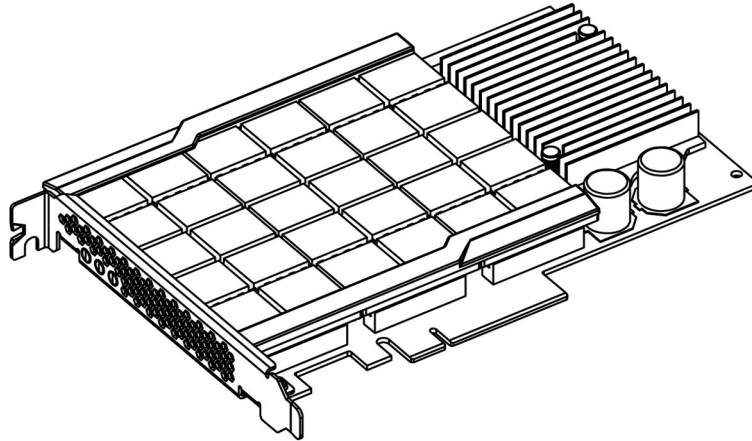
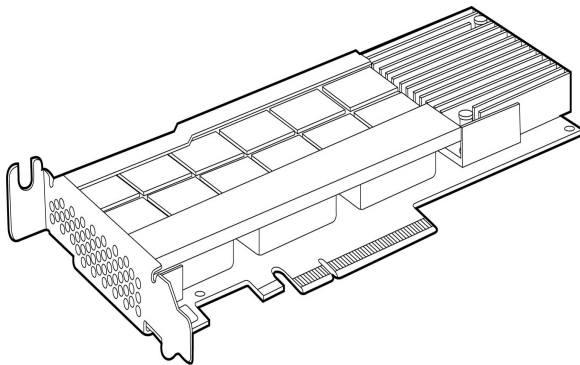


Overview

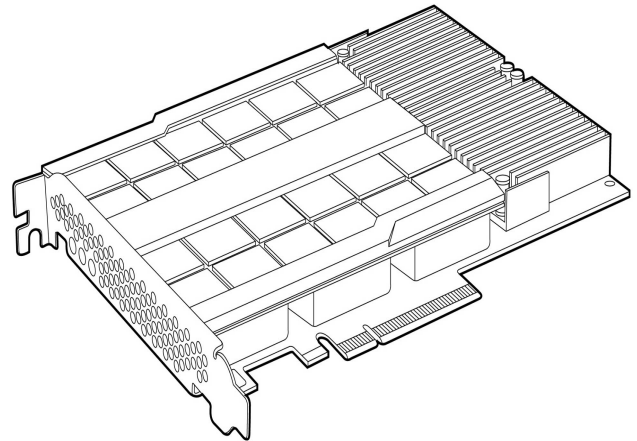
HP IO Accelerator for ProLiant Servers is a PCIe card-based direct-attach solid state storage technology solution for application performance enhancement. Based on Multi-Level Cell (MLC) and Single Level Cell (SLC) NAND Flash technology, these devices are ideal for low latency workloads requiring high transaction rates and real-time data access.



