



ATTO Technology, Inc.

ATTO Celerity Fibre Channel Host Adapter
Troubleshooting Guide for Mac OS X®

TABLE OF CONTENTS

1	Overview.....	3
2	Troubleshooting Techniques	4
3	Observations	5
4	Problem Isolation.....	6
4.1	Fibre Channel Links.....	6
4.2	Fabric Zoning.....	7
4.3	Storage configuration.....	7
4.4	Performance	7
4.5	Server/Workstation related issues.....	8
5	Error Log Capabilities	13
6	System NVRAM Capabilities	19
7	Contact Information	20

1 OVERVIEW

This document describes troubleshooting techniques that can be used to identify and resolve issues associated with the ATTO Celerity Fibre Channel Host Adapter.

Before continuing with this guide, verify that the latest host adapter driver and flash bundle are installed for your operating system. If you are experiencing an interoperability or protocol issue, chances are that other users have already reported the same thing. ATTO releases driver and flash bundle updates numerous times a year and there is a good chance your issue has already been resolved. The latest drivers can be obtained from the “Driver Download” section of the ATTO web site.

Also verify that you are using the latest versions of third party applications and storage devices.

In addition to the steps listed below, we highly recommend you explore the following additional technical resources:

- Read the information posted in the support section of the ATTO web site [www.attotech.com/support]. The known issues and workarounds are listed.
- The known issues section of the Product Release Notes document may also be helpful in identifying a potential issue. Product Release Notes can be obtained in the “Driver Download” section of the ATTO web site.
- The “Installation and Operations Manual” explains proper techniques and tips used for installation, operation, and configuration of the host adapters. The “ATTO Utilities Installation and Operations Manual” explains how to configure and tune your host adapter for optimal performance in given configurations. It also explains how the ATTO “Configuration Utility” can be used to monitor operation of the host adapter and the connections to your storage targets. Both of these manuals can be found in the support section of the ATTO web site.

ATTO spends a great deal of time testing third party applications and products. This testing ensures that each supported configuration performs as indicated and operates successfully. Interoperability matrices are available in the support section of the ATTO web site. While these are not all inclusive, the listed products are a good baseline for assuring that they have been tested and should work in your system. Storage and system providers’ web sites are the best sources for detailed configuration information including hardware and firmware/drivers/software for each component supported.

The ATTO Configuration Tool is a great utility that can be used to monitor the connections between your host adapter and your storage. It will list and provide details on each connected device the host adapter sees. It will also allow you to configure the host adapter for specific modes of operation. However, changing these settings can have adverse effects. ATTO recommends you leave the settings at their default values unless instructed to change them by an ATTO Technical Support representative or you have advanced knowledge of the Fibre Channel protocol.

2 TROUBLESHOOTING TECHNIQUES

There are a few categories that failures can be placed in:

- **Hardware:** A component completely or intermittently fails.
- **Interoperability:** One or more devices in the system interpret the protocol specification different than the others resulting in undesirable behavior.
- **Design:** There is an error in the implementation of the software or firmware that prevents or limits functionality.
- **User Error:** The system is unable to achieve expected behavior due to improper installation or configuration or the desired behavior is simply not achievable due to unrealistic expectations.

Troubleshooting steps need to be taken to isolate hardware failures and user errors, which can easily be remedied by replacing a piece of hardware or changing something, from interoperability or design errors which could require code changes and take considerable time to resolve.

Some of the following techniques may seem simplistic or overly obvious, but these are the ones that are commonly overlooked and can take several hours of frustration to locate. It is important to try only one technique at a time. While changing multiple variables may seem to be a time saver, it usually complicates the troubleshooting process. The goal is to observe the issue and systematically isolate it to identify the least common factors that cause it to occur.

3 OBSERVATIONS

Take a step back and think about what is being seen. Ask the following questions:

- Has the configuration been working and all of a sudden now fails? If you can absolutely assure that nothing has changed, the issue is most likely due to a hardware failure. However, there are some very subtle changes that could have been made (maybe by a colleague) that could affect overall system behavior. What has changed? Has the switch or storage firmware been upgraded? Has something been added or taken away? Even something as seemingly innocuous as an upgrade to disk drive firmware in a RAID storage system can have unexpected effects on a SAN.
- What is the observed behavior compared to the expected behavior? When reporting an issue to ATTO, try to observe and report the overall “high level” problem as well as the details. For example, an overall problem may be that drives disappear during heavy I/O. The details would include if the host adapter reported or logged an error when this occurred. Providing enough detail is important towards achieving a quick resolution.
- Is the problem repeatable? If yes, can it be repeated on a non-production test system? Collecting information such as system error logs is often needed. Since production systems are not generally set up to collect this information in normal operation, it is important to be able to configure the system to collect data and recreate the problem on a non-production test system.
- What do the status LEDs indicate? Check the adapter and switch LEDs to determine the status. Refer to the appropriate product manuals to gain an understanding of what the LEDs indicate, but they are usually a good source of information towards identifying root cause.

