SUPERTALENT RAIDDRIVE II

PCI EXPRESS SOLID STATE DRIVE

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1.0 PRODUCT DESCRIPTION

1.1 PRODUCT OVERVIEW

RAIDDrive II is designed to break the throughput bottleneck in the storage subsystem by removing the bandwidth limitation of the SATA bus. The PCIe (Gen.2) x8 interface used by RAIDDrive II supports 4GB/sec bandwidth, more than 10 times that of the SATA-II 3Gbps bus, and 5 times greater than the SATA-III bus.

Using the latest NAND flash memory and up-to-date RAID controller, RAIDDrive II is able to support Max. Read speeds of up to 2.4GB/sec. A turbocharged cache system with up to 1GB of DRAM cache enables Max. Write speeds as fast as 2.8GB/sec. RAIDDrive II, which houses eight discrete SATA SSDs, comes in a custom formfactor measuring 231.5 x 94 x 20.6 mm.

This small formfactor now can be fitted into the 1U/2U/3U storage server with the RISER card, which is one of the great advantages over the previous generation RAIDDrive I.

1.2 TARGET APPLICATIONS

- Audio/Video Streaming Server Cache storage
- Data Center Server Cache storage
- Web server Cache storage
- Supercomputing
- Near-line backup
- Security systems

1.3 PRODUCT FEATURES

- PCIe Gen.2 x8 lane host interface
- Max Speed: Read 2.4GB/s, Write 2.8GB/s
- Capacities up to 2TB
- MLC NAND Flash
- Minimum 10 year data retention
- Built in wear leveling algorithm and error detection and correction
- 100% tested HW and SW
- Designed and Manufactured in USA

2.0 RAIDDRIVER ARCHITECTURE

2.1 RAIDDRIVE ARCHITECTURE

- LSI 2108 ROC Processor for RAID core and SAS microcode
- 1GB On-board DDR2 SDRAM cache with ECC protection
- Write back cache support
- Supports up to 2TB capacity
- NVRAM for RAID configuration & transaction log
- Redundant flash image for adapter availability

2.2 RAID FEATURES

- User configurable RAID level 0 or 5.
- Instant Availability and background initialization
- Field-upgradeable firmware in flash ROM

2.3 MONITORS AND INDICATORS

- System status indication through global HDD activity/fault connector, alarm buzzer
- SMTP support for email notification
- SNMP support for remote manager
- Enclosure management (SES2, SMP and SGPIO) ready

2.4 OPERATING SYSTEM SUPPORT

- Windows® 2000/XP/Server2003/Vista/Win7/2008
- Linux
- VMWare
- Mac OS X 10.x (EFI Bios Support)
- FreeBSD
- Solaris® 10 x86/x86_64
- Others. (Contact SuperTalent Sales)

3.0 PRODUCT ORDERING PART NUMBERS

3.1 ORDERING PART STRUCTURE

RAIDDrive II is available in capacities up to 2TB, in RAID 0 or RAID 5 configurations with MLC NAND flash. (For SLC solution, please contact our Sales) Table 1 shows currently available part numbers and their specifics

Prefix R2S	RAID Level X	Density XXX	Version Number X
STT RAIDDrive II	0-RAID 0	480-480GB	1-Version 1 (Now)
	5-RAID 5	1T-1TB	2-Version 2 (for Future use)
		2T-2TB	

Table 1: Ordering Part Structure

3.2 VALID ORDERING PART NUMBERS

Part Number	Capacity	RAID Level	# of Enclosure	Media Storage
R2S0(5)4801	480GB (420GB)	0 (5)	8	MLC
R2S0(5)1T1	1TB (840GB)	0 (5)	8	MLC
R2S0(5)2T1	2TB (1.6TB)	0 (5)	8	MLC
R2S0(5)480E (for Macs)	480GB (420GB)	0 (5)	8	MLC
R2S0(5)1TE (for Macs)	1TB (840GB)	0 (5)	8	MLC
R2S0(5)2TE (for Macs)	2TB (1.6TB)	0 (5)	8	MLC

Table 2: Valid Ordering Part Numbers and Descriptions. (*Capacity may differ from User capacity when it is formatted)

