

SUPERTALENT RAIDDRIVE II PLUS

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 13 times that of the SATA-II 3Gbps bus, and 6 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 speed of up to 2.6GB/sec. A turbocharged cache system with up to 1GB of DRAM cache enables Max. Write speeds as fast as 3.2GB/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 GS.

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 2.6GB/s, Write 3.2GB/s
- Capacities up to 2TB
- MLC Sync. NAND Flash
- Up to 10 year data retention
- Built in wear leveling algorithm and error detection and correction
- 100% tested HW and SW
- Designed and Assembled in USA. Final tested 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, 5, 6, 10, ...
- 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 Plus 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 FP8	Density XXX	Technology XX	Form & Case Factor XX
↓	↓	↓	↓
PCIe x 8 RAIDDRIVE II	480 – 480GB	L4 – LSI	R0 – Raid Level 0
	1T0 – 1.0TB	SATA 6G	R5 – Raid Level 5
	2T0 – 2.0TB		

Table 1: Ordering Part Structure

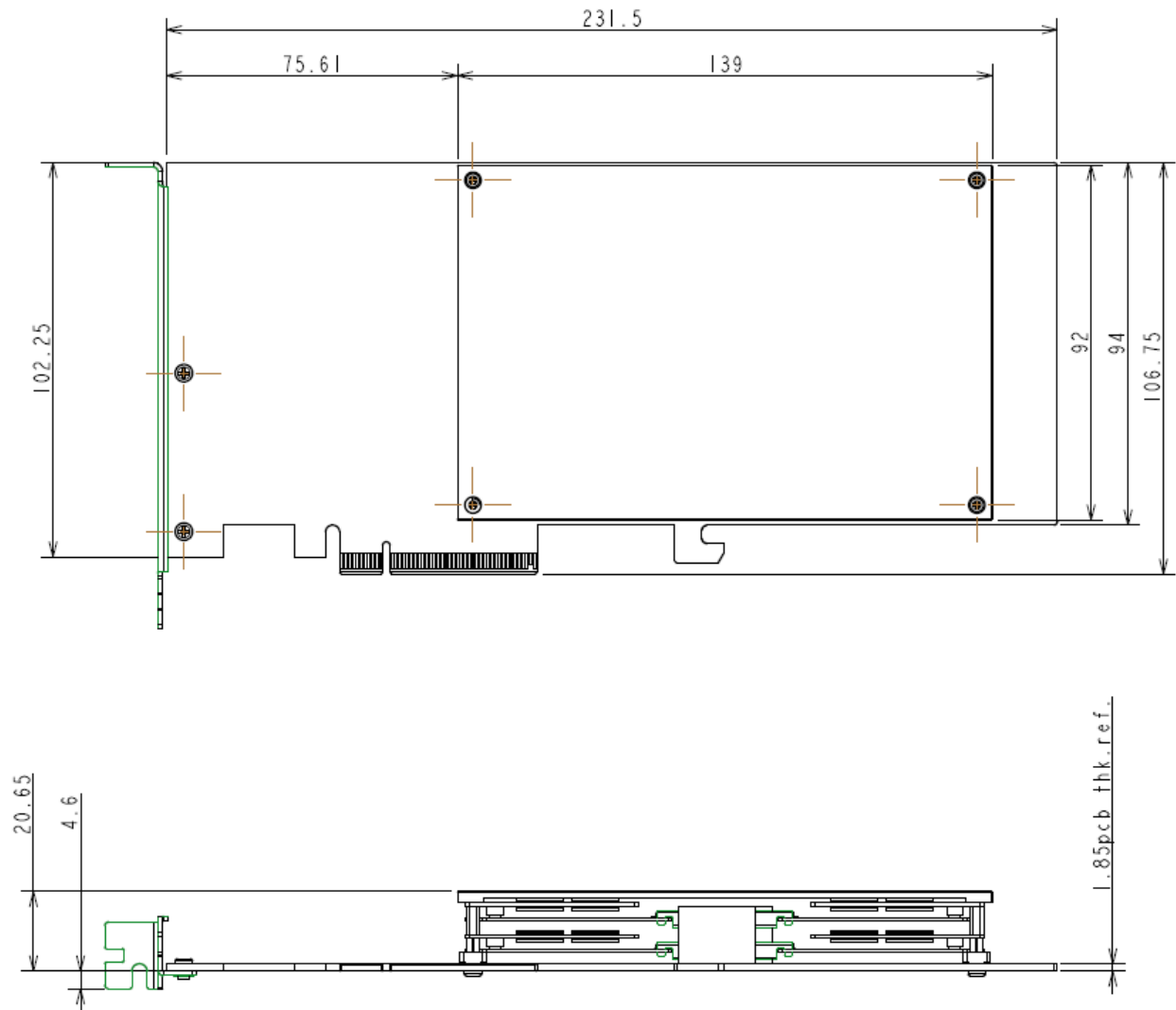
3.2 VALID ORDERING PART NUMBERS

Part Number	Capacity	RAID Level	# of Enclosure	Media Storage
FP8480L4R0	480GB	0	8	MLC
FP8420L4R5	420GB	5	8	MLC
FP81T0L4R0	1.0TB	0	8	MLC
FP8840L4R5	840GB	5	8	MLC
FP82T0L4R0	2.0TB	0	8	MLC
FP81T6L4R5	1.6TB	5	8	MLC

Table 2: Valid Ordering Part Numbers and Descriptions.

