LSI

SASFlash Utility
Quick Reference Guide

Version 1.0
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Revision History

Version and Date	Description of Changes
Version 1.0, February 2008	Initial release of document.

Quick Reference Guide

SASFlash Utility

This document describes the usage of the SASFlash utility. It describes the non-advanced and advanced commands.

1.1 Introduction

The SASFlash utility flashes Fusion-MPT™ firmware and the OptionROM image, and programs an LSISAS controller. SASFlash supersedes MPTUTIL due to the architectural limitations of MPTUTIL. It includes all MPTUTIL functionalities and some additional functionality. The SASFlash utility supports updating LSISAS controllers. It does not support Ultra320 SCSI or Fibre Channel. Portability is a major feature of SASFlash. It supports the DOS, Linux, Windows, and EFI platforms. Other platforms are also supported with this architecture.

The audiences for this document are as follows:

- Engineers who work in manufacturing environment
- System engineers, test engineers, and firmware engineers
- End users

The requirements of the manufacturing unit and lab are very similar with slight variations. The end user requirements are very different compared to the other two. Hence, the SASFlash utility suppresses some of its more powerful capabilities.

This document provides the command line option syntax and functionality of various commands of the SASFlash utility. It explains the limitations of different platform builds of SASFlash.

The SASFlash utility is compatible with the following hardware and software:

- Proprietary I/O Protocol Device

  SASFlash supports all SAS/SATA Fusion-MPT architecture controllers and host bus adapters based on these controllers. These are implemented to message passing interface (MPI) V1.5. MPI defines the host interface used by all LSI common architecture chipsets and allows the speedy development of host-based drivers and applications. Examples are the LSISAS1064, LSISAS1068, LSISAS1064E, LSISAS1068E, LSISAS1078, and any new SAS controllers.

- Hardware Platforms
  — EFI version 1.10.14.61 or greater
  — Intel EM64T/Advanced Micro Devices AMD64
  — Intel IA-64
  — Intel x86 (i386/i486 processor family) or compatible
  — PowerPC (only on ppc64 Linux)

- Operating Systems
    - EFI 1.10.14.61 or greater
    - FreeDOS 1.0
    - Linux 2.4 Kernel: Red Hat Enterprise Linux 3 and SUSE Linux Enterprise Server LES 8
    - Linux 2.6 Kernel: Red Hat Enterprise Linux 4, Red Hat Enterprise Linux 5, SUSE Linux Enterprise Server 9, and SUSE Linux Enterprise Server 10
    - Microsoft MS-DOS 6.22
    - Windows XP, Windows 2000, and Windows 2003
- Other Software
    - EFI firmware: Version 1.10.14.61 and greater
    - Fusion-MPT firmware: MPI V1.5
    - Linux driver: Version 3.02.00 (2.6 kernel) or greater and Version 2.06.36 (2.4 kernel) or greater
    - PCI firmware: PCI 2.x and PCI 30.0
    - Windows driver: Version 1.20.15 or greater
- UEFI 2.0 specification

NOTE: To execute, SASFlash requires the sum of flash memory size and 0.5 MB. It requires a memory of 2.5 MB to execute SAS controllers.

1.2 Interfaces

SASFlash supports four interfaces. The SASFlash utility is invoked using the `sasflash` command.

1.2.1 Command Line Interface

Most command line parameters run the SASFlash utility in the command line mode. This mode receives most input from the command line parameters. It attempts to run without prompting you for input. However, if it needs input to complete a command, it prompts you.

If the SASFlash utility is invoked in silent mode, it does not prompt you for input. If input is required, it logs an error indicating the input required.

1.2.2 User Interface

SASFlash uses a standard 80x25 text mode interface to give you an overview of an operation. The user interface contains advanced and standard modes, which are selected using the command line.

1.2.3 Command File Interface

SASFlash 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 would be on the command line. When a command file is provided, other command line parameters are not used.

1.2.4 Firmware Interface

The SASFlash supports MPI V1.5, but does not support previous versions.

1.3 Features

SASFlash provides the following features:

1.3.1 Functional Partitioning

Internal to the code, the SASFlash utility has a platform abstraction layer (PAL) that is separated from rest of the program. The PAL contains the platform-specific information, which eases the process of porting from one platform to another.

