



ATTO 360™ Networking

Tuning, Monitoring, and Analytics Software Installation and Operation Manual



The Power Behind the Storage

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ATTO 360™ Networking Edition - Features and Overview

Overview

The following document provides a tutorial on how to use ATTO 360™ Networking Edition to tune for network performance, monitor, and identify potential network issues when using ATTO FastFrame™ and ThunderLink™ Ethernet adapters on macOS®, Windows®, and Linux®.

Getting Started

In general, to install the ATTO 360 Networking application, you must:

1. Ensure you have the equipment and software you need for the installation:
 - FastFrame NIC or Thunderlink
 - A computer running macOS, Windows, or Linux

Software Installation

Note: Administrator privileges are required to install

Windows

1. Power on your system
2. Go to <https://www.atto.com/>
3. Click on support > software downloads – ATTO 360 Networking software is included within the driver download with each OS. Ethernet Suite installs the driver and 360 utility. If you would like more control you can choose to install them separately
4. You can also visit <https://www.atto.com/products/software/atto-360-tuning-monitoring-and-analytics-software/> to download the latest version of ATTO 360 Networking
5. ATTO Ethernet Suite includes an ATTO hardware driver for Windows 10 with option to install ATTO 360 Networking along with Driver installation
6. Scroll down to and click the Windows download.
7. A download window appears. Choose Save File.
8. Double-click the downloaded file to extract and launch the ATTO 360 Ethernet Suite.
9. Follow the on-screen instructions to complete the software installation.

Linux

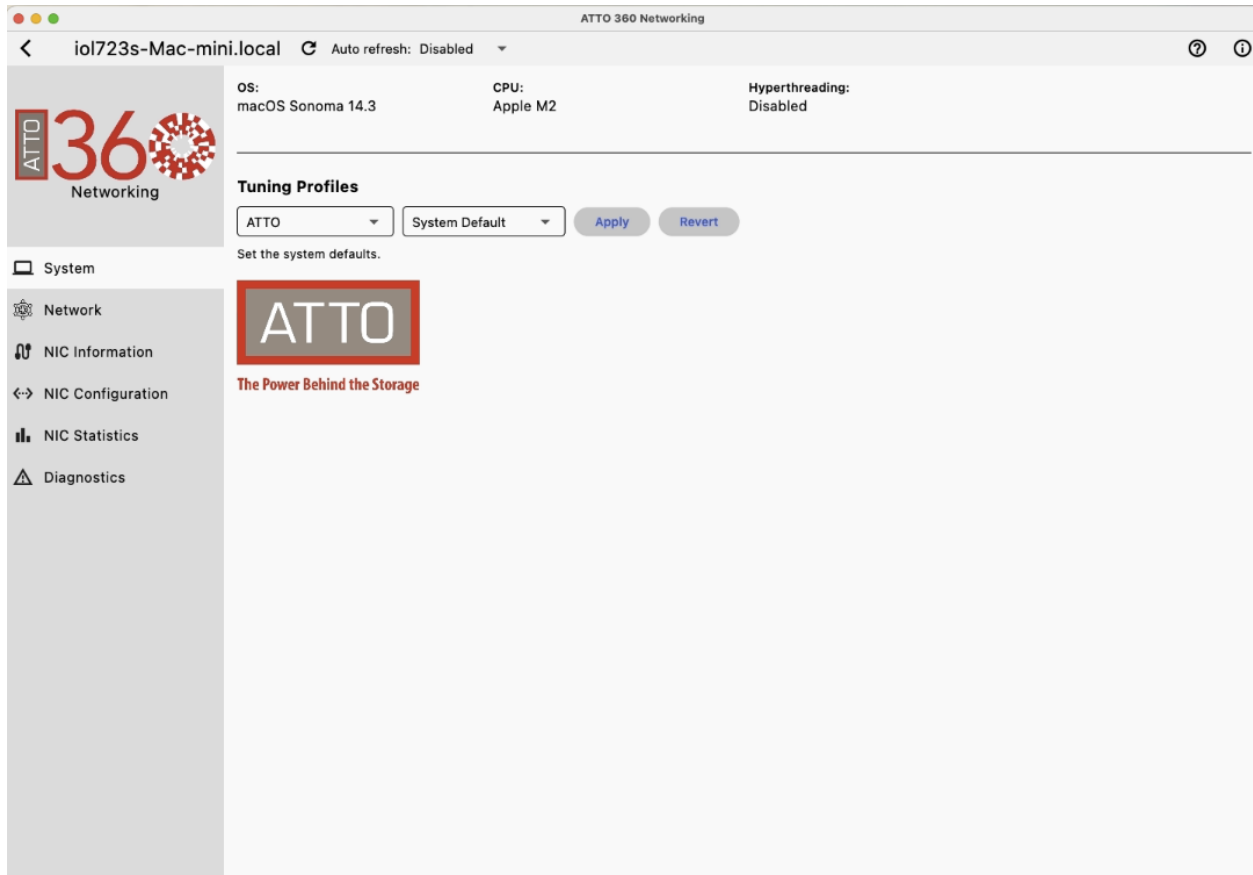
1. Power on your system
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4. You can also visit <https://www.atto.com/products/software/atto-360-tuning-monitoring-and-analytics-software/> to download the latest version of ATTO 360 Networking