4.0 PHYSICAL SPECIFICATIONS

4.1 RAIDDRIVE II BOARD
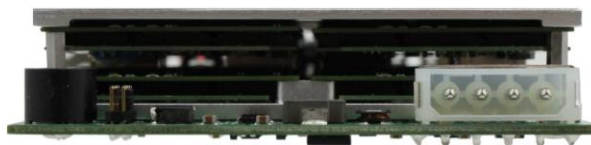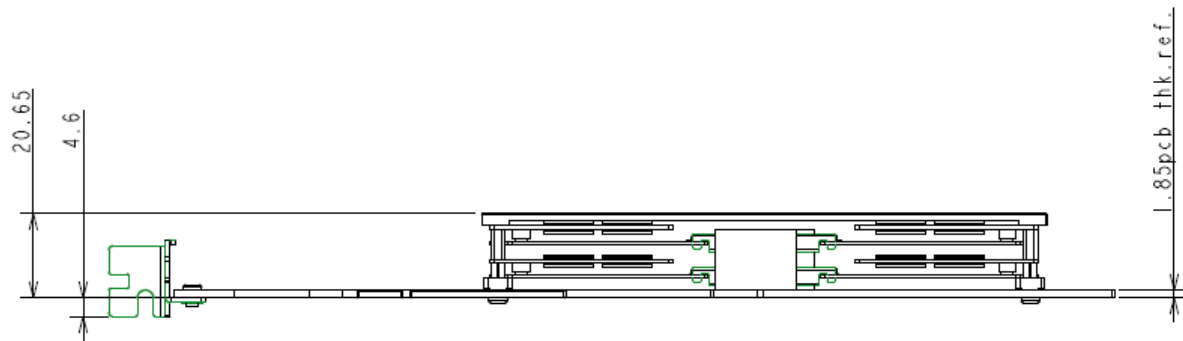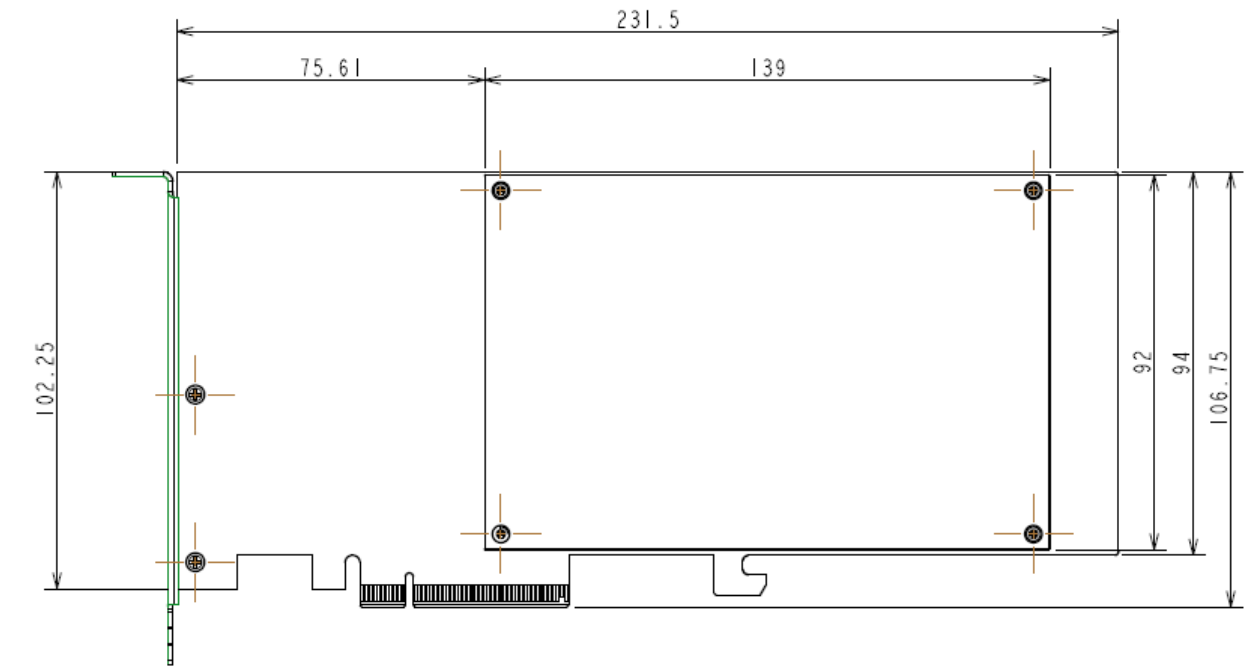
View from the Right hand side

View from the Bottom

View from the Top

4.2 DIMENSION

RAIDDrive II: 231.5 x 94 x 20.6 mm

5.0 PERFORMANCE SPECIFICATIONS (EXAMPLE – 1TB RAIDDRIVE II)

Interface: PCIe (Generation 2) x8

Access Time: 0.1 ms

Max. Speed: READ-2.4GB/sec, WRITE-2.8GB/sec

5.1 PERFORMANCE TEST SYSTEM CONFIGURATIONS

The following Performance Benchmark is showing the most popular configuration of the RAIDDRIVE II. It is 1TB storage and its part number is R2S01T1.

Test Platform	
1. Mother Board:	ASUS P6X58D PREMIUM
2. CPU:	Intel i7 975 @3.33GHz
3. Memory:	DDR3 2000 6GB (3 channel)
4. OS:	Windows 7 ULTIMATE 64bit
5. OS DRIVE:	SuperTalent ULTRA SSD MT 240GB
6. North Bridge:	INTEL X58
7. South Bridge:	INTEL ICH10R
8. Bios SATA Mode:	AHCI

5.2 BENCHMARKING SOFTWARE

- ATTO Disk Benchmark 2.34
- PC Mark Vantage Pro 64-bit
- Crystal Disk Mark 3.0
- HD Tune Pro 3.50
- AS SSD Benchmark 1.3.3626
- IO Meter 2008.16.18-RC2

5.3 DETAIL PERFORMACE TEST RESULTS

5.3.1 ATTO DISK BENCHMARK 2.46

The following screenshot show the ATTO disk benchmark with the Queue Depth of 10.