1.3.2 Command Line Format

The command line has the following generic format:

```
switch space filename
```

Space is required because there may be multiple command line options that start with the same letters.

Example:

```
sasflash -o -f filename
```

The first option, `-o`, is a switch. It does not take a parameter. The second option, `-f`, takes a parameter.

1.3.3 Command Line Ordering

The command line determines the order in which commands are executed by the following steps:

1. Sorts all the options according to a predetermined order.

    All commands have a preassigned order level, and are executed in that sequence. The commands have an order based on the following six categories at the higher level:

    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 – Programming and testing
    f. Order 5 – Display and list

2. Executes the commands in the order in which they appear on the command line (from left to right). This is applicable within an order level.

Order 0 commands are reserved for the command file, which is executed separately and cannot be run simultaneously with other commands. Even Order 2 commands cannot be run simultaneously with other commands, for example, the command to flash firmware on controllers. After executing Order 2 commands, the SASFlash utility exits reporting all other commands as *unexecuted*. If there are no Order 2 commands, the SASFlash utility proceeds to Order 3 and so on, and then executes all commands.

1.3.4 Command Line Rules

Whenever 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 fundamental rules of the operating system. If the operating system allows spaces in file names, enclose the file name and the path within double quotations. Duplicate command line options are not supported. If used, it results in failure with an appropriate error message.

The following table lists the command line parameters of the SASFlash utility.

Table 1-1: Command Line Parameters

Parameter	Order	Advanced Command	Arguments	Description
-? or –h	2	N	None	Display command line options help information
@	0	N	filename1	Specify command file name
-assem	5	Y	string1	Program the selected controller with an assembly value.
-b	4	Y/N	filename1	Flash a BIOS from filename1
-biosall	2	N	filename1	Update the BIOS on all supported controllers
-c	3	N	num1	Select a controller by number
-concat	3	Y	filename1 filename2 filename3	Concatenate a firmware image in filename1 with an NVDATA file in filename2 to produce output in filename3
-cpci	3	N	num1:num2:num3:num4	Select a controller by PCI bus, device, or function; or optionally by bus, device, function, or segment
-e	4	Y	num1	Erase a region specified by num1
-f	4	Y/N	filename1	Flash firmware from filename1
-fwall	2	N	filename1	Try to flash all controllers with firmware in filename1
-l	1	N	filename1	Log to the file in filename1
-o	1	N	None	Enable advanced command mode
-s	1	N	None	Enable silent operation mode
-sasadd	5	Y	Num1	Program the selected controller with SAS address from num1
-tracer	5	Y	string1	Program the selected controller with a board tracer of string1
-vpd	4	Y	filename1	Program the selected controller with the virtual product data (VPD) file in filename1
-fwdown	4	N	filename1	Downgrade firmware on a controller with firmware in filename1
-list	6	N	None	List information about the selected controller adapter
-listall	6	N	None	List information about all adapters
-listsasadd	6	Y	None	Show the SAS address of the selected controller
-sasaddhi	5	Y	Num1	Use num1 for the first 28 bits of the SAS address; user is prompted for the remainder
-scanchar	5	Y	string1	Look for character in string1 as the first character when scanning a SAS address
-showvpd	6	Y	None	Show the VPD contents
-testssid	5	Y	num1:num2	Test the selected controller Subsystem Vendor ID (SSVID) against num1 and Subsystem Device ID (SSDID) against num2
-ubios	4	N	filename1	Upload the boot services (BIOS) to filename1
-ufirmware	4	N	filename1	Upload the firmware image to filename1
-ufwbackup	4	Y	filename1	Upload the firmware backup location to filename1
-unvdata	4	Y	filename1	Upload the NVDATA image to filename1

Table 1-1: Command Line Parameters (Continued)

