OPEN COMPOSABLE COMPATIBILITY LAB

Phison X200P Pascari 3.84TB SSD Test Results

The Third Party Test Results for the are based on a comprehensive evaluation to ensure compatibility, performance, and reliability performed by the Open Composable Compatibility Lab (OCCL). The assessment covers basic interoperability and specialized workload performance using industry-standard benchmarking tools. This test result is not an endorsement of the third-party product by Western Digital and no warranty of the product is expressed or implied by Western Digital or the OCCL.

For more information related OCCL, see: https://www.opencomposable.com/.

Drive Details

Drive	Phison Pascari X200P
Form Factor	U.2 15mm
Interface	PCIe® Gen5
Security	N/A
Power	22W (Active)
Power Idle	5W
Part Number	XX208H023T84P324T0910

The following table displays the status and results of the testing of a specific device. The four columns represent specific configurations which progressively increase in terms of complexity in the following order: Local benchmark x1 > Data24 x1 > Data24 x8 > Data24 x24. All devices will start with the Local x1 and Data24 x1. Poor performance or interoperability issues in any configuration can eliminate the device from further consideration. The individual tests are consistent with general industry practices and reporting. Western Digital's OpenFlex™ Data24 NVMe-oF™ Storage Platform extends the high performance of NVMe™ flash to shared storage. The storage platform provides low-latency sharing of NVMe SSDs over a high-performance Ethernet fabric to deliver similar performance to locally attached NVMe SSDs.

For additional information on Western Digital's OpenFlex Data24 NVMe-oF Storage Platform, see: https://www.westerndigital.com/products/data-center-platforms/openflex-data24-nvme-of-platform?sku=1ES2380.

Phison X200 Pascari 3.84TB Top Line Performance

Test Description	Local x1	Data24 x1	Data24 x8	Data24 x24
Read Bandwidth (128KB) MB/s	6,933	3,578	44,442	133,630
Write Bandwidth (128KB) MB/s	6,895	3,319	31,506	96,301
Random Read (4KB)K IOPS	1,648	856	8,217	24,642
Random Write (4KB) K IOPS	381	378	3,085	9,222
Random Mixed (4KB) K IOPS	970	699	3,913	11,786
4K Random Write Latency (µs)	7.701	19.274	19.707	19.924
4K Random Read Latency (µs)	55.063	62.761	62.985	63.160
4K Random Write 4-9s µs	11.925	41.728	29.120	29.873
4K Random Read 4-9s µs	218.110	224.250	245.410	244.840

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The following table displays tests 2-4 normalized to test 1 (Local x1), the percentages in tests 2-4 should generally increase with more complex and larger configurations. The two QoS values (4-9s) by their stocastic behavior can have significant variability.

Phison X200P Pascari 3.84TB Normalized to Local x1 Top Line Performance

Test Description	Local x1	Data24 x1	Data24 x8	Data24 x24
Read Bandwidth (128KB) MB/s	1.00X	0.52X	6.41X	19.28X
Write Bandwidth (128KB) MB/s	1.00X	0.48X	4.57X	13.97X
Random Read (4KB)K IOPS	1.00X	0.52X	4.99X	14.96X
Random Write (4KB) K IOPS	1.00X	0.99X	8.09X	24.18X
Random Mixed (4KB) K IOPS	1.00X	0.72X	4.03X	12.15X
4K Random Write Latency (µs)	1.00X	0.40X	0.39X	0.39X
4K Random Read Latency (µs)	1.00X	0.88X	0.87X	0.87X
4K Random Write 4-9s µs	1.00X	0.29X	0.41X	0.40X
4K Random Read 4-9s µs	1.00X	0.97X	0.89X	0.89X

Coefficients of Variation (CoV) are a standard statistical measure that are directly comparable to other CoVs as opposed to Standard Deviations (SD) that can only be compared if the mean is the same for two sets of data. CoV = SD/MEAN. NAND storage has a higher variability than DRAM, for example, that is highly consistent. NAND is a noise technology that has higher error rates than most solid state memory. Each manufacturing process has its own baseline error rate. These error rates are based on one second intervals provided by standard monitoring tools like iosstat.

Phison X200P Pascari 3.84TB CoV Analysis

Test Description	Local x1	Data24 x1[6]	Data24 x8[7]	Data24 x24
Read Bandwidth (128KB) MB/s	0.000%	0.001%	1.050%	0.447%
Write Bandwidth (128KB) MB/s	0.011%	0.000%	0.378%	0.884%
Random Read (4KB)K IOPS	0.007%	0.019%	0.139%	0.055%
Random Write (4KB) K IOPS	0.259%	0.909%	0.040%	0.043%
Random Mixed (4KB) K IOPS	0.181%	0.034%	1.652%	0.508%
4K Random Write Latency (µs)	0.142%	3.524%	0.106%	0.135%
4K Random Read Latency (µs)	0.375%	1.054%	0.025%	0.010%
4K Random Write 4-9s µs	1.339%	5.236%	1.874%	0.236%
4K Random Read 4-9s µs	4.057%	1.292%	0.393%	0.758%