This ATTO test only shows the Sequential READ/WRITE speed.
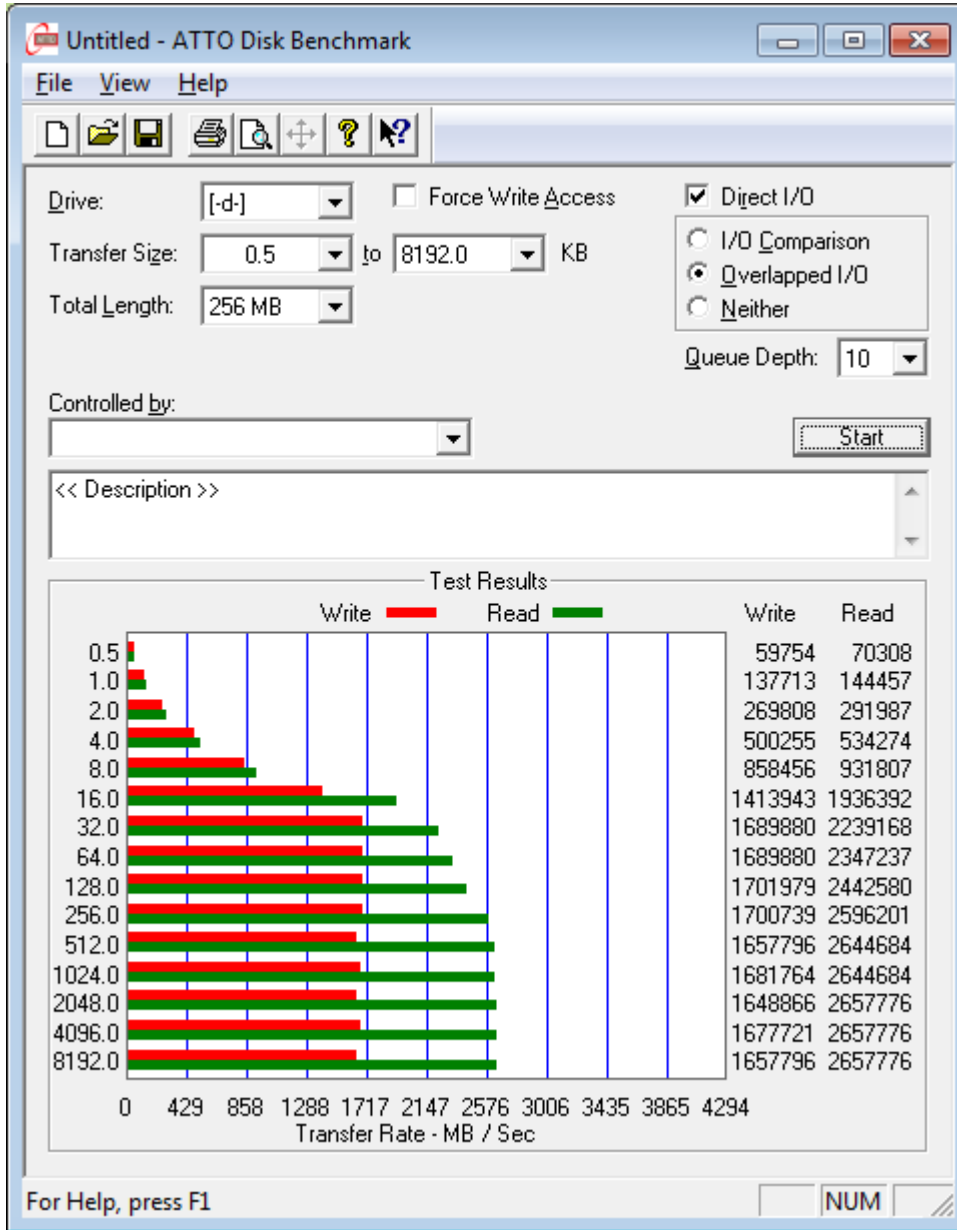
Figure 1: ATTO Disk Benchmark Scores

5.3.2 PC MARK VANTAGE

The RAIDDrive posted excellent scores in Media Center, but relatively slow scores in other applications because they are mostly using small file application except Video Editing.
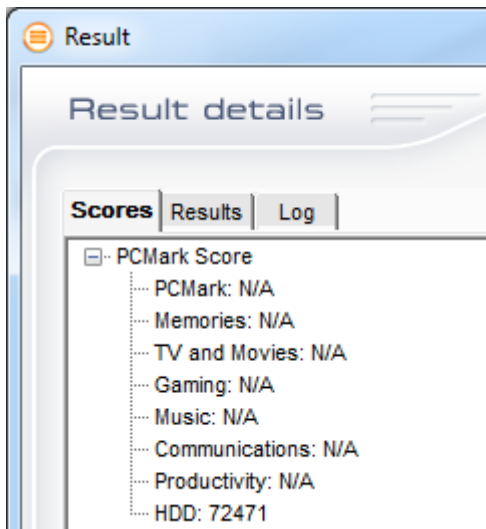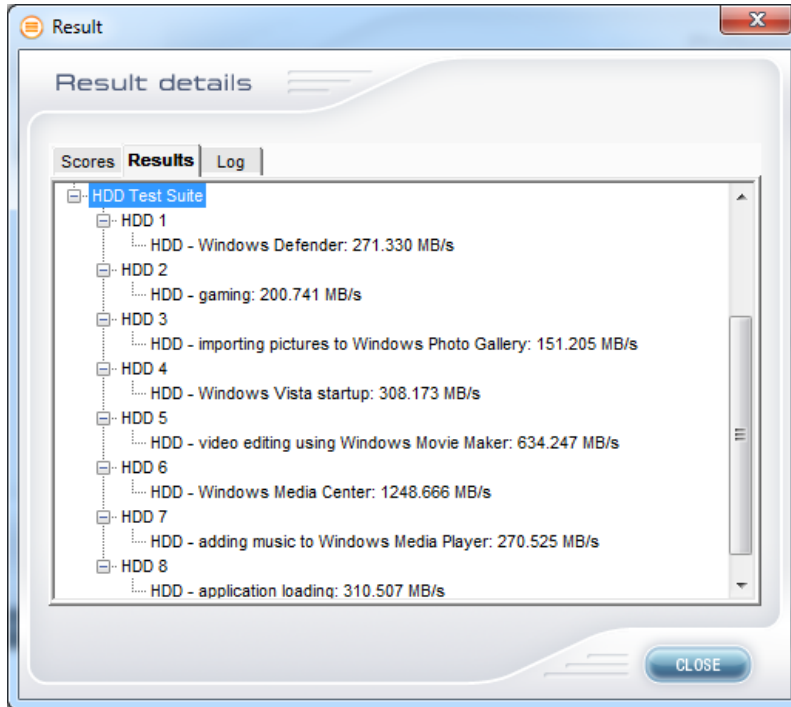
Figure 2: PC Mark Vantage Scores