Record your observations. When an error is encountered, please insure you have an answer to each of the following questions when reporting it as an issue to ATTO Technical Support. This will expedite the ability to find a resolution tremendously.

QUESTION	ANSWER
1. Computer Model:	
2. Operating System	
3. PCI slot # and type:	
4. ATTO Driver version:	
5. ATTO Flash Bundle version:	
6. ATTO Configuration Tool version:	
7. List all of the devices attached to the ATTO HBA. Include the manufacturer, model number and firmware level for each device:	
8. List the application(s) and version(s) that were running when the failure occurred.	
9. Did it ever work? Is this a new error that just started happening, or is this an error that has been existed since the first use?	

10. Does the error occur when you try it with a second host adapter (if possible)? For example, swap out one host adapter for another and see if error still occurs.	
11. Does the error occur when you try it with a different SFP (if possible)? For example, swap out one SFP for another and see if error still occurs.	
12. Is the HBA in default mode? Are there settings that have been adjusted that may be causing the problem? Do settings need to be adjusted to allow the device to function properly?	
13. Can the error be reproduced easily? How often does it fail? Does the error occur sporadically/randomly, or can it be reproduced every time?	

4 PROBLEM ISOLATION

Once the problem is observed, attempt to determine where the problem originates. Begin by eliminating problem sources at a high level. Is it the server, the SAN or the storage? If the SAN and storage can be eliminated, only the server and its components need to be examined.

4.1 Fibre Channel Links

If the issue appears to be connectivity related, start at the server and work your way out. Verify that there is a good link at the desired speed between all devices. Most Fibre Channel devices have link LEDs that can be used to verify the connections. The ATTO Configuration Tool can also be used to help troubleshoot. It will indicate which devices are visible on which host adapter paths.

- Bad cables are one of the most probable sources for a link failure. Cable ends can get dirty or the optical fibers can be damaged if a cable is bent or stepped on.
- SFP failures are also a common source for failures. Make sure they are matched to the speed of the host adapter (8Gb SFP+ with 8Gb host adapter). ATTO 8Gb HBAs will not negotiate 8Gb speeds if a 4Gb SFP is in the HBA. If there is an 8Gb SFP in the HBA, it will try to negotiate 8Gb with whatever is on the other end of the link. If there is a 4Gb SFP in an 8Gb switch port or storage device, the link will only be negotiated at 4Gb.
- Check the Fibre Channel devices to determine the setting type of the connection mode. Most devices use “auto” for these settings to auto negotiate with the host. Manually forcing the connection mode (Arbitrated Loop or Point-to-Point) may alleviate any topology negotiation problems between the devices.
- Check the Fibre Channel devices to determine the setting type of the data rate. Most devices use “auto” for these settings to auto negotiate with the host. Manually forcing the data rate (8G,4G,2G, or 1G) may alleviate any speed negotiation problems between the devices.

4.2 Fabric Zoning

Large switched fabrics are complicated to set up and maintain. Improper zoning is a key source for failures. They could occur during initial configuration of the SAN or when devices are added or taken away. Switch management applications are very useful in identifying which devices are visible on which ports. Check the switches nameserver and zone config info as a starting point.

4.3 Storage configuration

Storage devices are typically presented in the OS as volumes or disks. The host adapter device driver maps discovered storage devices as SCSI Targets and the Logical Units (LUNs). If the storage device associates certain LUNs to a particular storage controller port and the port is not discovered by the adapter, all the LUNs associated with that port will not be available for use. Verifying which LUNs are discovered versus the LUNs associated with each storage device port may help isolate where a discovery issue initiates. Many storage systems provide security by requiring that each host adapter port be associated or bound to specific storage controller ports using the HBA's World Wide Name. Associated LUNs will not be visible to servers not bound to a particular storage controller port. Verify the storage configuration if target disks or volumes are not being detected by the OS, but all links and zoning appear to be intact.

4.4 Performance

There are a few areas to investigate if all target disks are being discovered by the OS as expected, but the performance is less than anticipated.

- Check the Fibre Channel devices to determine the data rate setting. Most devices use "auto" for these settings to auto negotiate with the host. Manually forcing the speed (1Gb, 2Gb, 4Gb or 8Gb) may allow for proper negotiation between the devices. Data rates can either be verified by inspecting the LEDs on the Fibre ports or by using the management applications that come with your host adapters, switches or storage devices.
- Another leading cause of performance issues is improperly configured storage systems. Use performance tools to try and isolate bottlenecks. Most switches will allow you to measure performance through the ports. Try to avoid situations wherein not enough spindles are dedicated to the LUNs with the most traffic or where there may be too many hosts talking to a particular storage port.