5. ATTO Ethernet Suite is an installer package that includes ATTO hardware driver as well as ATTO 360 Networking software
6. A download window appears. Choose Save File.
7. After the download has completed, open the ATTO 360 volume on the desktop.
8. Open the Linux folder.
9. Copy the .tgz file to a temporary folder.
10. Open a terminal window and change the location of the copied tgz.
11. Extract the file using the command `tar -xzf <filename.tgz>`.
12. Embedded in the TGZ is a *.run file that must be run as 'sudo <filename>.run'

macOS

1. Power on your system
2. Go to <https://www.atto.com/>
3. Click on support > software downloads – ATTO 360 Networking™ software is included within the driver packages for all ATTO Ethernet devices
4. You can also visit <https://www.atto.com/products/software/atto-360-tuning-monitoring-and-analytics-software/> to download the latest version of ATTO 360 Networking
5. A .dmg file for ATTO 360 Networking will appear on your desktop
6. Click on ATTO 360 icon to install ATTO 360 Networking™
7. Follow the on-screen instructions.

System Information & Tuning Profiles



System information is the first screen that loads when you launch ATTO 360™

Here you can access relevant information about your system in one convenient area. You can identify items like Operating System, CPU and see TCP/IP settings like Receive/Transmit Buffers, TCP Window Scale, firewall, IP forwarding, and hyper-threading.

TUNING PROFILES

In this area you can also apply or delete our tuning profiles. The first drop down box indicates what brand of profile you want to select. You can choose from several ATTO branded profiles custom made by our engineers for different workflows. You can choose from options like “High Throughput, Low Latency, and SMB or NFS connections”.

You can also select a number of profiles crafted for our partner storage companies like Dell, Quantum, NetApp, Rohde & Schwarz, Symplify, AVID, and Autodesk

The Tuning Profiles area contains 1-click settings for applying pre-designated NIC and system parameters that are designed to work with specific workflows and storage use cases. These profiles were designed by ATTO engineers to work best in certain environments.

System Information and Tuning Profiles

Default – The system default.

High throughput – This is optimized for high throughput. This is better for systems that transmit or receive large amounts of data and favor throughput over latency.

Low Latency – This is optimized for reducing latency and favors reducing packet loss over high throughput.