4.0 PHYSICAL SPECIFICATIONS

4.1 RAIDDRIVE II PLUS BOARD



View from the Right hand side

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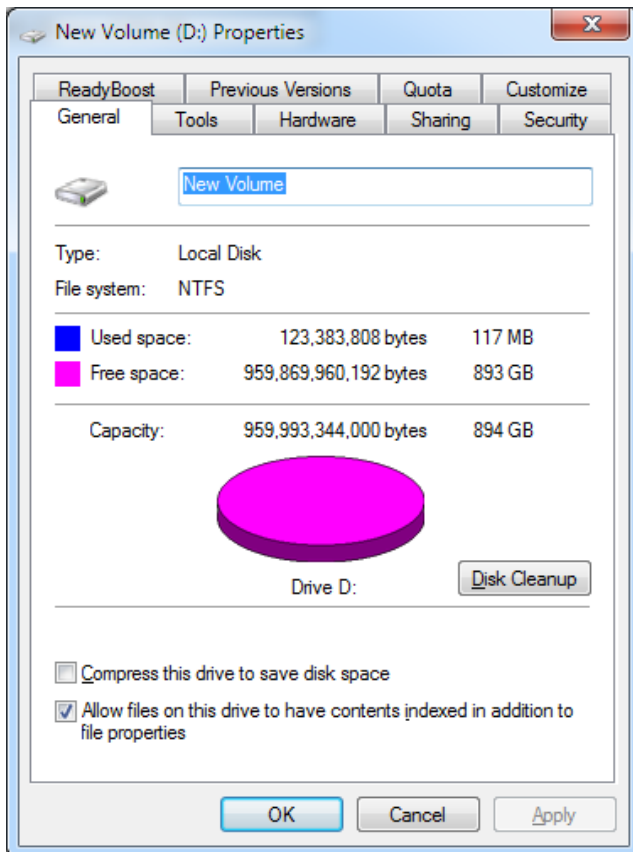
View from the Bottom



View from the Top

4.2 DIMENSION

RAIDDrive II PLUS: 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-2.6GB/sec, WRITE-3.2GB/sec

5.1 PERFORMANCE TEST SYSTEM CONFIGURATIONS

The following Performance Benchmark is showing the most popular configuration of the RAIDDRIVE II PLUS. It is 1TB storage and its part number is FP81TOL4R0.

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 GX 256GB
6. North Bridge:	INTEL X58
7. South Bridge:	INTEL ICH10R
8. Bios SATA Mode:	AHCI

5.2 BENCHMARKING SOFTWARE

- ATTO Disk Benchmark 2.46
- PC Mark Vantage Pro 64-bit
- Crystal Disk Mark 3.02 x64
- HD Tune Pro 3.50
- AS SSD Benchmark 1.6.4237.30508
- IO Meter 2008.16.18-RC2

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5.3 DETAIL PERFORMANCE 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.

(Left -1TB,

Right-1TB x 2 SW Raided)

