


Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	
Requested by: Mike Thompson	Job # 4CST155	
Tested By: Eric Hemming	Test Completion: 11-16-04	Systems Reliability Engineering Lab

System Level Thermal & Random Vibration Performance Loss Characterization

Western Digital XL80II RE 7200 RPM Disk Drive In The **Enhance RS2080SA-600U DAS** Enterprise Storage Appliance 2U 8-drive SATA-SCSI System

Report written By: Mike Thompson

WDT CONFIDENTIAL

This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.



Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	
Requested by: Mike Thompson	Job # 4CST155	
Tested By: Eric Hemming	Test Completion: 11-16-04	Systems Reliability Engineering Lab

Table of Contents

Thermal Profile Test.....	3
1.0 Test Purpose.....	3
2.0 Test Summary/Overview	3
2.1 Comments/Recommendations:.....	3
3.0 Test Information.....	3
4.0 Thermal Test DATA:.....	4
5.0 Test Setup.....	5
5.1 Methods/Procedures.....	5
5.2 Test Setup Photos.....	5
6.0 Environmental Results Summary	7
Shock & Vibration	8
7.0 Objective	8
8.0 Test Equipment	8
9.0 Test Procedure.....	9
9.1 Pre-Test procedure:.....	9
9.2 Vibration Test procedure:	9
10.0 Chassis Configuration / Observations	10
10.1 Configuration:.....	10
10.2 Observations:	10
11.0 Test Setup.....	11
12.0 Test Results	12
12.1 X-Axis:.....	12
12.2 Y-Axis:.....	13
12.3 Z-Axis:	14
13.0 Chassis Comparison Data	15
14.0 Summary:.....	16
14.1 Testes still in Progress:	16
14.2 Overview:.....	16
APPENDIX A	17
15.0 IOMETER	17
APPENDIX B	18
15.1 Western Digital XL80II RE	18

WDT CONFIDENTIAL

This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.

Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	 Western Digital® Systems Reliability Engineering Lab
Requested by: Mike Thompson	SRE Job Number: 4CST155	
Tested By: Eric Hemming	Test Completion: 11-16-04	

Thermal Profile Test

1.0 Test Purpose

This test report details the Thermal Profile testing performed on the Enhance RS2080SA-600U Enterprise Storage Appliance with Western Digital Falcon Raid Edition HDD's. System level testing is performed at three external case temperatures; 25°C, 35°C and 40°C to simulate heat generation internally.

~*High reliability operation* for the disk drives dictates maintaining less than or equal to 50°C as an upper limit base casting temperature under *normal operating conditions*.

~The *disk drive specification* dictates that under *any operating conditions*, the upper limit base casting temperature should not exceed 55°C.

2.0 Test Summary/Overview

The Enhance RS2080SA-600U DAS Enterprise Storage Appliance exhibited the following temperatures:

Maximum temperatures observed at HDD = 36.1°C at 25°C

Maximum temperatures observed at HDD = 45.5°C at 35°C

Maximum temperatures observed at HDD = 50.2°C at 40°C

2.1 Comments/Recommendations:


The Enhance RS2080SA-600U System ran error-free and exhibited temperatures within the *disk drive specification* thermal maximum and only exceeded the recommended *High reliability operation* maximum of 50°C after reaching 40C ambient. The system is considered to be thermally compliant.

3.0 Test Information

Tests performed by:	Eric Hemming
Date:	November 15 th – 16 th , 2004
Location:	Systems Reliability Engineering Lab Western Digital, Lake Forest, Ca.
Test equipment:	Envirotronics EH-16 Environmental Chamber Omega Digicator Thermocouple Display and 6 input Multipoint Selector
Software:	IOMETER
Test System	Gateway 9210 Server System
Power Supply Config	Hipro Model # HP-W351GF3
Motherboard	Intel Server Board SE7210
Processors	Intel 3.2GHz
Memory	512GB DDR
Hard Drives- NAS System	8 – Falcon Raid Edition SATA, WD2500SD 250GB
OS	Windows 2003 Advanced Server

