

## N2225 and N2226 12Gb SAS External HBAs

### Product Guide

The N2225 and N2226 SAS/SATA HBAs are low-cost, high-performance host bus adapters for high-performance connectivity between System x® servers and tapes drives and RAID storage systems. The N2225 provides two x4 external mini-SAS HD connectors with eight lanes of 12 Gbps SAS. The N2226 provides four x4 external mini-SAS HD connectors with 16 lanes of 12 Gbps SAS.

The following figure shows the N2225 and N2226 SAS/SATA HBAs.



Figure 1. N2225 (left) and N2226 (right) SAS/SATA HBAs

### Did you know?

The N2225 and N2226 SAS/SATA HBAs provide high performance for storage connectivity for servers by integrating the latest enhancements in PCI Express and SAS technology, offering eight lanes (N2225) or 16 lanes (N2226) of 12 Gbps SAS matched with eight lanes of PCIe 3.0 to eliminate performance bottlenecks and provide high data transfer rates for medium-to-large capacity server storage applications.

The N2225 and N2226 SAS/SATA HBAs support SAS data transfer rates of 3, 6, and 12 Gbps per lane and SATA transfer rates of 3 and 6 Gbps per lane, and they enable maximum connectivity and performance in a low-profile (N2225) or full-height (N2226) form factor.

Rigorous testing of the N2225 and N2226 SAS/SATA HBAs by Lenovo through the ServerProven® program ensures a high degree of confidence in storage subsystem compatibility and reliability. Providing an additional peace of mind, these controllers are covered under Lenovo warranty.

## Ordering information

The following table provides the ordering part numbers and feature codes.

Table 1. Ordering part numbers and feature codes

Description	Part number	Feature code
N2225 SAS/SATA HBA	00AE912	A5M0
N2226 SAS/SATA HBA	00AE916	A5M1

The N2225 option part number includes the following items:

- One N2225 or N2226 adapter with a full-height (3U) bracket attached
- One low-profile (2U) bracket (N2225 only)
- Warranty Flyer
- Documentation CD
- Important Notices Flyer

## Features and specifications

The N2225 and N2226 SAS/SATA HBAs have the following features and specifications:

- LSI SAS3008 12 Gbps I/O controller
- PCIe low profile (N2225) or full height (N2226), half-length form factor
- PCI Express 3.0 x8 host interface
- Eight (N2225) or 16 (N2226) external 12 Gbps SAS/SATA ports
- Supports 12, 6, and 3 Gbps SAS and 6 and 3 Gbps SATA data transfer rates
- Up to 12 Gbps throughput per port
- Two (N2225) or four (N2226) external x4 mini-SAS HD connectors (SFF-8644)
- Non-RAID SAS HBAs that support connectivity to the storage systems and tape drives
- High-performance IOPS LSI Fusion-MPT architecture
- Advanced power management support
- Support for SSP, SMP, STP, and SATA protocols
- Support for narrow and wide ports
- End-to-End CRC with Advanced Error Reporting
- T-10 Protection Model for early detection of and recovery from data corruption
- Spread Spectrum Clocking for EMI reductions

## Server compatibility

The following tables list the compatibility information for the N2225 and N2226 SAS/SATA HBAs and System x®, iDataPlex®, and NeXtScale™ servers.

Table 2. 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)
00AE912	N2225 SAS/SATA HBA	Y	Y	Y	Y	Y	N	N
00AE916	N2226 SAS/SATA HBA	N	N	N	Y	Y	N	N

Table 3. Lenovo server compatibility: Intel Xeon processor E3 v3, E5 v3, and E7 v3 families

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, E5 v3)
00AE912	N2225 SAS/SATA HBA	Y	Y	Y	Y	Y	Y	N
00AE916	N2226 SAS/SATA HBA	N	N	Y	Y	Y	Y	N

Table 4. Lenovo server compatibility: Intel Xeon processor E5 v2 and E7 v2 families

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 (8753)	x3850 X6/x3950 X6 (6241, E7 v2)	dx360 M4 (7912, E5-2600 v2)
00AE912	N2225 SAS/SATA HBA	Y	Y	Y	Y	Y	Y	Y	Y	Y	N
00AE916	N2226 SAS/SATA HBA	Y	N	N	Y	Y	Y	Y	Y	Y	N

For more information about the System x servers, including older servers that support the N2225 and N2226 adapters, see the following ServerProven® website: [www.lenovo.com/us/en/serverproven/](http://www.lenovo.com/us/en/serverproven/)

## Storage systems

The following table lists the external storage systems that are currently offered by Lenovo that can be used with the N2225 and N2226 SAS/SATA HBAs in storage solutions.