ioDrive (Generation2) FH/HL

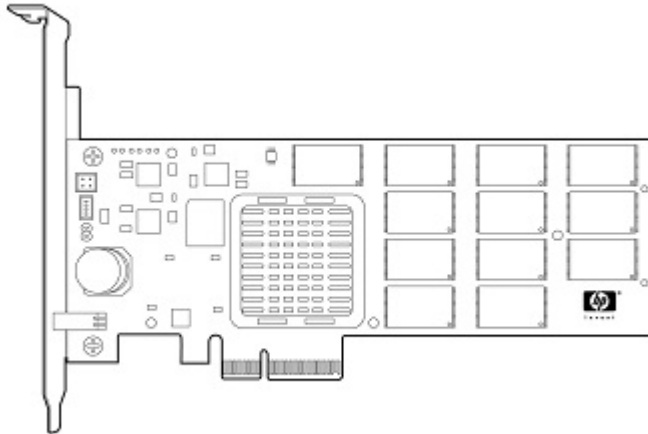


ioDrive (Generation2) HH/HL

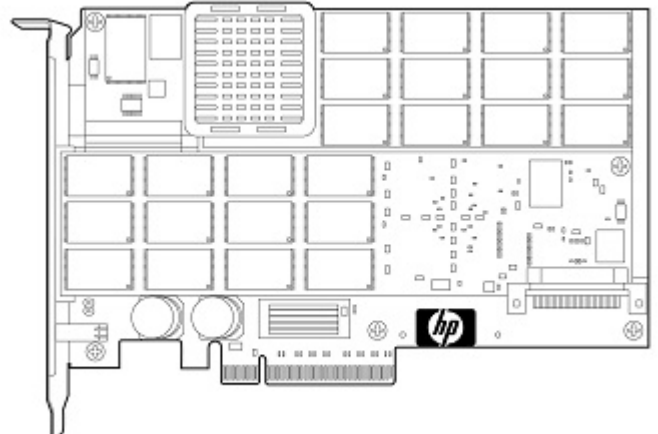


ioDrive Duo (Generation2) FH/HL

Overview



ioDrive (Generation 1)



ioDrive Duo (Generation 1)

What's New

- Introducing the Gen2 HP IO Accelerators for ProLiant ML/DL/SL server platforms
- As low as 17 microsecond WRITE latency
- Performance: Up to 935,000 WRITE IOPS, up to 892,000 READ IOPS, up to 3GB/s Bandwidth
- Industry-Leading Capacity: Up to 3TB
- Enterprise Endurance: Wear leveling, predictive monitoring and management, and warranty forecasting
- Enterprise Reliability: Adaptive flashback technology provides on-card redundancy with no downtime on multichip failures

Models

HP I/O Accelerator Options

Second Generation Accelerators

HP 365GB Multi Level Cell G2 PCIe ioDrive2 for ProLiant Servers	673642-B21
HP 785GB Multi Level Cell G2 PCIe ioDrive2 for ProLiant Servers	673644-B21
HP 1205GB Multi Level Cell G2 PCIe ioDrive2 for ProLiant Servers	673646-B21
HP 2410GB Multi Level Cell G2 PCIe ioDrive2 Duo for ProLiant Servers	673648-B21
HP 3TB G2 FH/HL PCIe ioDrive2 IO Accelerator for ProLiant Servers	721458-B21

First Generation Accelerators

HP 160GB Single Level Cell PCIe ioDrive for ProLiant Servers	600278-B21
HP 320GB Single Level Cell PCIe ioDrive Duo for ProLiant Servers	600281-B21

Compatibility

Compatibility

First Generation Accelerators Support

ProLiant DL (rack-optimized):

- HP ProLiant DL160 G6
- HP ProLiant DL160 Gen8
- HP ProLiant DL180 G6
- HP ProLiant DL360 G6
- HP ProLiant DL360 G7
- HP ProLiant DL360e Gen8
- HP ProLiant DL360p Gen8
- HP ProLiant DL370 G6
- HP ProLiant DL380 G6
- HP ProLiant DL380 G7
- HP ProLiant DL380e Gen8
- HP ProLiant DL380p Gen8
- HP ProLiant DL385 G6
- HP ProLiant DL385 G7
- HP ProLiant DL385p Gen8
- HP ProLiant DL580 G5
- HP ProLiant DL580 G7
- HP ProLiant DL585 G6
- HP ProLiant DL585 G7
- HP ProLiant DL980 G7

ProLiant ML (expansion-optimized):

- HP ProLiant ML370 G6
- HP ProLiant ML350p Gen8
- HP ProLiant ML370 G6

ProLiant SL (Scalable System)

- HP ProLiant SL160z G6
- HP ProLiant SL170z G6
- HP ProLiant SL230s Gen8

NOTE: For the list of supported skus per server, please see each server QuickSpecs.