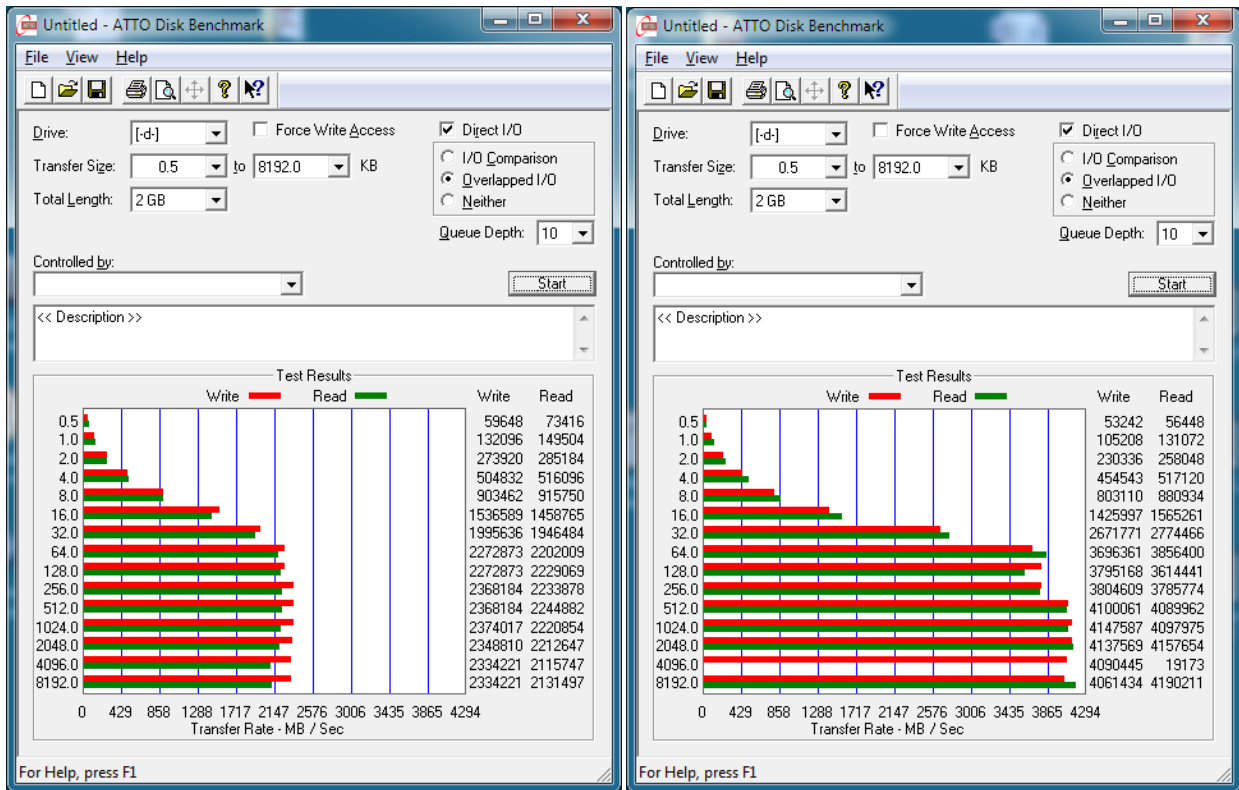


Figure 1: ATTO Disk Benchmark Scores

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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.

(Left -1TB,

Right-1TB x 2 SW Raided)

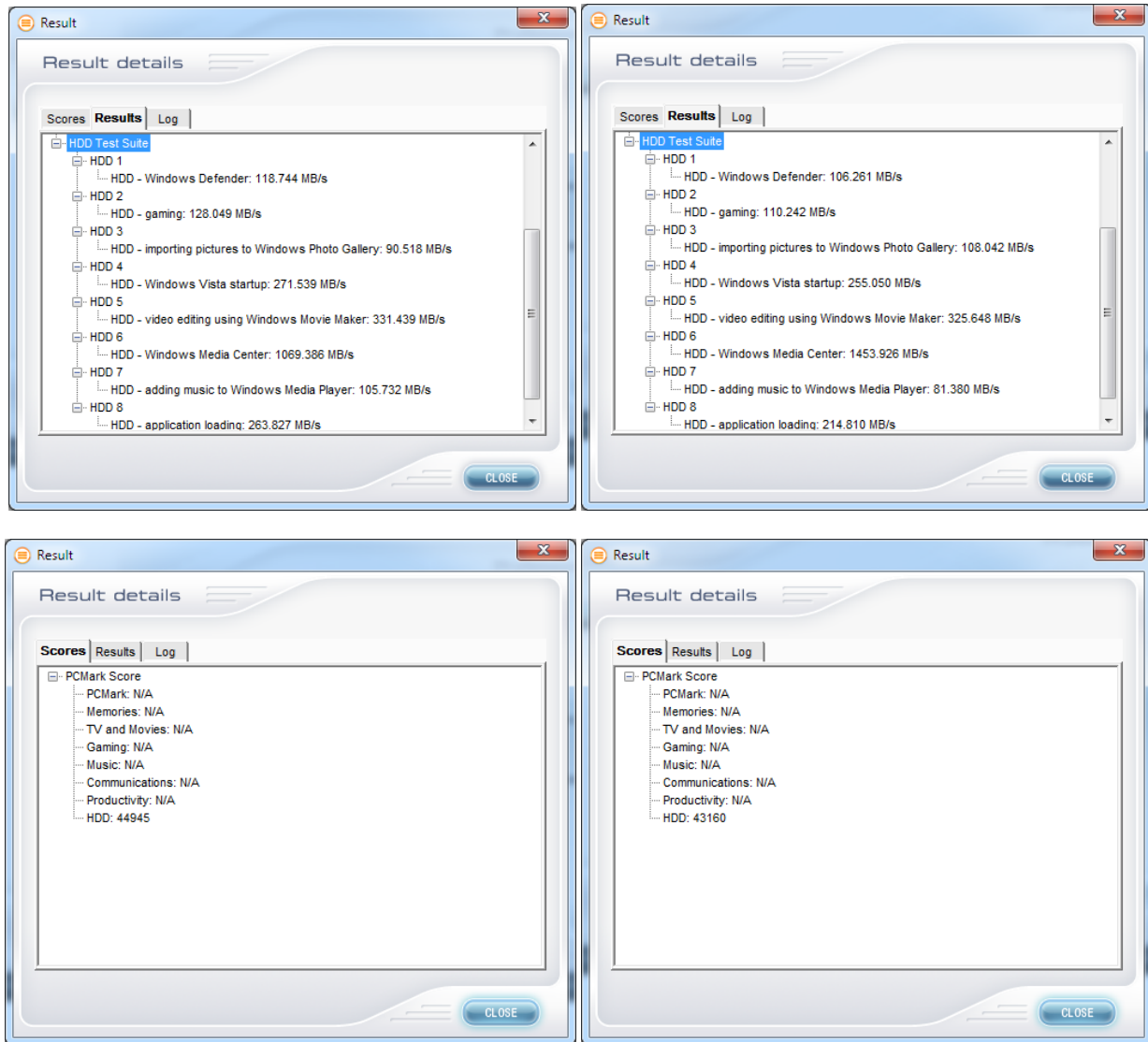


Figure 2: PC Mark Vantage Scores

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5.3.3 CRYSTAL DISK MARK 3.02 X64

