

# ATTO ExpressNVM<sup>®</sup> Smart NVMe Adapter Installation and Operation Manual

ATTO ExpressNVM S48F NVMe Switch Adapter  
ATTO ExpressNVM S4FF NVMe Switch Adapter



**The Power Behind the Storage**

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# 1 ATTO Provides Storage Solutions

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The ATTO ExpressNVM low-profile switch adapters provide flexible connectivity and scalability solutions for a wide range of applications that rely on high-performance, low-latency storage environments.

## Installation Procedure

To get started quickly, the ExpressNVM adapter Getting Started Guide provides basic set-up instructions. It is available for download on the [atto.com](http://atto.com) website.


To install your ExpressNVM adapter, you will need:


- ExpressNVM adapter.
- (Optional) Access to [atto.com](http://atto.com) to obtain management drivers, user manuals and utilities.
- (Optional) The included low-profile bracket and its installation procedure.
- A computer with an available x16 PCIe expansion slot.
- NVMe storage, cables and connectors.

 **Note** *ExpressNVM adapters use the standard NVMe operating system inbox drivers for basic operations. Your ExpressNVM adapter should be automatically detected and operational upon completion of system boot without the need to install any additional hardware drivers.*

1. If you want to take advantage of advanced management and monitoring functions, refer to [Driver Installation](#) for installation instructions.
2. Install the ExpressNVM adapter. Refer to [Install Hardware](#).

3. Attach NVMe storage.
4. While many adapter settings are managed directly by the system inbox driver, you should ensure that the ExpressNVM adapter is updated to the latest device firmware using the management CLI tools.

 **Note** *Default settings are appropriate for most systems but you may change settings using the management CLI tools.*

 **CAUTION** *Back up your system data before changing or installing any hardware.*

## ExpressNVM features

- PCIe 4.0 x4 NVMe device connectivity delivers full throughput to each connected storage device
- Support for M.2, U.2/U.3, and EDSFF NVMe device connectivity
- One-click installation
- Inbox Operation System NVMe drivers allow for simple, automatic discovery and configuration
- Inbox Operating System NVMe driver support for Windows®, Linux®, FreeBSD, and VMware® ESX/ESXi Server
- RoHS compliant
- 3-year standard warranty

# ExpressNVM NVMe Switch Adapter

ExpressNVM PCIe Gen4 switch adapters use PCIe 4.0 NVMe speeds to deliver low latency in real-time environments. They support a dense and efficient connection to storage from servers and workstations in datacenter, data warehousing, and other high-availability, high-performance applications.

## ENVM S48F Technical Specifications

- 4x Physical SlimSAS SFF-8654 connectors; x8 PCIe Gen 4 Lanes
- Each SFF-8654 connector supports two independent x4 PCIe 4.0 connections
- SFF-9402 compliant pinout
- Conforms to PCIe low profile form factor
- Length: 6.600"
- Height: 2.713"
- Operating temperature: 0-55 °C (32 °F-131 °F)
- Operating humidity: 10-90% non-condensing
- Storage temperature: -40-70 °C (-40 °F-157 °F)
- Storage humidity: 5-95% non-condensing
- Power:(typ) 12V @ 1.54A, 18.5W; (max) 12V @ 1.7A, 20.5W
- Airflow: 100 LFM minimum



## ENVM S4FF Technical Specifications

- 4x Physical SlimSAS SFF-8654 connectors; x16 PCIe Gen 4 Lanes
- Each SFF-8654 connector supports four independent x2 PCIe 4.0 connections
- SFF-9402 compliant pinout
- Conforms to PCIe low profile form factor
- Length: 6.600"
- Height: 2.713"
- Operating temperature: 0-55 °C (32 °F-131 °F)
- Operating humidity: 10-90% non-condensing
- Storage temperature: -40-70 °C (-40 °F-157 °F)
- Storage humidity: 5-95% non-condensing
- Power:(typ) 12V @ 1.54A, 18.5W; (max) 12V @ 1.7A, 20.5W
- Airflow: 100 LFM minimum



## 2 Install Management Drivers

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To function, ExpressNVM Switch Adapter require inbox drivers that are provided as part of the operating system. Therefore, the adapter should be fully operational right out of the box. ATTO management device drivers are optional for advanced management and monitoring functions available using command line tools (CLI) that are included with the driver. While not required for operation, ATTO strongly recommends installing these drivers for optimal user experience.

Management device drivers are provided on the ATTO website at <https://www.atto.com/downloads/>. Registration and login are required to access the ATTO download pages.