4.5 Server/Workstation related issues

Once an issue has been isolated to the server or workstation, there are numerous failure conditions that could occur as a result of the server – host adapter – operating system relationship. Please review the following list of possible failure conditions and corresponding items to check.

The computer will not boot when the host adapter is installed.

- The host adapter may be improperly seated. Power down the computer and reseal the host adapter.
- Try moving the host adapter to a different PCI slot.
- Restore the PRAM (command+option+P+R) at boot. Allow to chime 3 times.
- Disconnect any Fibre devices from the host adapter and reboot the computer. If this resolves the issue, investigate the Fibre cables, SFP's or Fibre target devices as described in the section below.
- If the computer still does not boot, try installing the host adapter in a different computer. If the host adapter works in the new computer, report this as a possible interoperability issue, to ATTO Technical support, between the host adapter and the computer. If the problem follows the host adapter, replace it with a new adapter.

With the ATTO host adapter installed, the operating system stops and displays a flashing question mark.

- This is an indication that the MAC is not able to find an OS to boot from.
- Use a CD or some other source to boot from and make sure the startup disk is correctly defined in "System Preferences" "Startup disks".
- Hold down the option key while booting and select the proper boot OS.
- ATTO's 8G (only) Celerity Fibre Channel Adapters only support booting from an external Fibre drive in OS10.6.x and later.

The Celerity Fibre channel host adapter is installed in the computer but it does not appear in the Apple System Profiler.

- The host adapter may be improperly seated. Power down the computer and reseal the host adapter.
- Check to ensure the latest driver is installed.
- Try moving the host adapter to a different PCI slot.
- Remove any non-vital PCI cards from the system to determine if there is a bus / driver conflict (unlikely).
- Disconnect any Fibre devices from the host adapter and reboot the computer. If this resolves the issue, investigate the Fibre cable, SFP, or Fibre target devices as described in the section below.
- If the adapter still does not appear, report this as a possible interoperability issue, to ATTO Technical Support, between the host adapter and the computer.

The Mac freezes or hangs.

- Disconnect all devices from the Fibre card and reboot the system.

If the system still freezes:

- Remove any non-vital PCI cards from the system to determine if there is a bus / driver conflict (unlikely).
- Remove the Celerity Fibre host adapter and test it in a different computer (not the same model if possible).
- If the problem follows the adapter, replace the host adapter with a new one.

If the system no longer freezes after disconnecting the Fibre devices:

- Check the Fibre Channel target devices to determine the data rate setting. Most devices use “auto” for these settings to auto negotiate with the host. Manually setting the speed (1Gb, 2Gb, 4Gb or 8Gb) may allow for proper negotiation between the devices. You may also want to manually force the data rate on the host adapter. This can be done by using the ATTO Configuration Tool.
- Check the Fibre Channel target devices to determine the setting type of the connection mode. Most devices use “auto” for these settings to auto negotiate with the host. Manually setting the connection mode (Arbitrated Loop or Point-to-Point) may allow for proper negotiation between the devices. You may also want to manually force the connection mode on the host adapter. This can be done by using the ATTO Configuration Tool.
- Check cable integrity. Check the cables for solid connections. Make sure the cables snap securely into place. Inspect cable for kinks or cuts. Be careful not to touch the ends of the cable.
- Verify the SFP is not damaged and is rated for the Data Rate trying to be negotiated. Also, try reseating the SFP. If this does not work, try replacing the SFP with a new one.
- If multiple Fibre devices are being attached (switch, multiple drive arrays, tape drives, etc.) try connecting one device at a time, adding devices until the problem occurs. This will help pinpoint the device or cable causing the problem.
- Watch the LED indicators on the Fibre card. They should show when you have a proper link and the connection speed you have negotiated with the device after startup. Drive lights should also illuminate at startup as the Fibre port is scanned. This may give a clue as to the root cause of the issue.

The Apple System Profiler (or ATTO Configuration Tool) recognizes the Celerity Fibre host adapter, but it does not detect any of the connected Fibre devices.

- Verify the Fibre channel devices are powered on.
- Boot into OSX and use the ATTO Configuration Tool to force the “connection mode” to PTP or Loop to match the target device (the default settings for the host adapter is “auto-negotiate”). Save the changes and restart the MAC with the Fibre Channel device attached.
- Boot into OSX and use the ATTO Configuration Tool set the “data rate” to the speed of your target devices (the default settings for the host adapter is “auto-negotiate”). Save the changes and restart the MAC with the Fibre Channel device attached.
- Check cable integrity. Check the cables for solid connections. Make sure the cables snap securely into place. Inspect cable for kinks or cuts. Be careful not to touch the ends of the cable.

