



**Subsystem Performance Testing  
Report for**

**Storageflex HA3969  
8Gbit FC-SAS/SATA  
RAID Subsystem**

## Table of Contents

<b>1. Performance Configuration.....</b>	<b>3</b>
1.1 Testing Configuration .....	3
<b>2. Performance Test Results .....</b>	<b>5</b>
2.1 End-to-End RAID 5 Performance.....	5
2.11 Sequential I/O .....	5
2.12 Random I/O .....	7
2.2 End-to-End RAID 6 Performance.....	10
2.21 Sequential I/O .....	10
2.22 Random I/O .....	12
2.3 Degraded RAID 5 Performance .....	14
2.31 Sequential I/O .....	14
2.4 Degraded RAID 6 Performance .....	16
2.41 Sequential I/O – 1 Drive Failed .....	16
2.42 Sequential I/O – 2 Drives Failed .....	18
2.5 Rebuilding RAID 5 Performance.....	20
2.51 Sequential I/O .....	20
2.6 Rebuilding RAID 6 Performance.....	22
2.61 Sequential I/O – 2 Drives Rebuilding .....	22
2.7 All Cache Hit RAID 5 Performance .....	24
2.71 Sequential I/O .....	24
2.7 All Cache Hit RAID 6 Performance .....	26
2.71 Sequential I/O .....	26

## 1. Performance Configuration

Below is a description of the benchmarking testing environment and includes specifications for the server hardware, disk drive, subsystem, management tools of the subsystem and the software-testing tool. The industry standard test application IOMeter was used to measure the performance of the unit. This system comes with the standard Java based management software called SANWatch®. Telnet and RS-232 connections can be used to manage the subsystem as well.

### 1.1 Testing Configuration

RAID	Controller	HA3969 Redundant Active-Active RAID Controllered
	FW	3.71A.25 (FA371A25_121_IPT_ESG6S3G.BIN)
	RAM	1GB DDR II SDRAM
	Drives	RAID: Seagate SAS 450GB (Model: ST3450856SS; Capacity: 450GB; Speed: 3G; 15,000 RPM) JBOD Seagate SAS 300GB (Model: ST3300656SS; Capacity: 300GB; Speed: 3G; 15,000 RPM)
	Channels	Host Channel - Channel 0, 1
		Drive Channel - Channel 2, 3
		RCC Channel – PCI-E
	Logical Drives (RAID5/6) (Dual Hosts)	LD0 - Host channel 0; AID 112; LUN 0; 8 drives/LD; 1 partition
		LD1 - Host channel 1; BID 113; LUN 0; 8 drives/LD; 1 partition
	Logical Drives (RAID5/6) (Four Hosts)	LD0 - Host channel 0; AID 112; LUN 0; 8 drives/LD; 1 partition
		LD1 - Host channel 0; BID 113; LUN 0; 8 drives/LD; 1 partition
		LD2 - Host channel 1; AID 112; LUN 0; 8 drives/LD; 1 partition
		LD3 - Host channel 1; BID 113; LUN 0; 8 drives/LD; 1 partition
	Setting	Optimization for – Raid 5 / 6 Default stripe size 128K
		Periodic Drive Check Time – Disable
Periodic SAF-TE and SES Device Check Time – Disable		
Verification on Normal Drive Writes – Disable		

		Verification on LD Rebuild Writes – Disable
		Max Drive Response Timeout – Disable
		Drive Delayed Write – Disable
		SDRAM ECC – Enable
		CBM – On
HBA	OS Register	MaximumSGList : FF ( Hexadecimal )
		NumberOfRequests: FF ( Hexadecimal )
	QLogic	QLE2562 (Driver VER: 9.1.7.18) ,Bios : v2.02
Server * 2 (Host)	M/B	SUPERMICRO X7DBE Single
	CPU	Intel Quad-Core Xeon 2.0GHz
	RAM	Kingston 2GB DDRII 667 DIMM * 8
	PCI	PCI-X 64-bit/133MHz *3
	System Drive	IDE Seagate 120G (ST3120026A)
	OS.	Microsoft Windows Server 2003 Enterprise R2 (With Service Pack 2)
Benchmark	IOmeter	2004.07.30
	I/O Tool Setting	Outstanding I/O - 16 for MB/s; ( Random < 16k : 64 for IO/s ) ; Other 16 for IO/s
		Ramp Up Time: 40 sec.
		Run Time: 30 sec.
		One LD Corresponds to One Worker.
		All Cache : Maximum Disk Size 10240
		Align I/Os on

## 2. Performance Test Results

The Performance test results are listed below.

**NOTE:**

1. In the following sections, “write-back” is abbreviated as **WB** and “write-through” is abbreviated as **WT**.
2. End-to-End four-channel IOPS Read having a lower performance than dual-channel configuration is a known issue, and will be resolved in the coming release of firmware.

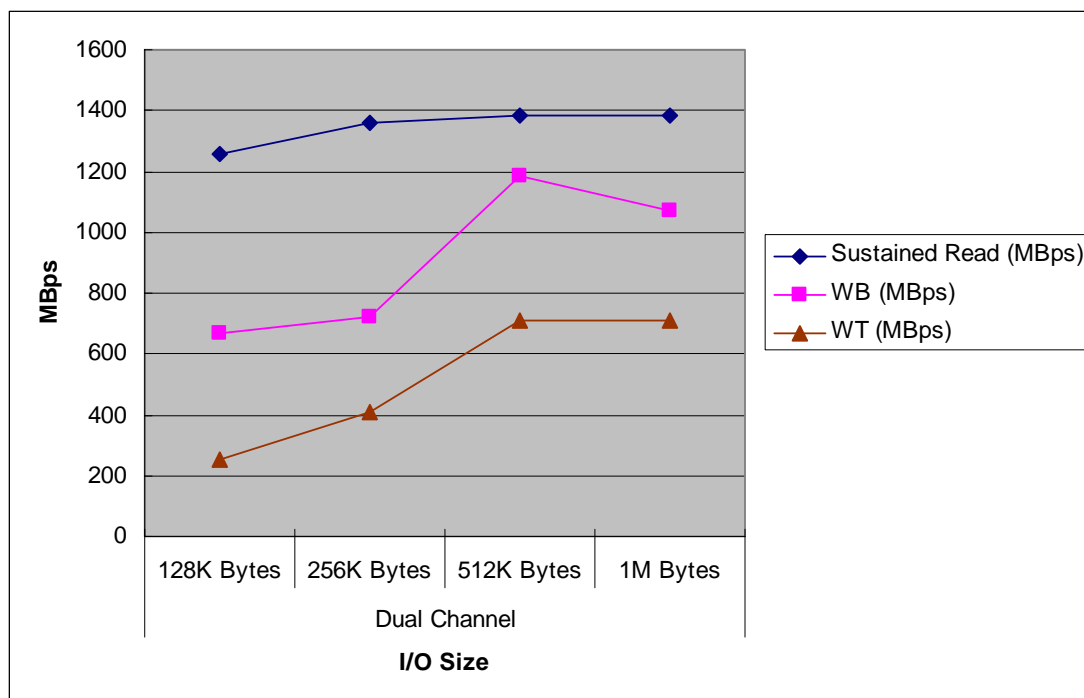
### 2.1 End-to-End RAID 5 Performance

#### 2.11 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)	WT (MB/sec)
Host Channels	I/O Size			
Dual Channel	128K Bytes	1255.05	667.62	254.05
	256K Bytes	1360.08	721.09	411.13
	512K Bytes	1380.85	1187.88	708.00
	1M Bytes	1380.81	1073.30	708.73



