

SAS3Flash Utility

Quick Reference Guide

Version 1.0
October 2014

DB13-000507-00

For a comprehensive list of changes to this document, see the [Revision History](#).

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Chapter 1: Introduction

The SAS3Flash Utility lets you flash the Fusion-MPT™ firmware and the OptionROM image on Avago® SAS-3 controllers and host bus adapters (HBAs). You can also use this powerful utility to perform tasks such as displaying HBA information, programming SAS addresses, testing BIOS versions, and displaying the contents of the Ethernet page. This document is intended for the following audiences:

- Engineers who work in manufacturing environments
- System engineers, test engineers, and firmware engineers
- Original equipment manufacturers (OEMs), Avago employees, and end users

This document provides the command line option syntax and functionality of all SAS3Flash Utility commands. It also explains a few limitations of different platform builds of the SAS3Flash Utility (see [Section 4.2, Operating System Limitations](#)).

CAUTION Before you use the SAS3Flash Utility commands, be sure you understand how they operate. Some of the commands, such as the command that erases regions of the controller, are potentially destructive if they are not used correctly.

1.1 Hardware and Software Compatibility

The SAS3Flash Utility is compatible with the following hardware and software.

1.1.1 SAS-3 Controllers and Host Bus Adapters

The SAS3Flash Utility supports all Avago SAS-3 Fusion-MPT architecture controllers and the HBAs based on these controllers, implemented to the message passing interface (MPI) v2.0. Currently, the SAS3Flash Utility supports the following controller models:

- LSISAS3004
- LSISAS3008
- LSISAS3108
- LSISAS3116
- LSISAS3208
- LSISAS3308
- LSISAS3216
- LSISAS3224
- LSISAS3316
- LSISAS3324

The MPI defines the host interface used by all Avago common architecture chipsets and allows the quick development of host-based drivers and applications.

1.1.2 Hardware Platforms

The SAS3Flash Utility is compatible with the following hardware platforms:

- Intel® EM64T/Advanced Micro Devices® AMD64®
- Intel IA-64

- Intel x86 (i386/i486 processor family) or compatible
- Sun® SPARC® V9
- IBM® PowerPC® 64

1.1.3 Operating Systems

The SAS3Flash Utility is compatible with the following operating systems:

- Red Hat® Enterprise Linux® (RHEL) 5, RHEL 6
- SUSE® Linux Enterprise Server (SLES) 10, and SLES 11
- Microsoft® MS-DOS® 6.22
- FreeDOS™ 1.0
- Windows® XP, Windows 2000, Windows Vista®, Windows Server® 2003, and Windows Server 2008
- WinPE 1.x (Server 2003/XP), WinPE 2.0 (Vista), WinPE 2.1 (Server 2008)
- Unified Extensible Firmware Interface (UEFI) version 2.1
- Sun OpenSolaris™ build 113 and later
- FreeBSD® 7.3

1.1.4 Operating System Architecture

The SAS3Flash Utility is compatible with the following operating system architectures:

- Windows/WinPE – x86, x64 (AMD64), IA64
- UEFI – UEFI Byte Code (UEBC)
- Linux® – x86 compatible, PPC64
- Solaris™ – x86 or compatible, SPARC
- FreeBSD – x86 or compatible

1.1.5 Other Software

The SAS3Flash Utility is compatible with the following software and firmware:

- PCI firmware – PCI 2.X, PCI 3.0
- MPT firmware – MPI 2.0.x
- DOS – Support for BIOS32 services in System BIOS (for DOS version)
- UEFI firmware 2.1 (for UEFI version)
- Windows driver v2.00.00.19 or later (for Windows version)
- Linux driver v00.255.04 (2.6 kernel) or later (for Linux version)
- Solaris driver v00.00.15.00 or later (for Solaris version)
- FreeBSD driver version 2.00.00.01 or later (for FreeBSD version)

NOTE The SAS3Flash Utility requires an amount of memory equal to the sum of the flash memory size of the SAS-3 controller, plus 0.5 MB. For most controllers, the requirement is 2.5 MB.

NOTE The SAS3Flash Utility supports the MPI V2.0.x firmware interface. It does not support any earlier versions of the MPI.

Chapter 2: Operation

2.1 Starting the Utility

Use the following commands to start the SAS3Flash Utility:

- DOS: `sas3flsh`
- Other operating systems: `sas3flash`

2.2 Modes of Operation

The SAS3Flash Utility supports the following modes of operation.

- Command line mode
Most command line parameters place the SAS3Flash Utility in command line mode. This mode receives most of its input from the command line parameters. It tries to run without prompting you for input, unless it needs input to complete a command.
If you invoke the SAS3Flash Utility in silent mode (see [Section 3.2.29, Silent Switch](#)), the utility does not prompt you for input. If it needs input, it logs an error that indicates the required input.
- User interface mode
The SAS3Flash Utility uses a standard 80x25 text mode interface to give you an overview of an operation. The user interface contains advanced mode and standard mode, which you select using the command line.
- Command file mode
The SAS3Flash Utility supports a command file, because command lines can be very long and many operating systems place a limit on their length. A command file, which is an ASCII text file, contains the parameters that you would otherwise enter on the command line. When you provide a command file, the utility does not use other command line parameters.