### Downloading Management Drivers from the ATTO Website

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Use this procedure if you need to update management drivers. The latest management driver for your adapters can be found on the ATTO website.


1. Go to [atto.com](https://www.atto.com).
2. On the home page menu, hover the cursor over **Support** then click on **Downloads** under **Technical Support**.
3. Register or log in if previously registered.
4. Select **NVMe Adapter** from the product list.
5. Select your model.
6. From the table, find your Operating System.
7. Click on the entry for the latest driver.
8. Depending on your web browser settings, a download window appears to choose a location for the file, or the download will be automatically saved in the **Downloads** folder for the current user.
9. Continue with the driver installation as described on the following pages for your Operating System.

### Windows Management Driver Installation

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#### Installing from the ATTO Technology website


1. Power on your system.
2. Log on to Windows as the system administrator.
3. Locate the ATTO driver on your system and run the executable to run the ATTO Self Extractor.
4. Click “Unzip” to decompress the driver files.
5. After the files are unzipped, the driver installation setup should automatically begin.
6. Follow the on-screen instructions to complete the driver installation.

 **Note** *If you have User Account Control enabled, you are asked for permission for the installer to continue. If you do not have administrator privileges, you are also asked for an administrator user name and password. Fulfill the required fields and click Continue.*

7. Continue on to [Install Hardware](#).

#### Installing from a directory containing the ExpressNVM driver

1. Power on your system.
2. Log on as the system administrator.
3. Navigate to the directory where the ExpressNVM driver MSI installer is located.
4. Run **win\_drv\_envmsc1\_XXXXXX.msi** and follow the prompts to install the driver.

 **Note** *If you have User Account Control enabled, you are asked for permission for the installer to continue. If you do not have administrator privileges, you are also asked for an administrator user name and password. Fulfill the required fields and click Continue.*

5. Continue on to [Install Hardware](#).

# Linux Management Driver Installation

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1. Power on your system.
2. Verify that the kernel header files, usually included with the Linux kernel development package, are installed.
3. Open a Terminal session and change to the directory where you stored the driver.



Note

*For the ExpressNVM Adapter, the driver filename appears as `lnx_drv_envmsc1_XXXXXX.tgz` where `XXXXXX` is the driver's current version number.*

4. Extract the driver source. For example:

```
tar -xzf lnx_drv_envmsc1_XXXXXX.tgz
```

5. The driver files are extracted to a directory called: `lnx_drv_envmsc1_XXXXXX`

Navigate to that directory.

```
cd lnx_drv_envmsc1_XXXXXX
```

6. Install the driver using elevated rights (sudo). For example:

```
sudo ./install.sh
```

The driver is now installed and ready to use.

7. Continue on to [Install Hardware](#).

# 3 Install Hardware

Use this chapter as a guide to install the ATTO ExpressNVM adapter into a x16 PCIe expansion slot on your computer. If you have followed the Getting Started Guide successfully, you do not need to read this chapter.

**CAUTION** *Back up your system data before changing or installing any hardware.*

## System Requirements

The ATTO ExpressNVM adapter package contains:

- ExpressNVM adapter
- A low-profile or standard bracket and the installation procedure
- If any of these items are missing, contact your ATTO authorized sales representative.
- In addition, you must have:
- A computer with an available x16 PCI Express 4.x/3.x/2.x/1.2 expansion slot. Check your computer's documentation.

## Installing the Adapter

**CAUTION** *ATTO ExpressNVM adapters contain components that are sensitive to electrostatic discharge (ESD). ESD can cause damage to the ATTO ExpressNVM adapter. Please follow standard methods to avoid ESD.*

1. Install management drivers before you begin hardware installation. Refer to [Install Drivers](#).

**Note** *To function, ExpressNVM Adapters require inbox drivers that are provided as part of the operating system. Management device drivers are required for advanced management and monitoring functions. While not required for operation, ATTO strongly recommends installing these drivers for optimal user experience.*

2. Power down the computer and unplug the computer from all power sources.
3. Open the case.
4. If applicable, attach the low profile or standard bracket to the adapter.
  - a. Remove the original bracket from the adapter, being careful not to damage the board. Use an ESD-safe #1 Phillips screwdriver to remove the Phillips screws at the top and bottom edges of the board.

**CAUTION** *Make sure the screwdriver is centered in the top of the screw to prevent damage to the screw. Damaging the screw can void the warranty.*

- a. Set the bracket and screws aside.

- NVMe storage, cables and connectors.

See [Bracket Details](#) and [Adapter Board Details](#) for details of the adapters and brackets.