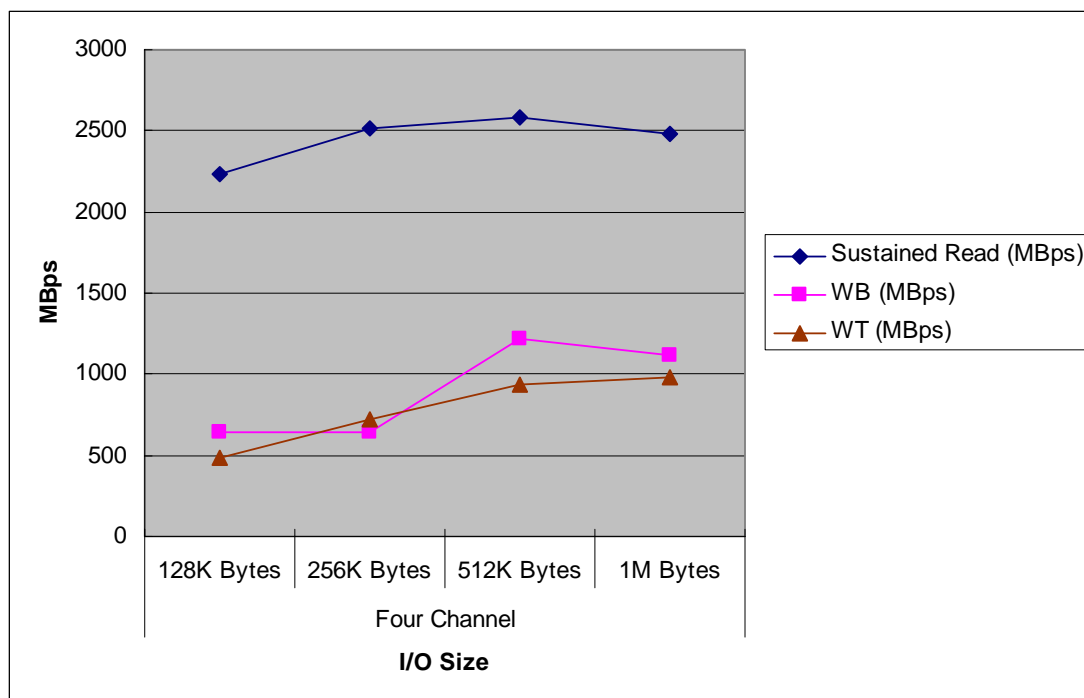
### Data Access Rate (IOPS)

I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	I/O Size		
Dual Channel	512 Bytes	155171.89	47168.00
	4K Bytes	120400.61	35984.17

### >> Four Channel

### Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)	WT (MB/sec)
Host Channels	I/O Size			
Four Channel	128K Bytes	2235.04	647.36	484.29
	256K Bytes	2516.00	646.58	723.82
	512K Bytes	2588.11	1218.39	937.05
	1M Bytes	2479.51	1112.38	986.04



### Data Access Rate (IOPS)

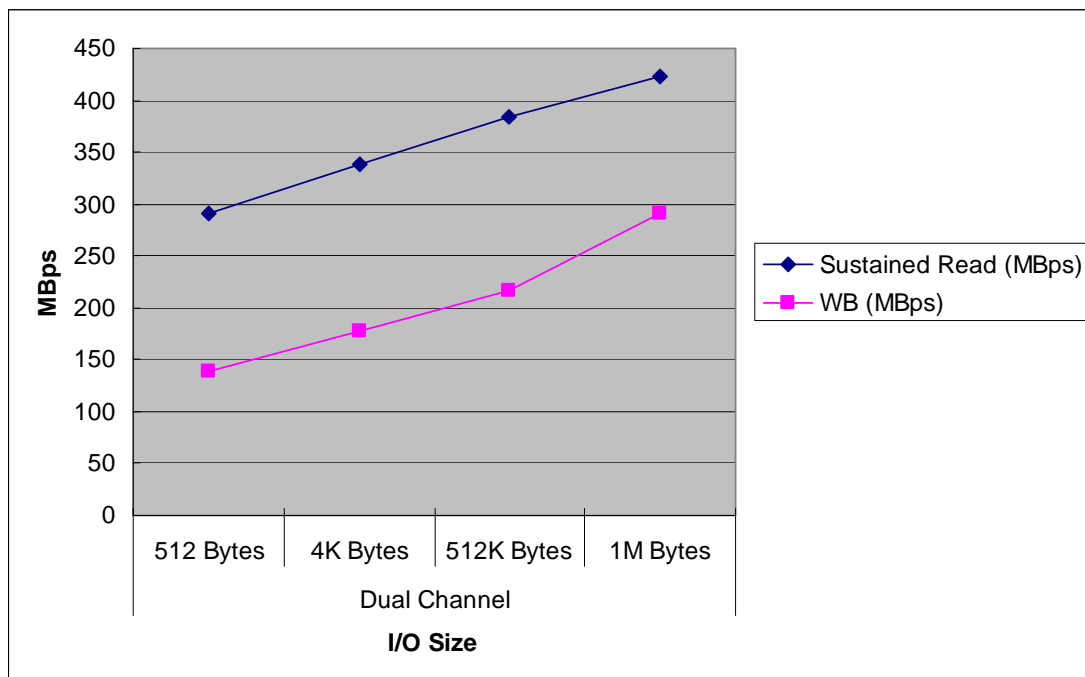
I/O Parameters		Read (IOPS)	WB (IOPS)
Host Channels	I/O Size		
Four Channel	512 Bytes	139739.30	51909.71
	4K Bytes	120625.95	39135.78

## 2.12 Random I/O

### >> Dual Channel

### Data Transfer Rate (MBps)

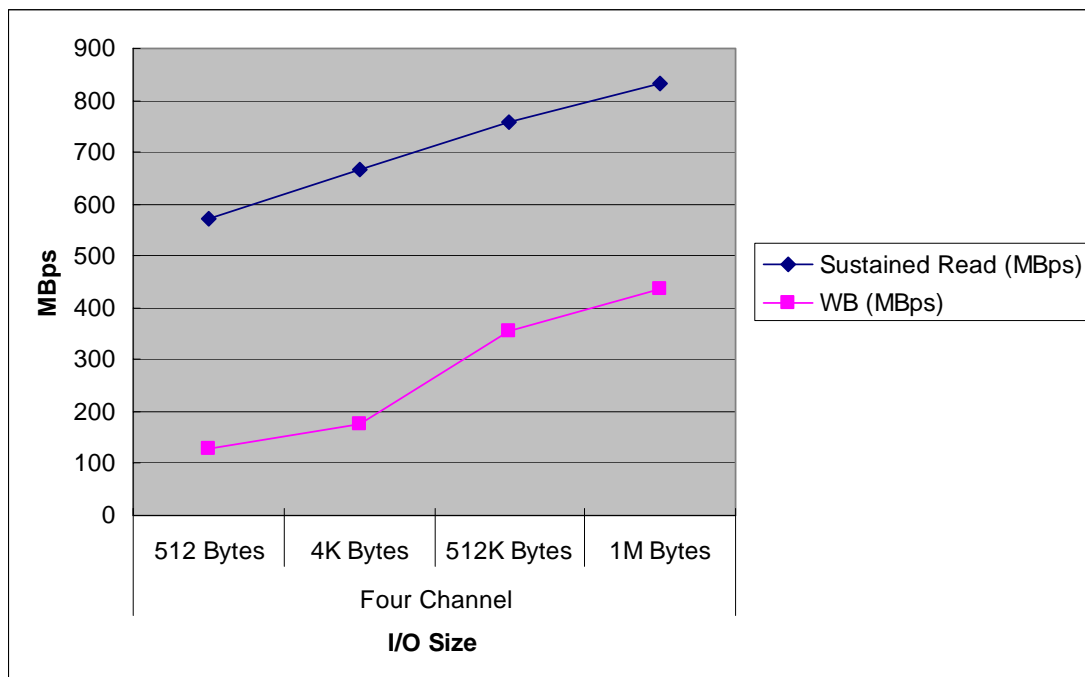
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	291.37	138.99
	256K Bytes	338.30	177.31
	512K Bytes	383.92	217.32
	1M Bytes	422.75	291.09