Table 5. External storage systems

Description	Part number
Lenovo Storage S2200 (mini-SAS HD interface)	
Lenovo Storage S2200 LFF Chassis SAS Single Controller, Rack Kit, 9x5NBD	64112B1
Lenovo Storage S2200 LFF Chassis SAS Dual Controller, Rack Kit, 9x5NBD	64112B2
Lenovo Storage S2200 SFF Chassis SAS Single Controller, Rack Kit, 9x5NBD	64112B3
Lenovo Storage S2200 SFF Chassis SAS Dual Controller, Rack Kit, 9x5NBD	64112B4
Lenovo Storage S3200 (mini-SAS HD interface)	
Lenovo Storage S3200 LFF Chassis SAS Single Controller, Rack Kit, 9x5NBD	64113B1
Lenovo Storage S3200 LFF Chassis SAS Dual Controller, Rack Kit, 9x5NBD	64113B2
Lenovo Storage S3200 SFF Chassis SAS Single Controller, Rack Kit, 9x5NBD	64113B3
Lenovo Storage S3200 SFF Chassis SAS Dual Controller, Rack Kit, 9x5NBD	64113B4
SAS cables for Lenovo Storage (mini-SAS HD to mini-SAS HD)	
External MiniSAS HD 8644/MiniSAS HD 8644 1m cable	00WE748
External MiniSAS HD 8644/MiniSAS HD 8644 2m cable	00WE749
Lenovo Storage V Series (mini-SAS HD)	
Lenovo Storage V3700 V2 LFF Control Enclosure	6535C1D
Lenovo Storage V3700 V2 LFF Control Enclosure (TopSeller)	6535EC1
Lenovo Storage V3700 V2 SFF Control Enclosure	6535C2D
Lenovo Storage V3700 V2 SFF Control Enclosure (TopSeller)	6535EC2
Lenovo Storage V3700 V2 XP LFF Control Enclosure	6535C3D
Lenovo Storage V3700 V2 XP LFF Control Enclosure (TopSeller)	6535EC3
Lenovo Storage V3700 V2 XP SFF Control Enclosure	6535C4D

Lenovo Storage V3700 V2 XP SFF Control Enclosure (TopSeller)	6535EC4
Lenovo Storage V5030 LFF Control Enclosure 3Yr S&S	6536C12
Lenovo Storage V5030 LFF Control Enclosure 5Yr S&S	6536C32
Lenovo Storage V5030 SFF Control Enclosure 3Yr S&S	6536C22
SAS cables for V3700 V2 (mini-SAS HD to mini-SAS HD)	
Lenovo Storage V3700 V2 0.6m 12Gb SAS Cable (mSAS HD)	01DC675
Lenovo Storage V3700 V2 1.5m 12Gb SAS Cable (mSAS HD)	01DC677
Lenovo Storage V3700 V2 3m 12Gb SAS Cable (mSAS HD)	01DC679
SAS cables for V5030 (mini-SAS HD to mini-SAS HD)	
Lenovo Storage V5030 0.6m 12Gb SAS Cable (mSAS HD)	01DE249
Lenovo Storage V5030 1.5m 12Gb SAS Cable (mSAS HD)	01DE251
Lenovo Storage V5030 3m 12Gb SAS Cable (mSAS HD)	01DE253
IBM Storwize for Lenovo (mini-SAS HD interface)	
IBM Storwize V3500 3.5-inch Dual Control Storage Controller Unit	6096CU2
IBM Storwize V3500 2.5-inch Dual Control Storage Controller Unit	6096CU3
IBM Storwize V3700 3.5-inch Storage Controller Unit	6099L2C
IBM Storwize V3700 2.5-inch Storage Controller Unit	6099S2C
IBM Storwize V3700 2.5-inch DC Storage Controller Unit	6099T2C
IBM Storwize V5000 LFF Control Enclosure	6194L2C
IBM Storwize V5000 SFF Control Enclosure	6194S2C
SAS cables for IBM Storwize (mini-SAS HD to mini-SAS HD)	
0.6m SAS Cable (mSAS HD to mSAS HD)	00MJ176
1.5m SAS Cable (mSAS HD to mSAS HD)	00MJ178
3m SAS Cable (mSAS HD to mSAS HD)	00MJ180

For more information, see the list of Lenovo Press Product Guides in the following categories:

- Lenovo Storage  
<https://lenovopress.com/storage/san/lenovo>
- IBM Storage  
<https://lenovopress.com/storage/san/ibm>

For a detailed listing of supported end-to-end storage configurations, see the System Storage Interoperation Center (SSIC) website:

<http://ibm.com/systems/support/storage/ssic>

## Tape backup units

The following table lists the external tape backup units that are currently offered by Lenovo that can be used with the N2225 and N2226 SAS/SATA HBAs in tape backup solutions.

Table 6. External tape backup units

Description	Part number
Tape drives (mini-SAS interface)	
IBM TS2250 Tape Drive Model H5S	6160S5E
IBM TS2260 Tape Drive Model H6S	6160S6E
IBM TS2270 Tape Drive Model H7S	6160S7E
Tape autoloaders (mini-SAS interface)	
IBM TS2900 Tape Autoloader w/LT05 HH SAS Drive	6171S5R
IBM TS2900 Tape Autoloader w/LT06 HH SAS Drive	6171S6R
IBM TS2900 Tape Autoloader w/LTO7 HH SAS	6171S7R
Tape libraries	
IBM TS3100 Tape Library Model L2U (Driveless)	61732UL
IBM TS3200 Tape Library Model L4U (Driveless)	61734UL
SAS tape drive options for TS3100/TS3200 Tape Libraries (mini-SAS interface)	
6173 LTO Ultrium 5 SAS Drive Sled	00NA109
6173 LTO Ultrium 5 Half High SAS Drive Sled	00NA111
6173 LTO Ultrium 6 Half High SAS Drive Sled	00NA117
6173 LTO Ultrium 7 Half High SAS Drive Sled	00WF767
SAS cables (mini-SAS HD to mini-SAS)	
HD-SAS to Mini-SAS Cable*	00NV419
Y-SAS HD to Mini-SAS Cable**	00NV420

\* One per tape drive.