## NVMe Address

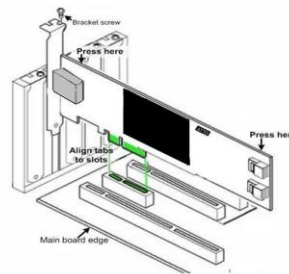
Each ATTO ExpressNVM adapter has a unique PCI node address which allows the system to recognize the ATTO ExpressNVM adapter as a unique part of your configuration.

The address is marked on the back of the board for easy identification. Please keep a reference copy of the number in a safe place.

- b. Place the adapter on top of the replacement bracket, positioning the bracket so that the holes in the bracket are aligned with the openings in the board.
- c. It is recommended that you dip the screws into Loctite® 242 to decrease the chance of the threads becoming loose.
- d. Use an ESD-safe #1 Phillips torque screwdriver to e tighten the screws. The screwdriver should be set to a maximum torque of 3.98 in/lbs (0.45N m).

**CAUTION** *Do not exceed the torque specification to avoid damaging the board, connectors or screws.*

5. Insert the ATTO ExpressNVM adapter into any open x16 PCI Express expansion slot. If you have questions about how to install an expansion card in your system, consult your computer's documentation.

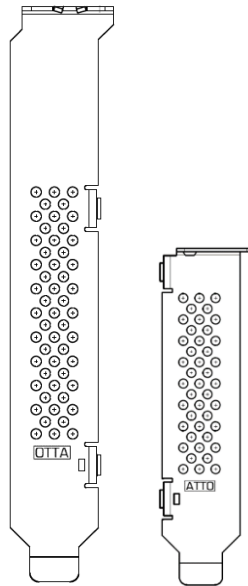


6. Close the case on the computer and power it up.
7. Installed drivers are loaded.

8. Shut down the computer.

## Bracket Details

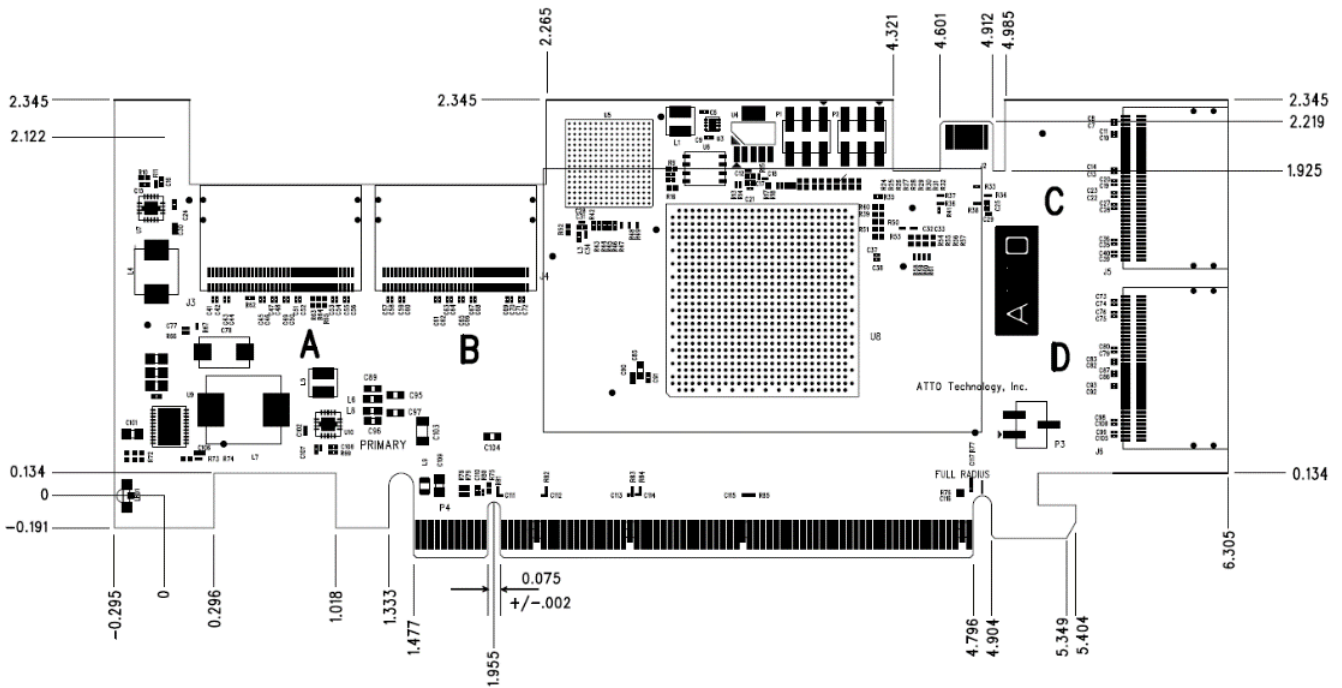
Exhibit 1 ExpressNVM S48F/S4FF Adapter brackets



Full Height/Half Height Brackets

## Adapter Board Details

Exhibit 2 ExpressNVM S48F/S4FF Adapter board.