Parameter	Order	Advanced Command	Arguments	Description
-ver	6	N	None	Print the version of this instance of SASFlash
-biosalt	4	Y	filename1	Load boot services (BIOS) image with alternate device ID
-reset	4	Y	None	Reset the specified controller
-resetall	2	Y	None	Reset all controllers
-testbios	5	Y	string1	Test BIOS version against string1 in format *AA.BB.CC.DD*
-testfw	5	Y	string1	Test firmware version against string 1 in format *AA.BB.CC.DD*
-testls	5	Y	Num1 num2	Test PHY num1 on selected controller for link state specified in num2
-testlsall	5	Y	None	Show link state on all phys
-testprodid	5	Y	Num1	Test the selected controller product ID against num1
-fwmr	4	Y	filename1	Download the MegaRAID® firmware from filename1
-ufwmr	4	Y	filename1	Upload the MegaRAID firmware to filename1

1.3.5 Help Command

This command lists the command line options that the SASFlash utility recognizes. The –o enables advanced help and allows the display of the advanced option help.

Usage:

```
sasflash -h
sasflash -?
sasflash -o -h
sasflash -o -?
```

Output:

```
-c x           Choose adapter by index.
               x = Index of the adapter to choose
-testssid x    Verify adapter by SSVID and SSDID.
               x = String indicating SSVID and SSDID.
               It must be of the following format:
               SSVID:SSDID.
-verbose       Set output to verbose mode.
-s             Set output to silent mode.
-l x           Log all output to file.
               x = Name of the log file.
-f x           Flash firmware image.
               x = Firmware file to flash.
```

Press any key to continue, or press *Q* to quit.

1.3.6 The @ (Command File) Directive

The command file directive allows you to specify a command file for execution. When a command file option is specified as a command line option in any order, all other command line parameters are ignored. The command file contains command line items. Carriage return and line feed characters are allowed in the file, and are ignored.

Usage:

```
sasflash @command.txt
```

The following are the sample commands in the **command.txt** file:

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

1.3.7 Program Assembly Command

This command allows you to program the specified controller with an assembly value. The complete assembly value must be provided, and it is programmed directly to the controller. The value is 16 characters long, and is truncated or padded with termination characters.

Usage:

```
sasflash -o -assem "12AB"
```

1.3.8 BIOS Update Command

This command downloads a new x86 BIOS image EFI boot services driver (BSD), or FCODE. It performs the following operations:

1. Opens the specified file
2. Checks whether or not 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. Performs a series of safety checks on each 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 checks fail, a failure report is sent to you.

4. Updates the controller if the file passes through all the checks

   The BIOS update command supports the duplicate command line option, allowing you to flash x86 BIOS/FCODE/EFI BSD in a single command line invocation.

The SASFlash utility performs a read, modify, and write operation on the BIOS region of the flash. The BIOS region is read; the type of image being updated (x86 BIOS, EFI or FCODE) is then found in the block and replaced with the new image. The modified image is written back to the boot region in the flash.

If the BIOS image is downloaded successfully, the SASFlash utility performs the following:

- Uploads the BIOS image and compares it with the downloaded image. If the comparison fails, a failure is logged.
- Updates the BIOS version in the VPD file. To check if valid VPD is available, the VPD information in Manufacturing Page 1 is verified. If valid VPD is available and if the VPD has a keyword to hold the BIOS version of the appropriate type (x86 BIOS/FCODE/EFI BSD), the version string is updated with the version of the newly downloaded BIOS image.

Usage:

```
sasflash -b mptsas.rom
```

1.3.9 BIOS Update Alternate Command

This command downloads a new BIOS image with an alternate device ID. It performs the following operations:

1. Opens the specified file
2. Checks whether or not 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. Performs a series of safety checks

   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 fail, the controller is skipped and the process continues with the next supported controller.

4. Updates the controller if the file passes through all the checks

If the BIOS image is downloaded successfully, the SASFlash utility uploads the BIOS image and compares it with the downloaded image. If the comparison fails, a failure is logged.

This command flashes the BIOS image on controllers that hold two legacy x86 BIOS images, where both have different device IDs. Therefore, this command supports only downloading a legacy x86 BIOS image type and not EFI BSD or FCODE. If the controller already has a legacy x86 BIOS flashed (with or without the same device ID), the BIOS update alternate command performs a read/modify/write operation and updates the correct x86 BIOS image.