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	572.72	130.01
	256K Bytes	667.16	176.03
	512K Bytes	758.27	356.03
	1M Bytes	832.90	436.16



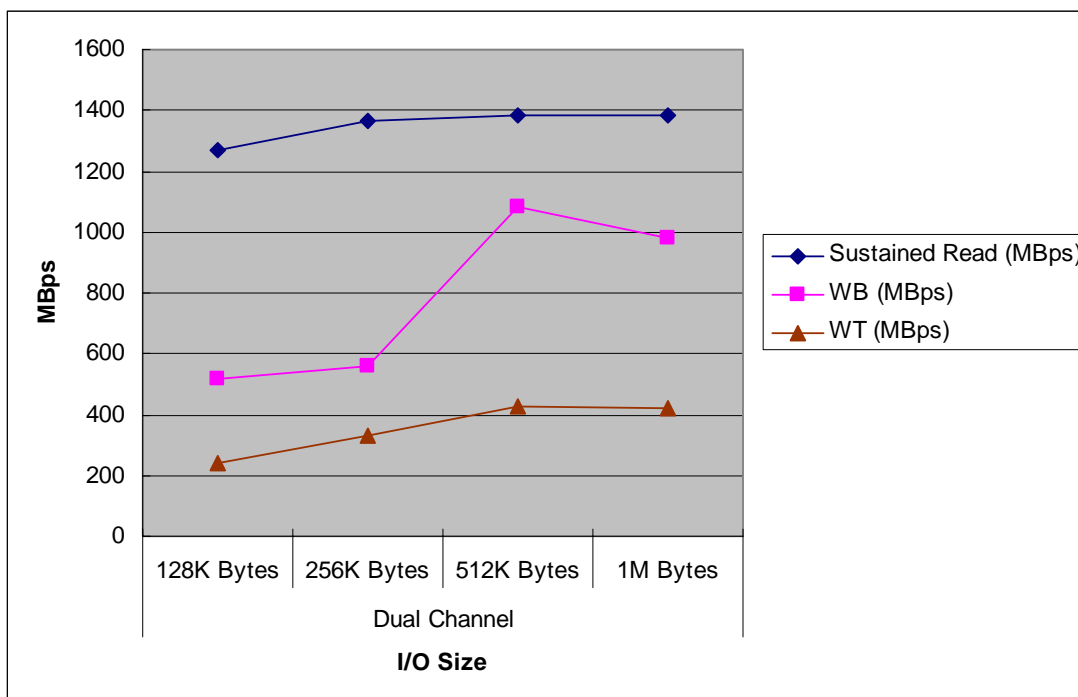
## 2.2 End-to-End RAID 6 Performance

### 2.2.1 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

I/O Parameters		Read	WB	WT
Host Channels	I/O Size	(MB/sec)	(MB/sec)	(MB/sec)
Dual Channel	128K Bytes	1269.78	515.26	239.89
	256K Bytes	1365.95	557.02	331.99
	512K Bytes	1382.90	1081.99	424.65
	1M Bytes	1383.29	980.94	421.55



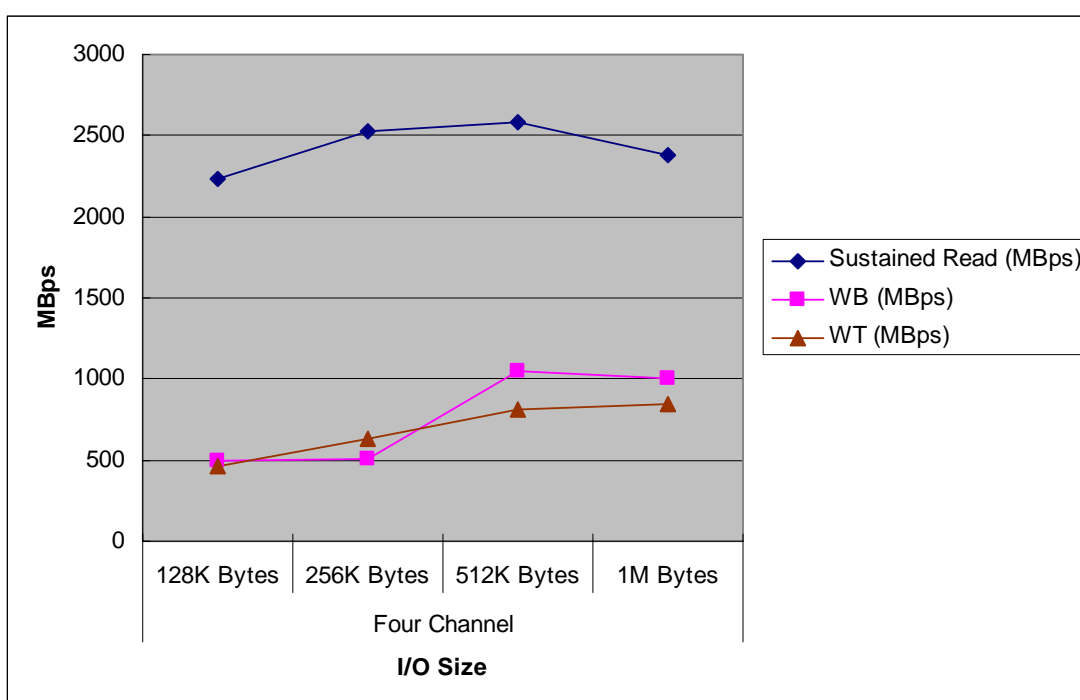
Data Access Rate (IOPS)

I/O Parameters		Read	WB
Host Channels	I/O Size	(IOPS)	(IOPS)
Dual Channel	512 Bytes	152582.19	48283.73
	4K Bytes	111159.50	33565.72

>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read	WB	WT
Host Channels	I/O Size	(MB/sec)	(MB/sec)	(MB/sec)
Four Channel	128K Bytes	2234.09	491.55	462.58
	256K Bytes	2529.10	506.29	635.78
	512K Bytes	2582.59	1052.72	808.90
	1M Bytes	2377.55	998.61	841.64



Data Access Rate (IOPS)

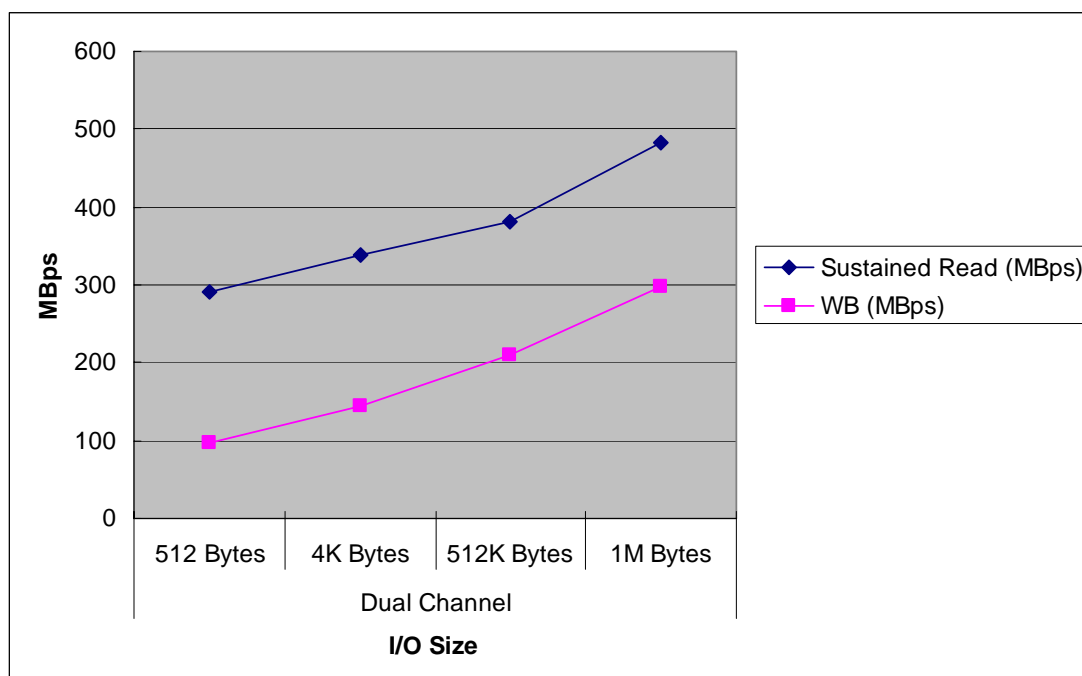
I/O Parameters		Read	WB
Host Channels	I/O Size	(IOPS)	(IOPS)
Four Channel	512 Bytes	138121.46	51274.01
	4K Bytes	116008.46	36544.41