## 4 Troubleshooting

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This chapter contains solutions for the most common problems you might encounter. If you need additional assistance, please refer to the ATTO Technology website or contact an ATTO Technology authorized representative.

### Issues with seeing your NVMe drives

- Check each cable connection on every device.
- Verify all cables are in proper working condition. Loose or broken cables are often the cause of errors or problems.
- Check that devices are plugged into an AC outlet and are turned on before you add power to your computer.
- Ensure you have the latest driver for your operating system and that the driver is installed (refer to [Driver Installation](#)).
- Ensure the ExpressNVM adapter is installed properly in the computer (refer to [Install Hardware](#)).

## 5 CLI Tool Command Set

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Use this chapter as a reference for the CLI tools provided with the management drivers. Each CLI tool has a pre-defined set of parameters when invoked and outputs information associated with the connected NVMe targets.

CLI tools must be run with administrator privileges.

- In Windows, right click on Command Prompt or Power Shell and select "Run as Administrator"
- In Linux, precede the command with "sudo" (i.e. `sudo atinfo -h`)

CLI tool functionality and syntax can be viewed using the "-h" parameter with the CLI tool. For example:

**atinfo -h**

S.No	CLI Command	Explanation
1.	<code>atinfo</code>	Displays product information
2.	<code>atdevinfo</code>	Displays target device information
3.	<code>atdpm</code>	Configures driver parameters
4.	<code>atnvminfo</code>	Displays NVMe topology
5.	<code>atnvmnvr</code>	Modifies NVRAM settings - Virtual SES device support
6.	<code>attrace</code>	Collects customer debug information - saves controller driver trace data to a file

# Appendix A Glossary

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Some terms used in the NVMe industry are defined below. More information is available through the ATTO Technology website ([atto.com](http://atto.com)), or the NVM Express Workgroup ([nvmexpress.org](http://nvmexpress.org)).

Term	Definition
ANSI	American National Standards Institute
Auto Negotiation	Hardware senses and automatically responds depending on configuration
Bit	Smallest unit of data a computer can process: a single binary digit with a value of either 0 or 1
Bus	A collection of unbroken signal lines used to transmit information from one part of a computer system to another; taps on the lines connect devices to the bus
Byte	An ordered set of 8 bits
CPU	Central Processing Unit: the portion of the computer that actually performs computations
Device Driver	A program that allows a microprocessor to direct the operation of a peripheral device
DMA	Direct Memory Access: a way to move data from a storage device directly to RAM without using the CPU's resources
DMA bus master	Allows a peripheral to control the flow of data to and from system memory by block as opposed to allowing the processor to control the data by bytes (PIO or programmed I/O)
Host	A processor, usually a CPU and memory, which communicates with devices over an interface
I2C	(Inter-Integrated Circuit) is a multi-master serial single-ended computer bus that is used to attach low-speed peripherals to a motherboard, backplane or embedded system
I2C Header	I2C header is a connector on the adapter used to connect an I2C cable
LED	Light-emitting diode: a type of diode that emits light when current passes through it; visible LEDs are used as indicator lights on all sorts of electronic devices
PCI	Peripheral Component Interconnect. Allows peripherals to be connected directly to computer memory, bypassing the slower ISA and EISA busses
PHY	A physical connection between the adapter and a drive on the backplane. Each NVMe connector carries signals for four or eight PCI PHYs
Port	An access point in a device

Port Address	Also port number; the address, assigned by the PCI bus, through which commands are sent to an adapter board
Port Number	See port address
Transfer Rate	The rate at which bytes or bits are transferred, as in megabytes or gigabits per second

## Appendix C Standards and Compliances

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The equipment described in this manual generates and uses radio frequency energy. The Technical Specification sheet for the ATTO ExpressNVM adapter shows certifications for each model.



### FCC standards: Radio and Television interference

This equipment has been tested and found to comply with the limits for a Class B digital device (ExpressNVM Adapters) and Class A digital device (ExpressNVM Adapters), pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna

Increase the separation between the equipment and receiver

Connect the equipment into an outlet on a circuit different from that to which the receiver is connected

Consult the dealer or an experienced radio/TV technician for help



### Canadian standards

This Class B digital apparatus complies with Canadian ICES-003 (ExpressNVM Adapters)

This Class A digital apparatus complies with Canadian ICES-003 (ExpressNVM Adapters)

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.