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

(Left -1TB,

Right-1TB x 2 SW Raided)

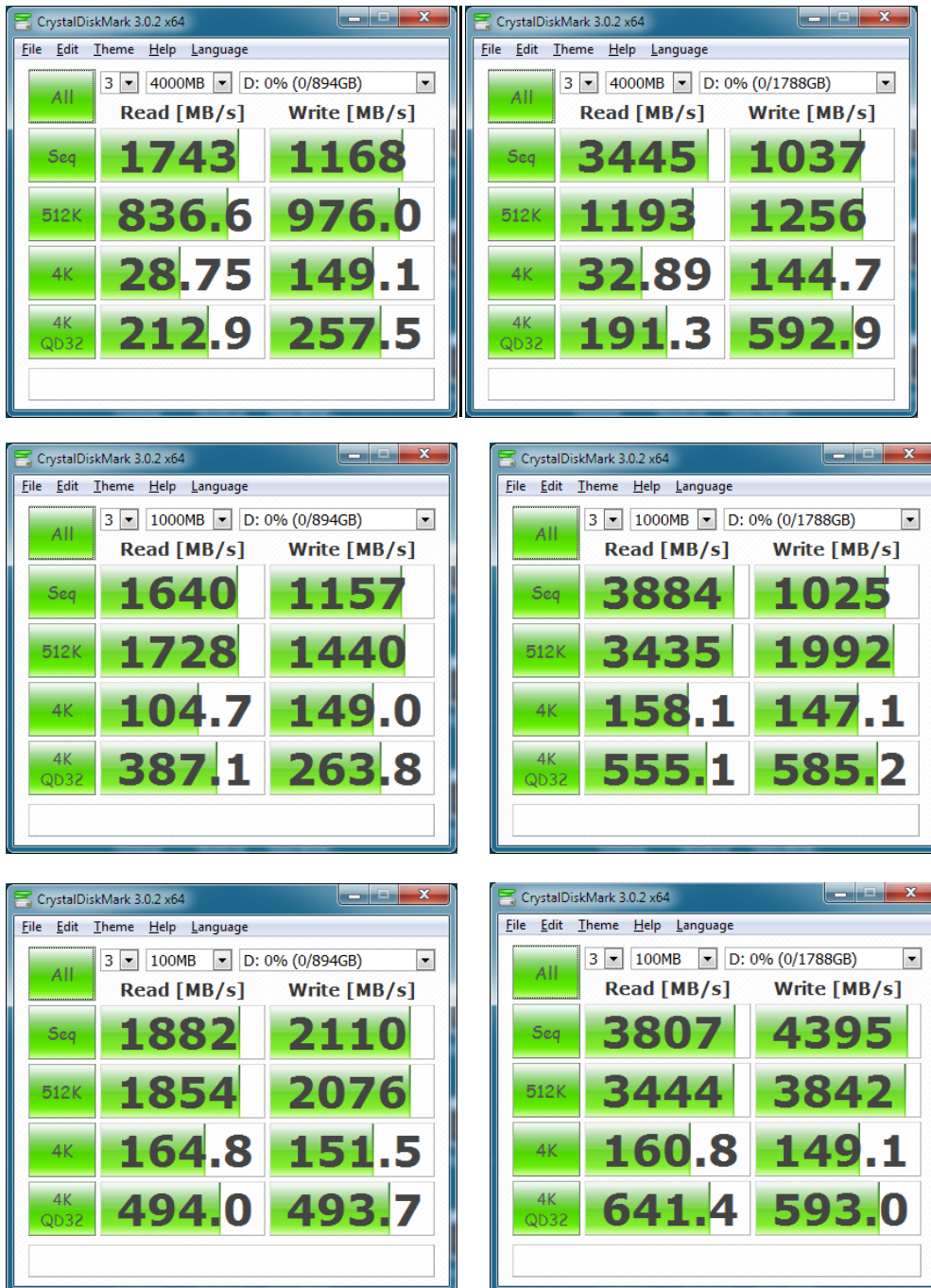