NOTE: This is a list of supported servers. Some may be discontinued.

Second Generation Accelerators Support

ProLiant DL (rack-optimized):

- HP ProLiant DL160 G6
- HP ProLiant DL180 G6
- HP ProLiant DL360 G7
- **NOTE:** Support for 673648-B21 only in x16 slot.
- HP ProLiant DL320e Gen8
- HP ProLiant DL360 G7
- **NOTE:** Support for 673648-B21 only in x16 slot.
- HP ProLiant DL360e Gen8

Compatibility

- HP ProLiant DL360p Gen8
NOTE: Support for 673648-B21 only in x16 slot.
- HP ProLiant DL370 G6
- HP ProLiant DL380 G7
- HP ProLiant DL380p Gen8
- HP ProLiant DL385 G7
- HP ProLiant DL385p Gen8
- HP ProLiant DL560 Gen8
- HP ProLiant DL580 G7
- HP ProLiant DL585 G6
- HP ProLiant DL585 G7
- HP ProLiant DL980 G7

ProLiant ML (expansion-optimized):

- HP ProLiant ML310e Gen8
- HP ProLiant ML350 G6
- HP ProLiant ML350p Gen8
- HP ProLiant ML370 G6

ProLiant SL (Scalable System)

- HP ProLiant SL4540 Gen8
- HP ProLiant SL4545 G7

NOTE: For the list of supported skus per server, please see each server QuickSpecs.

NOTE: This is a list of supported servers. Some may be discontinued.

Standard Features

What is an IO Accelerator? The IO Accelerator is an PCIe card-based, advanced storage device that uses solid state storage technology directly on the PCI bus, assuring high read and write data rates and accelerated application performance. The associated application performance improvements will have a positive impact on business results and the ability to accelerate IO-bound workloads like databases, virtualization and data analytics, resulting in significant cost and time savings.

Single Level Cell and Multilevel Cell NAND technology uses flash memory cells to store data. Single level Cell (SLC) stores one bit per cell, while Multi-level Cell (MLC) uses two bits per cell. While MLC can store more data within each device, it has lower endurance characteristics than SLC.

IO and Read/Write Performance HP PCIe IO Accelerators offer superior IO performance up to 892,000 READ IOPS and 935,000 WRITE IOPS, and high throughput up to 3.0 GB/s READ and up to 2.5 GB/s WRITE.

Latency HP PCIe IO Accelerators offer very low latency access to data, as low as 17 microseconds to write a 4K block and as low as 68 microseconds to read a 4K block. In other words, a virtually zero seek time compared to rotating magnetic media.

RAM Requirements The amount of free RAM required by the driver depends on the size of the blocks used when writing to the drive. The smaller the blocks, the more RAM required. Here are the guidelines for each 100GB of storage:

Average Block Size (bytes)	System RAM usage (Megabytes) per 100GB of storage for Driver version 2.x and 3.x
8,192	280MB
4,096 (most common)	530MB
2,048	1030MB
1,024	2,000MB
512	3,970MB

Manageability Command Line (CLI) tools for both Linux and Windows to configure, monitor, and upgrade firmware
SNMP Agent and System Management Homepage provided for Linux and Windows.
ioManager GUI for Windows and Linux.

PCI IDs Vendor & Device ID 1AED:1005; Subsystem Vendor & Device ID 103C:324E for Generation1 products. The Device ID for Generation2 is 2001. In Gen2 the Subsystem Vendor ID has changed to 1590. Each capacity has its own Subsystem Device ID.

Upgradeability The controller for the HP IO Accelerators can be upgraded in the future with new firmware. Online firmware update tools are available for all supported operating systems.

Wear-leveling NAND Flash devices use semiconductor technology that has a finite number of data that can be written to the device, defined as the Maximum Lifetime. Projected lifetime of the NAND storage due to wear-out varies with type of NAND and amount of writes to the device.