Usage:

```
sasflash -o -biosalt altern.rom
```

1.3.10 BIOS All Command

This command updates the BIOS on all supported controllers. It only updates to a later version of the BIOS image and does not allow downgrading in a version. It performs the following operations:

1. Opens the specified file
2. Checks whether or not 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. Performs a series of safety checks

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 fail, the controller is skipped and the process continues with the next supported controller.

4. Updates the controller if the file passes through all the checks

If the BIOS image is downloaded successfully, the SASFlash utility performs the following:

■ Uploads the BIOS image and compares it with the downloaded image. If the comparison fails, a failure is logged.

■ Updates the BIOS version in the VPD file. To check if valid VPD is available, the VPD information in Manufacturing Page 1 is verified. If valid VPD is available and if the VPD has a keyword to hold the BIOS version of the appropriate type (x86 BIOS/FCODE/EFI BSD), the version string is updated with the version of the newly downloaded BIOS image.

Usage:

```
sasflash -biosall mptsas.rom
```

1.3.11 Controller Number Flag

The SASFlash utility can operate on a specified controller. One of the methods to specify the controller is using a controller number. The number is arbitrary because it is the index of the controller based on the order in which the controllers were discovered. The number is a one-based index, therefore, 1 is the first controller found.

Usage:

```
sasflash -c 1
```

1.3.12 Controller Address Flag

The SASFlash utility can operate on a specified controller. One of the methods to specify the controller is using a PCI address. The address is specified as the bus, device, and function number. This is based on the current mapping of the PCI bus. The operating system and PAL support multi-domain PCI addressing. This addressing uses a PCI segment, bus, device, and function number.

Usage:

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

1.3.13 Advanced Command Mode

The advanced command mode enables many commands. These commands are intended for system engineers, test engineers, firmware engineers, and engineers who work in manufacturing environment. An end user does not use this command set. For any advanced command, the advanced mode switch must be used. Otherwise, the SASFlash utility rejects the command as *unrecognized*.

Usage:

```
sasflash -o
```

1.3.14 Erase Command

This command, which is available only in the advanced command set, erases a region specified by a number. You cannot undo an erase operation.

Usage:

```
sasflash -o -e 1
```

Parameter	Region
1	NVSRAM
2	Backup firmware
3	Persistent pages
4	Manufacturing area
5	Boot services
6	Clean flash (erase everything except manufacturing area)
7	Erase complete flash

1.3.15 Firmware All Command

This command updates the firmware on all supported controllers. It only updates to a later version of firmware image and does not allow downgrading in a version. It performs the following operations:

1. Opens the specified file
2. Checks whether or not the file is a valid firmware image, and runs through all supported controllers

   The firmware image validity check includes running a zero checksum on the image (using 32-bit dwords) and checking the signature bytes in the image.

3. Performs a series of safety checks on each controller

   The safety checks ensure the following:

   a. Firmware product ID matches the controller product ID
   b. NVDATA major version of the firmware file increases or remains the same
   c. NVDATA vendor field matches the NVDATA product field
   d. Firmware device ID and revision information match the controller device ID and revision information
4. If any safety check for a given controller fails, the controller is skipped and the process continues with the next supported controller

If the firmware download operation is successful, the SASFlash utility uploads the firmware image and compares it with the image that was downloaded. If the comparison fails, the image is erased and the command fails. If a firmware image already is loaded in the flash memory, 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 the adapter reset. The adapter reset copies the new firmware image from the backup area to the running firmware location.

After downloading the firmware image successfully, SASFlash updates the firmware version in VPD. The VPD information in Manufacturing Page 1 is checked for the availability of valid VPD. If so, and if the VPD has a keyword to hold the firmware version, the version string is updated with the version of the newly downloaded firmware image.

Usage:

```
sasflash -fwall image.fw
```

Limitations:

The Windows and Linux platforms do not support the migration of the firmware image build from 1 MB to 2 MB during the firmware download all operation.