## 2.22 Random I/O

>> Dual Channel

### Data Transfer Rate (MBps)

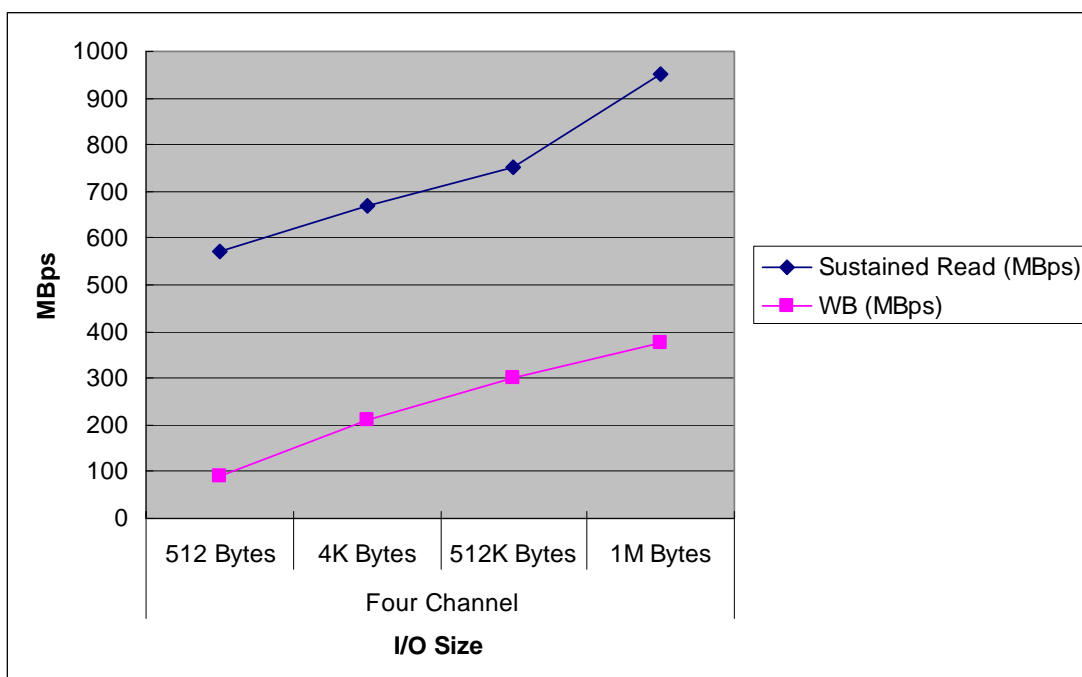
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	291.10	96.04
	256K Bytes	339.17	145.22
	512K Bytes	381.45	210.90
	1M Bytes	482.86	298.16



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	572.67	91.80
	256K Bytes	670.66	210.98
	512K Bytes	751.09	299.01
	1M Bytes	950.28	377.78