WDT CONFIDENTIAL

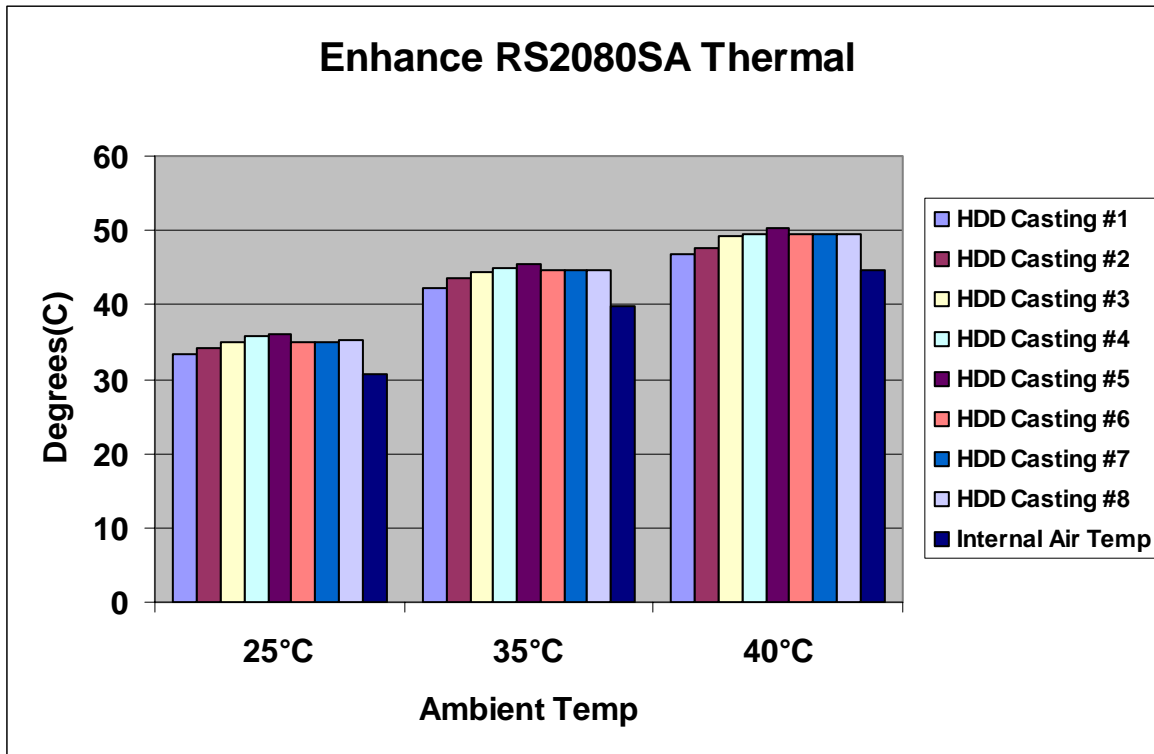
This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.

Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	 Western Digital® Systems Reliability Engineering Lab	
	Requested by: Mike Thompson		SRE Job Number: 4CST155
	Tested By: Eric Hemming		Test Completion: 11-16-04

4.0 Thermal Test DATA:


Enhance RS2080SA 8 – Falcon Raid Edition	In Thermal Chamber		
	@ 25°C	@ 35°C	@ 40°C
HDD Casting #1	33.3	42.2	46.7
HDD Casting #2	34.3	43.6	47.7
HDD Casting #3	35.0	44.4	49.2
HDD Casting #4	35.7	45.0	49.6
HDD Casting #5	36.1	45.5	50.2
HDD Casting #6	35.1	44.7	49.6
HDD Casting #7	35.1	44.6	49.4
HDD Casting #8	35.2	44.7	49.5
Internal Air Temp	30.7	39.9	44.6

Note: All measurements are in degrees Celsius



WDT CONFIDENTIAL

This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.

Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	 Western Digital®
	Requested by: Mike Thompson	
Tested By: Eric Hemming	Test Completion: 11-16-04	Systems Reliability Engineering Lab

5.0 Test Setup

1. Attach thermal wire to drives and system chassis as indicated below.
 - a) HDD Base Casting
 - b) Internal Chassis Air Temperature
2. Install system in test chamber.

5.1 Methods/Procedures

- 1 Set up system in test chamber and set target temperature for **25°C**.
- 2 Run IOMETER stress test for **2 hours**.
- 3 Measure required temperature points.
- 4 Ramp chamber temperature to **35°C**.
- 5 Repeat steps 2-3.
- 6 Ramp chamber temperature to **40°C**.
- 7 Repeat steps 2-3.
- 8 Ramp chamber to **25°C** and stop test.

System level testing is performed at three external case temperatures, 25°C, 35°C and 40°C with all fans operational in the system. See Test Results for the test durations and measured temperatures for each disk drive location.

To stress the hard drives and CPUs to simulate a typical heavy workload, a data integrity test IOMETER was performed during testing.

5.2 Test Setup Photos


Photo 1 of 4: Chassis in test chamber



Photo 2 of 4: Drive order configuration

WDT CONFIDENTIAL

This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.

Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	 Western Digital® Systems Reliability Engineering Lab	
	Requested by: Mike Thompson		SRE Job Number: 4CST155
	Tested By: Eric Hemming		Test Completion: 11-16-04