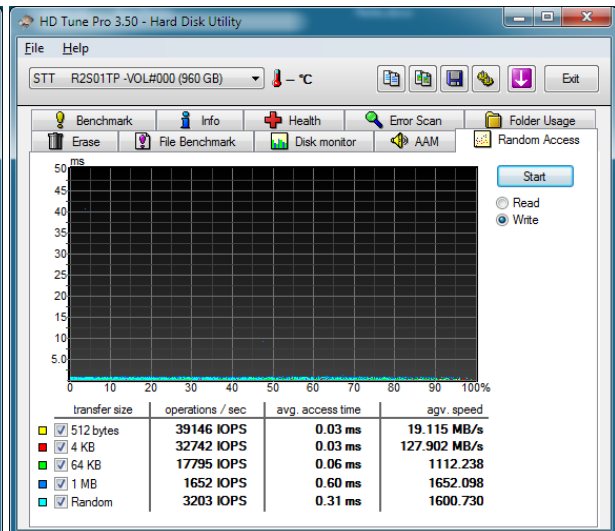
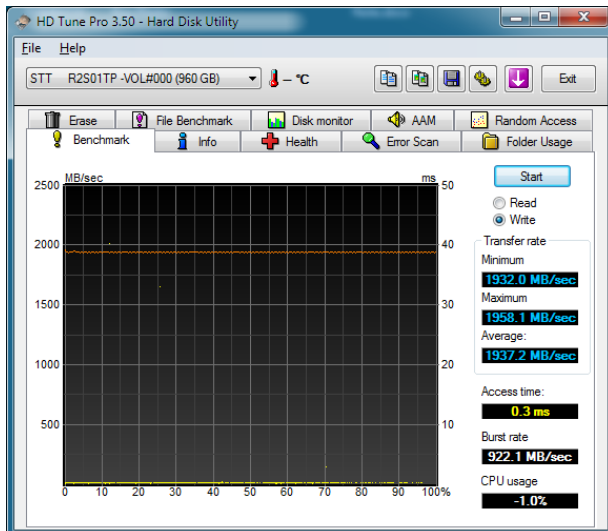
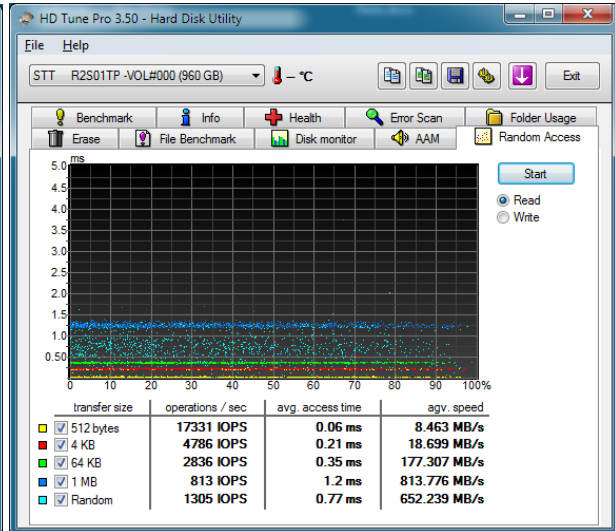
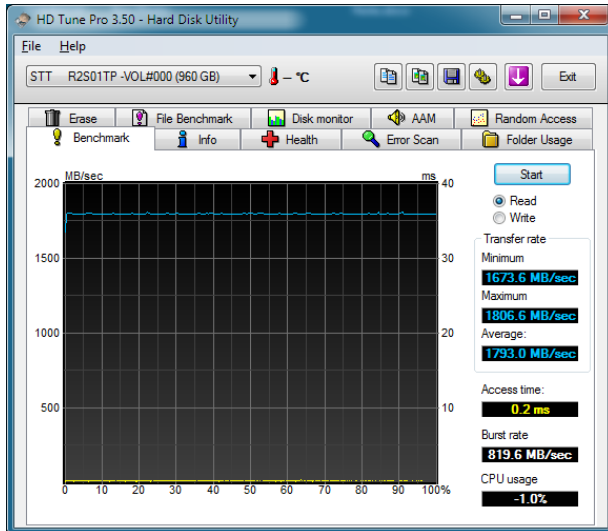