5.3.3 CRYSTAL DISK MARK 3.0

In Crystal DiskMark tested for five loops with 4000MB, 1000MB and 100MB data sizes.
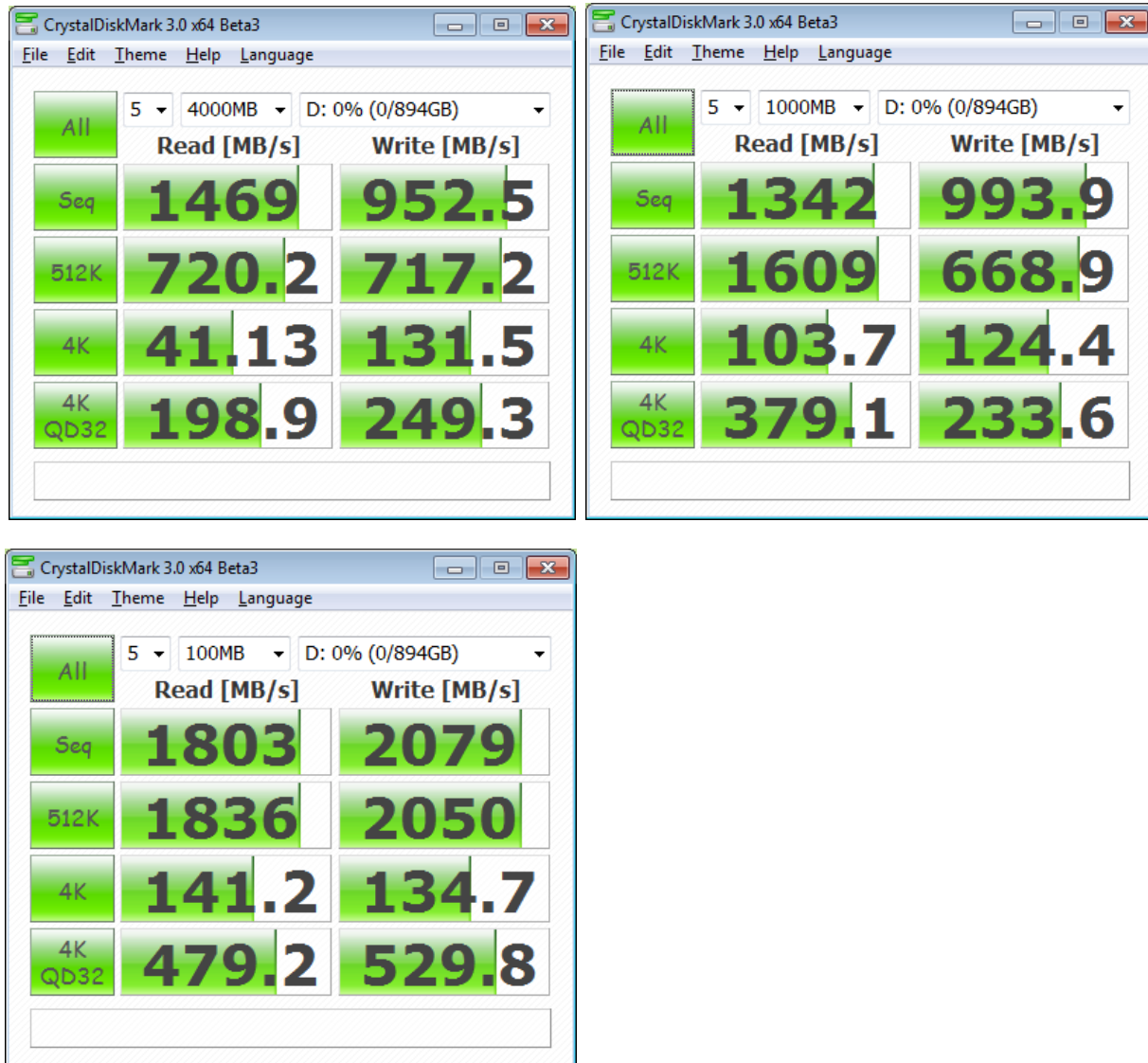
Figure 3: Crystal DiskMark Scores