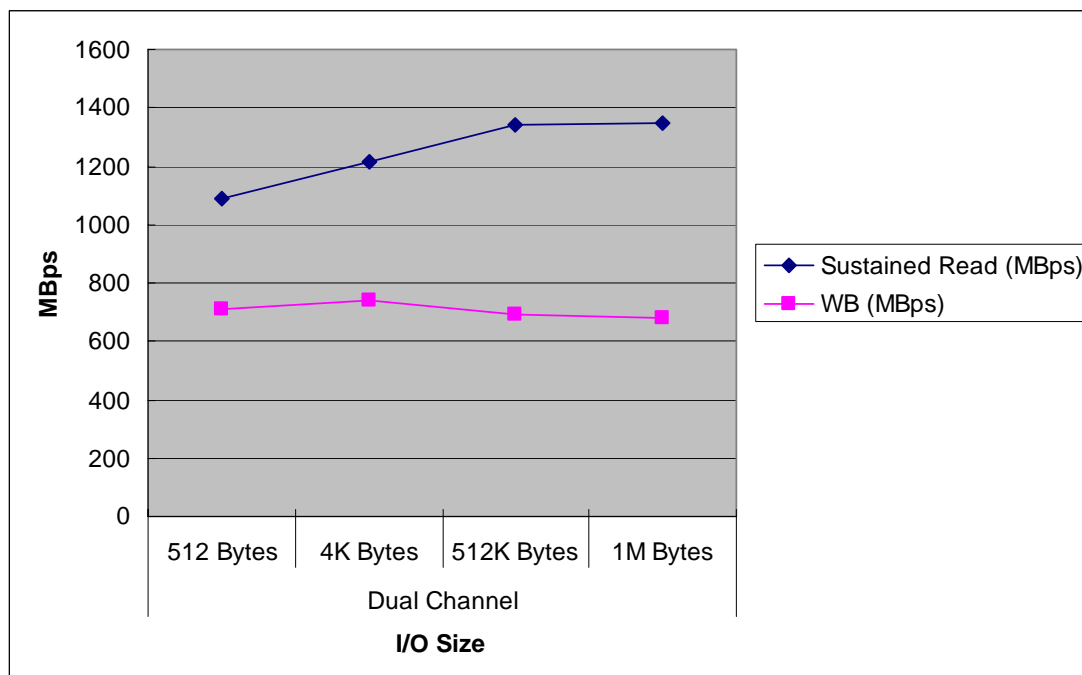
## 2.3 Degraded RAID 5 Performance

### 2.31 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

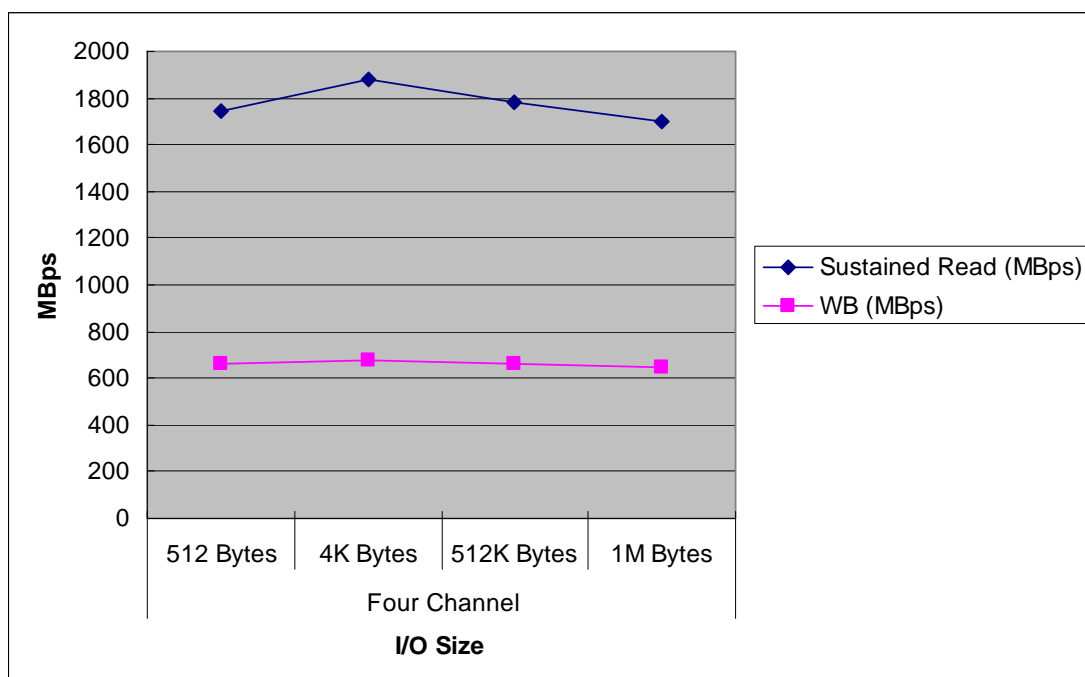
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1086.24	708.56
	256K Bytes	1216.09	741.96
	512K Bytes	1338.87	692.81
	1M Bytes	1346.61	682.12



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1745.81	658.78
	256K Bytes	1880.19	675.85
	512K Bytes	1782.64	662.98
	1M Bytes	1699.87	648.46



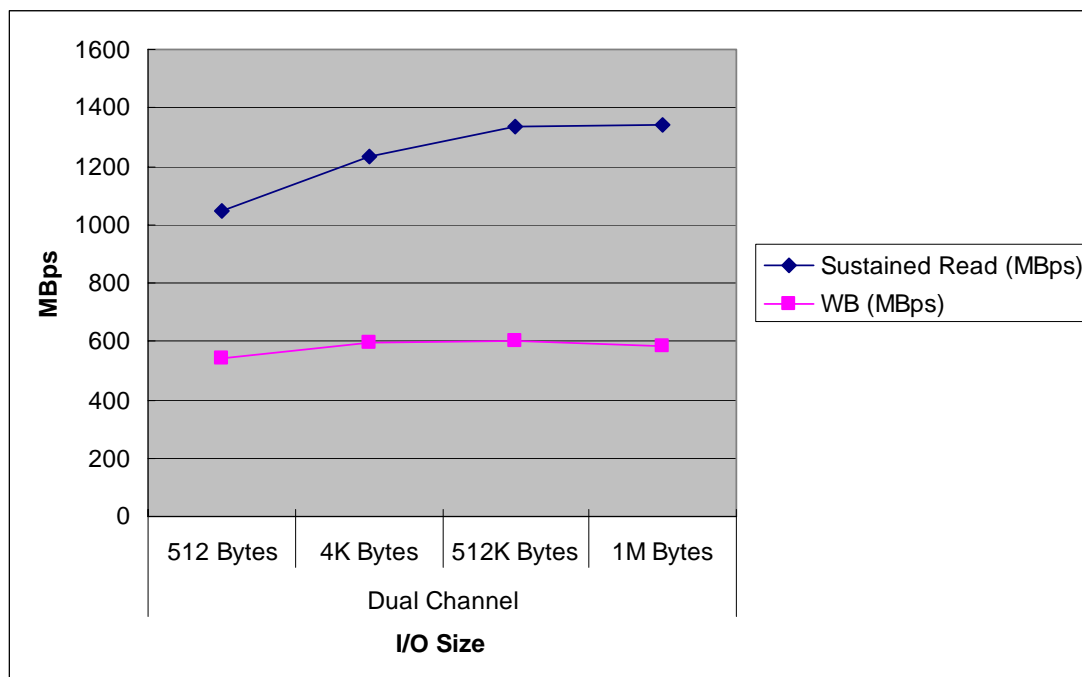
## 2.4 Degraded RAID 6 Performance

### 2.41 Sequential I/O – 1 Drive Failed

>> Dual Channel

Data Transfer Rate (MBps)

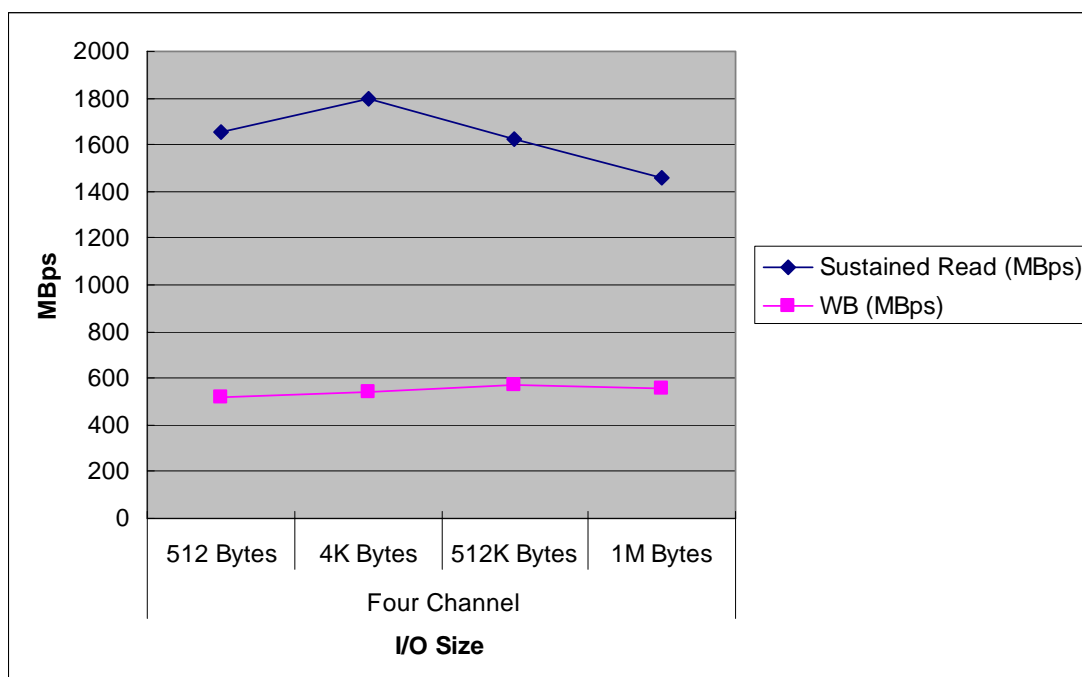
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1045.12	543.30
	256K Bytes	1236.03	597.22
	512K Bytes	1335.18	598.50
	1M Bytes	1343.91	581.49



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1650.81	522.37
	256K Bytes	1798.26	543.44
	512K Bytes	1627.27	569.66
	1M Bytes	1460.87	553.52