Chapter 3: Commands

This chapter describes the commands that the SAS3Flash Utility supports.

3.1 Command Line Format

The command line begins with `sas3flash` (or `sas3flsh` in DOS), followed by one or more switches that are separated by spaces, followed by a file name or other arguments required by a switch.

Example:

```
sas3flash -o -f filename
```

The first switch, `-o`, does not take a parameter. The second option, `-f`, takes a *filename* as a parameter. Spaces are required because multiple command line options that start with the same letters can occur.

3.1.1 Command Line Ordering

The structure of the command line determines the order in which the SAS3Flash Utility runs the commands. To determine the order of the commands, the utility follows this two-step order.

1. All commands have a preassigned order level based on the following six categories.
The SAS3Flash Utility sorts the options according to this order and runs the commands in that sequence.
 - a. Order 0 – Flags
 - b. Order 1 – All controller commands
 - c. Order 2 – Choose adapter
 - d. Order 3 – BIOS and firmware flash
 - e. Order 4 – Program and test
 - f. Order 5 – Display and list
2. Within each order level, the SAS3Flash Utility runs the commands in the sequence in which they appear on the command line, from left to right, with the following exceptions.
 - Order 0 commands are reserved for the command file, which is run separately and cannot be run simultaneously with other commands.
 - Order 2 commands (for example, the command to flash firmware on controllers), cannot run simultaneously with other commands.
After running Order 2 commands, the SAS3Flash Utility exits and reports all other commands as *not run*. If no Order 2 commands exist, the SAS3Flash Utility proceeds to Order 3 and so on, then runs all commands.

3.1.2 Command Line Rules

Use the following syntax rules to construct command lines:

- If a command line option takes a value, use a space to separate the option and the value.
- File names and paths must conform to the syntax rules of the operating system.
If the operating system allows spaces in file names, enclose the file name and the path in double quotation marks.
- The SAS3Flash Utility does not support duplicate command line options.
If you use duplicate options, the command fails and the utility returns an error message.
- Certain commands support duplicate options, which are mentioned in those command descriptions.

3.2 Command Line Parameters

The following table lists the command line parameters of the SAS3Flash Utility. The sections that follow the table explain the syntax and functionality for each command.

Table 1: Command Line Parameters

Command	Parameter	Order	Advanced Command	Argument	Description
Advanced Command Mode Switch	-o	1	—	—	Enable the advanced command mode.
BIOS All	-biosall	7	N	<i>filename1</i>	Try to flash all controllers with the BIOS in <i>filename1</i> .
BIOS Update	-b	4	Y/N	<i>filename1</i>	Flash a BIOS from <i>filename1</i> .
Controller Address Flag	-cpci	2	N	<i>num1:num2:num3:num4</i>	Select a controller by PCI <i>bus:device:function</i> , or optionally by <i>bus:device:function:segment</i> .
Controller Number Flag	-c	2	N	<i>num1</i>	Select a controller by <i>num1</i> .
Command File Directive	@	0	N	<i>filename1</i>	Use a command file from <i>filename1</i> .
Debug Switch	-debug	1	N	—	Turn on debug output.
Display Version	-ver	8	N	—	Show the version of the SAS3Flash Utility.
Download Complete Flash	-dflash	3	Y	<i>filename1</i> <i>filename2</i>	Download the complete flash image on the controller. <ul style="list-style-type: none"> ■ <i>Filename1</i> is the valid complete flash image that needs to be flashed on the controller. ■ <i>Filename2</i> is a valid firmware file that the utility uses to flash <i>filename1</i> on the controller.
Erase	-e	4	Y	<i>num1</i>	Erase the region specified by <i>num1</i> .
Firmware All	-fwall	7	N	<i>filename1</i>	Try to flash all controllers with firmware in <i>filename1</i> .
Firmware Update	-f	3	Y/N	<i>filename1</i>	Flash firmware from <i>filename1</i> .
Help	-? or -h	1	N	—	Display command line options help information.
List	-list	6	N	—	List information about the selected adapter.
List All	-listall	6	N	—	List information about all adapters.
List SAS Address	-listsasadd	6	Y	—	Show the SAS address of the selected controller.
Log File	-l	1	N	<i>filename1</i>	Specifies logging output to the file in <i>filename1</i> .
Program Assembly	-assem	5	Y	<i>string1</i>	Program the selected controller with an assembly value of <i>string1</i> .
Program Board Tracer	-tracer	5	Y	<i>string1</i>	Program the selected controller with a board tracer value of <i>string1</i> .
Program Ethernet Information	-eth	5	Y	<i>filename1</i>	Program the Ethernet page of the selected controller with the parameters in <i>filename1</i> .
Program SAS Address	-sasadd	5	Y	<i>num1</i>	Program the selected controller with SAS address from <i>num1</i> .
Program SAS Address High	-sasaddhi	5	Y	<i>num1</i>	Use <i>num1</i> for the upper 28 bits of the SAS address. You will be prompted for the remainder.
Program VPD	-vpd	5	Y	<i>filename1</i>	Program the selected controller with the vital product data (VPD) file in <i>filename1</i> .
Reset	-reset	3	Y	—	Perform a reset on the selected controller.
Reset All	-resetall	7	Y	—	Reset all controllers.
Scan Character Flag	-scanchar	5	Y	<i>string1</i>	Look for character in <i>string1</i> as the first character when scanning a SAS address.