Standard Features

Maximum usage

ioDrive (3 SKUs)		ioDrive Duo (2 SKUs)		
160GB	320GB	320GB	640GB	1.28TB
75 PB writes	4 PB writes	150 PB	8 PB writes	16 PB writes
ioDrive2 (4 SKUs)		ioDrive2 Duo (1 SKU)		
365GB	785GB	1205GB	3000GB	2410GB
4 PB written	11 PB written	17 PB written	37 PB written	34 PB written

NOTE: Subject to maximum usage limitations. Parts and components that have exceeded their maximum supported lifetime and/or the maximum usage limitations. Maximum supported lifetime-the period in years set to equal the warranty for the device. Maximum usage limit-This is the maximum amount of data that can be written to the device before write burn-out.

NOTE: PB written listed is writes to Flash, not host writes.

Data Integrity

Using advanced ECC techniques, the HP IO Accelerators can correct up to 11 bits out of every 240 bytes, with a design target of a 1 in 10 to the 20th Power probability of uncorrectable data and a 1 in 10 to the 30th Power probability of undetected bad data.

OS Support

RHEL 4,5,6 (64-bit support only)
 SLES 10, 11 (64-bit support only)
 Windows Server x86-64 2003, 2008 (64-bit support only), 2008 R2, 2012
 Oracle Enterprise Linux 5 (OEL 5)
 CentOS 5, 6
 VMware ESX 4.0 Update 1, ESXi 5.0/5.1
 Oracle Enterprise Linux 6
 Solaris x86 10, 11
 VMWare ESXi 4.1

NOTE: The HP IO Accelerators are currently not supported as boot devices.

Configurations

Mixing of capacities is allowed, OS RAID

Warranty

3/0/0 warranty; Customer Self Repair (CSR) Subject to maximum usage limitations (Please see note under Additional Services Information).

Service and Support

Service and Support

HP Technology Services

HP Technology Services offers you technical consultants and support expertise to solve your most complex infrastructure problems. We help keep your business running, boost availability, and avoid downtime.

Protect your business beyond warranty with HP Care Pack Services

When you buy HP Options, it's also a good time to think about what level of service you may need. HP Care Pack services provide total technical support and expertise with committed response choices designed to meet your specific IT and business need.

HP Foundation Care services deliver scalable reactive support-packages for HP industry-standard servers and software. You can choose the type and level of service that is most suitable for your business needs. New to this portfolio is HP Collaborative Support. If you are running business critical environments, HP offers Proactive Care or Critical Advantage. These services help you deliver high levels of application availability through a single point of contact, proactive service management and advanced technical response.

Here is the support service recommendation from the Foundation Care and Proactive Care portfolio. For customized support service solution, HP can work with you to tailor a service solution for your unique support requirements using broader services portfolio of Foundation Care and Proactive Care.

Recommended Services

Recommended HP Care Pack Services for optimal satisfaction with your HP product

3-Year HP 24x7 4 hour Response, Proactive Care

Helps optimize your systems and delivers high levels of application availability through proactive service management and advanced technical response. You will work with a single point of contact, a Technical Manager who will own your logged call and issue from end to end until resolved, accessing the resources that you need to resolve all issues and help minimize downtime.

OR

3-Year HP 24x7 4 hour Response, HP Collaborative Support

Provides problem resolution support across the stack of HW, firmware, and HP and 3rd party SW. In case the issue is with 3rd party SW, HP does known issue resolution. If HP cannot solve the issue, it will contact the third-party vendor and create a problem incident on your behalf

<http://h20195.www2.p.com/V2/GetPDF.aspx/4AA3-8232ENW.pdf>

HP Installation of ProLiant Add On Options Service

This easy-to-buy, easy-to-use HP Care Pack service helps ensure that your new HP hardware or software is installed smoothly, efficiently, and with minimal disruption of your IT and business operations

Service and Support

Related Services

Related HP Care Pack Services to enhance your HP product experience

3-Year HP 24x7 4 hour Response, Proactive Care

Helps optimize your systems and delivers high levels of application availability through proactive service management and advanced technical response. A Technical Account Manager will be assigned to you and work all problems from end to end until resolved, plus work with you to help minimize downtime and mitigate risk.