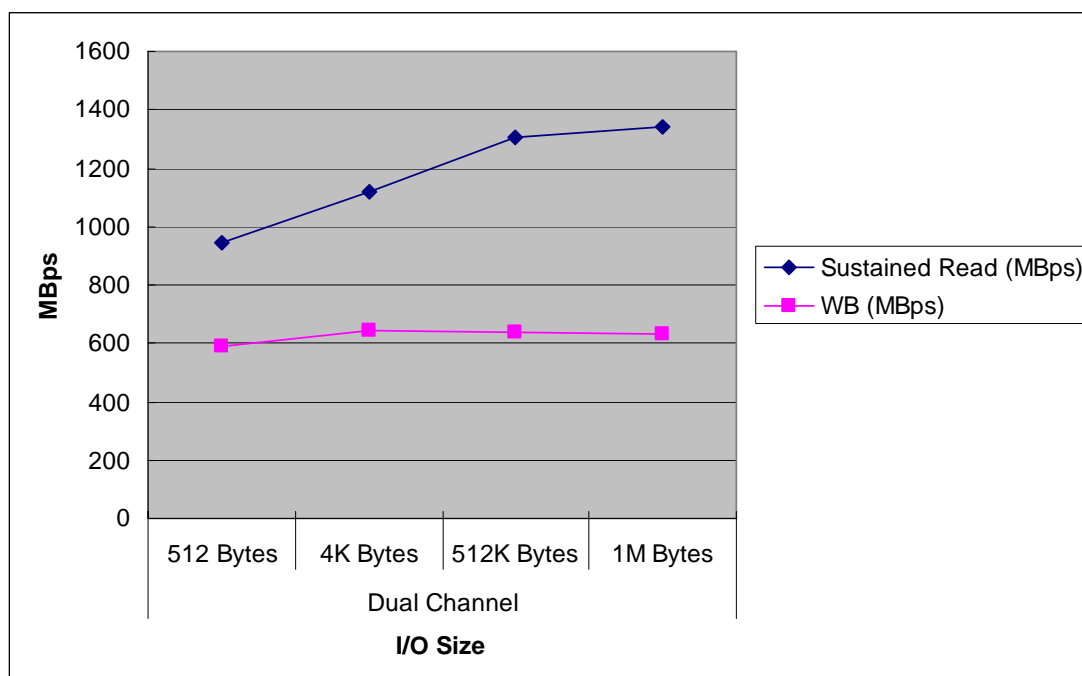


## 2.42 Sequential I/O – 2 Drives Failed

>> Dual Channel

Data Transfer Rate (MBps)

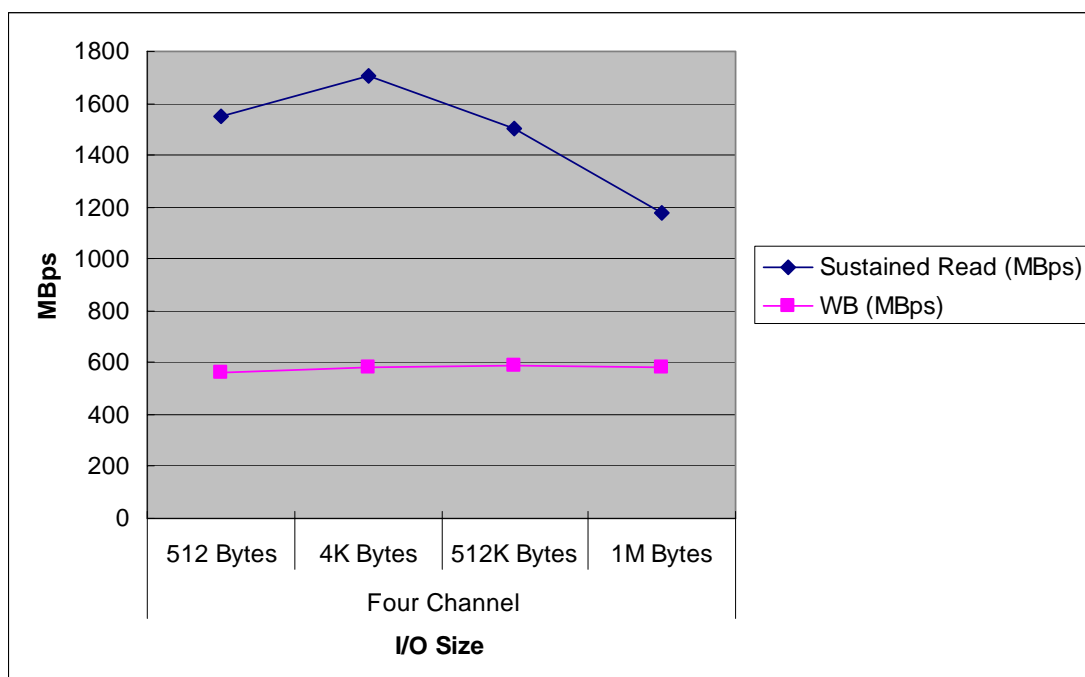
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	944.87	590.26
	256K Bytes	1120.30	644.72
	512K Bytes	1302.46	638.06
	1M Bytes	1340.67	634.25



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1552.44	561.40
	256K Bytes	1705.50	581.89
	512K Bytes	1500.08	590.79
	1M Bytes	1175.00	581.01