Figure 3: Crystal DiskMark Scores

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.



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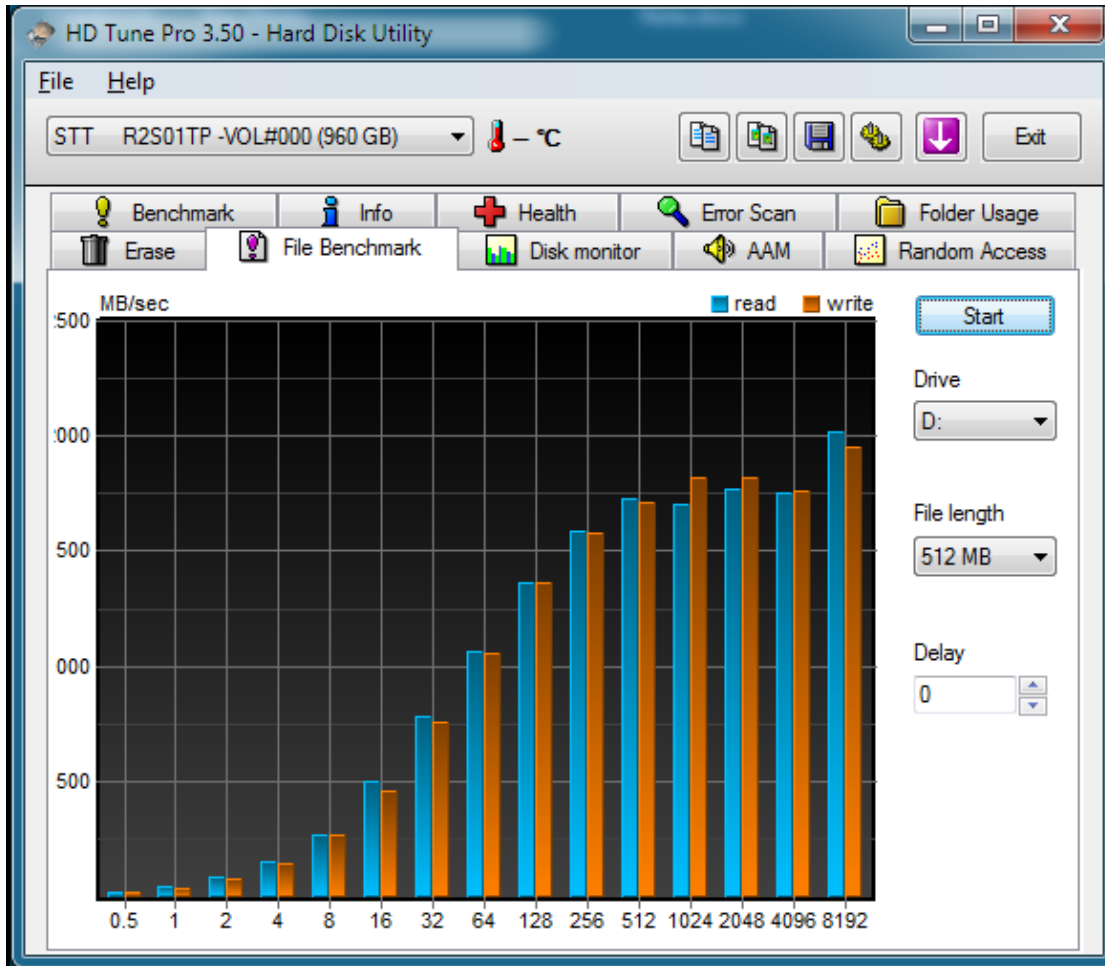


Figure 4: HD TUNE PRO 3.50 Scores

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5.3.5 AS SSD BENCHMARK 1.6.4237.30508

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

(Left -1TB,

Right-1TB x 2 SW Raided)

