

# Intel P3700 NVMe Enterprise Performance Flash Adapter

## Product Guide (withdrawn product)

The Intel P3700 NVMe Enterprise Performance Flash Adapters are a new family of PCIe Flash Storage Adapters that provides high performance data transfers from storage, at rates significantly faster than SAS or SATA-based SSDs.

The Intel P3700 NVMe Enterprise Performance Flash Adapter devices are based on Intel-developed controller, firmware, and leading manufacturing process NAND flash memory. Rigorous qualification and compatibility testing by Lenovo ensures a highly reliable flash adapter. By combining Flash NAND management techniques and NAND silicon enhancements, High Endurance Technology (HET) enables the P3700 Series to achieve up to 17 drive writes per day over a 5 year drive life.

The adapter is shown in the following figure.

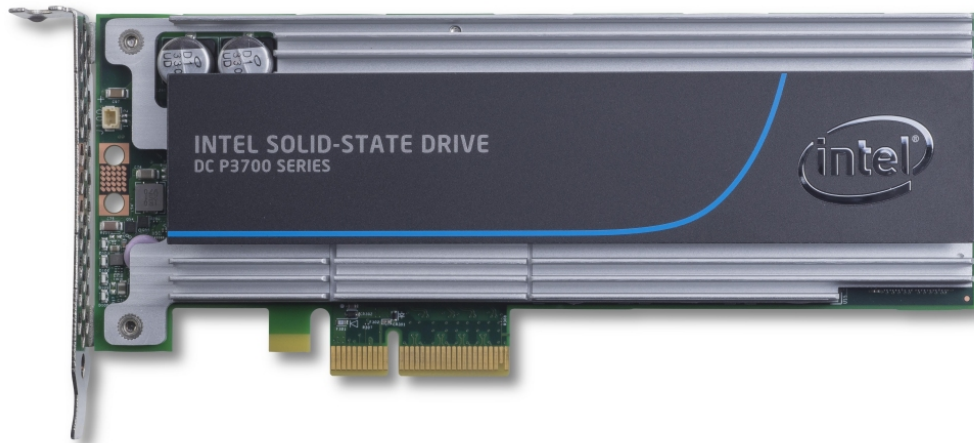


Figure 1. Intel P3700 NVMe Enterprise Performance Flash Adapter

### Did You Know?

NVMe (Non-Volatile Memory Express) is a technology that overcomes SAS/SATA SSD performance limitations by optimizing hardware and software to take full advantage of flash technology. Intel Xeon processors efficiently transfer data in fewer clock cycles with the NVMe optimized software stack compared to the legacy Advance Host Controller Interface (AHCI) stack, thereby reducing latency and overhead. These adapters connect directly to the processor via the PCIe bus, further reducing latency and TCO.

## Part number information

**Withdrawn:** All adapters are withdrawn from marketing.

The following table shows the part numbers for adapters supported on System x servers.

Table 1. Ordering part numbers - System x

Part number	Feature	Description
01GT711	AVPY	Intel P3700 800GB NVMe Enterprise Performance Flash Adapter
00YA812	AT7L	Intel P3700 1.6TB NVMe Enterprise Performance Flash Adapter
00YA815	AT7M	Intel P3700 2.0TB NVMe Enterprise Performance Flash Adapter

The following table shows the part numbers for adapters supported on ThinkServer systems.

Table 2. Ordering part numbers - ThinkServer

Part number	Description
4XB0K12391	ThinkServer Intel P3700 800GB NVMe Enterprise Performance Flash Adapter

The part numbers for the adapters include the following items:

- One adapter with full-height (3U) PCIe bracket attached
- Separate low-profile (2U) PCIe bracket
- Documentation

## Features

The Intel P3700 NVMe Enterprise Performance Flash Adapters are PCIe 3.0 storage devices in a standard half-high half-length PCIe form factor. The adapters use the the new Non-Volatile Memory express (NVMe) high-performance controller interface which delivers leading performance, low latency, and quality of service. The adapters offer capacities up to 2.0 TB and provide world-class reliability and endurance.

The P3700 adapters deliver excellent sequential read performance of up to 2.8 GB/s and sequential write speeds of up to 2.0 GB/s. The adapters can also deliver very high random read IOPS of 460K and random write IPS of 175K for 4 KB operations. Taking advantage of the direct path from the adapter to the processor, the P3700 adapters have low latency of less than 20  $\mu$ s for sequential access.