Table 1: Command Line Parameters (Continued)

Command	Parameter	Order	Advanced Command	Argument	Description
Show Ethernet Information	-showeth	5	Y	—	Show the contents of the Ethernet page.
Show VPD	-showvpd	5	Y	—	Show the VPD file.
Silent Switch	-s	1	N	—	Enable silent mode.
Test BIOS Version	-testbios	4	Y	<i>string1</i>	Test the BIOS version against <i>string1</i> in the <i>major.minor.unit.dev</i> format.
Test Firmware Version	-testfw	4	Y	<i>string1</i>	Test the firmware version against <i>string1</i> in the <i>major.minor.unit.dev</i> format.
Test Link State	-testls	4	Y	<i>num1:num2</i>	Test phy <i>num1</i> on the selected controller for the link state specified in <i>num2</i> .
Test Link State All	-testlsall	4	Y	—	Show the link state on all phys.
Test Product ID	-testprodid	4	Y	<i>num1</i>	Test the selected controller's product ID against <i>num1</i> .
Test Subsystem Identification	-testssid	6	Y	<i>num1:num2</i>	Test the selected controller's SSVID against <i>num1</i> and the SSDID against <i>num2</i> .
Upload BIOS	-ubios	5	N	<i>filename1</i>	Upload the boot services (BIOS) to <i>filename1</i> .
Upload Firmware	-ufirmware	5	N	<i>filename1</i>	Upload the firmware image to <i>filename1</i> .
Upload Firmware Backup	-ufwbackup	5	Y	<i>filename1</i>	Upload the firmware backup location to <i>filename1</i> .
Upload Flash Image	-uflash	5	Y	<i>filename1</i>	Upload the entire flash image to <i>filename1</i> .
Upload NVDATA	-unvdata	5	Y	<i>filename1</i>	Upload the nonvolatile data (NVDATA) to <i>filename1</i> .

3.2.1 Advanced Command Mode Switch

The Advanced Command Mode (-o) switch enables the SAS3Flash Utility commands that have a Y in the Advanced Command column in the preceding table. If you do not use the -o advanced mode switch preceding these commands on the command line, the SAS3Flash Utility rejects the commands as *unrecognized*.

Advanced commands are intended for system engineers, test engineers, firmware engineers, and engineers who work in a manufacturing environment. LSI advises that you use advanced commands with great caution.

Syntax:

```
sas3flash -o
```

3.2.2 BIOS All

Use the BIOS All (-biosall) command to update the BIOS on all supported controllers. The command only allows updates to a later version of the BIOS image. It does not allow downgrading in a version. The SAS3Flash Utility performs the following steps during the upgrade process:

1. Open the specified file.
2. Determine whether the file is a valid BIOS image.
The image validity check includes a basic check for a valid PCI ROM header and a checksum of the core BIOS image.

3. Perform a series of safety checks.

The safety checks make sure that the provided BIOS supports the specified controller family within the limits of the ability of the program. If any of the safety checks fail, the utility skips the controller and continues the process with the next supported controller.

4. Upload the BIOS image and compare it to the image that was downloaded if the BIOS download operation succeeds.
If the comparison fails, log a failure.
5. Attempt to update the BIOS version in the VPD file if the BIOS image downloads successfully.
The utility checks the VPD information in manufacturing page 1 to determine whether valid VPD data is available. If so, and if the VPD data has a keyword to hold a BIOS version of the appropriate type (x86 BIOS, FCODE, or UEFI boot services driver (BSD)), the utility updates the version string with the version of the newly downloaded BIOS image.