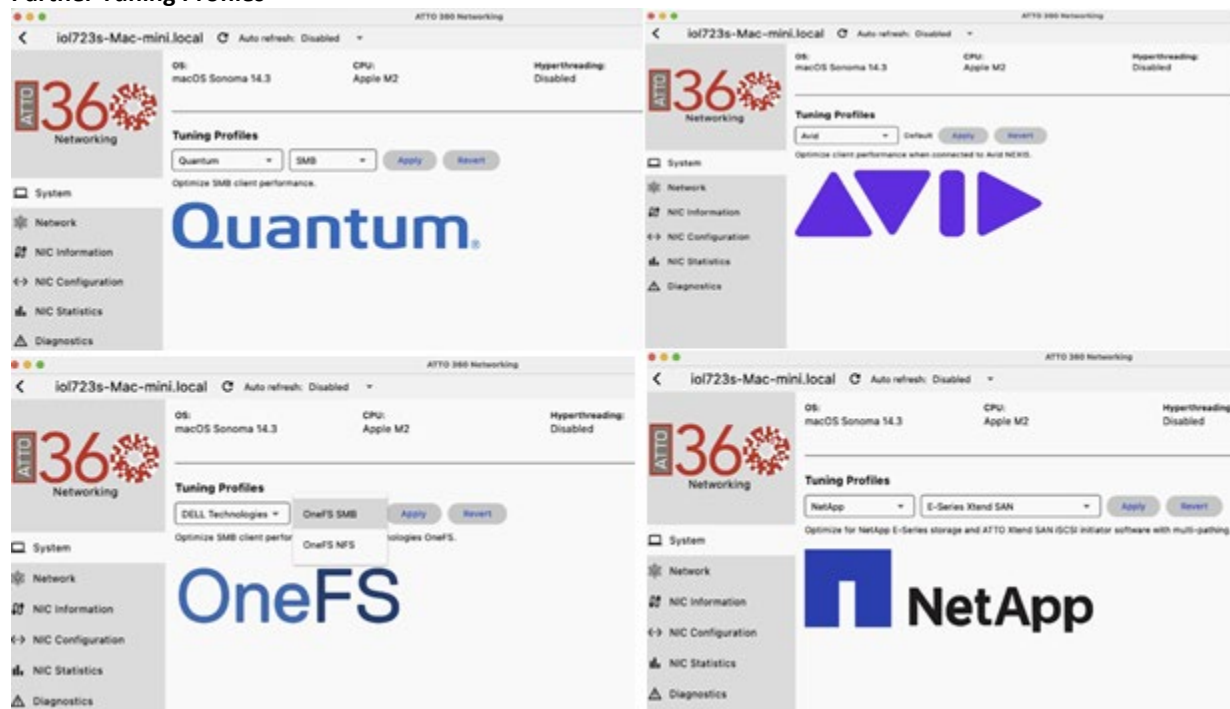
Multi-stream Throughput – This is optimized for multi-stream packet processing. This is better for systems that transmit or receive large amounts of data over multiple queues. This profile favors throughput over latency.

SMB – This profile is optimized for high throughput with SMB specific connections

NFS – This profile is optimized for high throughput with NFS specific connections

SMB MultiChannel – This profile is optimized for high throughput with SMB MultiChannel connections(Windows only)

Partner Tuning Profiles



You can select between several ATTO branded tuning profiles or a number of profiles custom made for our storage partners. Click on the first drop down box to see the full list. Partner profiles are designed and developed in conjunction with select storage partners and should be used when connecting your system to the corresponding partner storage devices.