The P3700 adapters also include High Endurance Technology (HET) which combines NAND silicon enhancements and SSD NAND management techniques to extend SSD write endurance up to 17 drive writes per day (DWPD) for 5 years.

Key features:

- Consistently high IOPS and throughput
- Sustained low latency
- High Endurance Technology (HET)
- Uncorrectable bit error rate (UBER): 1 sector per  $10^{17}$  bits read
- Mean time before failure (MTBF): 2 million hours
- Variable sector size (512, 520, 528, 4096, 4104, 4160 and 4224 byte support)
- Enhanced power-loss data protection
- Power loss protection capacitor self-test with S.M.A.R.T alerting
- Out-of-band management via SMBus interface
- Thermal throttling and management

## Technical specifications

The following table lists the technical specifications for the Intel P3700 NVMe Enterprise Performance Flash Adapters.

Table 3. Technical specifications

Specification	800 GB adapter	1.6 TB adapter	2.0 TB adapter
Part number	01GT711 4XC0G88861	00YA812	00YA815
Interface	PCIe 3.0 x4	PCIe 3.0 x4	PCIe 3.0 x4
Form factor	Half height, half length	Half height, half length	Half height, half length
Capacity	800 GB	1.6 TB	2.0 TB
Endurance	14.6 PB TBW 10 DWPD	43.8 PB TBW 15 DWPD	62.05 PB TBW 17 DWPD
Random read IOPS (4 KB blocks)	460,000 (90% consistent)	450,000 (90% consistent)	450,000 (90% consistent)
Random write IOPS (4 KB blocks)	90,000 (90% consistent)	150,000 (90% consistent)	175,000 (90% consistent)
Sequential read throughput	2.8 GBps	2.8 GBps	2.8 GBps
Sequential write throughput	1.9 GBps	1.9 GBps	1.9 GBps
Read access latency sequential*	20 $\mu$ s	20 $\mu$ s	20 $\mu$ s
Read access latency random*	115 $\mu$ s	115 $\mu$ s	115 $\mu$ s
Write access latency sequential*	20 $\mu$ s	20 $\mu$ s	20 $\mu$ s
Write access latency random*	25 $\mu$ s	25 $\mu$ s	25 $\mu$ s
Power requirements	25 W	25 W	25 W

\* Latency measured using 4 KB transfer size with queue depth = 1 on a sequential workload using Windows Server 2012 R2 drivers. Power mode set at 25W.

Enterprise Performance solid-state devices have read and write IOPS and throughput performance that are comparable to Enterprise Mainstream devices, but the key difference between them is their endurance (or lifetime); that is, how long they can perform write operations because solid-state devices have a finite number of program/erase (P/E) cycles.

Enterprise Performance PCIe Flash Adapters have better endurance and higher IOPS/GB ratio but also a higher cost/IOPS ratio compared to Enterprise Mainstream PCIe Flash adapters. Because of this fact, the Enterprise Performance PCIe Flash Adapters are targeted for mixed read- and write-intensive workloads, and the Enterprise Mainstream PCIe Flash Adapters are targeted for read-intensive workloads. Solid-state device write endurance often is measured by the number of P/E cycles that the drive incurs over its lifetime, which is listed as the total bytes of written (TBW) data in the device specification.

The TBW value that is assigned to a solid-state device is the total bytes of written data (based on the number of P/E cycles) that a device can be guaranteed to complete (the percentage of remaining P/E cycles is equal to the percentage of remaining TBW). The Lenovo warranty for the solid-state storage is limited to devices that have not reached the maximum guaranteed number of program/erase cycles. Solid-state storage that reaches this limit might fail to operate according to its specifications. Because of such behavior by solid-state devices, careful planning must be done to use solid-state storage in the application environments to ensure that the TBW of the device is not exceeded before the end of the required life expectancy.

## Server support - System x

The following tables list the server compatibility information for the adapters on System x servers.