- Verify the SFP is not damaged and is rated for the Data Rate trying to be negotiated. Also, try reseating the SFP. If this does not work, try replacing the SFP with a new one.
- If multiple Fibre devices are being attached (switch, multiple drive arrays, tape drives, etc.) try connecting one device at a time, adding devices until the problem occurs. This will help pinpoint the device or cable causing the problem.
- Watch the LED indicators on the Fibre card. They should show when you have a proper link and the connection speed you have negotiated with the device after startup. Drive lights should also illuminate at startup as the Fibre port is scanned. This may give a clue as to the root cause of the issue.
- Try updating the firmware of the attached device(s). (not applicable to all devices)
- If all else fails, replace the Fibre host adapter.

The Apple System Profiler (or ATTO Configuration Tool) recognizes the Dual/Quad Channel Celerity Fibre channel host adapter, but only detects connected Fibre devices on one of the ports. The other port reports no devices.

- Swap the devices, cables and SFP's from the Fibre port that appears to be working with the one having issues. If the issue follows the port, replace the Celerity Fibre channel host adapter.

If the issue follows the attached FIBRE devices, troubleshoot the attached devices:

- Verify the Fibre devices are powered on.
- Boot into OSX and use the ATTO Configuration Tool to force the “connection mode” to PTP or Loop to match the target device (the default setting for the host adapter is “auto-negotiate”). Save the changes and restart the MAC with the Fibre Channel device attached.
- Boot into OSX and use the ATTO Configuration Tool set the “data rate” to the speed of your target devices (the default settings for the host adapter is “auto-negotiate”). Save the changes and restart the MAC with the Fibre Channel device attached.
- Check cable integrity. Check the cables for solid connections. Make sure the cables snap securely into place. Inspect cable for kinks or cuts. Be careful not to touch the ends of the cable.
- Verify the SFP is not damaged and is rated for the Data Rate trying to be negotiated. Also, try reseating the SFP. If this does not work, try replacing the SFP with a new one.
- If multiple Fibre devices are being attached (switch, multiple drive arrays, tape drives, etc.) try connecting one device at a time, adding devices until the problem occurs. This will help pinpoint the device or cable causing the problem.
- Watch the LED indicators on the Fibre card. They should show when you have a proper link and the connection speed you have negotiated with the device after startup. Drive lights should also illuminate at startup as the Fibre port is scanned. This may give a clue as to the root cause of the issue.
- Try updating the firmware of the attached device(s). (not applicable all devices)
- If all else fails, replace the Fibre host adapter.

The Celerity host adapter is detected by the operating system, it detects some of the connected devices on some or all Fibre ports, but does not detect all of the connected devices in Apple System Profiler or the ATTO Configuration Tool.

- Swap the devices, cables and SFP from the Fibre port that appears to be working with the one having issues. If the issue follows the Fibre port, verify the NVRAM settings are the same for all host adapter channels (connection mode and data rate) using the ATTO Configuration Tool. If this does not resolve the problem, contact ATTO Technical Support.

If the issue follows the attached Fibre Channel devices, troubleshoot the attached devices:

- Verify that the Fibre devices are powered on.
- Check cable integrity. Check the cables for solid connections. Make sure they snap into place. Inspect cable for kinks or cuts.
- Verify that the SFP is not damaged and that it is rated for the Data Rate trying to be negotiated. Also, try reseating the SFP. If this does not work, try replacing the SFP with a new one.
- Check the Fibre Channel target devices to determine the data rate setting. Most devices use “auto” for these settings to auto negotiate with the host. Manually setting the speed (1Gb, 2Gb, 4Gb or 8Gb) may allow for proper negotiation between the devices. You may also want to manually force the data rate on the host adapter. This can be done by using the ATTO Configuration Tool.
- Check the Fibre Channel target devices to determine the setting type of the connection mode. Most devices use “auto” for these settings to auto negotiate with the host. Manually setting the connection mode (Arbitrated Loop or Point-to-Point) may allow for proper negotiation between the devices. You may also want to manually force the connection mode on the host adapter. This can be done by using the ATTO Configuration Tool. If multiple Fibre devices are being attached (switch, multiple drive arrays, tape drive, etc.) try connecting one device at a time, adding devices until the problem occurs. This will help pinpoint the device or cable causing the problem.
- Watch the LED indicators on the Fibre card. They should show when you have a proper link and the connection speed you have negotiated with the device after startup. Drive lights should also illuminate at startup as the Fibre port is scanned. This may give a clue as to the root cause of the issue.

► Errors are reported while trying to flash new firmware onto the Celerity host adapter.