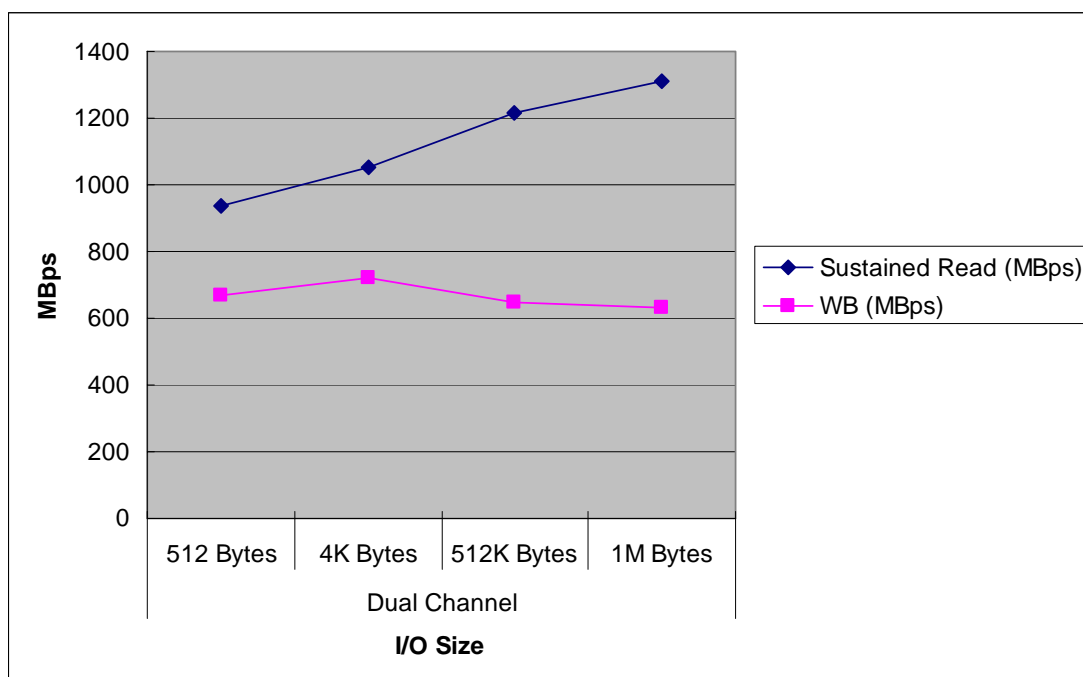
## 2.5 Rebuilding RAID 5 Performance

### 2.51 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

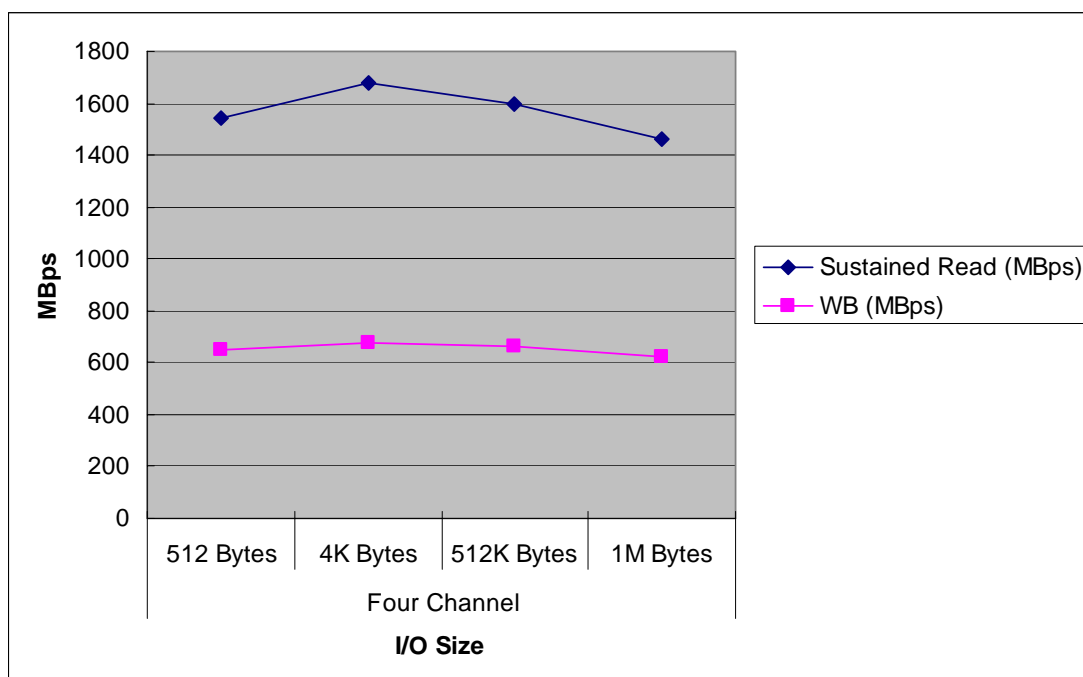
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	934.31	667.40
	256K Bytes	1052.60	723.23
	512K Bytes	1217.65	646.40
	1M Bytes	1308.91	634.05



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1542.85	649.95
	256K Bytes	1677.93	678.62
	512K Bytes	1598.86	660.65
	1M Bytes	1463.72	620.55



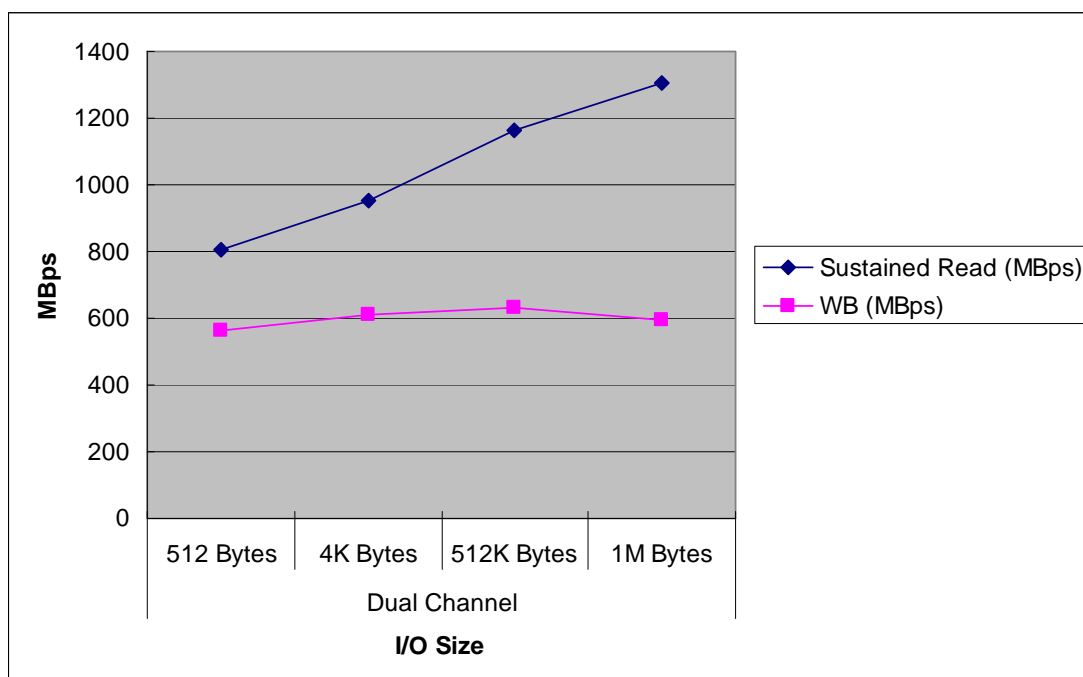
## 2.6 Rebuilding RAID 6 Performance

### 2.61 Sequential I/O – 2 Drives Rebuilding

>> Dual Channel

Data Transfer Rate (MBps)

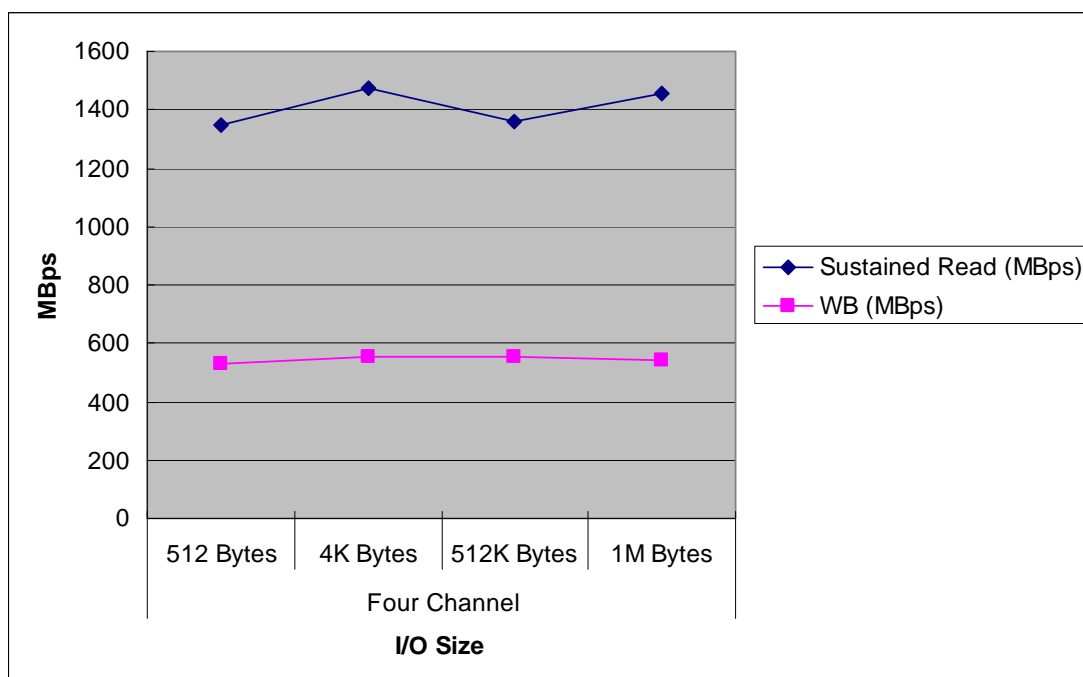
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	806.63	561.66
	256K Bytes	953.10	611.44
	512K Bytes	1165.32	631.88
	1M Bytes	1303.04	593.99



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	1347.55	527.19
	256K Bytes	1473.37	554.39
	512K Bytes	1362.22	555.63
	1M Bytes	1455.55	540.21