### Support for System x and dense servers with Xeon E5/E7 v4 and E3 v5 processors

Table 4. Support for System x and dense servers with Xeon E5/E7 v4 and E3 v5 processors

Part number	Description	x3250 M6 (3943)	x3250 M6 (3633)	x3550 M5 (8869)	x3650 M5 (8871)	x3850 X6/x3950 X6 (6241, E7 v4)	nx360 M5 (5465, E5-2600 v4)	sd350 (5493)
01GT711	Intel P3700 800GB NVMe Enterprise Performance Flash Adapter	N	N	Y	Y	Y	N	N
00YA812	Intel P3700 1.6TB NVMe Enterprise Performance Flash Adapter	N	N	Y	Y	Y	N	N
00YA815	Intel P3700 2.0TB NVMe Enterprise Performance Flash Adapter	N	N	Y	Y	Y	N	N

### Support for System x and dense servers with Intel Xeon v3 processors

Table 5. Support for System x servers with Intel Xeon v3 processors

Part number	Description	x3100 M5 (5457)	x3250 M5 (5458)	x3500 M5 (5464)	x3550 M5 (5463)	x3650 M5 (5462)	x3850 X6/x3950 X6 (6241, E7 v3)	nx360 M5 (5465)
01GT711	Intel P3700 800GB NVMe Enterprise Performance Flash Adapter	N	N	N	N	N	N	N
00YA812	Intel P3700 1.6TB NVMe Enterprise Performance Flash Adapter	N	N	N	Y	Y	Y	N
00YA815	Intel P3700 2.0TB NVMe Enterprise Performance Flash Adapter	N	N	N	Y	Y	Y	N

## Support for System x servers with Intel Xeon v2 processors

Table 6. Support for System x servers with Intel Xeon v2 processors

Part number	Description	x3500 M4 (7383, E5-2600 v2)	x3530 M4 (7160, E5-2400 v2)	x3550 M4 (7914, E5-2600 v2)	x3630 M4 (7158, E5-2400 v2)	x3650 M4 (7915, E5-2600 v2)	x3650 M4 BD (5466)	x3650 M4 HD (5460)	x3750 M4 (8752)	x3750 M4 (8753)	x3850 X6/x3950 X6 (3837)	x3850 X6/x3950 X6 (6241, E7 v2)	dx360 M4 (E5-2600 v2)	nx360 M4 (5455)
01GT711	Intel P3700 800GB NVMe Enterprise Performance Flash Adapter	N	N	N	N	N	N	N	N	N	N	N	N	N
00YA812	Intel P3700 1.6TB NVMe Enterprise Performance Flash Adapter	N	N	N	N	N	N	N	N	N	N	Y	N	N
00YA815	Intel P3700 2.0TB NVMe Enterprise Performance Flash Adapter	N	N	N	N	N	N	N	N	N	N	Y	N	N

## Support for Flex System compute nodes

The adapters are supported in the following Flex System compute nodes when installed in an attached PCIe Expansion Node.

Table 7. Support for Flex System servers

Part number	Description	x220 (7906)	x222 (7916)	x240 (8737, E5-2600)	x240 (8737, E5-2600 v2)	x240 (7162)	x240 M5 (9532, v3 & v4)	x440 (7917)	x440 (7167)	x880/x480/x280 X6 (7903)	x280/x480/x880 X6 (7196)
01GT711	Intel P3700 800GB NVMe Enterprise Performance Flash Adapter	N	N	N	N	N	N	N	N	N	N
00YA812	Intel P3700 1.6TB NVMe Enterprise Performance Flash Adapter	N	N	N	N	N	Y†	N	N	N	N
00YA815	Intel P3700 2.0TB NVMe Enterprise Performance Flash Adapter	N	N	N	N	N	Y†	N	N	N	N

† Supported when installed in an attached PCIe Expansion Node

## Server support - ThinkServer

The following tables list the server compatibility information for the adapters on ThinkServer systems.

**Support for sd350:** The ThinkServer sd350 is listed in [Table 4](#).

### Support for ThinkServer Generation 5 servers with E5 v4 and E3 v5/v6 processors

Table 8. Support for ThinkServer Generation 5 servers with E5 v4 and E3 v5/v6 processors

Part number	Description	TS150	TS450	TS460	RS160	TD350	RD350 (70Qx)	RD450 (70Qx)	RD550 (70Rx/70Sx)	RD650 (70Rx)
4XB0K12391	Intel P3700 800GB NVMe Enterprise Performance Flash Adapter	N	N	N	N	N	N	N	Y	Y

### Support for ThinkServer Generation 5 servers with E5 v3 and E3 v3 processors

Table 9. Support for ThinkServer Generation 5 servers with E5 v3 and E3 v3 processors

Part number	Description	TS140	TS440	RS140	TD350	RD350 (70Dx)	RD450 (70Dx)	RD550 (70Cx)	RD650 (70Dx)
4XB0K12391	Intel P3700 800GB NVMe Enterprise Performance Flash Adapter	N	N	N	N	N	N	N	N

## Operating system support

The following tables list the supported operating systems for the adapters.