5.3.4 HD TUNE PRO 3.50

HD TUNE showed average read speeds of around 1,600MB/sec and average write speeds of around 2,000MB/sec, This HD TUNE benchmark shows Sequential speed and the next page shows the random access on READ and WRITE.
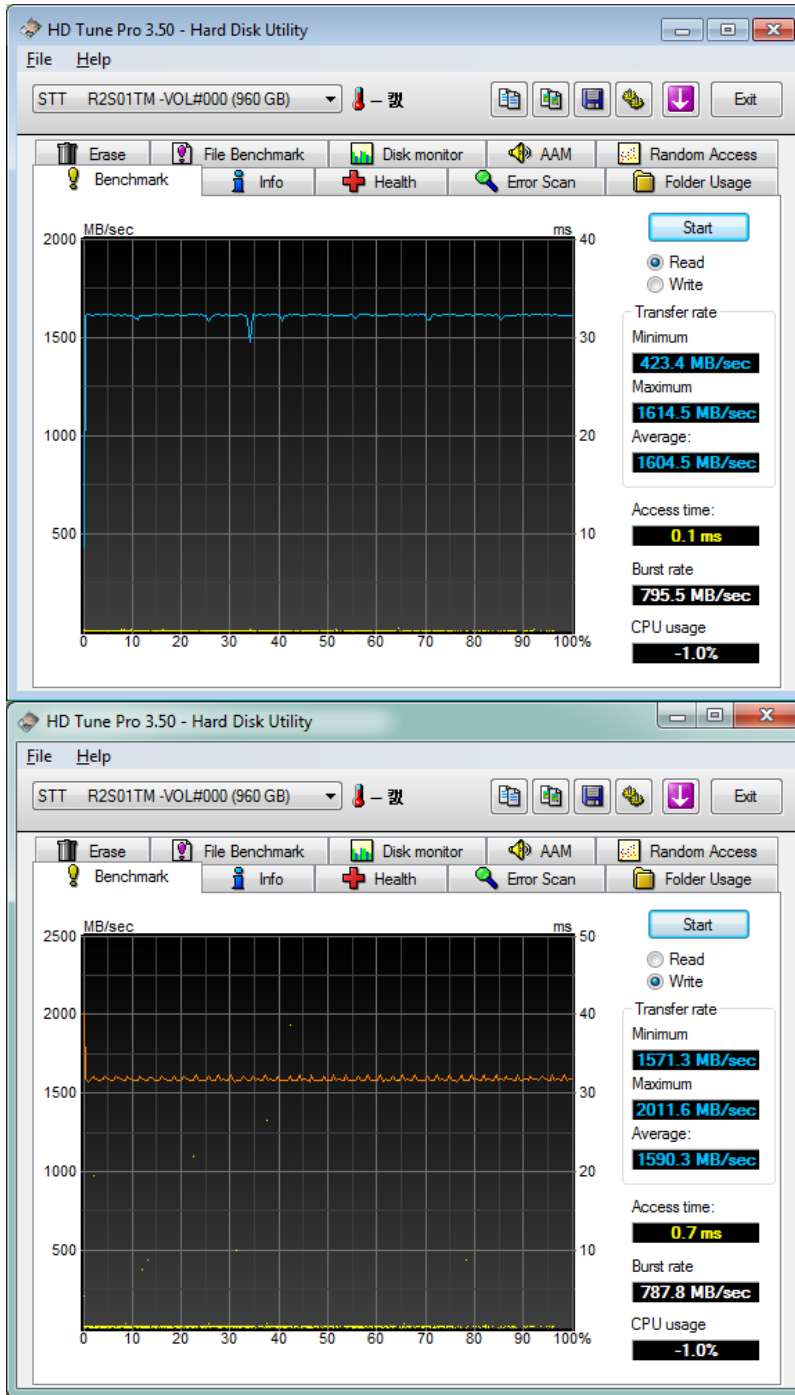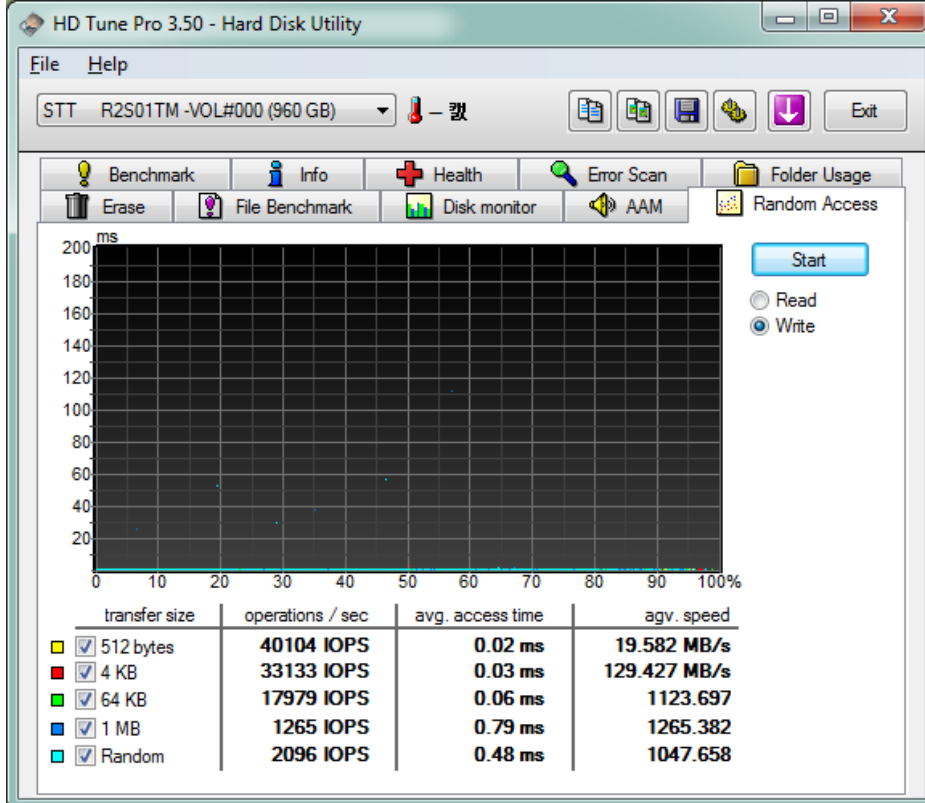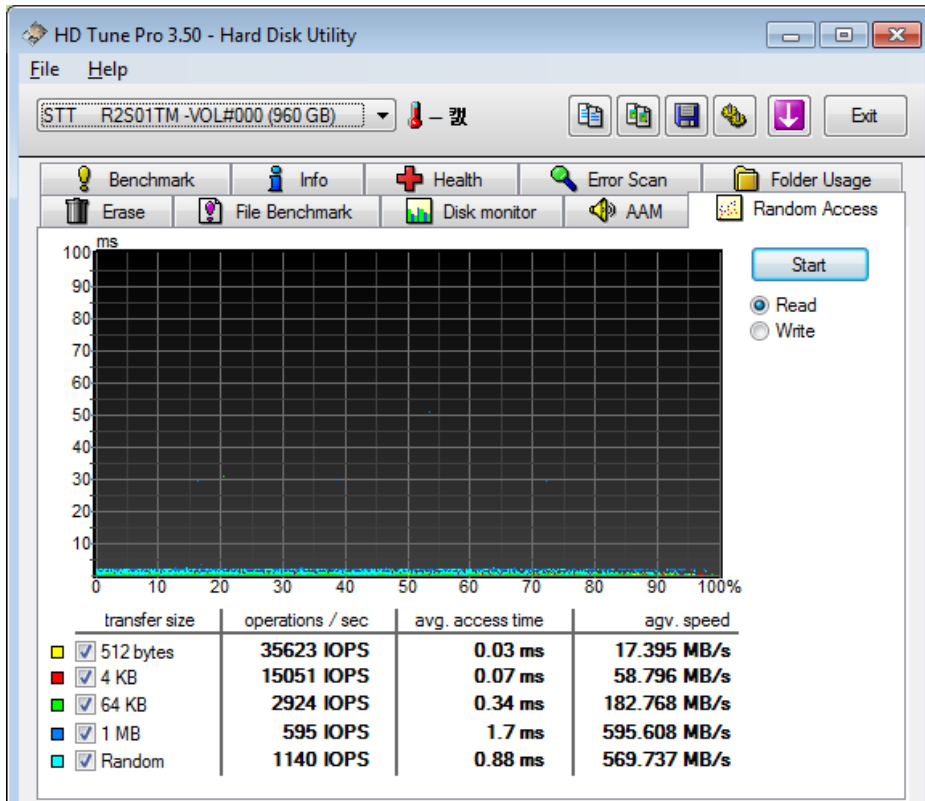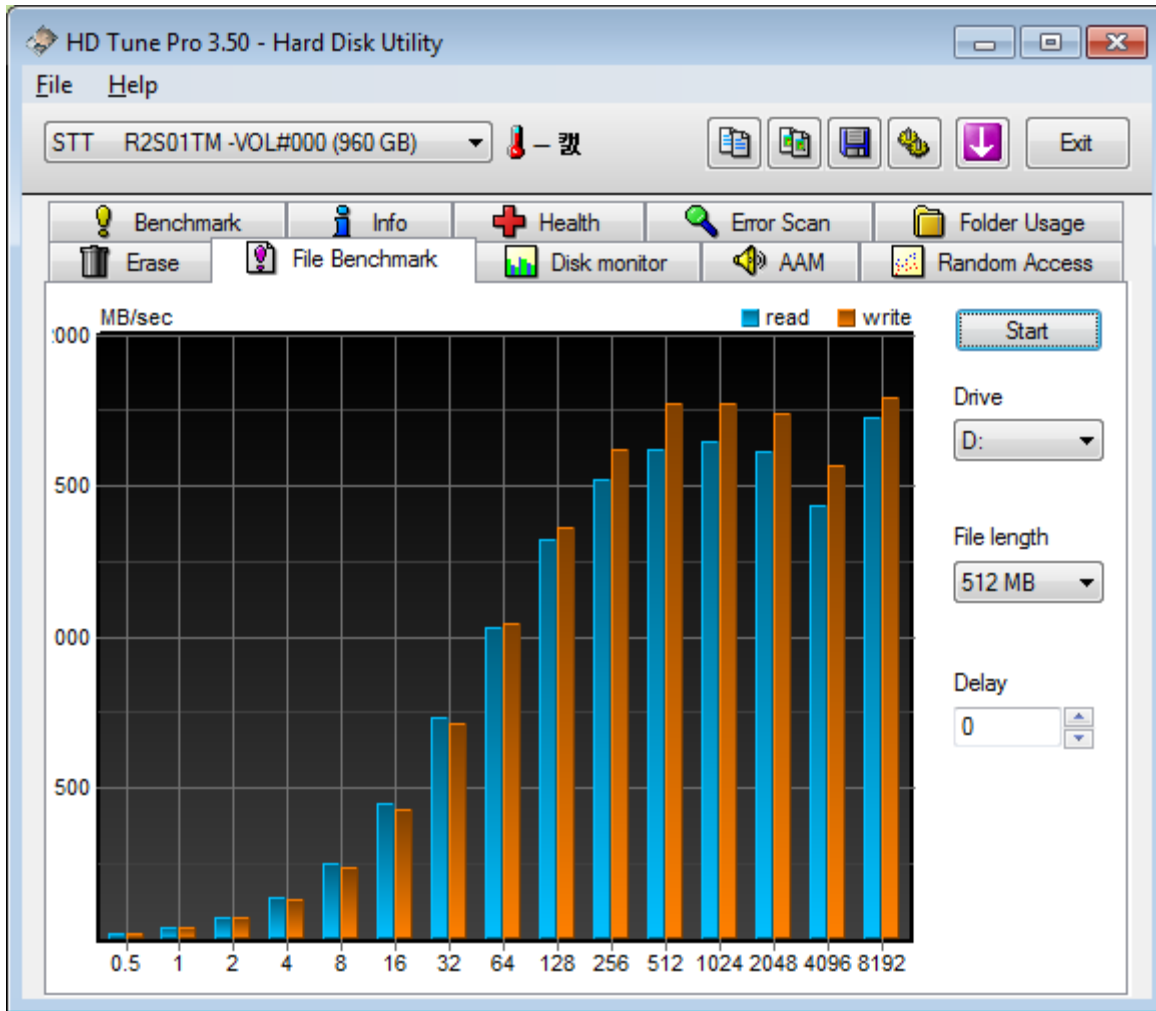
Figure 4: HD TUNE PRO 3.50 Scores