1.3.16 Firmware Downgrade Command

This command allows the version downgrade of the firmware image, whereas the standard firmware update command does not support this operation. It performs the following operations:

1. Opens the specified file
2. Checks whether or not the file is a valid firmware image, and runs through all supported controllers

   The firmware image validity check includes running a zero checksum on the image (using 32-bit dwords) and checking the signature bytes in the image.

3. Performs a series of safety checks on each controller

   The safety check ensures that the firmware device ID and revision information matches the controller device ID and revision information.

4. If any safety check for a given controller fails, a failure is logged to the screen and to the log file
5. Updates the controller if it passes all safety checks

The flash operation for the firmware downgrade is a complex process and must be performed offline.

To downgrade the firmware version, the operation must erase the flash memory. This process erases the firmware, persistent pages, and boot loader areas of the flash memory. It then flashes the new firmware.

If the NVDATA major version of the firmware file that is passed in the firmware image being flashed is not less than the version of firmware file that is on the flash, then the erase operation is not required and the firmware downgrade command works like a regular firmware update command.

If the firmware download operation is successful, the SASFlash utility uploads the firmware image and compares it with the downloaded firmware image. If the comparison fails, the image is erased and the command fails. If a firmware image already is loaded in the flash memory, 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 the adapter reset. The adapter reset copies the new firmware image from the backup area to running the firmware location.

After downloading the firmware image successfully, SASFlash updates the firmware version in VPD. The VPD information in Manufacturing Page 1 is checked for the availability of valid VPD. If so, and if the VPD has a keyword to hold the firmware version, the version string is updated with the version of newly downloaded firmware image.

Usage:

```
sasflash –fwdown image.fw
```

Limitations:

If the NVDATA major version in the firmware image flashed is less than the version of NVDATA on flash, the firmware downgrade command is not supported. This is applicable to the SAS1078 controller. To flash the firmware to the SAS1078 controller, erase the firmware on the card followed by a host boot. To downgrade the firmware, manually erase the firmware and initiate the firmware download using host boot.

1.3.17 Firmware Update Command

This command downloads a new firmware image. It performs the following operations:

1. Opens the specified file
2. Checks whether or not the file is a valid firmware image, and runs through all supported controllers

   The firmware image validity check includes running a zero checksum on the image (using 32-bit dwords) and checking the signature bytes in the image.

3. Performs a series of safety checks on each controller

   The safety checks ensure the following:

   a. The firmware product ID matches the controller product ID
   b. The NVDATA major version of the firmware file increases or remains the same
   c. The NVDATA vendor field matches the NVDATA product field
   d. The firmware device ID and revision information matches the controller device ID and revision information

4. Logs failure to the screen and to the log file when any safety check for a given controller fails
5. Updates the controller if it passes all safety checks

The advanced mode version of this command offers an override if the NVDATA vendor field does not match the NVDATA product field.

A SAS1078 firmware build can have a common boot block (CBB) image that is shared between the Fusion-MPT firmware and the MegaRAID firmware. If the SAS1078 firmware build supports CBB image and if a valid CBB image is found, the CBB image is first stripped from the original firmware image before it is downloaded. If the version of the CBB image from the file is later than the version of the CBB image on the flash, the new CBB image is downloaded as a separate firmware download request. If there is no CBB image on the flash and if there is a valid CBB image on file, the new CBB image is downloaded as a separate firmware download request.

If the firmware download operation is successful, the SASFlash utility uploads the firmware image and compares it with the image that was downloaded. If the comparison fails, the image is erased and the command fails. If a firmware image is already loaded in the flash memory, 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 the adapter reset. The adapter reset copies the new firmware image from the backup area to the running firmware location.

After downloading the firmware image successfully, SASFlash updates the firmware version in VPD. The VPD information in Manufacturing Page 1 is checked for the availability of valid VPD. If so, and if the VPD has a keyword to hold the firmware version, the version string is updated with the version of a newly downloaded firmware image.

Usage:

```
sasflash –f image.fw
```

Limitations:

The Windows and Linux platforms do not support the migration of the firmware image build from 1 MB to 2 MB during firmware download all operation.

1.3.18 List All Command

This command lists information about all controllers supported by the SASFlash utility. The information is printed to the screen. This information is output to a log file, if specified, and can be piped to another destination.