- The ATTO Configuration Tool performs validations on the structure of the file. If it does not pass these validations, the file is rejected. The image file may be corrupted. Try downloading the image file from the “Driver Downloads” section of the ATTO web site again. If you continue to have problems, contact our ATTO Technical Support.
- Install the latest Celerity driver and try again.
- Install the latest ATTO Configuration Tool and try again.

► Cannot format volumes using Apple Disk Utility.

- The volumes may have been formatted in Windows with GPT partitions. ADU cannot format volumes that have used this format. Return the disks to Windows and delete the partition.
- Use ATTO ExpressStripe (Available for purchase at www.Attotech.com) to initialize the disk.

► **My Mac displays a multi-language screen (kernel panic) and does not boot.**

- Disconnect all devices from the ATTO card. If this resolves the issue, troubleshoot the target connection. If not proceed.
- Remove the Celerity HBA to see if the panic still occurs.
- If it does not update to the latest driver and re-install the Celerity HBA.
- If a kernel panic occurs, information is added to a log file in the folder Library/Logs/PanicReporter. The name of each log file in this location includes the date and time when the kernel panic was logged. Please send this info along with an Apple System Profiler output to ATT Technical Support.

► **The software application being used to communicate with the attached Fibre Channel devices reports communication errors.**

- Check your cables. There could be a kink or a cut in the cable. Also, make sure the ends of the Fibre cables are clean. Dirt or fingerprints can obstruct the optical link and cause communication problems.
- Check the Fibre Channel target devices to determine the data rate setting. Most devices use “auto” for these settings to auto negotiate with the host. Manually setting the speed (1Gb, 2Gb, 4Gb or 8Gb) may allow for proper negotiation between the devices. You may also want to manually force the data rate on the host adapter. This can be done by using the ATTO Configuration Tool.
- If the issue is not resolved, enable the Event logs as described below and contact ATTO Tech Support.

► **Errors are reported while using the ATTO Configuration Tool.**

Note: Sometimes when using the ATTO Configuration Tool, an error message describing an unexpected event or incorrect information discovered by the application will be displayed.

- Use the help text presented with the error message to correct the issue.

The following conditions cause a warning or error message to be posted in the "Status" area of the configuration utility. These messages will be shown in red.

- *An error occurred loading NVRAM data* - The first time a host adapter channel is highlighted, the application makes an attempt to read NVRAM from the card. If the size of the NVRAM buffer does not match the expected size, or if the NVRAM buffer couldn't be retrieved at all, this message is displayed.
- *Warning: NVRAM could not be read, defaults returned* - This message occurs as a result of corrupt NVRAM. When the driver accesses the NVRAM, a continuity check is performed on the NVRAM to ensure the returned data is valid. If this check fails, the driver has no other alternative than to return a known NVRAM data buffer that represents card defaults. When this situation occurs the defaults are presented via the graphical user interface and the user is informed that the values shown are defaults. These defaults must be committed in order to correct the state of the NVRAM.
- *An error occurred updating the NVRAM* – This message occurs during a committal of NVRAM to the card. If the driver is unable to put the new settings on the card, this message is displayed to the user and no changes are made to the card.
- *This is not a flash file, or it is corrupt* – Checks are performed to assure the proper file has been selected for flashing to the specific model of host adapter.

5 ERROR LOG CAPABILITIES

The ATTO Celerity FC Driver does not use the system log to communicate to the user. The system log driver events have very limited resources and events are easily lost. Instead, the driver logs events internally until they are retrieved using the ATTOCelerityFCLog or ATTOCelerityFC8Log utility (depending on adapter version).

The application is stored in /System/Library/Extensions/ATTOCelerityFCUtils or /System/Library/Extensions/ATTOCelerityFC8Utils (depending on adapter version).

The ATTOCelerityFCLog or ATTOCelerityFC8Log utility will continuously display events as they are logged by the driver.

To keep the events for future reference, save the terminal output (copy and paste into a text document) or use standard redirection when starting ATTOCelerityfcLog to save the output to a file.

NOTE: Event Logging is enabled by default so there is no need to enable it.

When reviewing error logs, be aware that certain events reported as errors are expected. For example, a SCSI Check Condition error will be reported for the first command sent to a device after power on or a reset condition.

All events report the host adapter number on which the event occurred. The adapter number is simply the order in which Mac OS X initialized the adapter channels and has no relevance to what slot the adapter is in or which channel of the adapter is being reported.

In the descriptions below, the ID is the Event ID reported in Event Viewer, and Severity is the Type reported in Event Viewer.

The driver records events broken into the following classifications.