Syntax:

```
sas3flash -biosall mptsas.rom
```

3.2.3 BIOS Update

Use the BIOS Update (`-b`) command to download a new x86 BIOS image, FCODE, or UEFI BSD. The SAS3Flash Utility performs the following steps during the upgrade process:

1. Open the specified file.
2. Determine if the file is a valid BIOS image.
The image validity check includes a basic check for a valid PCI ROM header and a checksum of the core BIOS image.
3. Perform a series of safety checks on the controller.
The safety checks ensure that the provided BIOS supports the specified controller family within the limits of the ability of the program. If any of the safety checks fails, the utility generates a failure report.
4. Update the controller if the file passes all of the checks.
The BIOS update command supports the duplicate command line option, which lets you flash x86 BIOS, FCODE, and UEFI BSD in a single command line invocation.

The SAS3Flash Utility performs a read, modify, and write operation on the BIOS region of the flash. The utility reads the BIOS region, finds the type of image being updated (x86 BIOS, FCODE, or UEFI BSD) in the block, and replaces it with the new image. The utility writes the modified image to the boot region in the flash.

If the BIOS image downloads successfully, the SAS3Flash Utility uploads the BIOS image and compares it with the downloaded image. If the comparison fails, it logs a failure.

Syntax:

```
sas3flash -b mptsas.rom
```

3.2.4 Controller Address Flag

Use the Controller Address (`-cpci`) flag to indicate the PCI address of the controller on which you want the SAS3Flash Utility to operate. The address is specified as the bus, device, and function number, based on the current mapping of the PCI bus. Multi domain PCI addressing is supported if the operating system supports it. Multi domain PCI addressing uses a PCI segment, bus, device, and function number, as shown in the second of the following syntax examples.

Syntax:

```
sas3flash -cpci 5:3:0  
sas3flash -cpci 1:3:2:0
```

3.2.5 Controller Number Flag

Use the Controller Number (`-c`) flag to make the SAS3Flash Utility operate on a specified controller. The controller number, which is the index of the controller, is arbitrary because it is based on the order in which the controllers in the system were discovered. The number is a 1-based index, so the number 1 is assigned to the first controller that is found. Specify the controller number as a hexadecimal value.

Syntax:

```
sas3flash -c 1
```

3.2.6 Command File Directive

Use the Command File (`@`) directive to specify a command file for execution. When you specify a command file option on the command line, in any order, the SAS3Flash Utility ignores all other command line parameters. Carriage return and line feed characters in the command file are ignored.

Syntax:

```
sas3flash @command.txt
```

The command file contains command line items, such as the ones shown in the following example:

```
-c 2  
-b mptsas3.rom  
-f ir1068.fw  
-reset
```

3.2.7 Debug Switch

Use the Debug (`-debug`) switch to enable debug data in the tool that is output to the screen, along with normal output messages. Alternatively, you can direct the debug output to a log file. The debug flag is helpful during the debugging process and can be used together with one or more commands.

Syntax:

```
sas3flash -debug
```

3.2.8 Display Version

Use the Display Version (`-ver`) command to display the Avago banner and the SAS3Flash Utility version.

Syntax:

```
sas3flash -ver
```

3.2.9 Download Complete Flash

Use the Download Complete Flash (`-dflash`) command to download the complete flash image on the controller. The command takes two files as arguments.

- *Filename1* is the valid complete flash image that must be flashed on the controller.
- *Filename2* is a valid firmware file that the SAS3Flash Utility must use to flash *filename1* on the controller.

The SAS3Flash Utility performs minimum validation on the flash image file. The utility opens the specified firmware file (*filename2*), verifies that it is a valid firmware image, performs a series of safety checks, and uses the file to flash the controller with the flash image.

The SAS3Flash Utility completes the following steps to validate the firmware file:

1. Open the firmware file.
2. Check for a valid firmware header signature, as defined by the *Fusion-MPT 2.0 MPI Specification*.
3. Check for zero checksum on the entire firmware image.
4. Determine whether the firmware image is valid for the controller being flashed.

The utility checks for support in the firmware image for the PCI device and revision ID. It checks the PCI device and revision ID from the controller's PCI configuration space with the list of devices supported in the supported devices firmware extended image data.

5. Check for a valid NVDATA extended image in the firmware image.
6. Check for NVDATA compatibility.

The SAS3Flash Utility checks the signature of the CFGI directory header and CFGI product ID structure for validity on the firmware image from the file and on the firmware image from the controller (if the controller already has firmware on it). If this check passes, and if the controller already has firmware on it, the utility checks the NVDATA product ID and NVDATA vendor ID from the NVDATA in the file with the NVDATA from the controller.

7. Verify that the firmware image has a valid INIT image.
8. Verify that the firmware image has a valid BOOTLOADER image.

If any of the validation checks fail, the SAS3Flash Utility sends a failure message to the screen and logs it to the log file.

When the flash image is successfully downloaded, the SAS3Flash Utility tries to update the firmware version in the VPD file. It checks the VPD information on manufacturing page 1 to determine whether valid VPD data is available. If so, and if the VPD data has a keyword to hold the firmware version, the utility updates the version string with the version of the newly downloaded firmware image.