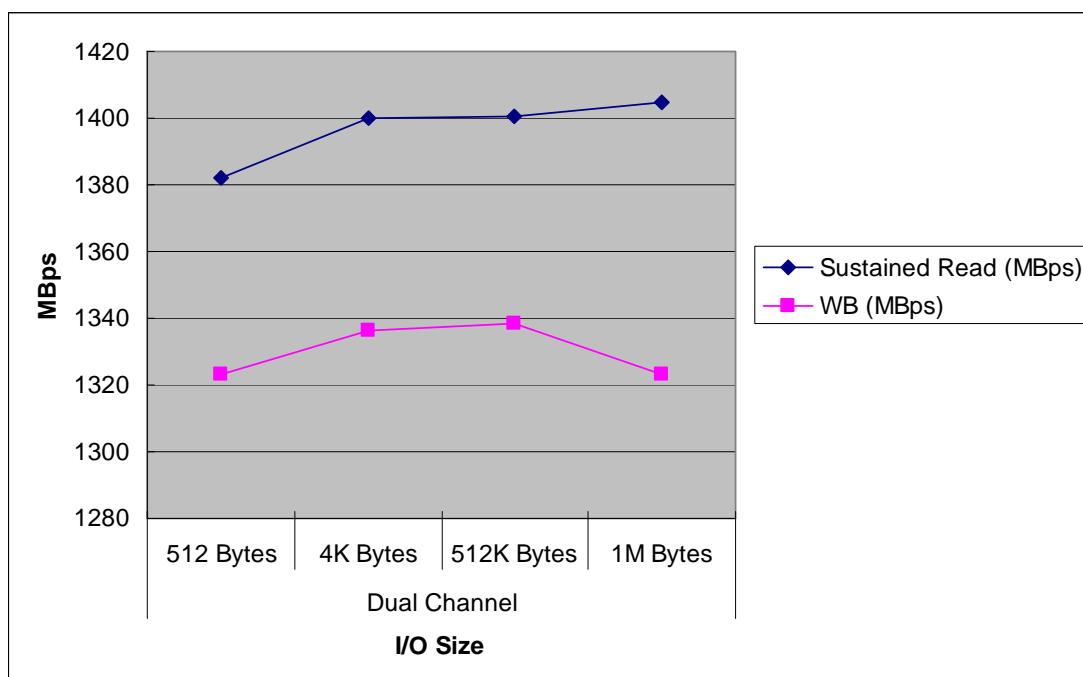
## 2.7 All Cache Hit RAID 5 Performance

### 2.7.1 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

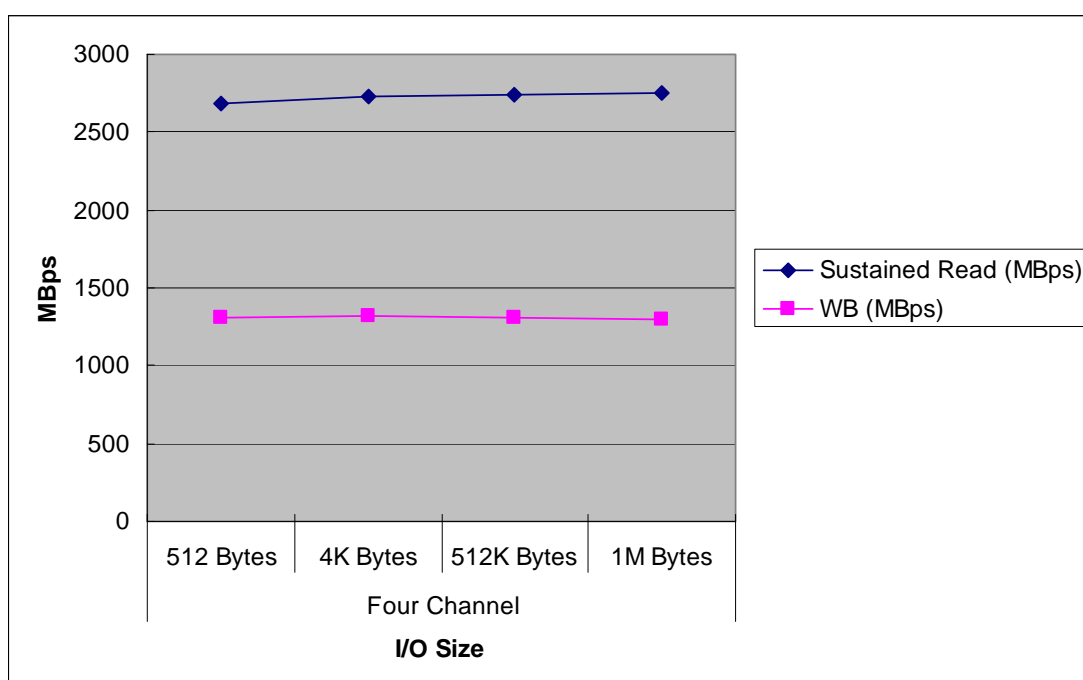
I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1382.12	1323.01
	256K Bytes	1399.78	1336.09
	512K Bytes	1400.50	1338.67
	1M Bytes	1404.85	1322.93



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	2687.60	1310.54
	256K Bytes	2732.47	1316.42
	512K Bytes	2736.54	1309.28
	1M Bytes	2747.66	1296.90



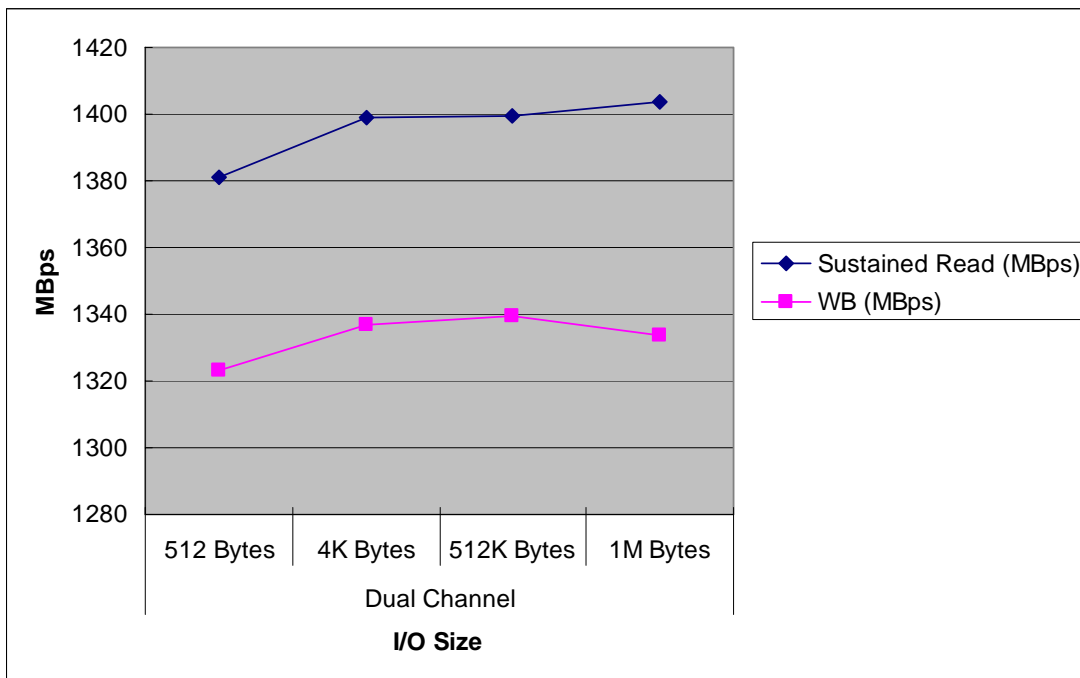
## 2.7 All Cache Hit RAID 6 Performance

### 2.7.1 Sequential I/O

>> Dual Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Dual Channel	128K Bytes	1381.05	1323.40
	256K Bytes	1398.79	1336.95
	512K Bytes	1399.56	1339.25
	1M Bytes	1403.64	1333.85



>> Four Channel

Data Transfer Rate (MBps)

I/O Parameters		Read (MB/sec)	WB (MB/sec)
Host Channels	I/O Size		
Four Channel	128K Bytes	2686.23	1309.83
	256K Bytes	2732.30	1316.00
	512K Bytes	2736.44	1309.75
	1M Bytes	2747.82	1299.67