EVENT TYPE	DESCRIPTION
Fatal	Fatal errors, always reported
Link	FC link events
SCSI	SCSI command errors
Protocol	FC protocol errors
Login	Device login/logout events
RSCN	RSCN events
Resource	Resource usage failures
Info	Informational messages
Underflow	Data underflow errors

The following events are classified as 'Fatal' and are always reported:

Severity	Event Message	Description
Error	Error doing Bus Reset	An error occurred while the system was attempting to reset link attached to the adapter channel.
Error	Invalid SCSI Request Block.	The operating system sent an unrecognized SCSI request block.
Error	No PCI I/O Base Address	The operating system was not able to map the device registers.
Error	Can't Get Uncached Extension	The operating system was unable to allocate the memory required for the uncached data required by the driver.
Error	Maximum number of adapters exceeded.	More than 64 adapter channels discovered. The driver can handle at most 64 adapter channels.
Error	Unrecoverable FC layer error	The FC layer encountered an unrecoverable error. The driver will attempt to reinitialize the FC layer.
Error	Stuck Frame Manager interrupt	The Frame Manager interrupt could not be cleared in 100 iterations through the Frame Manager Interrupt procedure. The error is not fatal in that the FC layer may recover from the situation. It sometimes occurs during loop disturbances. If it is persistent, it may indicate a bad Fibre Channel cable or a misbehaving device.
Error	SEST Programming Error. {Reason} Additional info: {Value}	This error indicates that invalid parameters were used to program the SCSI Exchange State Table (SEST). The {Reason} can be one of: # of SEST entries out of range SEST length not a power of 2 SEST Logical or Physical Address is 0 Invalid SEST address alignment. The Additional Info is either the SEST length or the SEST address. This error should never be seen in a released driver.
Warning	ABTS received for Exchange OX_ID (OX_ID) Port ID: {PortID}	An ABTS (Abort Sequence) Basic Link Service request has been received. An ABTS is typically sent by a SCSI Initiator (HBA) when a request has timed out. If Target Mode is disabled or if the Initiator is currently not logged in, this warning will always be reported regardless of the setting of EventLogMask. In these cases, the reported {PortID} will be 0. If Target Mode is enabled and the Initiator is logged in, this warning is reported only if the EVENT_TYPE_SCSI bit is set in EventLogMask.
Error	PCI Bus Error, channel being reset PCI Status: {Status} Function Status: {Fstat} PCI-X Received Split Completion: (0/1) PCI-X Unexpected Split Completion: (0/1) PCI-X Split Completion Discarded: (0/1)	A PCI Bus error has occurred. An attempt to reset and restart the adapter channel will be performed. Any I/O requests that are outstanding will be terminated with an error status (the OS may retry them). The additional information provided should be forwarded to Tech Support for analysis if the error persists.
Error	Target Command received, Target Mode disabled! OX_ID {OX_ID} Frame Type {n}	A SCSI command was received when Target Mode is not enabled on the adapter channel. This error indicates that something is wrong with the Initiator sending the command - it is not legal to send a SCSI command unless properly logged in at both the FC2 and FC4 levels and the TGT bit was set in the PRLI (Process Login) response.

Error	Unexpected Primitive Send completion	The FC layer reported that a Primitive Send operation has completed. Since the OS and HW layers never send primitives, this completion is unexpected. This error should never occur in released drivers.
Error	Unknown Event passed to {Function} Event {Event} Parameter {Parameter}	An unknown event was sent from the FC layer to the indicated function. The Event Code and associated Parameter are displayed. This error should never occur in released drivers.
Error	Unknown frame type received. OX_ID {Originator Exchange ID} Frame Type {FrameType}	An unknown frame type was received by the FC layer. This error indicates that some device sent a FC frame with an invalid or illegal FC Frame Type. The additional information should be reported to a Tech Support representative.
Error	Multiple adapters with same Port Name {PortName}. Reflash and update WWNs of offending adapters.	Two or more adapter channels in the computer have the same Port Name. Only the last 12 digits of the Port Name are displayed. No two ports in the world should ever have the same Port Name. Adapters are shipped from the factory with unique Port Names. Each adapter has a WWN sticker on it. The user should use the NODENAM3.BAT batch file in the DOS\UTILITIES directory on the driver diskette to re-program the offending adapters' Port Names using the WWN indicated on the sticker.
Error	More than 3 attempts to recover from PCI errors in the last minute. Channel is now inoperative.	After 3 attempts to recover from PCI errors within a one-minute period, the driver gives up and renders the adapter channel inoperative to avoid affecting the operation of the rest of the system. This error typically indicates that either the adapter or the slot into which it is plugged has a serious problem.
Error	Initiator Not Logged In (Target Mode). OX_ID {Originator Exchange ID} Frame Type {Frame Type}.	A SCSI command has been received from an Initiator who is not currently logged in.
Info	Bus Reset Request Completed. Status: {n} ({Desc}).	This event indicates that a requested Bus Reset has completed. If there was no error during the reset procedure, this event will only be reported if the EVENT_TYPE_INFO bit is set in EventLogMask, otherwise it will be reported regardless of the EventLogMask.
Error	Configuration parameters not found or corrupt. Please reflash card.	This event indicates that the driver could not read the configuration parameters for the indicated adapter. Default configuration values will be used. The adapter needs to have its flash memory rewritten.
Error	Unknown Event Code. Code is {Code}. Least Significant Word is {Info}.	This event indicates that an unknown event code was generated by the driver code that the decoder does not know about. This event should never occur in a released driver.
Error	Event Buffer Overflow. Number of Events Lost is {Count}.	This event indicates that events occurred faster than the OS could get them dumped to the event log on disk. This doesn't happen very often.