OR

3-Year HP 24x7 4 hour Response, Hardware Support Onsite Service

Provides you with rapid remote support and if required an HP technical representative will be on site 24X7 any day of the year to begin hardware maintenance service within 4 hours of the service request being logged.

<http://h20195.www2.hp.com/V2/GetPDF.aspx/5982-6547EEE.pdf>

3-Year HP 6-hour Onsite Call-to-Repair, HP Collaborative Support

Offers customers a single point of contact for server problem diagnosis, hardware problem resolution to return the hardware in operating condition within 6 hours of the initial service request to the HP Global Solution Center, and basic software problem diagnosis, fault isolation, and resolution if available to HP.

<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA3-8232ENW.pdf>

HP Proactive Select Service

Provides a flexible way to purchase HP best-in-class consultancy and technical services. You can buy Proactive Select Service Credits when you purchase your hardware and then use the credits over the next 12 months.

<http://h20195.www2.hp.com/V2/GetPDF.aspx/4AA2-3842ENN.pdf>

Insight Remote Support

Provides 24 X 7 remote monitoring, proactive notifications, and problem resolution. Learn more

<http://www.hp.com/go/insightremotesupport>

HP Support Center

Personalized online support portal with access to information, tools and experts to support HP business products. Submit support cases online, chat with HP experts, access support resources or collaborate with peers. Learn more <http://www.hp.com/go/hpsc>

HP's Support Center Mobile App* allows you to resolve issues yourself or quickly connect to an agent for live support. Now, you can get access to personalized IT support anywhere, anytime.

HP Insight Remote Support and HP Support Center are available at no additional cost with a HP warranty, HP Care Pack or HP contractual support agreement.

*HP's Support Center Mobile App is subject to local availability

Service and Support

Parts and materials

HP will provide HP-supported replacement parts and materials necessary to maintain the covered hardware product in operating condition, including parts and materials for available and recommended engineering improvements. Supplies and consumable parts will not be provided as part of this service; standard warranty terms and conditions apply. Parts and components that have exceeded their maximum supported lifetime and/or the maximum usage limitations as set forth in the manufacturer's operating manual or the technical product data sheet will not be provided, repaired or replaced as part of this service.

Warranty / Service Coverage

For ProLiant servers and storage systems, this service covers HP-branded hardware options qualified for the server, purchased at the same time or afterward, internal to the enclosure, as well as external monitors up to 22" and tower UPS products; these items will be covered at the same service level and for the same coverage period as the server unless the maximum supported lifetime and/or the maximum usage limitation has been exceeded. Coverage of the UPS battery is not included; standard warranty terms and conditions apply.

The defective media retention service feature option applies only to Disk or eligible SSD/Flash Drives replaced by HP due to malfunction. It does not apply to any exchange of Disk or SSD/Flash Drives that have not failed. SSD/Flash Drives that are specified by HP as consumable parts and/or that have exceeded maximum supported lifetime and/or the maximum usage limit as set forth in the manufacturer's operating manual or the technical data sheet are not eligible for the defective media retention service feature option.

Subject to: Maximum supported lifetime: This is a period in years set to equal the warranty for the specific drive. After this period no further service coverage will be available for the drive. Maximum usage limit: This is the maximum amount of data that can be written to the drive. Drives that have reached this limit will not be eligible for services coverage

For more information

To learn more on services for HP ESSN Options, please contact your HP sales representative or HP Authorized Channel Partner. Or visit: <http://www.hp.com/services/proliant> or www.hp.com/services/bladesystem