Usage:

```
sasflash –listall
```

Output:

Assume the SAS1064 and SAS1068 controllers are plugged into the system. The List All Command outputs the following information about the controllers.

Number	Controller	Firmware Version	NVDATA	x86 BIOS	EFI BSD	PCI Address
1	LSI1064 A3	1.11.00	25.01	6.08.00	3.00.00	09:02:00
2	LSI1068 B0	1.11.00	25.01	6.08.00	3.00.00	08:03:00

1.3.19 List Command

This command lists information about the controller specified in the command. The information is printed to the screen. This information is output to a log file, if specified, and can be piped to another destination.

The CBB version is displayed only for the SAS1078 controller, and only if the SAS1078 firmware build supports the CBB.

Usage:

```
sasflash –list
sasflash –c 2 –list
```

Output:

```
Controller Number              2
Controller                     LSI1068 B0
PCI Address                    5:3:0
SAS Address                    50062B0-0-0000-0000
NVDATA Version (Default)       25.01
NVDATA Version (Persistent)    25.01
NVDATA Vendor                  LSI
NVDATA Product ID              SAS3442X
Product ID                     1122
Firmware Version               1.11.00
Common Boot Block Version      1.00.00.01-0008
BIOS Version                   6.08.00
BIOS Alternate Version         N/A
EFI Version                    2.00.14
FCODE Version                  N/A
```

1.3.20 List SAS Address Command

This command lists the SAS address of the specified controller. The information is printed to the screen. This information is output to a log file, if specified, and can be piped to another destination.

Usage:

```
sasflash -o -listsasadd
sasflash -c 2 -o -listsasadd
```

Output:

```
2    LSI1068 B0            0x50062B0-0-0000-0000
```

1.3.21 Log File Command

This command provides the option to specify a file for logging output. The SASFlash utility creates the file with the name you specify. If this file name already exists, the file is opened and all its contents are deleted.

Usage:

```
sasflash -l logfilename.log
```

1.3.22 MegaRAID Firmware Update Command

This command downloads a MegaRAID firmware image. It updates the MegaRAID firmware only if the controller has valid Fusion-MPT firmware on it. It is not possible to download MegaRAID firmware to a blank controller using SASFlash. It performs the following operations:

1. Opens the specified file
2. Checks whether or not the file is a valid MegaRAID firmware image, by verifying a valid signature byte in the firmware header
3. Updates the controller with the image, if the file passes the validity check

A MegaRAID firmware build can have a CBB image that is shared between the Fusion-MPT firmware and the MegaRAID firmware. If the MegaRAID firmware build supports the CBB image and if a valid CBB image is found, then the CBB image is deleted from the original firmware image before it is downloaded. If the version of the CBB image from the file is later than the version of the CBB on the flash, the new CBB image is downloaded as a separate firmware download request. If there is no CBB image on the flash and there is a valid CBB image on the file, the new CBB image is downloaded as a separate firmware download request.

Usage:

```
sasflash -o -fwmr megaraid.fw
```

1.3.23 NVDATA Concatenation Command

This command concatenates a new NVDATA image to the firmware image. Because firmware is initially built without an NVDATA image attached to it, a valid NVDATA image must be concatenated to it. The NVDATA files contain a version. The current version of SASFlash supports only one version of NVDATA major. In addition, given firmware requires a specific version of NVDATA major and supports only this major version. If the compatibility checks are successful, this command concatenates or reconcatenates the new NVDATA image to the firmware image. If the firmware image already has a valid NVDATA image concatenated to it, then this command overwrites the firmware image with the new NVDATA image.

Usage:

```
sasflash -o -concat 68i_r_l.fw sas3442x.dat ir1068.fw
```

1.3.24 Program SAS Address Command

This command allows you to program the specified controller with a SAS address. The complete SAS address must be provided, and it is programmed directly to the controller. This command recognizes the input format of SAS address, and the format can be with or without the preceding hexadecimal characters *0x*.

Usage:

```
sasflash -o -sasadd 50062b000000000
sasflash -o -sasadd 0x50062b000000000
```

1.3.25 Program SAS Address High Command

This command allows you to program the specified controller with the first 28 bits of the SAS address, which are provided on the command line. You are prompted to provide rest of the 9 characters (36 bits), and the value is programmed to the controller. This command is used with a barcode reader.