\*\* One per two tape drives.

For more information, see the list of Product Guides in the Backup units category:

<http://lenovopress.com/systemx/tape>

For a detailed listing of supported end-to-end storage configurations, see the System Storage Interoperation Center (SSIC) website:

<http://ibm.com/systems/support/storage/ssic>

## Operating systems

The N2225 and N2226 SAS/SATA HBAs support the following operating systems:

- Microsoft Windows Server 2012 R2
- Microsoft Windows Server 2012
- Microsoft Windows Server 2008 R2
- Red Hat Enterprise Linux 7
- Red Hat Enterprise Linux 6 Server Edition
- Red Hat Enterprise Linux 6 Server x64 Edition
- SUSE Linux Enterprise Server 11 for AMD64/EM64T
- SUSE Linux Enterprise Server 11 for x86
- SUSE Linux Enterprise Server 11 with Xen for AMD64/EM64T
- VMware vSphere 6.0 (ESXi)
- VMware vSphere 5.5 (ESXi)
- VMware vSphere 5.1 (ESXi)

For more information about the specific versions and service levels that are supported and any other prerequisites, see the ServerProven website:

<http://www.lenovo.com/us/en/serverproven/nos/matrix.shtml>

## Warranty

The N2225 and N2226 SAS/SATA HBAs carry a one-year limited warranty. When installed in a supported System x server, the adapters assume your system's base warranty and any Lenovo warranty upgrade.

## Physical specifications

The N2225 SAS/SATA HBA has the following physical specifications.

Dimensions and weight (approximate):

- Height: 69 mm (2.7 in.)
- Width: 17 mm (0.7 in.)
- Depth: 170 mm (6.7 in.)
- Weight: 100 g (0.2 lb)

Shipping dimensions and weight (approximate):

- Height: 51 mm (2.0 in.)
- Width: 143 mm (5.6 in.)
- Depth: 238 mm (9.4 in.)
- Weight: 205 g (0.45 lb)

The N2226 SAS/SATA HBA has the following physical specifications.

Dimensions and weight (approximate):

- Height: 111 mm (4.4 in.)
- Width: 18 mm (0.7 in.)
- Depth: 170 mm (6.7 in.)
- Weight: 222 g (0.5 lb)

Shipping dimensions and weight (approximate):

- Height: 51 mm (2.0 in.)
- Width: 143 mm (5.6 in.)
- Depth: 238 mm (9.4 in.)
- Weight: 327 g (0.7 lb)

## Operating environment

The N2225 and N2226 SAS/SATA HBAs are supported in the following environment:

- Temperature (operational): 5 - 40 °C (41 - 104 °F) at 0 - 5,000 m (0 - 16,404 ft)
- Temperature (non-operational): -40 - 60 °C (-40 - 140 °F) at 10,700 m (35,105 ft)
- Relative humidity: 8% - 93% (non-condensing)
- Maximum altitude: 10,700 m (35,105 ft)

## Agency approvals

The N2225 and N2226 SAS/SATA HBAs conform to the following regulations:

- UL
- cUL
- IEC60950
- EMC
- FCC
- CE
- VCCI
- BSMI
- C-tick
- KC

## Related publications and links

For more information, see the following documents:

- US Announcement Letter  
<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENUS114-075>
- N2225 and N2226 Quick Installation Guide  
<https://support.lenovo.com/docs/UM920924>
- N2225 and N2226 Users Guide  
<https://support.lenovo.com/docs/UM920923>
- N2225 support and downloads  
[http://www.ibm.com/support/entry/myportal/product/system\\_x\\_hardware\\_options/sas~sata\\_controller/host\\_bus\\_adapter/00ae912\\_-\\_n2225\\_sas~sata\\_host\\_bus\\_adapter](http://www.ibm.com/support/entry/myportal/product/system_x_hardware_options/sas~sata_controller/host_bus_adapter/00ae912_-_n2225_sas~sata_host_bus_adapter)
- N2226 support and downloads  
[http://www.ibm.com/support/entry/myportal/product/system\\_x\\_hardware\\_options/sas~sata\\_controller/host\\_bus\\_adapter/00ae916\\_-\\_n2226\\_sas~sata\\_hot\\_bus\\_adapter](http://www.ibm.com/support/entry/myportal/product/system_x_hardware_options/sas~sata_controller/host_bus_adapter/00ae916_-_n2226_sas~sata_hot_bus_adapter)
- ServerProven  
<http://www.lenovo.com/us/en/serverproven/>

## Related product families

Product families related to this document are the following:

- [Host Bus Adapters](#)

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