Syntax:

```
sas3flash -o -dflash FlashImage.bin FirmwareImage.bin
```

3.2.10 Erase

Use the Erase (-e) command, which is available only in the advanced command set, to erase an entire region, as specified by a number.

CAUTION Be sure you want to erase the region before using this command. You cannot undo an erase operation.

Syntax:

```
sas3flash -o -e 1
```

The following table shows the parameters for this command and the region that each parameter erases.

Table 2 Command Parameters and Regions

Parameter	Region to Erase
1	NVSRAM
2	Backup firmware
3	Persistent configuration pages
4	Manufacturing area (MPB)

Table 2 Command Parameters and Regions (Continued)

Parameter	Region to Erase
5	Boot services
6	Clean flash (erase everything except manufacturing area)
7	Erase complete flash
8	MegaRAID [®] firmware

3.2.11 Firmware All

Use the Firmware All (`-fwall`) command to update the firmware on all supported controllers. This command only updates to a later version of the firmware image and does not allow the firmware to be downgraded. The update process includes the following steps:

1. Open the specified file.
2. Verify that the file is a valid firmware image, and run through all supported controllers.
 The steps to update and validate the firmware image are listed in the description of the [Firmware Update](#) command.
3. Perform a series of safety checks on each controller, and update the controller if all of the checks are validated.
 This command relies on the SAS3Flash Utility to determine which controllers need to be updated. Therefore, it is not possible to override any of the safety checks.
4. Skip the controller and continue the process with the next supported controller if any safety check for a given controller fails.

If the firmware download operation succeeds, the SAS3Flash Utility uploads the firmware image and compares it with the downloaded image. If the comparison fails, the utility erases the firmware image and the command fails. If a firmware image is already loaded in the flash memory, it continues to be used, and all firmware update operations download the new firmware image to a backup area.

If both the firmware download operation and the comparison of the uploaded firmware image with the downloaded firmware image are successful, this command issues an adapter reset, which automatically copies the new firmware image from the backup area to the running firmware location.

When the firmware image is successfully downloaded, the SAS3Flash Utility tries to update the firmware version in the VPD file. It checks the VPD information on manufacturing page 1 to determine whether valid VPD data is available. If so, and if the VPD data has a keyword to hold the firmware version, the utility updates the version string with the version of the newly downloaded firmware image.

Syntax:

```
sas3flash -fwall image.fw
```

3.2.12 Firmware Update

Use the Firmware Update (`-f`) command to download a new firmware image. This process includes the following operations:

1. Open the specified file.
2. Verify that the file is a valid firmware image, and run through all supported controllers.
 The firmware image validation involves the following steps:
 - a. Check for a valid firmware header signature, as defined by the *Fusion-MPT 2.0 MPI Specification*.
 - b. Check for zero checksum on the firmware image.

- c. Determine whether the firmware image is valid for the controller being flashed.
To validate, the SAS3Flash Utility compares the PCI device and revision ID information from the controller's PCI configuration space and from the list of devices in the supported devices firmware extended image data.
 - d. Check for a valid NVDATA extended image in the firmware image.
 - e. Check for NVDATA compatibility.
Check the signature of the CFGI directory header and CFGI product ID for validity on the firmware image from the file and on the firmware image from the controller (if the controller already has firmware on it). If the checks pass and the controller already has firmware on it, compare the NVDATA product ID and NVDATA vendor ID from the NVDATA from the file with the corresponding IDs from the NVDATA from the controller.
 - f. Verify that the firmware image has a valid INIT image.
 - g. Verify that the firmware image has a valid BOOTLOADER image.
 - h. Determine if NVSRAM is present before allowing integrated RAID (IR) firmware flashing.
If NVSRAM is not present, do not allow IR firmware flashing.
 - i. Determine whether the initiator target firmware is present before allowing IR firmware flashing and vice versa.
If the initiator target firmware is present, do not allow the firmware update.
3. Perform a series of safety checks on each controller.
 4. Display any firmware validation check failures for a given controller on the screen and log them to the log file.
 5. Update the controller if it passes all safety checks.

The advanced mode version of this command offers an override if the NVDATA vendor ID and the NVDATA product ID fields from the new firmware image do not match the same fields in the firmware that are already flashed on the controller.

If the firmware download operation is successful, the SAS3Flash Utility uploads the firmware image and compares it with the downloaded image. If the comparison fails, the utility erases the image and the command fails. If a firmware image is already loaded in the flash memory, it continues to be used, and all firmware update operations download the new firmware image to a backup area.

If both the firmware download operation and the comparison of the uploaded firmware image with the downloaded firmware image are successful, this command automatically issues an adapter reset, which copies the new firmware image from the backup area to the running firmware location.

When the firmware image is successfully downloaded, the SAS3Flash Utility tries to update the firmware version in the VPD file. It checks the VPD information on manufacturing page 1 to determine whether valid VPD data is available. If so, and if the VPD data has a keyword to hold the firmware version, the utility updates the version string with the version of the newly downloaded firmware image.