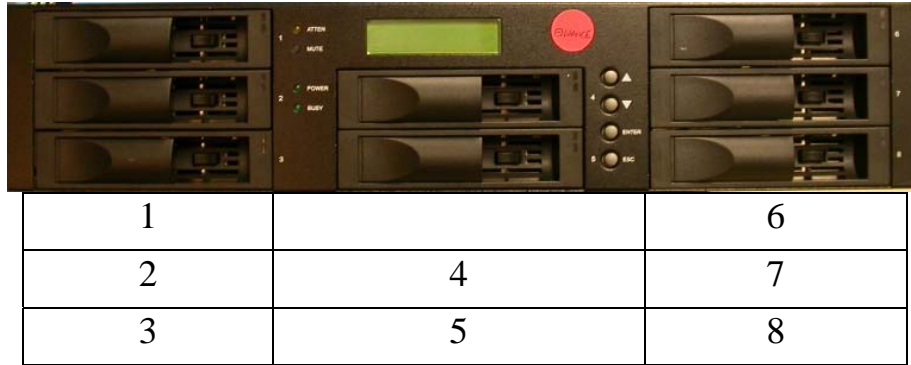


Photo 3 of 4: Thermocouple installed on HDD Base Casting

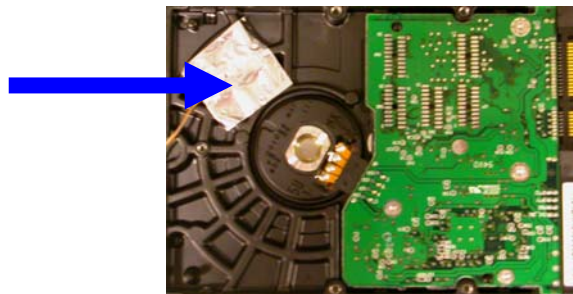
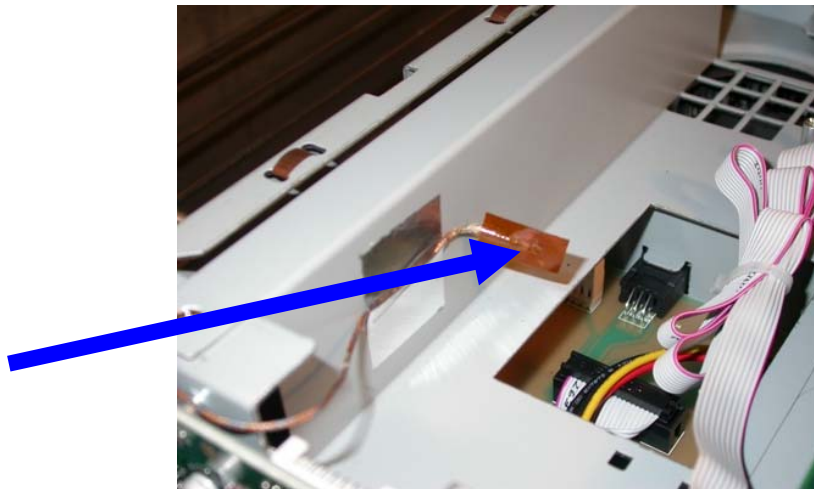



Photo 4 of 4: Internal chassis thermocouple



WDT CONFIDENTIAL

This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.


Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	
Requested by: Mike Thompson	SRE Job Number: 4CST155	
Tested By: Eric Hemming	Test Completion: 11-16-04	Systems Reliability Engineering Lab

6.0 Environmental Results Summary

Test Platform	Environment	Test duration	Pass/Fail
Windows 2003 Advanced Server	25°C	2 Hours	Pass
Test Platform	Environment	Test duration	Pass/Fail
Windows 2003 Advanced Server	35°C	2 Hours	Pass
Test Platform	Environment	Test duration	Pass/Fail
Windows 2003 Advanced Server	40°C	2 Hours	Pass

WDT CONFIDENTIAL

This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.

Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	
Requested by: Mike Thompson	SRE Job Number: 4CST155	
Tested By: Eric Hemming	Test Completion: 11-16-04	Systems Reliability Engineering Lab

Shock & Vibration

7.0 Objective

The object of this test was to evaluate the performance of the Enhance RS2080SA-600U DAS Enterprise Storage Appliance 2U 8-drive SATA-SCSI System chassis, while subjected to increasing levels of random vibration in the

This test is designed primarily to measure the chassis and its ability to isolate vibration impact to the storage installed in the chassis and is not indicative of the performance capability of the storage device.

For performance characteristics of the storage device, please request the drive level RV performance report for the subject product model.

Drives utilized in this test process;


Western Digital XL80II RE disk drives.

8.0 Test Equipment

- Dactron SpectraBook Shaker Controller, Software Version 5.0100
- Unholtz Dickie Shaker Table
- Endevco Accelerometers
- Unholtz Dickie Amplifier
- Endevco Charge Amplifier, Model 104
- Endevco PWR Supply, Model 109
- Standard PC to run Iometer test scripts
- Appropriate HBA to connect PC to system under test

WDT CONFIDENTIAL

This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.

Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	
Requested by: Mike Thompson	SRE Job Number: 4CST155	
Tested By: Eric Hemming	Test Completion: 11-16-04	Systems Reliability Engineering Lab

9.0 Test Procedure

9.1 Pre-Test procedure:


- Install the target disk drives into all slots of the system to be tested.
- Mount the system in the rack aligning the chassis center of mass and the rack center of mass.
- Configure the system as JBOD so each drive can be individually monitored.
- Set up and run Iometer using the following parameters:
 - 2K block size
 - 100% Random write operation
 - Queue depth of 1
 - 1 minute ramp with 3 minute run time
- Analyze the results to determine if any specific drive slot appears to have lower relative performance
- If any slot exhibits a performance delta at this point it should be used as a monitored target for the vibration test
- If all slots are relatively similar in performance select monitored targets to represent a physical cross section of the system.
- A total of three drives should be selected as monitored targets.

9.2 Vibration Test procedure:

- Set up Iometer using the following parameters:
 - 2K block size
 - 100% Random write operation
 - Command depth of 8 for monitored target drives, depth of 1 for all other drives
 - 1 minute ramp with 3 minute run time
- Start Iometer test and save results as baseline performance data
- Start vibration table at initial input setting of 0.05 Grms @ 5 – 500 Hz random
- Run Iometer test and save results
- Verify performance of monitored target drives
 - Increment vibration input by 0.01Grms and rerun test
 - If performance has dropped below 90% of baseline continue with the rest of the procedure.

WDT CONFIDENTIAL

This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.

Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	 Western Digital® Systems Reliability Engineering Lab
	Requested by: Mike Thompson	
Tested By: Eric Hemming	Test Completion: 11-16-04	

10.0 Chassis Configuration / Observations

10.1 Configuration:

- We used 8 WD XL80II RE drives and a Gateway 2110 host system for the tests

Chassis Front View



Chassis Rear View



10.2 Observations:


- Easy access to all components
- System had good overall layout
- The system had good thermal performance
- The drives had a good fit in the rails
- The rails fit solidly into the system
- No apparent design flaws to report

Inside View



WDT CONFIDENTIAL

This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.

Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	 Systems Reliability Engineering Lab
	Requested by: Mike Thompson Tested By: Eric Hemming	

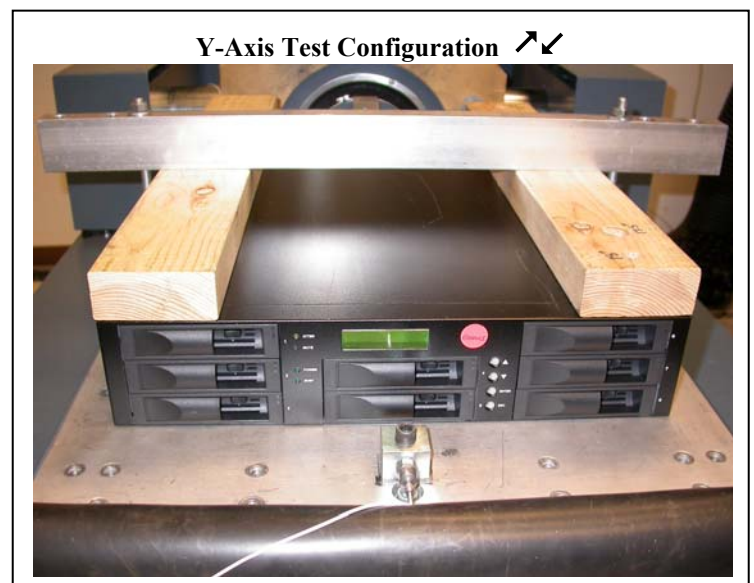
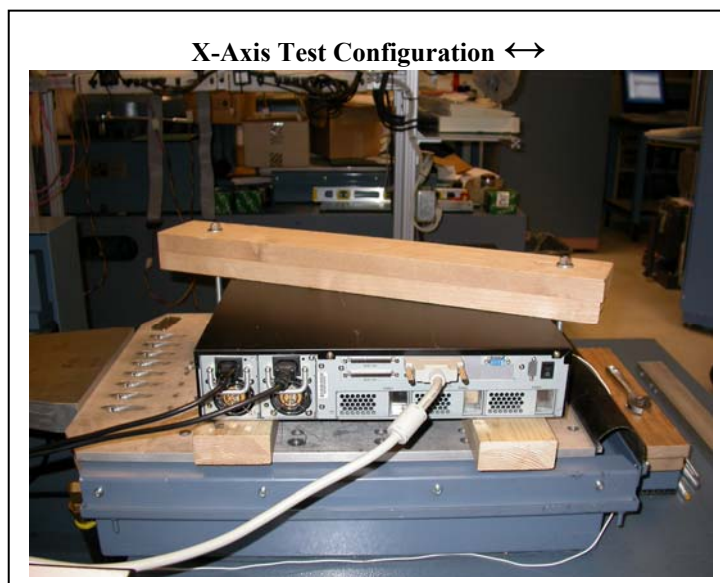
11.0 Test Setup

The test setup configuration is shown in following figures.

The chassis was mounted on the shaker table.


An accelerometer was attached to the shaker table to monitor input levels.

Chassis Test Configurations on Vibration Table:



WDT CONFIDENTIAL

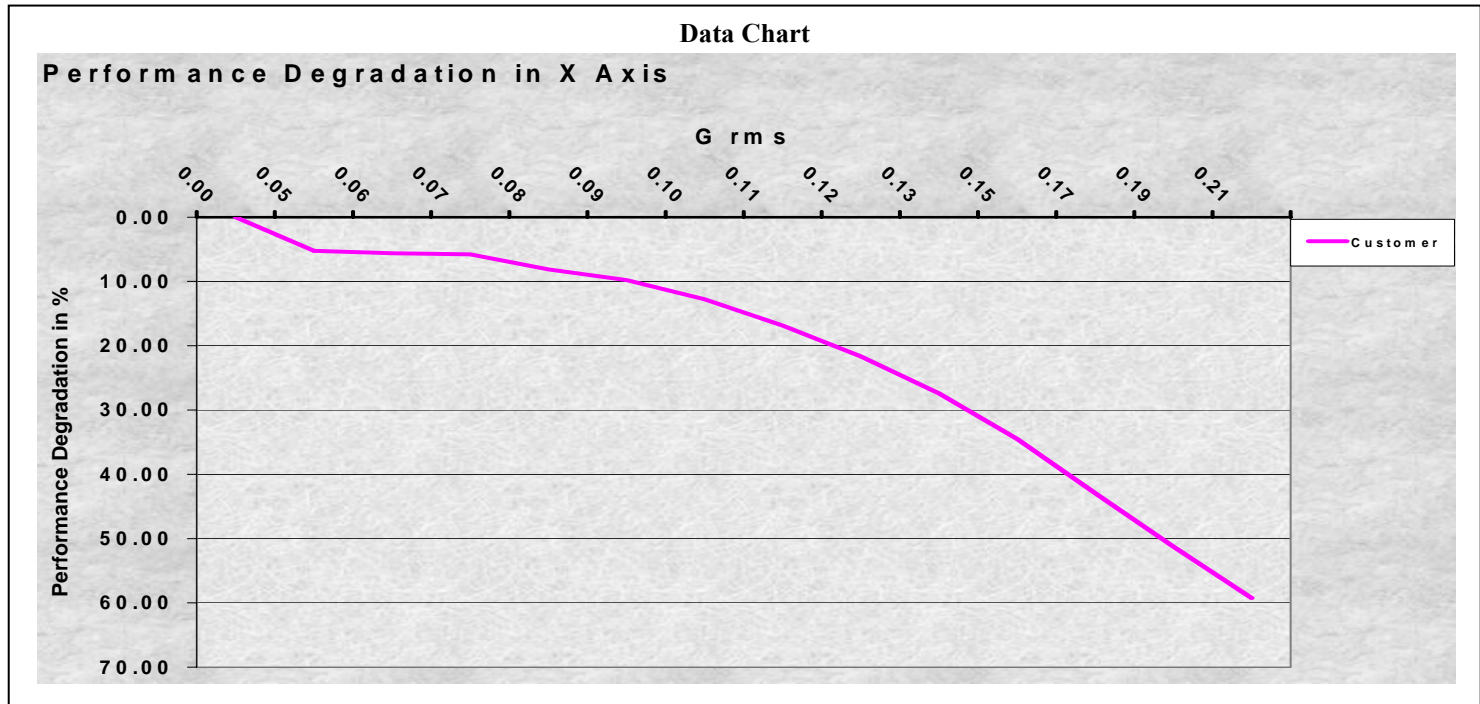
This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.

Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	 Western Digital®
	Requested by: Mike Thompson	
Tested By: Eric Hemming	Test Completion: 11-16-04	Systems Reliability Engineering Lab

12.0 Test Results


12.1 X-Axis:

Raw Data														
G rms	0.00	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.15	0.17	0.19	0.21
MB/s in X-Axis														
Disks 1-8	1.43	1.36	1.35	1.35	1.32	1.29	1.25	1.19	1.12	1.04	0.94	0.82	0.70	0.58
IOPS in X-Axis														
Disks 1-8	734.2	695.7	693.0	691.7	674.5	662.3	640.4	610.4	575.2	533.1	480.9	418.9	357.9	299.3
Performance Degradation in %														
Disks 1-8	0.00	5.24	5.61	5.79	8.13	9.79	12.77	16.86	21.66	27.39	34.50	42.94	51.25	59.23



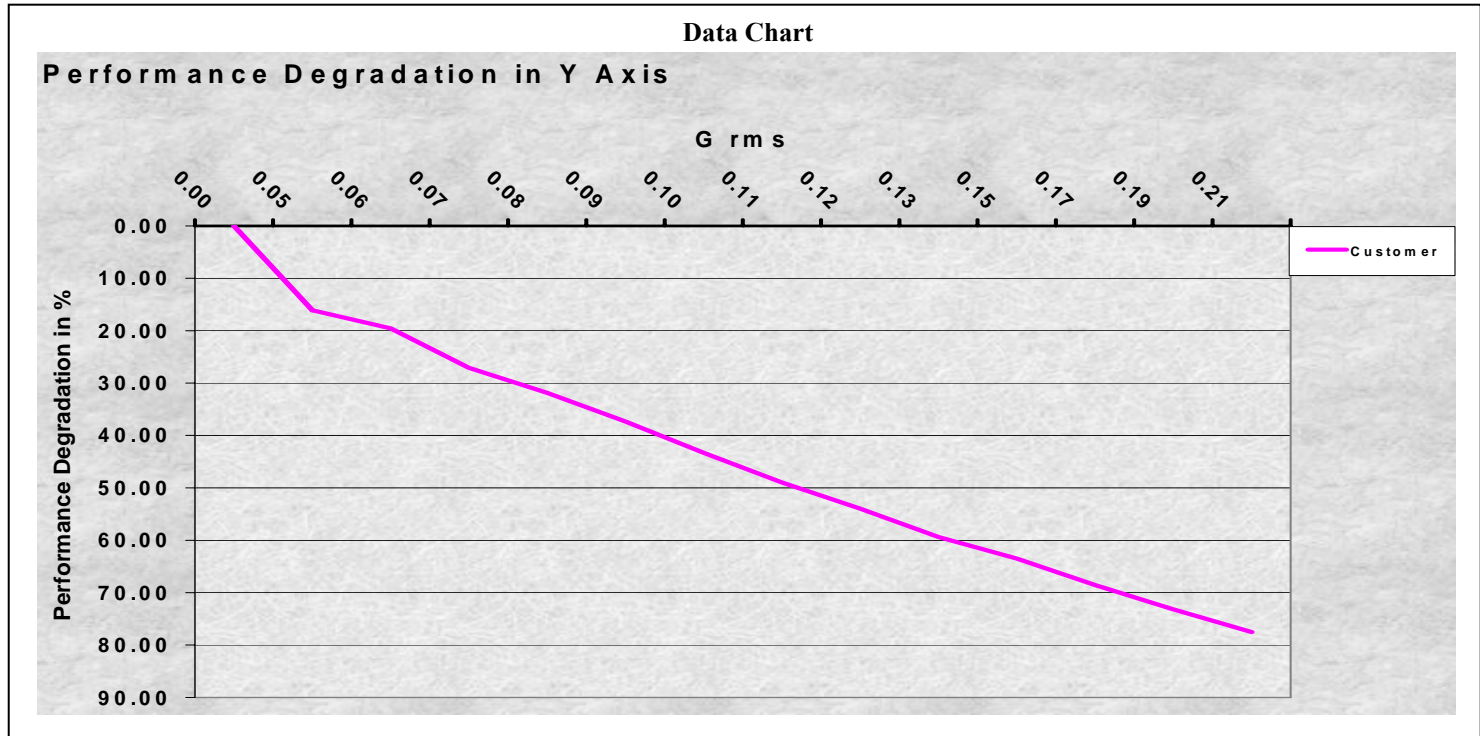
WDT CONFIDENTIAL

This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.

Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	 Western Digital®
	Requested by: Mike Thompson	
Tested By: Eric Hemming	Test Completion: 11-16-04	Systems Reliability Engineering Lab


12.2 Y-Axis:

Raw Data														
G rms	0.00	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.15	0.17	0.19	0.21
MB/s in Y-Axis														
Disks 1-8	1.43	1.20	1.15	1.05	0.98	0.90	0.81	0.73	0.66	0.58	0.52	0.45	0.38	0.32
IOPS in Y-Axis														
Disks1-8	734.2	615.8	590.7	535.4	500.2	460.3	416.3	374.9	337.9	298.3	268.3	230.9	197.0	165.0
Performance Degradation in %														
Disks 1-8	0.00	16.12	19.54	27.07	31.87	37.31	43.30	48.94	53.97	59.37	63.46	68.54	73.17	77.52



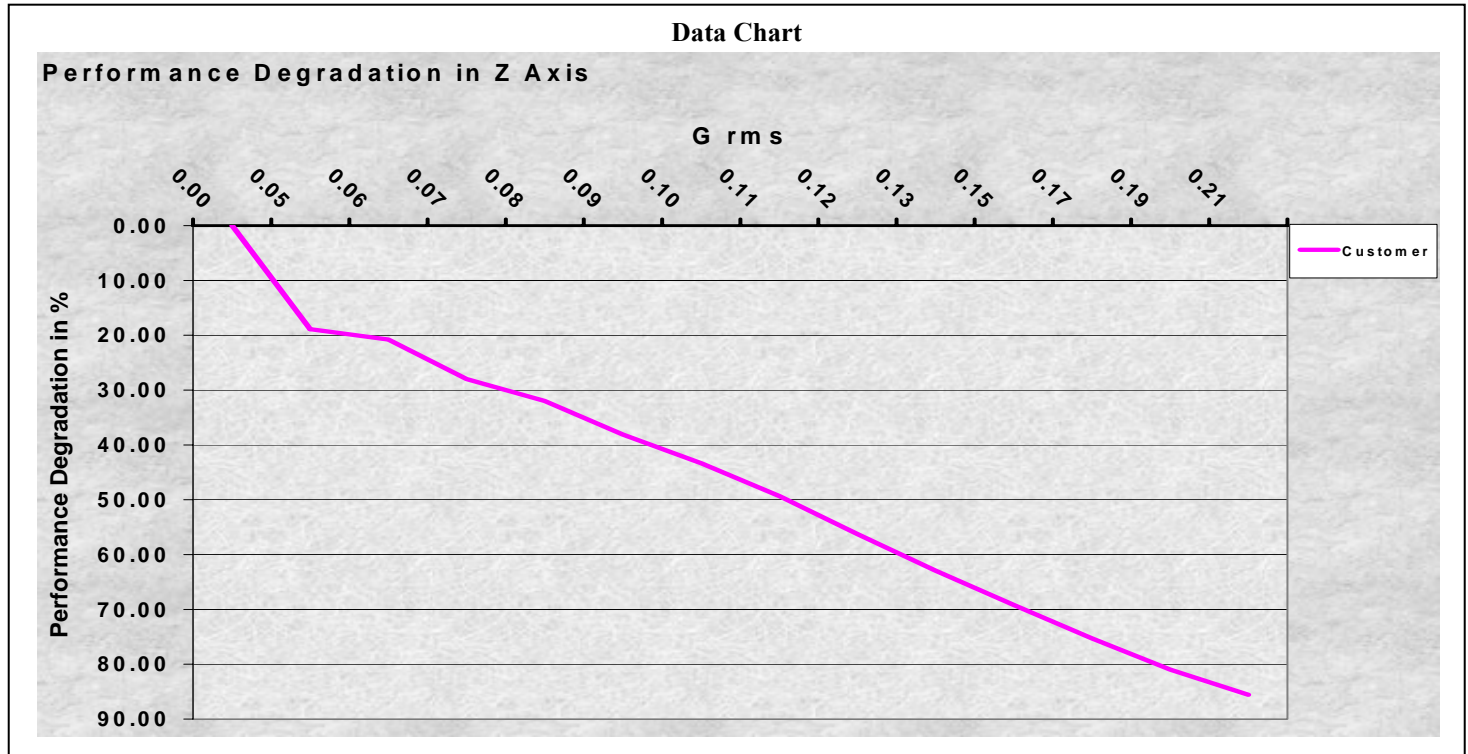
WDT CONFIDENTIAL

This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.

Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	 Western Digital®
	Requested by: Mike Thompson	
Tested By: Eric Hemming	Test Completion: 11-16-04	Systems Reliability Engineering Lab


12.3 Z-Axis:

Raw Data														
G rms	0.00	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.15	0.17	0.19	0.21
MB/s in Z-Axis														
Disks 1-8	1.43	1.16	1.14	1.03	0.98	0.89	0.81	0.73	0.63	0.53	0.44	0.35	0.27	0.21
IOPS in Z-Axis														
Disks 1-8	734.2	595.5	581.7	528.8	499.4	454.3	416.0	372.3	321.2	272.2	226.1	181.3	139.7	106.0
Performance Degradation in %														
Disks 1-8	0.00	18.89	20.77	27.98	31.98	38.12	43.33	49.30	56.26	62.92	69.20	75.30	80.97	85.57

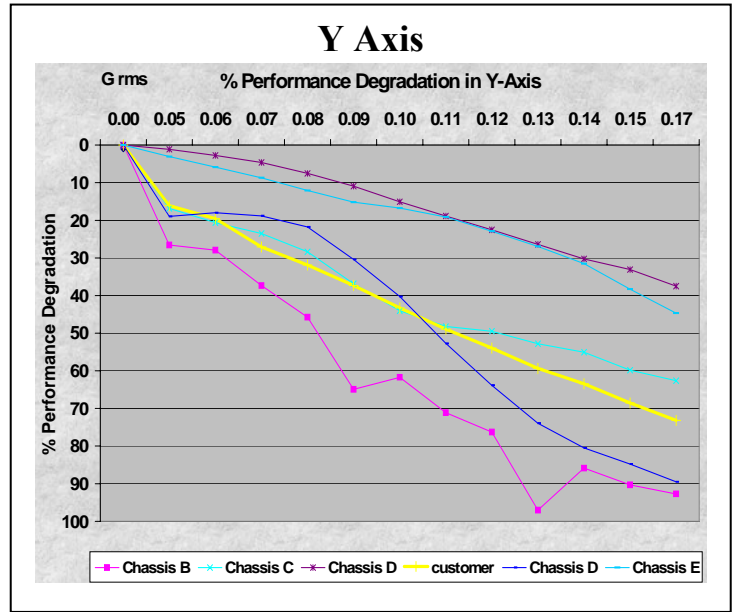
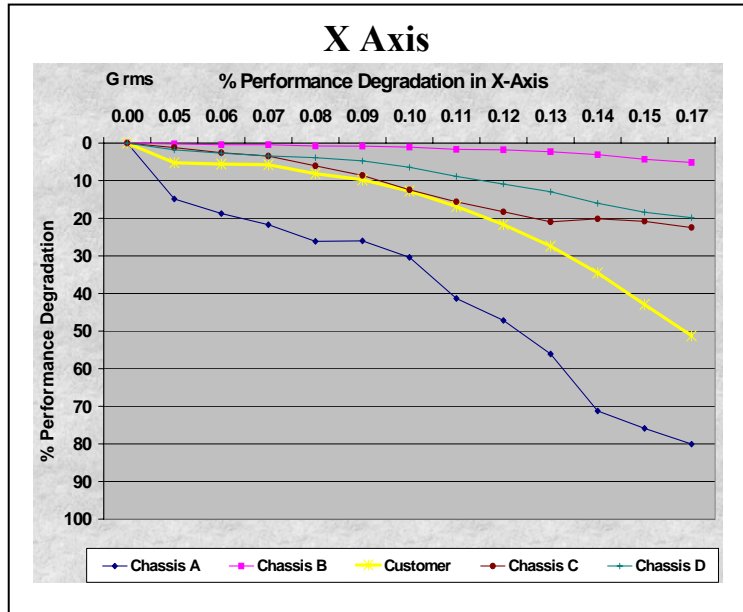


WDT CONFIDENTIAL

This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.

Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	 Western Digital® Systems Reliability Engineering Lab
	Requested by: Mike Thompson Tested By: Eric Hemming	

13.0 Chassis Comparison Data

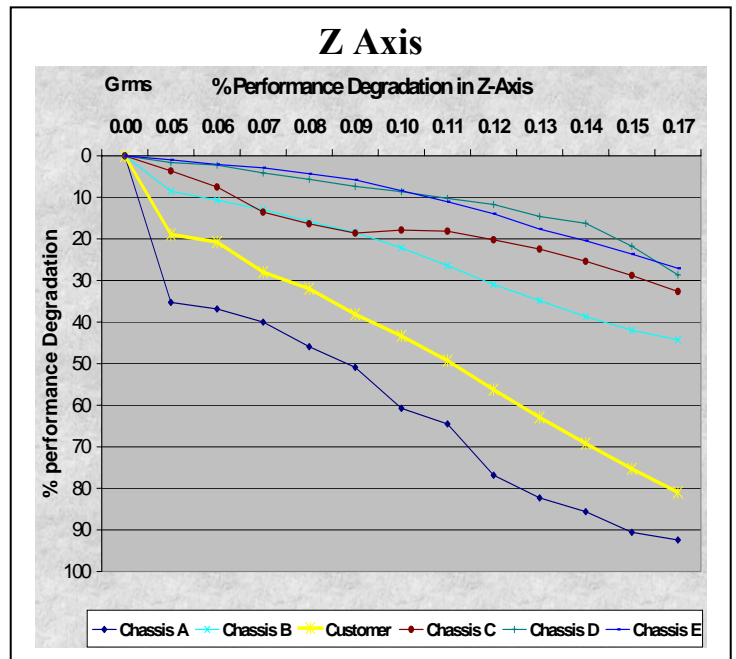


The **Yellow** line in each chart is the Enhance system and is based on the average trend line for each axis.

These charts compare the RS2080SA system chassis design to a range of other server and storage chassis designs available from the industry.


As shown, the Enhance design falls in the middle of the performance range for X , Y, and Z axis performance This represents a solid design and indicates above average performance.

It must be noted that the Y axis performance is the most difficult axis in terms of performance impact and it is visible in the charts that all chassis have a wider range of variance and performance loss in the Y axis.