Usage:

```
sasflash -o -sasaddhi 50062b0
```

1.3.26 Program Board Tracer Command

This command allows you to program the specified controller with a board tracer value. The board tracer value is provided on the command line and is programmed directly to the controller. The board tracer value is 16 characters long and is truncated or padded with termination characters.

Usage:

```
sasflash -o -tracer "12AB"
```

1.3.27 Program VPD Command

This command allows you to program the specified controller with a VPD file. The file is provided on the command line. It is parsed, and the data is programmed to the appropriate location in nonvolatile storage. Individual field length, not the value, is verified.

Usage:

```
sasflash -o -vpd file.vpd
```

1.3.28 Reset All Command

This command issues a diagnostic reset to all controllers supported in the system. It resets the chip hardware, where complete chip information is reinitialized. It performs the following operations:

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

Usage:

```
sasflash -o -resetall
```

1.3.29 Reset Command

This command issues a diagnostic reset to the specified controller. It resets the chip hardware, where complete chip information is reinitialized. It performs the following operations:

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

Usage:

```
sasflash -o -reset
```

1.3.30 Scan Character Flag

The scan character flag specifies a scan character before accepting SAS address input. It specifies the scan character that a barcode scanner sends to indicate the beginning of a valid string. The scan character flag is used only in conjunction with programming a SAS address. In the order of command line options, it should be specified before the option to program SAS address.

Usage:

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

1.3.31 Show VPD Command

This command displays the contents of the VPD file for the specified controller.

Usage:

```
sasflash -o -showvpd
```

1.3.32 Silent Flag

The silent flag enables silent operation mode. In silent mode, the SASFlash utility does not solicit your feedback. It logs the output to the screen, and to any log file if specified. If an error occurs, the SASFlash utility does not prompt you for input to correct an error or for permission to override a safety check.

Usage:

```
sasflash –s
```

1.3.33 Test BIOS Version Command

This command tests the current BIOS version against a version provided on the command line. The provided version must be a four-part version, and all four parts are checked for the version number in the format *AA.BB.CC.DD*. It outputs the result of the version number checks through the return codes.

NOTE: This command is supported only in the x86 BIOS.

Usage:

```
sasflash -o –testbios 6.08.00.00
```

1.3.34 Test Firmware Version Command

This command tests the current firmware version against a version provided on the command line. The provided version must be a four-part version, and all four parts are checked for the version number in the format *AA.BB.CC.DD*. It outputs the result of the version number checks through the return codes.

Usage:

```
sasflash –o –testfw 1.11.00.00
```

1.3.35 Test Link State All Command

This command does not directly test the link state, but 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*.

Usage:

```
sasflash –o –testlsall
```

Output:

```
LSI1068 B0
PHY 0    3.0 Gbps
PHY 1    3.0 Gbps
PHY 2    3.0 Gbps
PHY 3    3.0 Gbps
PHY 4    Link Down
PHY 5    Link Down
PHY 6    Link Down
PHY 7    Link Down
```

1.3.36 Test Link State Command

This command tests the link state of a specific phy on a specific controller against a provided value. It outputs the test results through the return codes.

The valid values for testing the link state are as follows:

Value	Link State
0	Link Down
1	1.5 Gbps
2	3.0 Gbps

Usage:

```
sasflash –o –testls 4 2
```

1.3.37 Test Product ID Command

This command tests the product ID of the current firmware against a product ID provided on the command line. The product ID input should be in hexadecimal. It outputs the test results through the return codes.

Usage:

```
sasflash –o –testprodid 0x2702
```

1.3.38 Test Subsystem Identification (SSID) Command

This command receives the SSVID and SSDID, and matches them with the appropriate PCI information for the selected controller. The output displays any discrepancies in either SSVID or SSDID, or a success message if both values match the selected controller.