Syntax: This command is used in both regular mode and advanced mode, with the differences described earlier in this section.

```
sas3flash -f image.fw  
sas3flash -o -f image.fw
```

3.2.13 Help

Use the Help (-h, -?) command to list the command line options that the SAS3Flash Utility recognizes. The -o option enables advanced help and lets you view the advanced option help menu.

Syntax:

```
sas3flash -h  
sas3flash -?
```

```
sas3flash -o -h  
sas3flash -o -?
```

3.2.14 List

Use the List (`-list`) command to list information on the screen about the controller specified in the command. You also can output the information to a log file and pipe it to another destination.

Syntax:

```
sas3flash -list  
sas3flash -c 2 -list
```

3.2.15 List All

Use the List All (`-listall`) command to list information on the screen about all controllers supported by the SAS3Flash Utility. You also can output the information to a log file and pipe it to another destination.

Syntax:

```
sas3flash -listall
```

3.2.16 List SAS Address

Use the List SAS Address (`-listsasadd`) command to list the SAS address of the specified controller on the screen. You also can output the information to a log file and pipe it to another destination.

Syntax:

```
sas3flash -o -listsasadd  
sas3flash -c 2 -o -listsasadd
```

3.2.17 Log File

Use the Log File (`-l`) command to specify a file for logging output. The SAS3Flash Utility creates the file with the name you specify. If this file name already exists, the utility opens the file and deletes all its contents.

Syntax:

```
sas3flash -l logfilefilename.log
```

3.2.18 Program Assembly

Use the Program Assembly (`-assem`) command to program the specified controller with an assembly value. You must provide the complete 16-character assembly value, which is programmed directly to the controller. The value is truncated or padded with termination characters, as required.

NOTE

The utility programs the assembly number and tracer number directly to manufacturing page 0. It programs the SAS address directly to manufacturing page 5.

Syntax:

```
sas3flash -o -assem "12AB"
```

3.2.19 Program Board Tracer

Use the Program Board Tracer (`-tracer`) command to program the specified controller with a board tracer value. When you enter the 16-character value on the command line, the SAS3Flash Utility programs it to the controller. The board tracer value is truncated or padded with termination characters, as needed.

Syntax:

```
sas3flash -o -tracer "12AB"
```

3.2.20 Program Ethernet Information

Use the Program Ethernet Information (`-eth`) command to program an Ethernet parameter file to the specified controller. You specify the file on the command line. The SAS3Flash Utility then parses the file and programs the data to the appropriate location in nonvolatile storage.

NOTE See [Section A.2, Sample Parameter File for Program Ethernet Information Command](#), for an example of an Ethernet parameter file.

Syntax:

```
sas3flash -o -eth ethernet_settings.txt
```

3.2.21 Program SAS Address

Use the Program SAS Address (`-sasadd`) command to program the specified controller with a SAS address. You must provide the complete SAS address, which is programmed directly to the controller. This command recognizes the input format of the SAS address. The address can optionally include the hexadecimal prefix `0x`.

Syntax:

```
sas3flash -o -sasadd 50062b0000000000  
sas3flash -o -sasadd 0x50062b0000000000
```

3.2.22 Program SAS Address High

Use the Program SAS Address High (`-sasaddhi`) command to program the specified controller with the first 28 bits (seven characters) of the SAS address, which are specified at the command line. The SAS3Flash Utility then prompts you to enter the other nine characters and programs the value to the controller. Use this command with a barcode reader.

Syntax:

```
sas3flash -o -sasaddhi 50062b0
```

3.2.23 Program VPD

Use the Program VPD (`-vpd`) command to program the specified controller with a VPD parameter file. The file name is provided on the command line. The SAS3Flash Utility parses the data in the file you enter on the command line and programs it to the appropriate location in nonvolatile storage. The utility verifies the individual field lengths, but it does not verify the parameter values.

NOTE See [Section A.1, Sample Parameter File for Program VPD Command](#), for an example of a VPD parameter file.

Syntax:

```
sas3flash -o -vpd file.vpd
```

3.2.24 Reset

Use the Reset (`-reset`) command to issue a reset to the specified controller. The command resets the chip hardware and re-initializes all chip information. It also performs the following steps:

- Moves a new firmware image from the firmware backup location to the current firmware location.
- Migrates the NVDATA changes.
- Runs the new firmware.

Syntax:

```
sas3flash -o -reset
```

3.2.25 Reset All

Use the Reset All (`-resetall`) command to issue a reset to all supported controllers in the system. The command resets the chip hardware and re-initializes all chip information. It also performs the following steps:

- Moves a new firmware image from the firmware backup location to the current firmware location.
- Migrates the NVDATA changes.
- Runs the new firmware.