5.3.5 AS SSD BENCHMARK 1.3.3626

The AS SSD Benchmark is almost same as the mix of Crystal DiskMark and PC Mark Vantage.

Figure 5: AS SSD Scores

5.3.6 IO METER

IO Meter tests the RAIDDrive's transaction speed in I/O operations per second. We ran this test with queue depth settings of 1 ~ 64. The larger queue depth tended to offer the highest transaction speeds. We specially ran this program for 50 minutes per each thread at the Steady State SSD status.

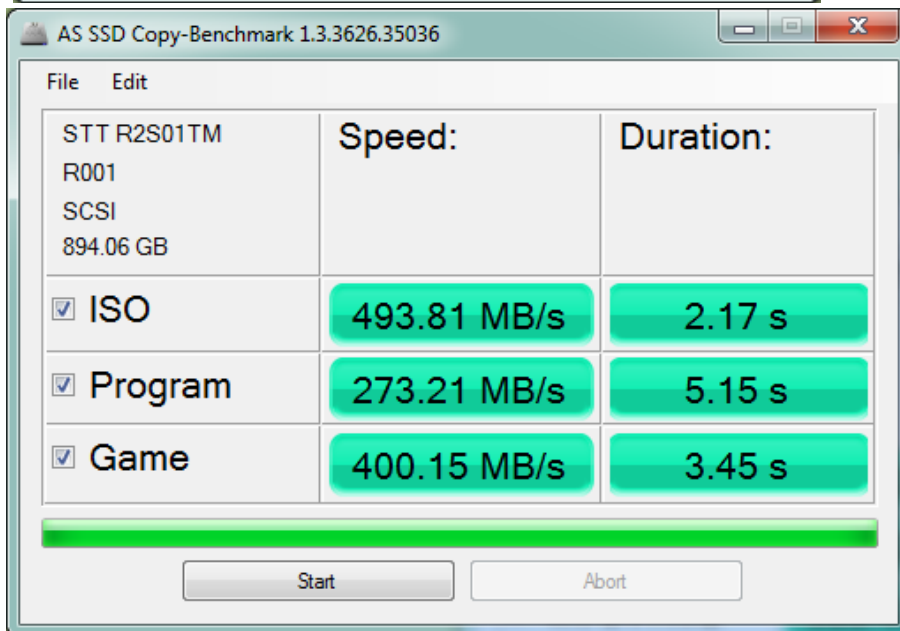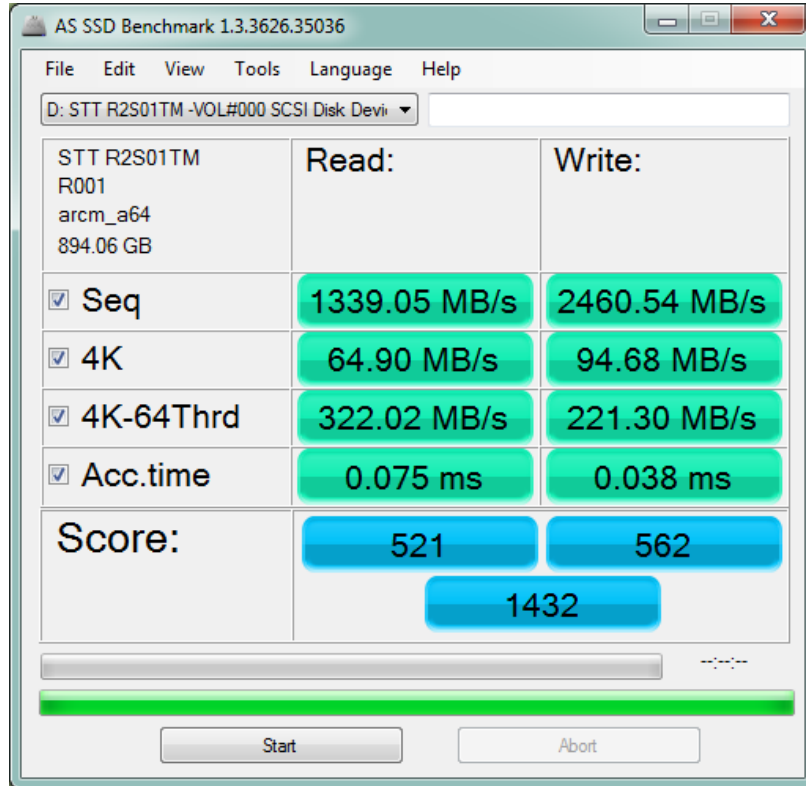| Test SPEC	IOps							MBps						
	QD=1	QD=2	QD=4	QD=8	QD=16	QD=32	QD=64	QD=1	QD=2	QD=4	QD=8	QD=16	QD=32	QD=64
128KB-RR	10,642	17,300	17,400	17,406	17,364	17,272	17,267	1,330	2,162	2,175	2,176	2,170	2,159	2,158
128KB-RW	10,250	19,828	20,745	20,758	20,738	20,579	20,571	1,281	2,479	2,593	2,595	2,592	2,572	2,571
128KB-SR	11,095	19,789	19,836	19,913	19,918	19,919	19,922	1,387	2,474	2,479	2,489	2,490	2,490	2,490
128KB-SW	10,261	20,374	22,419	22,460	22,464	22,467	22,467	1,283	2,547	2,802	2,808	2,808	2,808	2,808
4KB-RR	35,013	85,603	132,609	132,717	132,673	132,880	126,301	137	334	518	518	518	519	493
4KB-RW	33,034	87,279	119,161	117,774	118,205	117,944	118,375	129	341	465	460	462	461	462
4KB-SR	28,179	49,262	54,956	57,297	58,461	64,528	61,957	110	192	215	224	228	252	242
4KB-SW	33,177	88,179	116,929	115,972	116,824	116,204	118,692	130	344	457	453	456	454	464
64KB-RW	15,723	31,215	41,614	41,721	41,692	41,408	41,382	983	1,951	2,601	2,608	2,606	2,588	2,586
8KB-RW	29,850	80,812	109,962	110,233	110,441	109,921	110,523	233	631	859	861	863	859	863
Database	29,939	61,591	78,587	82,650	90,408	95,186	82,988	234	481	614	646	706	744	648
File Server	28,625	52,355	68,413	80,922	88,613	78,802	76,357	310	566	740	876	959	853	826
Web Server	28,904	54,919	74,057	90,284	100,279	103,360	87,376	442	840	1,133	1,381	1,534	1,581	1,336
Workstation	31,026	67,221	87,045	93,647	102,770	93,758	88,203	242	525	680	732	803	732	689
64KB Stream Read	17,134	33,458	39,126	39,120	39,155	39,148	39,146	1,071	2,091	2,445	2,445	2,447	2,447	2,447
64KB Stream Write	15,904	32,059	45,029	45,136	45,096	45,108	45,121	994	2,004	2,814	2,821	2,819	2,819	2,820
128KB Stream Read	11,049	19,802	19,857	19,930	19,935	19,938	19,929	1,381	2,475	2,482	2,491	2,492	2,492	2,491
128KB Stream Write	10,288	20,471	22,440	22,486	22,495	22,503	22,500	1,286	2,559	2,805	2,811	2,812	2,813	2,813
256KB Stream Read	6,373	10,017	10,037	10,041	10,042	10,043	10,044	1,593	2,504	2,509	2,510	2,511	2,511	2,511
256KB Stream Write	6,114	11,401	11,462	11,463	11,465	11,463	11,465	1,528	2,850	2,865	2,866	2,866	2,866	2,866
512KB Stream Read	3,466	4,556	4,559	4,563	4,557	4,556	4,556	1,733	2,278	2,280	2,282	2,278	2,278	2,278
512KB Stream Write	3,404	5,190	5,198	5,199	5,174	5,174	5,173	1,702	2,595	2,599	2,599	2,587	2,587	2,587

Figure 6: IO Meter Scores

6.0 ELECTRICAL SPECIFICATIONS

6.1 POWER SUPPLY REQUIREMENTS

Power Rail	Voltage Tolerance	Supply Current	Capacitive Load
+3.3V	Max +/-9%	Max 3.0A	Max 1000µF
+12V	Max +/-8%	Max 2.1A	Max 1000µF
+3.3Vaux	Max +/-9%	Wakeup Enabled-Max 375mA Non-wakeup Enabled-Max 20mA	Max 150µF

7.0 ENVIRONMENTAL SPECIFICATIONS

Operating Temperature: Commercial Temp Range Only

- Commercial +0°C to +70°C

Storage Temperature: -40°C to +70°C

Humidity: 5% to ~ 90% RH

8.0 QUALITY AND RELIABILITY SPECIFICATIONS

Data Retention: Maximum of 10 years

Wear Leveling: Dynamic and static wear-leveling

Bad Block Management: Drive will self identify bad blocks and remap physical to logical addresses to avoid bad blocks.