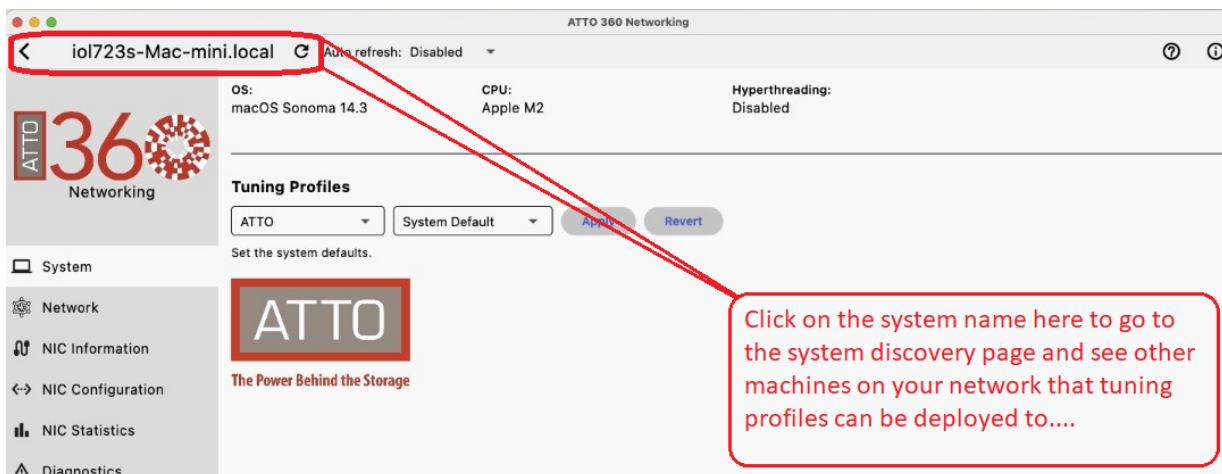
If you own any of our partner storage devices you should feel comfortable knowing that ATTO engineers have spent thousands of hours testing and validating and the recipes inside these custom partner tuning profiles will ensure you are getting the most out of your investment in storage.

System Discovery



A completely new area for this version is our System Discovery page. This page will display all of the systems on your network with 360 installed and allow you to deploy tuning profiles to these systems over the network. Systems are listed by their name, Operating System, and which version of ATTO 360™ is installed. Click anywhere on the tile to select that machine.

List view/Gridview at the top lets you select multiple machines at one time.



Network


The screenshot shows the ATTO 360 Networking application interface. The top navigation bar includes 'Info', 'IPv4 Routing', 'IPv6 Routing', and 'Network'. The 'Info' tab is active, displaying settings for Firewall (Disabled), IP Forwarding (Disabled), and Window Scale (3). Below these are buttons for 'Save Changes', 'Discard Changes', and 'Set Defaults'. A section for 'SMB signing' is shown with a toggle switch and a description. Two sections for 'TCP Tx buffer max' and 'TCP Rx buffer max' are visible, both set to 4, with a note that values are 0.5 to 16 MiB.

The next area is the network tab. It has been divided into 4 sections. Info, IPv4 Routing, IPv6 Routing, and Network. Flipping between these sections is easy using the top menu columns. Under “info” you can view information about firewall settings and set TCP buffer sizes. Next to that you access IPv4 and IPv6 routing tables.

The final column “Network” displays open sockets. Depending on the operating system there will be as many as 24 points of data collected for each socket that will be displayed in this area. It offers valuable information that is used for the troubleshooting, diagnostics, and analytics areas within the application. See the “Glossary” section at the end of the manual for definitions for the data points we are collecting and monitoring.

NIC Information and NIC Configuration

iol723s-Mac-mini.local
Auto refresh: Disabled



- System
- Network
- NIC Information
- NIC Configuration**
- NIC Statistics
- Diagnostics

Interface: en6 (ATTO ThunderLink N3 3102 Port 1)

Controller State: Operational	Port State: Link Up	Link Speed: 10 Gb/s	MAC Address: 00:10:80:00:00:00
Flags: UP,BROADCAST,SMART,RUNNING,SIMPLEX,MULTICAST	Driver Version: 1.14.0f1	Firmware Version: 14.31.1014	Flash Version: 31.1014
Thunderbolt Speed: 40 Gb/s (2 x 20 Gb/s)	Controller Temperature: 70°C (Normal)	PCIe Speed: 8 GT/s (Gen3)	PCIe Width: x4

Transceiver Information:

Vendor:	Intel Corp
Type:	Optical
Model Number:	FTLX8571D3BCV-IT
Serial Number:	AGS02CV
Revision:	A
Compliance:	10GBASE-SR
Temperature:	50°C
Voltage:	3163.9 mV
Rx Power [1]:	525 uW
Tx Power [1]:	589 uW
Tx Bias Current [1]:	8 mA

[Update Flash](#)

iol723s-Mac-mini.local
Auto refresh: Disabled

- System
- Network
- NIC Information
- NIC Configuration**
- NIC Statistics
- Diagnostics

Interface: en6 (ATTO ThunderLink N3 3102 Port 1)

[Save Changes](#)
[Discard Changes](#)
[Set Defaults](#)

Network services:

Thunderbolt Ethernet Slot 0 IPv4: 10.100.100.55

Hardware LRO

Enable hardware large receive offload.

