 MB max
Price: 27 Dollar (Enterprise)

Product name: **Microsoft DDK KMDf Ramdisk**

Product version: WIN 2000

Source: <http://msdn.microsoft.com/en-us/library/dd163312.aspx>
<http://support.microsoft.com/kb/257405>

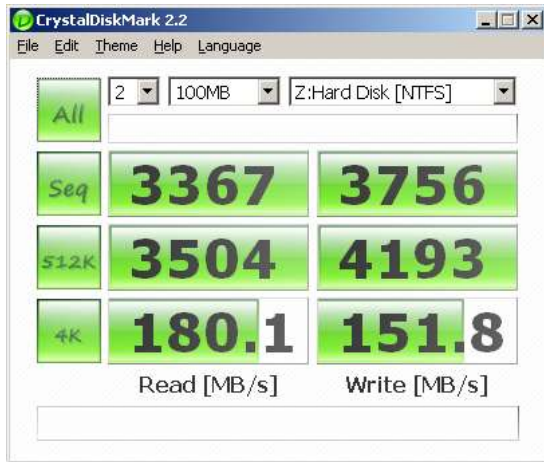


Utility: Ramdisk.sys sample driver for Windows 2000; No mount under WIN7;
in WIN7 use **hdwwiz** (Hardware Wizard)

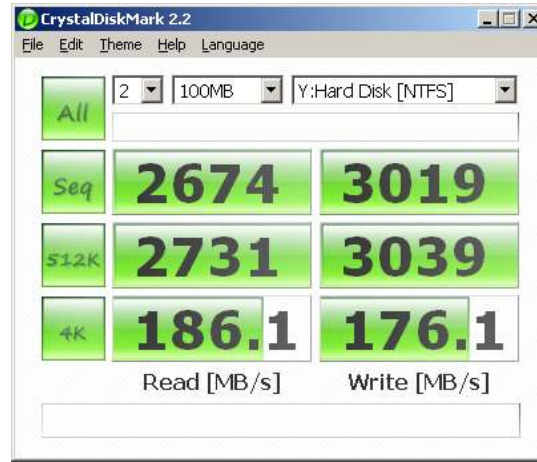
Price: Free/open source

RAID of RAMDisks

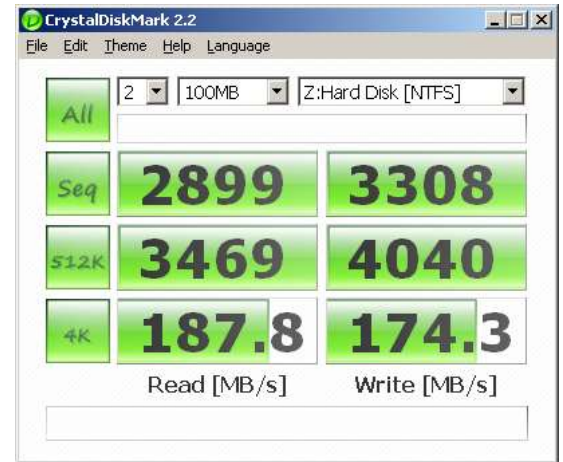
(not recommended on production systems)



Mirrored Disks Windows



Striped Disks Windows



Spanned Disks Windows



Windows Disk Management

Windows Disk management allows striped, spanned, mirrored and RAID5 software disks
Example with SuperSpeed driver (volumes visible in WIN7 Disk Manager)
Software RAID system is slower than single drive alone