### European standards

Declaration of Conformity

This following statement applies to the ATTO ExpressNVM adapter.

This device has been tested in the basic operating configuration and found to be compliant with the following European Union standards: Application of Council Directive: 89/336/EEC

Standard(s) to which conformity is declared: EN55024:2002; EN55022:2002 CLASS B

EN55024:2002; EN55022:2002 CLASS A

This Declaration will only be valid when this product is used in conjunction with other CE approved devices and when the entire system is tested to the applicable CE standards and found to be compliant.



The ATTO ExpressNVM adapters comply with Directive 2011/65/EU on the Restriction of the Use of Hazardous Substances in Electrical and Electronic Equipment (RoHS). Contact your ATTO representative regarding RoHS compliant products.

## Appendix D Safety and Warranty

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All ATTO adapter products have been tested to meet applicable safety standards when operated in proper electrical and thermal environments.

### Safety

Please review the specifications for your specific adapter before installing and operating it in any computer system to ensure compatibility.

### Installation

Before installing an ATTO adapter product into your computer system, unplug the computer from its electrical power source and allow adequate time for electrical discharge and the internal components to cool down before removing the computer system cover. This will decrease the risk of personal injury from electrical shock or touching the hot surface of an electrical component.

Once an ATTO adapter is installed in a computer system, the computer cover must be reinstalled properly before turning the computer system back on.

### Operation

ATTO adapters require adequate cooling to function properly. If you have any questions as to the airflow provided by your computer system, please refer to your computer system manual or contact your computer system manufacturer.

To facilitate proper air circulation, ATTO adapters should never be operated in a computer system without the cover installed or with an inoperable fan as this may cause safety or thermal problems which could damage the ATTO adapter and void the warranty.

### ATTO Technology, Inc. limited warranty

ATTO Technology, Inc. ("ATTO") warrants to the original purchaser of this product ("Product") that the Product is free from defects in material and workmanship for the term described for this specific Product on ATTO's website ([atto.com](http://atto.com)). ATTO's liability shall be limited to replacing or repairing any defective product at ATTO's option. There is no charge for parts or labor if ATTO determines that this product is defective.

PRODUCTS WHICH HAVE BEEN SUBJECT TO ABUSE, MISUSE, ALTERATION, NEGLECT, OR THOSE PRODUCTS THAT HAVE BEEN SERVICED, REPAIRED OR INSTALLED BY UNAUTHORIZED PERSONNEL WILL NOT BE COVERED UNDER THIS WARRANTY. DAMAGE RESULTING FROM INCORRECT CONNECTION OR AN INAPPROPRIATE APPLICATION OF THIS PRODUCT SHALL NOT BE THE RESPONSIBILITY OF ATTO. LIABILITY UNDER THIS LIMITED WARRANTY IS LIMITED TO ATTO PRODUCT(S). DAMAGE TO OTHER EQUIPMENT CONNECTED TO ATTO PRODUCT(S) IS THE CUSTOMER'S RESPONSIBILITY. THIS LIMITED WARRANTY IS MADE IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED. ATTO DISCLAIMS ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. TO THE EXTENT IMPLIED WARRANTIES CANNOT BE EXCLUDED, SUCH IMPLIED WARRANTIES ARE LIMITED IN DURATION TO THE EXPRESS WARRANTY PERIOD APPLICABLE TO THE PRODUCT. BECAUSE SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON THE DURATION OF IMPLIED WARRANTIES, THE ABOVE MAY NOT BE APPLICABLE. ATTO'S RESPONSIBILITY TO REPAIR OR REPLACE A DEFECTIVE PRODUCT IS THE SOLE AND EXCLUSIVE REMEDY PROVIDED TO THE CUSTOMER FOR BREACH OF THIS WARRANTY.

ATTO IS NOT RESPONSIBLE FOR DAMAGE TO OR LOSS OF ANY DATA, PROGRAMS OR ANY MEDIA. THE PRODUCTS ARE NOT INTENDED FOR USE IN: (I) MEDICAL DEVICES OR THE MEDICAL FIELD; OR (II) USE IN RUGGED APPLICATIONS.

ATTO IS NOT LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, IRRESPECTIVE OF WHETHER ATTO HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. NO ATTO DEALER, AGENT OR EMPLOYEE IS AUTHORIZED TO MAKE ANY MODIFICATION, EXTENSION OR ADDITION TO THIS WARRANTY.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.