Technical Specifications

**HP 3TB G2 FH/HL PCIe
ioDrive2 IO Accelerator
for ProLiant Servers**
721458-B21

Usable Capacity	3000GB
Technology	NAND Flash, MLC
Bandwidth (1MB)	1.3GB/s Writes, 1.5GB/s Reads
Access Latency	17 microseconds for Writes, 68 microseconds for Reads
IOPS	Read 445,000 IOPS (sequential 512B), Write 535,000 IOPS (sequential 512B) Read 143,000 IOPS (random 512B), Write 535,000 IOPS (random 512B)
Form factor	Full Height/Half length-Low profile PCI Express x 4 slot (spec 2.0)
Bus Interface	PCI Express x 4
Power (Nominal)	PCI Express x 4 (power spec 2.0)
Operating Temperature	0-55°C (Operational)/-40-70°C (non-operational)
Supported Driver Version	3.2.3 and higher

**HP 2410GB Multi Level
Cell G2 PCIe Solid State
Drive IO Accelerator**
673648-B21

Usable Capacity	2410GB
Technology	NAND Flash, MLC
Bandwidth (1MB)	2.5GB/s Writes, 3.0GB/s Reads
Access Latency	17 microseconds for Writes, 68 microseconds for Reads
IOPS	Read 892,000 IOPS (sequential 512B), Write 935,000 IOPS (sequential 512B) Read 285,000 IOPS (random 512B), Write 725,000 IOPS (random 512B)
Form factor	Full Height/Half length PCI Express x 8 slot (spec 2.0)
Bus Interface	PCI Express 2.0 x 8
Power (Nominal)	PCI Express 2.0 x 8
Operating Temperature	0-55°C (Operational)/-40-70°C (non-operational)
Supported Driver Version	3.x and higher
Auxillary Power (for ioDrive2 Duo only)	NOTE: This SKU may require auxiliary power to achieve maximum performance. Included in the box is a power cable kit that will plug into the Duo and into a GPU power cable kit for the server (which is not included with the Duo). Please refer to the Quickspec of the applicable server to determine which GPU power cable kit from HP is required.

Technical Specifications

HP 1205GB Multi Level Cell G2 PCIe Solid State Drive IO Accelerator 673646-B21	Usable Capacity	1205GB
	Technology	NAND Flash, MLC
	Bandwidth (1MB)	1.3GB/s Writes, 1.5GB/s Reads
	Access Latency	17 microseconds for Writes, 68 microseconds for Reads
	IOPS	Read 445,000 IOPS (sequential 512B), Write 535,000 IOPS (sequential 512B) Read 143,000 IOPS (random 512B), Write 535,000 IOPS (random 512B)
	Form factor	Half Height/Half length-Low profile PCI Express x 4 slot (spec 2.0)
	Bus Interface	PCI Express x 4
	Power (Nominal)	PCI Express x 4 (power spec 2.0)
	Operating Temperature	0-55°C (Operational)/-40-70°C (non-operational)
	Supported Driver Version	3.x and higher

HP 785GB Multi Level Cell G2 PCIe Solid State Drive IO Accelerator 673644-B21	Usable Capacity	785GB
	Technology	NAND Flash, MLC
	Bandwidth (1MB)	1.1GB/s Writes, 1.5GB/s Reads
	Access Latency	17 microseconds for Writes, 68 microseconds for Reads
	IOPS	Read 443,000 IOPS (sequential 512B), Write 535,000 IOPS (sequential 512B) Read 141,000 IOPS (random 512B), Write 535,000 IOPS (random 512B)
	Form factor	Half Height/Half length-Low profile PCI Express x 4 slot (spec 2.0)
	Bus Interface	PCI Express x 4
	Power (Nominal)	PCI Express x 4 (power spec 2.0)
	Operating Temperature	0-55°C (Operational)/-40-70°C (non-operational)
	Supported Driver Version	3.x and higher