Syntax:

```
sas3flash -o -resetall
```

3.2.26 Scan Character Flag

Use the Scan Character (`-scanchar`) flag to specify a scan character to look for before accepting a SAS address input. You typically use this command to specify the scan character that a barcode scanner sends to indicate the beginning of a valid string. Use the scan character flag only when programming a SAS address. In the command line, the flag must appear before the option to program the SAS address, as shown in the following syntax example.

Syntax:

```
sas3flash -o -scanchar " " -sasadd 50062b000000000
```

3.2.27 Show Ethernet Information

Use the Show Ethernet Information (`-showeth`) command to display the contents of the Ethernet pages for the specified controller.

Syntax:

```
sas3flash -o -showeth
```

3.2.28 Show VPD

Use the Show VPD (`-showvpd`) command to display the contents of the VPD file for the specified controller.

Syntax:

```
sas3flash -o -showvpd
```

3.2.29 Silent Switch

Use the Silent (`-s`) switch to enable the silent operation mode, in which the SAS3Flash Utility does not solicit your feedback. The SAS3Flash Utility logs the output to the screen and to a log file, if specified. If an error occurs, the utility does not prompt you for input to correct an error or for your permission to override a safety check.

Syntax:

```
sas3flash -s  
sas3flash -s silent_logfile.txt
```

3.2.30 Test BIOS Version

Use the Test BIOS Version (`-testbios`) command to test the current BIOS version against a version provided on the command line in the format *AA.BB.CC.DD*. The SAS3Flash Utility checks all four parts of the version number and outputs the result of the checks through the return codes.

NOTE This command is supported only in the x86 BIOS.

Syntax:

```
sas3flash -o -testbios 6.08.00.00
```

3.2.31 Test Firmware Version

Use the Test Firmware Version (`-testfw`) command to test the current firmware version against a version provided on the command line in the format *AA.BB.CC.DD*. The SAS3Flash Utility checks all four parts of the version number and outputs the result of the checks through the return codes.

Syntax:

```
sas3flash -o -testfw 1.11.00.00
```

3.2.32 Test Link State

Use the Test Link State (`-testls`) command to test the link state of a specific phy on a specific controller against a provided value. The SAS3Flash Utility outputs the test results through the return codes.

3.2.33 Test Link State All

When you use the Test Link State All (`-testlsall`) command, the utility does not directly test the link state. Instead, it lists the state of all links on the selected adapter. If a phy does not have a device connected to it, its link state is *Link Down*.

Syntax:

```
sas3flash -o -testlsall
```

The valid values for testing the link state follow.

Table 3 Valid Values for Link State Testing

Value	Link State
0	Link Down
1	1.5 Gb/s
2	3.0 Gb/s
3	6.0 Gb/s

Syntax:

```
sas3flash -o -testls 4 2
```

3.2.34 Test Product ID

Use the Test Product ID (`-testprodid`) command to test the product ID of the current firmware against a product ID provided on the command line in hexadecimal format. The SAS3Flash Utility outputs the test results through the return codes.

Syntax:

```
sas3flash -o -testprodid 0x2713
```

3.2.35 Test Subsystem Identification

Use the Test Subsystem Identification (SSID) (`-testssid`) command to input the Subsystem Vendor ID (SSVID) and Subsystem Device ID (SSDID), and to match them to the appropriate PCI information for the selected controller. The output displays any discrepancies in either the SSVID or SSDID, or it displays a success message if both values match the selected controller.

Syntax:

```
sas3flash -o -testssid 1000:3020
```

3.2.36 Upload BIOS

Use the Upload BIOS (`-ubios`) command to upload the boot block (BIOS, UEFI, and FCODE) to a file. If the file already exists, the command overwrites it. The command fails if not enough free disk space exists to hold the block. This command is useful in manufacturing environments to perform a comparison after an update.

Syntax:

```
sas3flash -ubios image.rom
```

3.2.37 Upload Firmware

Use the Upload Firmware (`-ufirmware`) command to upload the current firmware image to a file. If the file already exists, the command overwrites it. The command fails if not enough free disk space exists to hold the firmware image. This command is useful in manufacturing environments to perform a comparison after an update.

Syntax:

```
sas3flash -ufirmware image.fw
```

3.2.38 Upload Firmware Backup

Use the Upload Firmware Backup (`-ufwbackup`) command to upload the firmware backup image to a file. If the file already exists, the command overwrites it. The command fails if not enough free disk space exists to hold the firmware backup image. This command is useful in manufacturing environments to perform a comparison after an update.

Syntax:

```
sas3flash -o -ufwbackup image.fw
```

3.2.39 Upload Flash Image

Use the Upload Flash Image (`-uflash`) command to upload the complete contents of the flash to a file. If the file already exists, the command overwrites it. The command fails if not enough free disk space exists to hold the block. This uploaded image can be used as a master image, with some changes, to program multiple similar controllers.