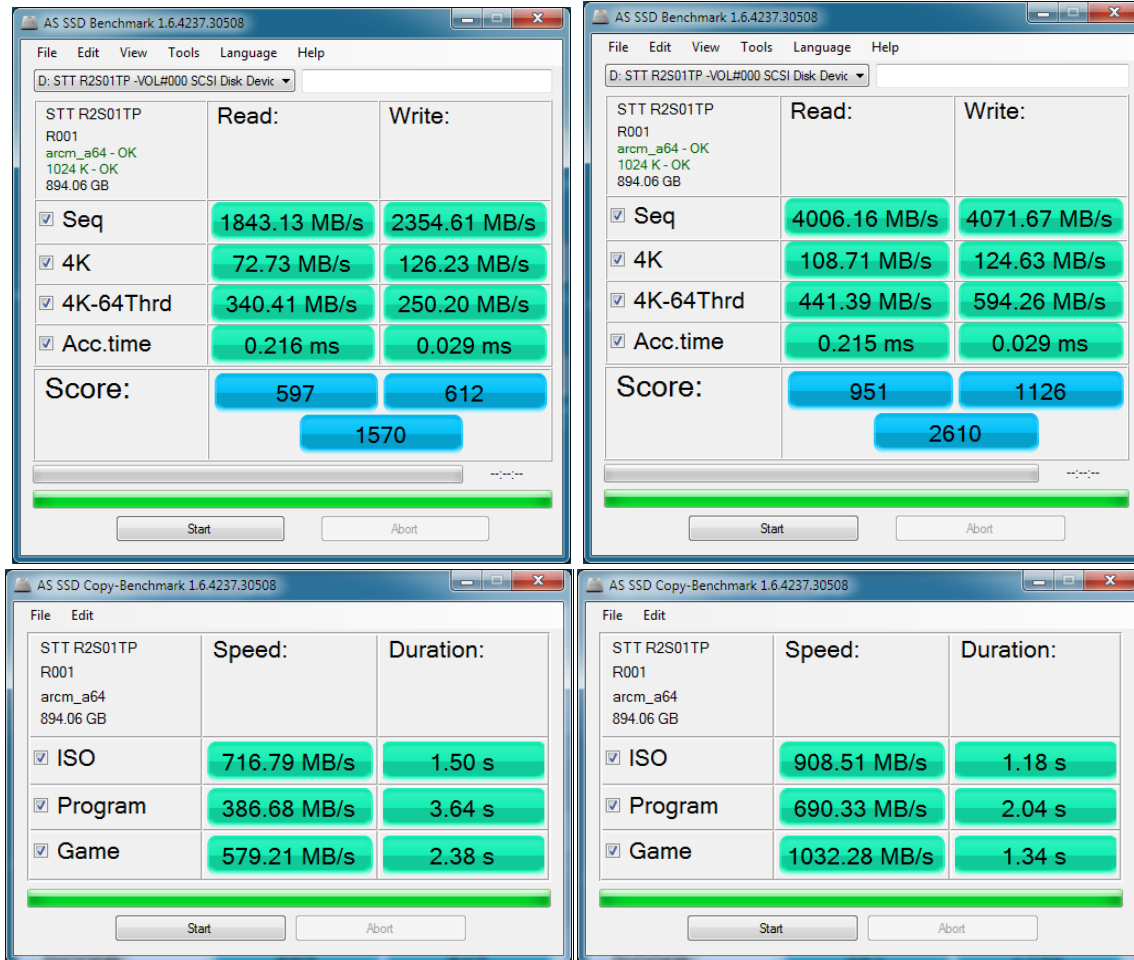


Figure 5: AS SSD Scores

RAIDDrive II Plus PCIe SSD Datasheet

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. (Top-1TB, Bottom-1TB x 2 SW Raided)

IO Meter 2008 RC2 TEST SPEC	IO/s						MB/s					
	QD=1	QD=2	QD=4	QD=8	QD=16	QD=32	QD=1	QD=2	QD=4	QD=8	QD=16	QD=32
4KB-RR	5,106	9,801	17,425	28,599	38,998	46,969	19.9	38.3	68.1	111.7	152.3	183.5
4KB-RW	33,179	55,298	68,720	66,745	65,608	65,458	129.6	216.0	268.4	260.7	256.3	255.7
4KB-SR	35,520	84,051	126,724	129,890	129,837	129,717	138.7	328.3	495.0	507.4	507.2	506.7
4KB-SW	33,634	74,287	112,148	112,490	112,599	112,538	131.4	290.2	438.1	439.4	439.8	439.6
8KB-RR	4,695	8,962	15,849	25,787	34,853	41,364	36.7	70.0	123.8	201.5	272.3	323.2
8KB-RW	29,965	50,271	63,216	61,652	60,617	60,626	234.1	392.7	493.9	481.7	473.6	473.6
8KB-SR	33,381	72,419	116,172	124,222	124,445	124,346	260.8	565.8	907.6	970.5	972.2	971.5
8KB-SW	32,613	72,731	105,821	108,561	109,016	107,810	254.8	568.2	826.7	848.1	851.7	842.3
16KB-RR	3,920	7,605	13,391	21,602	29,016	33,838	61.2	118.8	209.2	337.5	453.4	528.7
16KB-RW	27,532	44,542	55,719	54,378	53,217	53,331	430.2	696.0	870.6	849.7	831.5	833.3
16KB-SR	28,700	62,261	110,928	115,819	115,794	115,781	448.4	972.8	1,733.3	1,809.7	1,809.3	1,809.1
16KB-SW	28,415	58,020	98,391	104,983	105,304	105,453	444.0	906.6	1,537.4	1,640.4	1,645.4	1,647.7
32KB-RR	3,417	6,529	11,427	18,094	23,830	27,242	106.8	204.0	357.1	565.4	744.7	851.3
32KB-RW	21,234	35,972	43,608	42,224	41,494	41,403	663.6	1,124.1	1,362.8	1,319.5	1,296.7	1,293.8
32KB-SR	23,832	45,936	68,457	68,522	68,647	68,895	744.7	1,435.5	2,139.3	2,141.3	2,145.2	2,153.0
32KB-SW	22,676	46,025	74,922	75,253	75,416	75,388	708.6	1,438.3	2,341.3	2,351.7	2,356.8	2,355.9
128KB-RR	2,265	4,164	7,018	10,516	12,887	12,990	283.2	520.5	877.3	1,314.5	1,610.9	1,623.7
128KB-RW	9,925	15,179	16,816	16,133	15,626	15,798	1,240.6	1,897.4	2,102.0	2,016.6	1,953.3	1,974.8
128KB-SR	10,778	19,037	19,187	19,249	19,246	19,220	1,347.2	2,379.6	2,398.3	2,406.1	2,405.7	2,402.5
128KB-SW	10,321	19,814	21,536	21,619	21,842	22,045	1,290.2	2,476.7	2,692.0	2,702.4	2,730.3	2,755.6
256KB Stream Read	6,242	9,801	9,820	9,825	9,807	9,821	1,560.5	2,450.4	2,454.9	2,456.2	2,451.9	2,455.3
256KB Stream Write	6,056	10,918	11,330	11,359	11,373	11,384	1,514.0	2,729.4	2,832.4	2,839.7	2,843.2	2,846.1
512KB Stream Read	3,391	4,961	4,964	4,963	4,963	4,966	1,695.7	2,480.3	2,481.8	2,481.7	2,481.4	2,482.8
512KB Stream Write	3,315	5,722	5,725	5,738	5,762	5,790	1,657.6	2,860.9	2,862.4	2,868.8	2,880.9	2,895.0