HP 365GB Multi Level Cell G2 PCIe Solid State Drive IO Accelerator 673642-B21	Usable Capacity	365GB
	Technology	NAND Flash, MLC
	Bandwidth (1MB)	590MB/s Writes, 900MB/s Reads
	Access Latency	17 microseconds for Writes, 68 microseconds for Reads
	IOPS	Read 415,000 IOPS (sequential 512B), Write 535,000 IOPS (sequential 512B) Read 137,000 IOPS (random 512B), Write 535,000 IOPS (random 512B)
	Form factor	Half Height/Half length-Low profile PCI Express x 4 slot (spec 2.0)
	Bus Interface	PCI Express x 4
	Power (Nominal)	PCI Express x 4 (power spec 2.0)
	Operating Temperature	0-55°C (Operational)/-40-70°C (non-operational)
	Supported Driver Version	3.x and higher

Technical Specifications

HP 160GB Single Level Cell PCIe ioDrive for ProLiant Servers 600278-B21	Usable Capacity	160GB
	Technology	NAND Flash, SLC
	Bandwidth (64kB)	770 MB/s Writes 770MB/s Reads
	Access Latency (512 Byte)	26 microseconds
	IOPS	123,000 IOPS (75/25 R/W)
	Form factor	Half Height/Half length-Low profile PCI Express x 4 slot (spec 1.1)
	Bus Interface	PCI Express x 4
	Power (Nominal)	PCI Express x 4 (power spec 1.1)
	Operating Temperature	0-55°C (Operational)/-40-70°C (non-operational)
	Supported Driver Version	2.x and higher. NOTE: For interoperability with the new IO Accelerator G2 SKUs, you must use a 3.x or higher driver. If upgrading from 2.x to 3.x, you must back up your data first, as a low-level format occurs during the upgrade process and all data will be lost.

HP 160GB SLC PCIe ioDrive 600278-B21	Usable Capacity	160GB
	Technology	NAND Flash, SLC
	Bandwidth (64kB)	750 MB/s Writes 770MB/s Reads
	Access Latency (512 Byte)	26 microseconds
	IOPS	123,000 IOPS (75/25 R/W)
	Form factor	Half Height/Half length-Low profile PCI Express x 4 slot (spec 1.1)
	Bus Interface	PCI Express x 4
	Power (Nominal)	PCI Express x 4 (power spec 1.1)
	Operating Temperature	0-55°C (Operational)/-40-70°C (non-operational)

HP 320GB Single Level Cell PCIe ioDrive Duo for ProLiant Servers 600281-B21	Usable Capacity	320 GB
	Technology	NAND Flash, SLC
	Bandwidth (64kB)	1.5GB/s Writes 1.5GB/s Reads
	Access Latency (512 Byte)	26 microseconds
	IOPS	238,000 (75/25 R/W mix)
	Form factor	Full Height/Half Length PCI Express 2.0
	Bus Interface	PCI Express x 8 or PCI Express 2.0 x 4
	Power (Nominal)	PCI Express power spec 2.0
	Operating Temperature	0-55°C (Operational)/-40-70°C (non-operational)
	Supported Driver Version	2.x and higher. NOTE: For interoperability with the new IO Accelerator G2 SKUs, you must use a 3.x or higher driver. If upgrading from 2.x to 3.x, you must back up your data first, as a low-level format occurs during the upgrade process and all data will be lost.

Technical Specifications

**Environment-friendly
Products and Approach****End-of-life Management
and Recycling**

Hewlett-Packard offers end-of-life HP product return, trade-in, and recycling programs in many geographic areas. For trade-in information, please go to: <http://www.hp.com/go/green>. To recycle your product, please go to: <http://www.hp.com/go/green> or contact your nearest HP sales office. Products returned to HP will be recycled, recovered or disposed of in a responsible manner. The EU WEEE directive (2002/95/EC) requires manufacturers to provide treatment information for each product type for use by treatment facilities. This information (product disassembly instructions) is posted on the Hewlett Packard web site at: <http://www.hp.com/go/green>. These instructions may be used by recyclers and other WEEE treatment facilities as well as HP OEM customers who integrate and re-sell HP equipment.

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For hard drives, 1GB = 1 billion bytes. Actual formatted capacity is less.