Hardware LRO Size Values are 16384-65535 (default 16384)

The maximum TCP packet aggregated by the hardware.

Striding Receive Queue

Enable striding RQ feature. This feature will improve Rx resource utilization and help reduce Rx misses. Additional Rx resources are required.

TCP Segmentation Offload

TCP Segment Offload is a technique for increasing outbound throughput of high-bandwidth network connections by reducing CPU overhead.

Software Large Receive Offload

Enable software large receive offload.

Media

Selects the link rate and features. Flow control is the process of managing the rate of data transmission between two nodes to prevent a fast sender from overwhelming a slow receiver.

MTU Values are 1280-9000

Maximum transmission unit in bytes.

Logging level

The driver logging level. The selected level logs messages for that level and lower.

NIC Information and NIC Configuration

The next 2 areas are NIC information and NIC configuration. NIC info now displays information specific to our SmartNICs where as NIC Configuration has several features and parameters that can be adjusted within your FastFrame™ and ThunderLink™ Ethernet devices.

Select the network interface you would like to display information for in the top drop down box. You will see all the available ATTO device interfaces that are connected.

When you select a corresponding ATTO interface you will be given access to several points of data about your NIC including, Link status/speed, Model, channel, current PCIe slot, PCI location, flags, MAC address, MTU size/selection, RSS profiles (Linux and Windows), driver version, network services(macOS only), and firmware version.

You can also adjust several important settings that help in fine-tuning the performance of your NIC and can affect throughput positively or negatively.

aRFS - Accelerated Receive Flow Steering is a technique where packets are forwarded based on the location of the application consuming the packet directly to a CPU that is local to the thread consuming the data. – *Linux only*

GRO – Generic Receive Offload is a widely-used software based offloading technique to reduce per-packet processing overheads. – *Linux only*

LRO – Large Receive Offload is a technique for increasing inbound throughput of high-bandwidth network conditions by reducing CPU overhead.

TSO – TCP segmentation Offload is a technique for increasing outbound throughput of high-bandwidth TCP network communications by reducing CPU overhead.

RSC – Receive Segment Coalescing enables network card miniport drivers to coalesce multiple TCP segments and indicate them as a single coalesced unit. – *Windows only*

LSO – Large Send Offload is a technique for increasing outbound throughput of high-bandwidth network communications by reducing CPU overhead. – *Windows only*

RSS - Receive Side Scaling is a network driver technology that enables the efficient distribution of network receive processing across multiple CPUs in multiprocessor systems. – *Windows only*

Flow control – Flow control is the process of managing the rate of data transmission between two nodes to prevent a fast sender from overwhelming a slow receiver.

Striding RQ – Enables a striding queue that offloads packet processing helping users deal with smaller packet traffic (not supported by FFRM-N351 and N352)

NIC Statistics

The screenshot shows the ATTO 360 Networking application interface. At the top, the browser address bar shows 'iol723s-Mac-mini.local' and 'Auto refresh: Disabled'. The interface title is 'ATTO 360 Networking'. The selected interface is 'en6 (ATTO ThunderLink N3 3102 Port 1)'. Below the interface name are three buttons: 'Reset HW Statistics' (Reset counters in the hardware), 'Ignore History' (Zero the statistics and show future changes. The hardware is not affected.), and 'Restore History' (Revert to displaying statistics as reported by the hardware.).

The main content area displays statistics for the selected interface, organized into two columns: Receive Statistics and Transmit Statistics.