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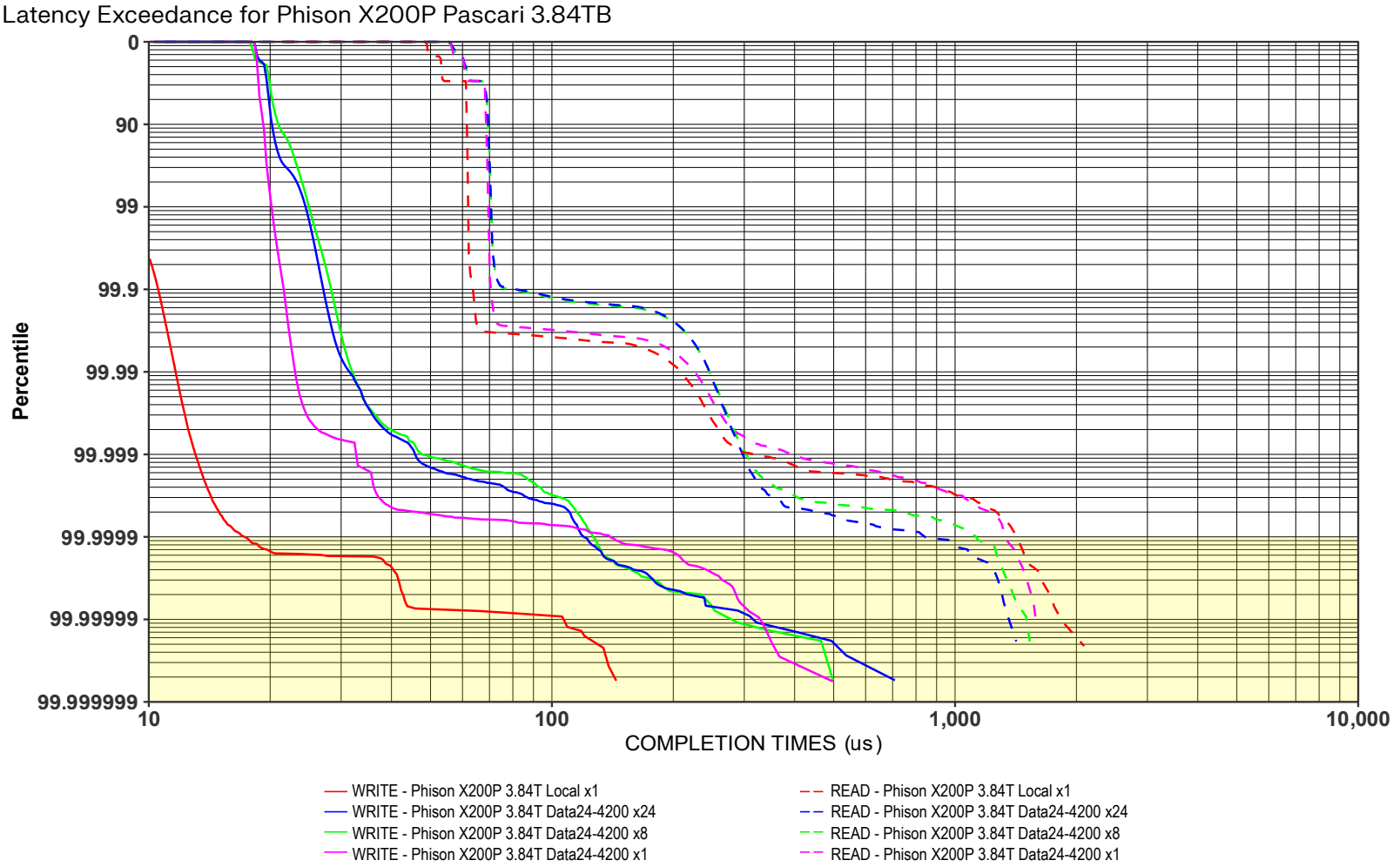
Exceedance Chart

The following charts contain the technical and most accurate information. Exceedance charts are typically used for only single drive, single process, queue depth one analysis as in the following example. The chart is the most fundamental measurement of SSD or disk performance as it shows the minimum latency as well as the expected error rate and latency for the device under test. These results are often referred to as the “number of nines”. For example, “4-9s” shows the latency or response time for 9999 of 10000 IOs. The number of IOs grows exponentially with the increase in the number of nines. This chart shows for 6-9s that the best performer for random writes is the small blue dotted line at approximately 90 µs. Random writes are faster than random reads, because random writes are cached in the asynchronous write buffer and are periodically written to the underlying NAND media. Exceedance charts can be run and compared as long as all tests were run on similar systems using the same workload.



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