IO Meter 2008 RC2 TEST SPEC	IOps						MBps					
	QD=1	QD=2	QD=4	QD=8	QD=16	QD=32	QD=1	QD=2	QD=4	QD=8	QD=16	QD=32
4KB-RR	5,106	9,801	17,425	28,599	38,998	46,969	19.9	38.3	68.1	111.7	152.3	183.5
4KB-RW	33,179	55,298	68,720	66,745	65,608	65,458	129.6	216.0	268.4	260.7	256.3	255.7
4KB-SR	35,520	84,051	126,724	129,890	129,837	129,717	138.7	328.3	495.0	507.4	507.2	506.7
4KB-SW	33,634	74,287	112,148	112,490	112,599	112,538	131.4	290.2	438.1	439.4	439.8	439.6
8KB-RR	4,695	8,962	15,849	25,787	34,853	41,364	36.7	70.0	123.8	201.5	272.3	323.2
8KB-RW	29,965	50,271	63,216	61,652	60,617	60,626	234.1	392.7	493.9	481.7	473.6	473.6
8KB-SR	33,381	72,419	116,172	124,222	124,445	124,346	260.8	565.8	907.6	970.5	972.2	971.5
8KB-SW	32,613	72,731	105,821	108,561	109,016	107,810	254.8	568.2	826.7	848.1	851.7	842.3
16KB-RR	3,920	7,605	13,391	21,602	29,016	33,838	61.2	118.8	209.2	337.5	453.4	528.7
16KB-RW	27,532	44,542	55,719	54,378	53,217	53,331	430.2	696.0	870.6	849.7	831.5	833.3
16KB-SR	28,700	62,261	110,928	115,819	115,794	115,781	448.4	972.8	1,733.3	1,809.7	1,809.3	1,809.1
16KB-SW	28,415	58,020	98,391	104,983	105,304	105,453	444.0	906.6	1,537.4	1,640.4	1,645.4	1,647.7
32KB-RR	3,417	6,529	11,427	18,094	23,830	27,242	106.8	204.0	357.1	565.4	744.7	851.3
32KB-RW	21,234	35,972	43,608	42,224	41,494	41,403	663.6	1,124.1	1,362.8	1,319.5	1,296.7	1,293.8
32KB-SR	23,832	45,936	68,457	68,522	68,647	68,895	744.7	1,435.5	2,139.3	2,141.3	2,145.2	2,153.0
32KB-SW	22,676	46,025	74,922	75,253	75,416	75,388	708.6	1,438.3	2,341.3	2,351.7	2,356.8	2,355.9
128KB-RR	2,265	4,164	7,018	10,516	12,887	12,990	283.2	520.5	877.3	1,314.5	1,610.9	1,623.7
128KB-RW	9,925	15,179	16,816	16,133	15,626	15,798	1,240.6	1,897.4	2,102.0	2,016.6	1,953.3	1,974.8
128KB-SR	10,778	19,037	19,187	19,249	19,246	19,220	1,347.2	2,379.6	2,398.3	2,406.1	2,405.7	2,402.5
128KB-SW	10,321	19,814	21,536	21,619	21,842	22,045	1,290.2	2,476.7	2,692.0	2,702.4	2,730.3	2,755.6
256KB Stream Read	6,242	9,801	9,820	9,825	9,807	9,821	1,560.5	2,450.4	2,454.9	2,456.2	2,451.9	2,455.3
256KB Stream Write	6,056	10,918	11,330	11,359	11,373	11,384	1,514.0	2,729.4	2,832.4	2,839.7	2,843.2	2,846.1
512KB Stream Read	3,391	4,961	4,964	4,963	4,963	4,966	1,695.7	2,480.3	2,481.8	2,481.7	2,481.4	2,482.8
512KB Stream Write	3,315	5,722	5,725	5,738	5,762	5,790	1,657.6	2,860.9	2,862.4	2,868.8	2,880.9	2,895.0

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 +125°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 PLUS are compliant with the following standards and regulations:

- RoHS

10.0 PIN DESCRIPTIONS

10.1 RAIDDRIVE II PLUS 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,

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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

End of the x4 connector

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

End of the x8 connector

Table 3: Data Pin Signal Assignment

11.0 INSTALLATION

BEFORE YOU BEGIN INSTALLATION

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

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 Plus box includes the following items.
 - a. RAIDDRIVE II Plus 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 Plus box
2. Power PC/Server off
3. Install the RAIDDRIVE II Plus (PCIe x8 slot should be available)
 - a. Plug the 4pin power cable into the RAIDDRIVE II Plus. (*optional)
4. Power up the system
5. Go into the RAIDDRIVE II Plus 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:

Super Talent Technology
2077 North Capitol Avenue
San Jose, CA 95132
USA
Tel: +1 (408) 934-2560
Support: Support@supertalent.com
Sales: Sales@supertalent.com
OEM Sales: OEMSales@supertalent.com

CHANGE RECORD

Version	Release Date	Changes
1.0	Jan. 27, 2014	Initial Release

Table 4: Change Record