WDT CONFIDENTIAL

This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.

Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	
Requested by: Mike Thompson	SRE Job Number: 4CST155	
Tested By: Eric Hemming	Test Completion: 11-16-04	Systems Reliability Engineering Lab

14.0 Summery:

14.1 Testes still in Progress:


- NONE
-

14.2 Overview:

- The RS2080SA is a solid performer and had many good features. This system can compete side by side with some of the best systems that we have tested in our lab to date. There should be no problem using any of our compatible drive models (SATA) in this system. The RS2080SA had above average Thermal performance and above industry standard performance loss. This system ranked at the upper end of the performance curve.

WDT CONFIDENTIAL

This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.

Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	
Requested by: Mike Thompson	SRE Job Number: 4CST155	
Tested By: Eric Hemming	Test Completion: 11-16-04	Systems Reliability Engineering Lab

APPENDIX A

15.0 IOMETER

Iometer is an I/O subsystem measurement and characterization tool for single and clustered systems. Iometer is pronounced “eye-OM-i-ter,” to rhyme with “thermometer.” Iometer does for a computer’s I/O subsystem what a dynamometer does for an engine: it measures performance under a controlled load. Iometer was formerly known as “Galileo.”

Iometer is both a workload generator (that is, it performs I/O operations in order to stress the system) and a measurement tool (that is, it examines and records the performance of its I/O operations and their impact on the system). It can be configured to emulate the disk or network I/O load of any program or benchmark, or can be used to generate entirely synthetic I/O loads. It can generate and measure loads on single or multiple (networked) systems.


For a complete description, open the PDF document below.



IOMETER.pdf

WDT CONFIDENTIAL

This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.

Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	 Western Digital® Systems Reliability Engineering Lab
Requested by: Mike Thompson	SRE Job Number: 4CST155	
Tested By: Eric Hemming	Test Completion: 11-16-04	

APPENDIX B

15.1 Western Digital XL80II RE


Serial ATA
WD Caviar® RE 250 GB
 7200 RPM



General	
Rotational Speed	7,200 RPM (nominal)
Buffer Size	8 MB
Average Latency	4.20 ms (nominal)
Contact Start/Stop Cycles	0 minimum
Seek Times (Average)	
Read Seek Time (Average)	8.9 ms
Write Seek Time (Average)	10.9 ms (average)
Track-To-Track Seek Time	2.0 ms (average)
Full Stroke Seek	21.0 ms (average)
Transfer Rates	
Buffer To Host (Serial ATA)	1,200 Mbits/s (Max)
Buffer To Disk	748 Mbits/s (Max)
Buffer To Disk	61 MB/s (Sustained)
General	
Number of Heads (Physical)	6
General	
Formatted Capacity	250,059 MB
Capacity	250 GB
Interface	SATA
Actuator Type	Rotary Voice Coil
Number of Platters	3
Bytes Per Sector	512
User Sectors Per Drive	488,397,168
Servo Type	Embedded
English	
Height (English)	1.028 Inches (Max)
Length (English)	5.787 Inches (Max)
Width (English)	4.00 Inches (+/- 0.010 inch)
Weight (English)	1.32 Pounds (+/- .10 lb)
Metric	
Height (Metric)	26.1 mm (Max)
Length (Metric)	147 mm (Max)
Width (Metric)	101.6 mm
Weight (Metric)	0.6 kg (+/- .082 kg)
Shock	
Operating Shock (Read)	65G, 2 ms
Non-operating Shock	250G, 2 ms
Acoustics	

WDT CONFIDENTIAL

This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.

Thermal Profile & System Level Performance Loss Characterization	Unit Under Test: Enhance RS2080SA-600U DAS Enterprise Storage Appliance	 Western Digital®
	Requested by: Mike Thompson	
Tested By: Eric Hemming	Test Completion: 11-16-04	Systems Reliability Engineering Lab

Idle Mode	28 dBA (average)
Seek Mode 0	33 dBA (average)
Seek Mode 3	29 dBA (average)
Temperature (English)	
Operating (English)	41° F to 131° F
Non-operating (English)	-40° F to 149° F
Temperature (Metric)	
Operating (Metric)	5° C to 55° C
Non-operating (Metric)	-40° C to 65° C
Humidity	
Operating	5-95% RH non-condensing
Non-operating	5-95% RH non-condensing
Altitude (English)	
Operating (English)	-1,000 feet to 10,000 feet
Non-operating (English)	-1,000 feet to 40,000 feet
Altitude (Metric)	
Operating (Metric)	-305M to 3,050M
Non-operating (Metric)	-305M to 12,200M
Vibration	
Operating	
Linear	20-300 Hz, 0.75G (0 to peak)
Random	10-300 Hz, 0.004 g2/Hz
Non-operating	
Low Frequency	5-20 Hz, 0.195 inches (double amplitude)
High Frequency	20-500 Hz, 4.0G (0 to peak)
Current Requirements	
12 VDC	
Read/Write	450 mA
Idle	430 mA
Standby	20 mA
Sleep	20 mA
5 VDC	
Read/Write	800 mA
Idle	730 mA
Standby	270 mA
Sleep	250 mA
Power Dissipation	
Read/Write	9.50 Watts
Idle	8.75 Watts
Standby	1.60 Watts
Sleep	1.50 Watts

WDT CONFIDENTIAL

This information is confidential and proprietary to Western Digital Technologies and shall not be reproduced, transmitted or otherwise disclosed to anyone other than WDC employees without written permission from Western Digital Technologies.