The following events are classified as 'Link':

Severity	Event Message	Description
Info	Bus Reset started Status: # (meaning)	The link connected to the adapter channel is being reset. This can occur if the OS requests a bus reset to recover from some error situation or when a topology change is needed, for example when the channel is currently in loop mode and needs to switch to point-to-point.
Info	FC Link Up	The FC link is in the operational state - synchronization has occurred, and speed and topology have been determined.
Info	FC Link Down	Synchronization has been lost.
Info	Login qualifier recovery complete Port ID {PortID}, Port Speed {Speed}, Topology {Topology}	Link speed and topology have been established and the FC link has received a Port ID.
Info	Hub port change detected. Int Status {IntStat}, Port Status {PortStat} Change detected on hub port(s) {Ports}.	A loop disturbance was detected on one of the hub ports on the card. The hub Interrupt and Port status are shown in hex.
Info	LIP occurred {count} time(s)	The indicated number of LIP (Loop Initialize) primitives has occurred. The link is attempting to initialize in Loop mode.
Info	NOS/OLS occurred {count} time(s)	The indicated number of NOS (Not Operational State) or OLS (Off Line State) primitives has occurred. The link is attempting to initialize in point-to-point mode.

The following events are classified as 'SCSI':

Severity	Event Message	Description
Warning	ABTS received for Exchange OX_ID (OX_ID) Port ID: {PortID}	An ABTS (Abort Sequence) Basic Link Service request has been received. An ABTS is typically sent by a SCSI Initiator (HBA) when a request has timed out. If Target Mode is disabled or if the Initiator is currently not logged in, this warning will always be reported regardless of the setting of EventLogMask. In these cases, the reported {PortID} will be 0. If Target Mode is enabled and the Initiator is logged in, this warning is reported only if the EVENT_TYPE_SCSI bit is set in EventLogMask.
Error	SCSI Error. Error Code {Code}, Sense Key {Key}, Add'l Sense Code {ASC}, Command Code {Cmd}, Path ID {Path}, Target ID {TargetID}, LUN {Lun}.	An error has been reported by the target device. The Error Code is usually 0x02 (Check Condition), in which case the Sense Key and Additional Sense Code displayed are valid. It is normal for the first command sent to a SCSI device after power on or reset to report a SCSI error, in which case the Sense Key would be 0x06 (Unit Attention) and the Additional Sense Code would be 0x29 (Power-On/Reset).
Info	SCSI Bus Reset Requested	The OS is requesting that a bus reset be performed. This may happen in cases where a request times out and the Abort that the driver attempts is not successful. The Bus Reset will cause the FC layer to send Target Reset Task Management requests to every logged in target. Any requests outstanding at the time will be completed with a status of Aborted due to Bus Reset.

The following events are classified as 'Protocol':

Severity	Event Message	Description
Error	IOC Error (Initiator). IOC Status is {n} {Desc}. Command Code {Cmd}, Path ID {Path}, Target ID {Targ}, LUN {Lun} LBA {Logical Block Address}.	A transport or other error has been detected on an Initiator mode request. Common errors reported might include 0x06, Aborted due to Bus Reset, or 0x0E, Lost Frame. Note that the Logical Block Address is only valid if the command is a read (0x28) or write (0x2A).
Error	IOC Error (Target). IOC Status is {n} {Desc}.	A transport or other error has been detected on a Target Mode assist. These errors are very rare.

The following events are classified as 'Login':

Severity	Event Message	Description
Info	Port Database Update requested	The Port Database is being updated. This happens whenever a change to the LUN masks has been made by the LUN mask application.
Info	Port Logged In. Port Name is {PortName}.	The indicated port has logged in. Note that only the last 12 digits of the Port Name are displayed.
Info	Port Logged Out. Port Name is {PortName}.	The indicated port has logged out. Note that only the last 12 digits of the Port Name are displayed. The logout may be explicit (requested by the device) or it may be implicit (it has gone offline without issuing a logout, its cable may have been pulled, etc.)