Usage:

```
sasflash o -testssid 1000:3020
```

1.3.39 Upload BIOS Command

This command uploads the boot block (BIOS, EFI, and FCODE) to a file. If the file already exists, then the command overwrites the file. If there is not enough free disk space to hold the block, the command fails. This is useful in manufacturing environments when you want to compare them after an update.

Usage:

```
sasflash –ubios image.rom
```

1.3.40 Upload Firmware Command

This command uploads the current firmware image to a file. If the file already exists, then the command overwrites the file. If there is not enough free disk space to hold the firmware image, the command fails. This is useful in manufacturing environments when you want to compare them after an update.

Usage:

```
sasflash –ufirmware image.fw
```

1.3.41 Upload MegaRAID Firmware Command

This command uploads the MegaRAID firmware image to a file. If the file already exists, then the command overwrites the file. If there is not enough free disk space to hold the MegaRAID firmware image, the command fails. This is useful in manufacturing environments when you want to compare after an update. The MegaRAID firmware upload operation requires the running of Fusion-MPT firmware on the controller.

Usage:

```
sasflash –o –ufwmr megaraid.fw
```

1.3.42 Upload Firmware Backup Command

This command uploads the firmware backup image to a file. If the file already exists, then the command overwrites the file. If there is not enough free disk space to hold the firmware backup image, the command fails. This is useful in manufacturing environments when you want to compare after an update.

Usage:

```
sasflash –o –ufwbackup image.fw
```

1.3.43 Upload Binary NVDATA Command

This command uploads the current binary NVDATA image to a file. If the file already exists, then the command overwrites the file. If there is not enough free disk space to hold the binary NVDATA image, the command fails. This is useful in manufacturing environments when you want to compare after an update.

Usage:

```
sasflash –o –unvdata nvdata.img
```

1.3.44 Display Version Command

This command prints the SASFlash LSI banner and the SASFlash version followed by the NVDATA major version. This SASFlash version supports the concatenation of NVDATA to the firmware image.

Usage:

```
sasflash –ver
```

Output:

```
************************************************************

LSI Corporation SAS FLASH Utility.

SASFlash Version 1.10.00.00 (2007.08.03)

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reserved.

************************************************************

SASFlash Version is: 1.10.00.00 (2007.08.03)

NVDATA Major Version supported: 2b00

Finished Processing Commands Successfully.

Exiting SASFlash.
```

1.4 Performance

The SASFlash utility does not cause unnecessary delays and executes in an efficient manner. Memory utilization, which depends on the selected operation, can be as high as 20 MB. SASFlash is verified according to the Integration Test Specification, which is published by the Software Test Group.

The SASFlash utility supports the following exit codes:

Table 1-2: Exit Codes

Code	Description
0	Success
1	Failure

1.5 Limitations of Operating Systems, including Windows and Linux

Certain operating systems do not support all functionalities of SASFlash due to limitations in their controller interface. The PAL operates as a gate in this area. If an operating system does not support a command, the PAL returns a code of invalid function.

The Windows and Linux operating systems do not support commands that require the controller to be taken offline or require a firmware download of the boot loader. The migration of 1-MB to 2-MB firmware build requires a download of the boot loader, and hence is not supported. A workaround to allow the value migration of 1 MB to 2 MB firmware build is to use a bridge firmware build version 1.18.99.00. This involves the following two step process:

1. Update the bridge firmware
2. Update the actual 2 MB build firmware

The migration to 2-MB firmware requires the support of 2-MB flash memory on the adapter.

The Windows and Linux operating systems support the following commands:

- `-s`
- `-o`
- `-l`
- `-f`
- `-b`
- `-c`
- `-cpci`
- `-concat`
- `-ubios`
- `-ufirmware`
- `-ufwbackup`
- `-unvdata`
- `-list`
- `-listall`
- `-testbios`
- `-testfw`
- `-testlsall`

- ■ `-testls`
- ■ `-testprodid`
- ■ `-listsasadd`
- ■ `-h`
- ■ `-ver`
- ■ `-showvpd`
- ■ `-reset`
- ■ `-resetall`
- ■ `-fwall`
- ■ `-biosall`
- ■ `-biosalt`
- ■ `@`

In addition, the Windows operating system cannot flash any part that does not already have valid firmware loaded and running.