- [Intel P3700 800GB NVMe Enterprise Performance Flash Adapter, 01GT711](#)
- [Intel P3700 1.6TB Enterprise Performance NVMe Flash Adapter, 00YA812](#)
- [Intel P3700 2TB Enterprise Performance NVMe Flash Adapter, 00YA815](#)

**Tip:** This table is automatically generated based on data from [Lenovo ServerProven](#).

Table 10. Operating system support for Intel P3700 800GB NVMe Enterprise Performance Flash Adapter, 01GT711

Operating systems	x3850/3950 X6 (6241, E7 v4)			
	x3550 M5 (8869)	x3650 M5 (8871)	x240 M5 (9532)	
Microsoft Windows Server 2012 R2	Y	N	Y	Y
Microsoft Windows Server 2016	Y	Y	Y	Y
Microsoft Windows Server 2019	Y	Y	Y	Y
Microsoft Windows Server version 1709	Y	Y	Y	Y
Microsoft Windows Server version 1803	N	Y	Y	N
Red Hat Enterprise Linux 6 Server x64 Edition	Y	Y	Y	Y
Red Hat Enterprise Linux 7	Y	Y	Y	Y
Red Hat Enterprise Linux 8.0	Y	N	N	N
SUSE Linux Enterprise Server 11 for AMD64/EM64T	Y	Y	Y	Y
SUSE Linux Enterprise Server 12	Y	Y	Y	Y
SUSE Linux Enterprise Server 15	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.0	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.5	Y	Y	Y	Y
VMware vSphere Hypervisor (ESXi) 6.7	Y	Y	Y	Y



Table 11. Operating system support for P3700 1.6TB Enterprise Performance NVMe Flash Adapter, 00YA812

Operating systems	x3850/3950 X6 (6241, E7 v3)	x3850/3950 X6 (6241, E7 v4)	x3550 M5 (5463)	x3550 M5 (8869)	x3650 M5 (5462)	x3650 M5 (8871)	x240 M5 (9532)
Microsoft Windows Server 2008 R2	Y	N	Y	Y	Y	N	N
Microsoft Windows Server 2012	Y	Y	Y	N	Y	N	Y <sup>1</sup>
Microsoft Windows Server 2012 R2	Y	Y	Y	Y	Y	Y	Y <sup>1</sup>
Microsoft Windows Server 2016	Y	Y	Y	N	Y	Y	Y
Microsoft Windows Server version 1709	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 6 Server x64 Edition	Y	Y	Y	N	Y	N	Y <sup>1</sup>
Red Hat Enterprise Linux 7	Y	Y	Y	Y	Y	Y	Y <sup>1</sup>
SUSE Linux Enterprise Server 11 for AMD64/EM64T	Y	Y	Y	N	Y	N	Y <sup>1</sup>
SUSE Linux Enterprise Server 11 with Xen for AMD64/EM64T	Y	Y	Y	N	Y	N	Y <sup>1</sup>
SUSE Linux Enterprise Server 12	Y	Y	Y	Y	Y	Y	Y <sup>1</sup>
SUSE Linux Enterprise Server 12 with Xen	Y	Y	Y	Y	Y	Y	Y <sup>1</sup>
VMware vSphere Hypervisor (ESXi) 5.5	Y	N	Y	N	Y	N	Y <sup>1, 2</sup>
VMware vSphere Hypervisor (ESXi) 6.0	Y	Y	Y	Y	Y	Y	Y <sup>1</sup>

<sup>1</sup> Support Haswell only

<sup>2</sup> [VMware 5.5 up 3 does not support NVMe as boot drive. Tested as data drive.]