The following events are classified as 'Resource':

Severity	Event Message	Description
Warning	Resource Failure. {ResourceType}. Unavailable Count is {count}.	The driver encountered a situation where not enough of the indicated resource is available. The ResourceType will be one of the following (the Registry entry controlling the number of each resource is indicated in parentheses): SEST Entries (NumSest), Exchange CB's (NumXcb), Sequence CB's (NumScb), S/G Lists (NumSgLists, SglPageSize). Exchange CB's and Sequence CB's are only used for Target Mode. When running out of SEST Entries, Sequence CB's, or S/G Lists, nothing bad will happen; the driver will retry the operation when the resources become available. If running Target Mode, however, and there are not enough Exchange CB's, the incoming command(s) will be dropped and the Initiator will time these requests out and issue Aborts. If this happens, the NumXcb registry entry should be adjusted to a higher value. Refer to the registry.txt file for a complete description of the resource entries.

The following events are classified as 'Info':

Severity	Event Message	Description
Info	Registered State Change Notification. Page Descriptor: {Page}.	The channel has received a Registered State Change Notification. The Page is an indication of which domain, area or the actual Port ID that has experienced a change. Subsequently, you may see notifications that ports have logged in or logged out. This event can only occur if the adapter channel is connected to a fabric switch.
Info	Fabric Login complete	A fabric has been detected and the adapter channel has registered with the name server.
Info	Fabric Login unsuccessful {Reason}	Fabric login was not successful. The reason is displayed. Under normal conditions, the reason will be "Fabric not present." Other reasons (which are errors) may include: Resources unavailable, Fabric Login (FLOGI) was rejected, Fabric Login (FLOGI) was unsuccessful, Name Server Registration was rejected, or Name Server Registration was unsuccessful.
Info	Online, acquiring topology	The adapter channel has established synchronization and is attempting to establish what topology is to be used.
Info	Port Stop operation complete	A Port Stop operation has completed. In the process of determining topology when the adapter channel has been set to one of the auto topology modes, the port may need to be stopped and restarted to determine what topology to use.
Error	Frame Manager stuck in Out-of-Sync condition	This message is obsolete and should never occur.
Error	Directed Reset failed	This message is obsolete and should never occur.
Info	Adapter Initialization Complete	The driver has completed initialization of the indicated adapter channel.
Info	Mac OS X Adapter Control Function Called. Control Type is {ControlType}.	Mac OS X has called the AdapterControl function. The ControlType will be one of the following: QuerySupportedControlTypes, StopAdapter, RestartAdapter, or ScsiSetRunningConfig.
Info	Bus Reset Request . Completed. Status: {n} ({Desc}).	This event indicates that a requested Bus Reset has completed. If there was no error during the reset procedure, this event will only be reported if the EVENT_TYPE_INFO bit is set in EventLogMask, otherwise, it will be reported regardless of the EventLogMask.

The following events are classified as 'Underflow':

Severity	Event Message	Description
Error	IOC Error (Initiator). IOC Status is 21 (Data Underrun). Command Code {Cmd}, Path ID {Path}, Target ID {Targ}, LUN {Lun} LBA {Logical Block Address}.	A Data Underrun has occurred. Data Underruns may occur quite expectedly on certain commands, such as Inquiry, due to the OS or application program specifying a larger buffer than required to execute the command, hence this particular error has its own enabling bit in the Event- LogMask. Note that the Logical Block Address is only valid if the command is a read (0x28) or write (0x2A). In the specific case of an Inquiry command, the Inquiry Page number can be found in one of the bytes of the reported "LBA."

6 SYSTEM NVRAM CAPABILITIES

A system NVRAM environment variable, `atto-args-celerityfc` (for 4G Celerity) or `atto-args-celerityfc8` (for 8G Celerity) , can be used to pass options to the Celerity driver. The options are as follows:

- d Disable the driver
- e [mask] Specify the hexadecimal event mask for event logging. All event types are enabled by default.
- f Load the driver in 'flash-only' mode. You will be able to use the ATTO Configuration Tool to update the adapter, but devices will not be visible.
- m Enable OS X failover which is useful in multipathing environments.

Changing Driver Settings in OS X

1. Open a Terminal window.
2. At the prompt, enter the command `'sudo nvram atto-args-celerityfc="[options]"'` or `'sudo nvram atto-args-celerityfc8="[options]"'` (depending on model) where [options] are listed above. If you are not the root user, you will be prompted for an administrator password.
3. Reboot the system for the changes to take effect.

7 CONTACT INFORMATION

You may receive customer service, sales information, and technical support by phone Monday through Friday, 8:00 AM to 6:00 PM Eastern Standard Time, or by email and web site contact form.

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