ECC/EDC (Error Correction Code/Error Detection Code): Built in error detection and correction will correct physical bit errors in NAND.

MTBF: >1,500,000 hours

Power Cycle: TBD

9.0 COMPLIANCE SPECIFICATIONS

All RAIDDrive II are compliant with the following standards and regulations:

- RoHS

10.0 PIN DESCRIPTIONS

10.1 RAIDDRIVE PCIE PIN ASSIGNMENTS

Pin	Side B		Side A	
	Name	Description	Name	Description
1	+12V	12V Power	PRSNT1#	Hot-Plug presence detect
2	+12V	12V Power	+12V	12V Power
3	RSVD	Reserved	+12V	12V Power
4	GND	Ground	GND	Ground
5	SMCLK	SMBus (System Management Bus) Clock	JTAG2	TCK (Test Clock), clock input for JTAG interface
6	SMDAT	SMBus (System Management Bus) Data	JTAG3	TDI (Test Data Input)
7	GND	Ground	JTAG4	TDO (Test Data Output)
8	+3.3V	3.3V Power	JTAG5	TMS (Test Mode Select)
9	JTAG1	TRST# (Test Reset) resets the JTAG interface	+3.3V	3.3V power
10	3.3Vaux	3.3V auxiliary power	+3.3V	3.3V power
11	WAKE#	Signal for Link reactivation	PERST#	Fundamental reset
		Mechanical Key		
12	RSVD	Reserved	GND	Ground
13	GND	Ground	REFCLK+	Reference clock (differential pair)
14	PETp0	Transmitter differential pair, Lane 0	REFCLK-	
15	PETn0		GND	Ground
16	GND	Ground	PERp0	Receiver differential pair, Lane 0
17	PRSNT2#	Hot-Plug presence detect	PERn0	
18	GND	Ground	GND	Ground
		End of the x1 connector		
19	PETp1	Transmitter differential pair, Lane 1	RSVD	Reserved
20	PETn1		GND	Ground
21	GND	Ground	PERp1	Receiver differential pair, Lane 1
22	GND	Ground	PERn1	
23	PETp2	Transmitter differential pair, Lane 2	GND	Ground
24	PETn2		GND	Ground
25	GND	Ground	PERp2	Receiver differential pair,

Pin	Side B		Side A	
	Name	Description	Name	Description
26	GND	Ground	PERn2	Lane 2
27	PETp3	Transmitter differential pair, Lane 3	GND	Ground
28	PETn3		GND	Ground
29	GND	Ground	PERp3	Receiver differential pair, Lane 3
30	RSVD	Reserved	PERn3	
31	PRSNT2#	Hot-Plug presence detect	GND	Ground
32	GND	Ground	RSVD	Reserved

<div align="center">End of the x4 connector</div>

Pin	Side B		Side A	
33	PETp4	Transmitter differential pair, Lane 4	RSVD	Reserved
34	PETn4		GND	Ground
35	GND	Ground	PERp4	Receiver differential pair, Lane 4
36	GND	Ground	PERn4	
37	PETp5	Transmitter differential pair, Lane 5	GND	Ground
38	PETn5		GND	Ground
39	GND	Ground	PERp5	Receiver differential pair, Lane 5
40	GND	Ground	PERn5	
41	PETp6	Transmitter differential pair, Lane 6	GND	Ground
42	PETn6		GND	Ground
43	GND	Ground	PERp6	Receiver differential pair, Lane 6
44	GND	Ground	PERn6	
45	PETp7	Transmitter differential pair, Lane 7	GND	Ground
46	PETn7		GND	Ground
47	GND	Ground	PERp7	Receiver differential pair, Lane 7
48	PRSNT2#	Hot-Plug presence detect	PERn7	
49	GND	Ground	GND	Ground

<div align="center">End of the x8 connector</div>

Table 3: Data Pin Signal Assignment

11.0 INSTALLATION

BEFORE YOU BEGIN INSTALLATION

Thanks for purchasing the RAIDDRIVE II as your data storage solution. The following shows you simple step-by-step instructions for installing and configuring the RAIDDRIVE II.

PACKAGE CONTENTS

1. If your package is missing any of the items listed below, please contact your dealer before you install.
2. The RAIDDRIVE II box includes the following items.
   a. RAIDDRIVE II in an ESD-protective bag.
   b. CD – containing drivers, user's manual, other information for drive.
   c. You can download the latest driver from Super Talent website/FORUM.
      i. http://www.supertalent.com/home/forum/viewforum.php?f=52

TOOLS REQUIRED

An ESD grounding strap or mat is required. You may also require some standard tools to open your system's case.

INSTALLATION (PLEASE REFER TO THE USER'S MANUAL FOR THE DETAILS)

1. Unpack the RAIDDRIVE II box
2. Power PC/Server off
3. Install the RAIDDRIVE II (PCIe x8 slot should be available)
   a. Plug the 4pin power cable into the RAIDDRIVE II. (*optional)
4. Power up the system
5. Go into the RAIDDRIVE II BIOS (*press F6 key)
   a. Make sure it is configured right.
   b. RAID0 or RAID5, Stripe size, …
   c. See the "How to set up the RAIDDRIVE" pdf file in a CD for the details.
6. After the completion of OS, install the driver.
   a. See the manual for the details.
7. After the completion of the driver installation, please restart the system.

FOR MORE INFORMATION

For Technical Support:

If additional support is needed, please visit the Super Talent Web site at www.supertalent.com for the following topics:

- **Warranty Services:** Includes the warranty service policy and the RMA request forms.
- **Technical Information:** Includes product data sheets and various SSD whitepapers.
- **Tools Section:** Includes frequently asked questions (FAQs).

For More Information or Further Technical Support Please Contact:

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OEM Sales: OEMSales@supertalent.com

CHANGE RECORD

Version	Release Date	Changes
1.0	July 1, 2011	Initial Release

Table 4: Change Record