Table 12. Operating system support for P3700 2TB Enterprise Performance NVMe Flash Adapter, 00YA815

Operating systems	x3850/3950 X6 (6241, E7 v3)	x3850/3950 X6 (6241, E7 v4)	x3550 M5 (5463)	x3550 M5 (8869)	x3650 M5 (5462)	x3650 M5 (8871)	x240 M5 (9532)
Microsoft Windows Server 2008 R2	Y	N	Y	Y	Y	N	N
Microsoft Windows Server 2012	Y	Y	Y	N	Y	N	Y <sup>1</sup>
Microsoft Windows Server 2012 R2	Y	Y	Y	Y	Y	Y	Y <sup>1</sup>
Microsoft Windows Server 2016	Y	Y	Y	N	Y	Y	Y
Microsoft Windows Server version 1709	Y	Y	Y	Y	Y	Y	Y
Red Hat Enterprise Linux 6 Server x64 Edition	Y	Y	Y	N	Y	N	Y <sup>1</sup>
Red Hat Enterprise Linux 7	Y	Y	Y	Y	Y	Y	Y <sup>1</sup>
SUSE Linux Enterprise Server 11 for AMD64/EM64T	Y	Y	Y	N	Y	N	Y <sup>1</sup>
SUSE Linux Enterprise Server 11 with Xen for AMD64/EM64T	Y	Y	Y	N	Y	N	Y <sup>1</sup>
SUSE Linux Enterprise Server 12	Y	Y	Y	Y	Y	Y	Y <sup>1</sup>
SUSE Linux Enterprise Server 12 with Xen	Y	Y	Y	Y	Y	Y	Y <sup>1</sup>
VMware vSphere Hypervisor (ESXi) 5.5	Y	N	Y	N	Y	N	Y <sup>1, 2</sup>
VMware vSphere Hypervisor (ESXi) 6.0	Y	Y	Y	Y	Y	Y	Y <sup>1</sup>

<sup>1</sup> Support Haswell only

<sup>2</sup> [VMware 5.5 up 3 does not support NVMe as boot drive. Tested as data drive.]

## Warranty

The Intel P3700 NVMe Enterprise Performance Flash Adapters carry a 1-year, customer-replaceable unit (CRU) limited warranty. When installed in a supported Lenovo server, these adapters assume the system's base warranty and any warranty upgrade.

## Physical specifications

The Intel P3700 NVMe Enterprise Performance Flash Adapters have the following physical specifications:

Dimensions and weight (approximate):

- Width: 19 mm (0.7 in.)
- Height: 69 mm (2.7 in.)
- Depth: 167 mm (6.6 in.)
- Weight: 195 g (0.43 lb)

Shipping dimensions (approximate):

- Height: 27 mm (1.1 in.)
- Width: 206 mm (8.1 in.)
- Depth: 140 mm (5.5 in.)

## Operating environment

The Intel P3700 NVMe Enterprise Performance Flash Adapters are supported in the following environment:

- Temperature (operational): 0 - 55 °C (32 - 131 °F) at 0 - 3,048 m (0 - 10,000 ft)
- Relative humidity: 5 - 95% (non-condensing)
- Maximum altitude (operational): 3,048 m (10,000 ft)
- Shock: 50 G Trapezoidal, 170 in/s
- Vibration: 2.17 G<sub>RMS</sub> (5-700 Hz)

## Agency approvals

The Intel P3700 NVMe Enterprise Performance Flash Adapters conform to the following regulations:

- FCC Title 47, Part 15 Subpart B, Class B
- CAN ICES-3 (B) NMB-3 (B)
- EN 55022: 2010
- EN 61000-3-2: 2006 plus A1:2009 and A2:2009
- EN 61000-3-3: 2008
- EN 55024: 2010
- VCCI V-3/2013.04 Class B
- ANSI C63.4: 2009 Class B
- BSMI CNS 13438: 2006 Class B
- AS/NZS CISPR 22
- KCC MSIP-REM-CPU-SSDPIA
- EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011
- DIRECTIVE 2011/65/EU

## Related publications and links

For more information, see the following documents:

- Lenovo System x storage options product web page  
<https://www.lenovo.com/us/en/data-center/servers/server-options/system-x-options/server-storage/c/system-x-storage>
- US Announcement letter  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS115-154>
- ServerProven compatibility for Flash Storage Adapters  
<http://www.lenovo.com/us/en/serverproven/xseries/storage/mcmatrix.shtml>
- Intel SSD DC family for PCIe product page  
<http://www.intel.com/content/www/us/en/solid-state-drives/intel-ssd-dc-family-for-pcie.html>
- Intel P3700 specifications  
<http://www.intel.com/content/www/us/en/solid-state-drives/ssd-dc-p3700-spec.html>
- Intel P3700 product brief  
<http://www.intel.com/content/www/us/en/solid-state-drives/intel-ssd-dc-family-for-pcie-brief.html>

## Related product families

Product families related to this document are the following:

- [PCIe Flash Adapters](#)

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This document, LP0049, was created or updated on September 8, 2019.

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