Receive Statistics		Transmit Statistics	
Rx Total Packets:	287,157	Tx Total Packets:	203
64 byte:	256,144	Tx Broadcast Packets:	33
65-127 byte:	7,195	Tx Multicast Packets:	170
128-255 byte:	20,209	Tx Good Bytes:	35,462
256-511 byte:	3,527	Tx Total Errors:	0
512-1023 byte:	82	Tx Oversized Packets:	0
Other:	0	Tx Carrier Errors:	0
Rx Broadcast Packets:	5,851	Single Collision Frames:	0
Rx Multicast Packets:	103,261	Multi Collision Frames:	0
Rx Good Packets:	287,157	Deferred Transmissions:	0
Rx Good Bytes:	21,432,020	Late Collisions:	0
Tx Total Errors:	0	Excessive Collisions:	0
Rx CRC Errors:	0		
Rx Illegal Bytes:	0		
Rx Length Errors:	0		
Rx Undersize Packets:	0		
Rx Oversize Packets:	0		
Rx Fragments:	0		
Rx Checksum Errors:	0		
Rx Alignment Errors:	0		
Rx FCS Errors:	0		
Frames Too Long:	0		
Control Frames Unknown:	0		
Rx Missed Packets:	0		

The NIC Statistics page allows the user to monitor Layer 2 Frame statistics and offer a view into Layer 1, for the purpose of assisting with troubleshooting issues and offering insight into performance-tuning opportunities. See our GLOSSARY of terms below for info on the items being displayed in this and other areas of our application.

Diagnostics



The Diagnostics menu will be highlighted red if the application recognizes settings that could be negatively impacting performance or connectivity. Selecting this option will present any built-in alerts that point to possible areas of concern or issues with performance.

GLOSSARY

Term	Definition
Rx Total Packets	Total number of all packets received (unicast, broadcast, multicast), regardless of length, errors, or L2 filtering, but excluding flow control packets.
Rx Broadcast Packets	Number of good (non-erred) broadcast packets received while the broadcast address filter is configured to allow reception of broadcast packets.
Rx Multicast Packets	Number of good (non-erred) multicast packets received that pass L2 filtering, excluding broadcast packets and flow control packets.
Rx Good Packets	Number of good (non-erred) packets received that pass L2 filtering and have a legal length. Counts of good packets received are also displayed by packet size.
Rx Good Bytes	Total number of all bytes received in good (non-erred) packets from the field through the field, inclusively.
Rx Errors	Total number of errors in packets received. When errors are displayed, check SFP, cable, MTU as well as local or remote interfaces.
CRC Errors	Number of packets received with CRC errors, not including packets whose length is less than 64 bytes (Fragments) or greater than the max packet size (Jabbers).
Illegal Bytes	Number of packets received with illegal byte errors, such as an illegal symbol in the packet.
Length Errors	Number of packets received whose packet length field in the MAC header doesn't match the actual packet length.
Undersize Packets	Receive undersize errors: Received frames that are shorter than the minimum size (64 bytes) and have a valid CRC.
Oversize Packets	Receive oversize errors: Received frames that are longer than the configured maximum packet size and have a valid CRC.
Fragments	Receive fragment errors: Received frames that are shorter than the minimum size (64 bytes) and have an invalid CRC
Checksum Errors	Number of packets received that contain IPv4, TCP, UDP or SCTP checksum errors. Checksum errors are not counted when a packet has any MAC error (CRC, length, undersize, oversize, byte error or symbol error).
Allocation Fails	Number of packets that were dropped because of a memory allocation failure.
Rx Missed Packets	Number of packets received that were dropped because no buffer was available to receive the data. Check MBUF structures with netstat -m. Counts the total number of packets missed on all Traffic Classes (TC).
Tx Total Packets	Total number of all packets transmitted, including standard, secure, FC, and manageability packets.