Syntax:

```
sas3flash -o -uflash flash.rom
```

3.2.40 Upload NVDATA

Use the Upload NVDATA (`-unvdata`) command to upload the current binary NVDATA image to a file. If the file already exists, the command overwrites it. The command fails if not enough free disk space exists to hold the binary NVDATA image. This command is useful in manufacturing environments to perform a comparison after an update.

Syntax:

```
sas3flash -o -unvdata nvdata.img
```

Chapter 4: Performance and Limitations

4.1 Performance

The SAS3Flash Utility runs efficiently and does not cause unnecessary delays. Memory use can be as high as 20 MB, which depends on the selected operation.

The SAS3Flash Utility supports the following exit codes.

Table 4 Exit Codes

Code	Description
0	Success
1	Failure

4.2 Operating System Limitations

Some operating systems do not support all SAS3Flash Utility features, because of limitations in their controller interface. If an operating system does not support a command, the utility returns an *invalid function* code.

The Windows, Linux, and Solaris operating systems do not support commands that require the controller to be taken offline or that require a firmware download of the boot loader. In addition, these operating system cannot flash any part that does not already have valid firmware loaded and running.

Appendix A: Sample Parameter Code

A.1 Sample Parameter File for Program VPD Command

This section shows the contents of a sample parameter file for the [Program VPD](#) command. Each parameter, or group of parameters, is preceded by a descriptive comment.

```
;Large Resource Type ID String Tag. Describe the data type.
LR_ID_STRING_TAG = 0x82
;Length of the ID String. Must match the length of the LR_ID_STRING.
LR_ID_STRING_LENGTH = 0x001F
;Data. The actual ID String to describe the device this VPD data represents.
LR_ID_STRING = "PCIe2 SAS Adapter Dual-port 6Gb"
;Large Resource Type VPD Tag.
LR_VPD_TAG = 0x90
;Total Length of all the VPD keyword, length and data wrapped by a Large
;Resource Type VPD Tag.
LR_VPD_LENGTH = 0x004C
;VPD Keyword. Part Number of Assembly.
VPD_KEYWORD = "PN"
VPD_LENGTH = 0x07
VPD_DATA = "45D8028"
;VPD Keyword. Engineering Data Code.
VPD_KEYWORD = "EC"
VPD_LENGTH = 0x07
VPD_DATA = " G37068"
;VPD Keyword. CC - Field Service CCIN.
VPD_KEYWORD = "CC"
VPD_LENGTH = 0x04
VPD_DATA = "763A"
;VPD Keyword. Reserved and Checksum.
VPD_KEYWORD = "RV"
VPD_LENGTH = 0x01
VPD_DATA = "CHECKSUM"
;Small Resource Type End Tag.
SR_END_TAG = 0x79
```

A.2 Sample Parameter File for Program Ethernet Information Command

This section shows the contents of a sample parameter file for the [Program Ethernet Information](#) command. Each parameter, or group of parameters, is preceded by a descriptive comment.

```
; Flags
EP_FLAGS = 0xFF
; Media State Flags.
EP_MEDIASTATE = 0xFF
; 48-bit MAC address of the Ethernet Interface.
; EP_IPV6=0 indicates static IP address are to be considered as IPv4.
; EP_IPV6=1 indicates static IP address are to be considered as IPv6.
EP_IPV6 = 0
```

```
EP_MAC_ADDRESS = 11:22:33:44:55:66
; Static IP address.
EP_STATIC_IP_ADDRESS = 192.168.0.213
; Subnet mask.
EP_STATIC_SUBNET_MASK = 255.255.255.0
; Gateway address.
EP_STATIC_GATEWAY_ADDRESS = 192.168.0.1
; DNS1 Address.
EP_STATIC_DNS1_ADDRESS = 172.31.171.31
; DNS2 Address.
EP_STATIC_DNS2_ADDRESS = 172.31.171.16
;Hostname (Maximum 32 characters).
EP_HOSTNAME = "long_hostname_of_computer_max32_"
```

Glossary

B

BIOS

basic input/output system

C

CFG

H

HBA

host bus adapter

M

MPI

message passing interface

N

NVDATA

nonvolatile data

Data that persists across reboots of the device.

O

OEM

original equipment manufacturer

P

PCI

Peripheral Component Interface

S

SAS

Serial-Attached SCSI

SAS is a serial, point-to-point, enterprise-level device interface that leverages the SCSI protocol set. The SAS interface provides improved performance, simplified cabling, smaller connectors, lower pin count, and lower power requirements when compared to parallel SCSI.

SCSI

small computer system interface

SSDID

subsystem device ID

SSVID

subsystem vendor ID

U

UEBC

UEFI byte code

UEFI

Unified Extensible Firmware Interface

V

VPD

vital product data

Revision History

Version 1.0, October 2014

Initial document release.

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