GLOSSARY

Tx Broadcast Packets	Number of broadcast packets transmitted.
Tx Multicast Packets	Number of multicast packets transmitted.
Tx Good Bytes	Number of successfully transmitted bytes, including bytes from the field.
Tx Inlined Packets	Number of Inlined packets transmitted.
Tx Errors	Total number of errors in packets transmitted
Map Fails	Number of packets that were dropped because of an error mapping the packet memory.
Other Fails	Number of packets that were dropped due to a general failure.
Tx Oversized Packets	Oversize errors: Frames that are longer than the configured maximum packet size and have a valid CRC
TSO Count	Number of Transmit Segmentation Offload operations attempted (including attempts that may have failed)
LRO Flushed	Number of Large Receive Offloads operations flushed.
Rx Flow Control XOFFs	Counts of Ethernet Pause Frames (Flow Control). Flow control is a Link layer attempt to relieve the pressure on queues to avoid congestion. When an Ethernet device gets congested or over loaded, flow control allows it to send PAUSE requests to the transmitter until the over loaded condition dissipates. If flow control is not enabled and an over loaded condition occurs, the device will drop packets. Dropping packets will impact performance.
Tx Flow Control XOFFs	Counts of Ethernet Pause Frames (Flow Control). Flow control is a Link layer attempt to relieve the pressure on queues to avoid congestion. When an Ethernet device gets congested or over loaded, flow control allows it to send PAUSE requests to the transmitter until the over loaded condition dissipates. If flow control is not enabled and an over loaded condition occurs, the device will drop packets. Dropping packets will impact performance.
OS	Indicates which Operating System is installed on the system running ATTO 360. An operating system (OS) is system software that manages computer hardware, software resources, and provides common services for computer programs.
CPU	Indicates CPU model is installed on system running ATTO 360. A central processing unit (CPU) is the electronic circuitry within a computer that carries out the instructions of a computer program by performing the basic arithmetic, logic, controlling, and input/output (I/O) operations specified by the instructions.
Performance Mode	Indicates which CPU is running in high performance mode rather than power saving or sleep modes that would cause performance problems
Firewall	Indicates whether or not firewall is established.

GLOSSARY

IP Forwarding	Indicates whether IP forwarding is enabled/disabled.
Hyper Threading	Indicates whether Hyper Threading is enabled/disabled. Hyper Threading is a high-performance computing architecture that simulates some degree of overlap in executing two or more independent sets of instructions.
Receive Buffer	Displays size of receive buffer window. The buffer size of system memory that can be used by the adapter for receiving packets
Transmit Buffer	Displays size of transmit buffer window. The buffer size of system memory that can be used by the adapter for sending packets
Window Scale	Displays TCP Window Scale option. The TCP window scale option is an option to increase the receive window size allowed in Transmission Control Protocol above its former maximum value of 65,535 bytes.
Link Status	Displays whether Link Status is up or down.
Model	Indicates model number for the ATTO adapter that is currently installed
Channel	Indicates which Ethernet port the application is monitoring
Thunderbolt	Thunderbolt is the brand name of a hardware interface developed by Intel (in collaboration with Apple) that allows the connection of external peripherals to a computer.
PCIe Generation	Displays PCI Express generation NIC is running
PCIe Width	Displays PCIe width determining the number of lanes that can be used in parallel by the device for communication (i.e. x4, x8, x16)
PCIe Speed	Displays PCIe speed in gigatransfers per second
PCIe Location	Displays PCIe location

GLOSSARY

Link Speed	Displays the maximum speed in bits per second that your device can communicate with the device that it is linked to.
IPv4 Address	Displays IPv4 address. The IPv4 address is a 32-bit number that uniquely identifies a network interface on a machine.
IPv6 Address	Displays IPv6 address. An IPv6 address is a 128-bit value that identifies an endpoint device in the Internet Protocol Version 6 (IPv6) addressing scheme.
MAC Address	Displays MAC address. A media access control address of a device is a unique identifier assigned to a network interface controller.
MTU	Here you can change MTU size. Maximum Transmission Unit (MTU) is the size of the largest protocol data unit (PDU) that can be communicated in a single network layer transaction.
Driver Version	Displays what driver version is installed
FW Version	Displays what Firmware version is installed for the selected adapter