



Creating RAID arrays in the EFI shell

Supported configurations

When booting to a GPT RAID partition it is necessary to first create the RAID array. The boot array, in addition to data volumes, can be created using tools in the EFI shell prior to booting from the install media.

- GPT is currently supported by Win7-64 only
- Storage controllers must be configured to use the EFI driver.
- Controllers:
 - Z420/Z620: Intel C602 AHCI and SCU controllers
 - Z820: Intel C602 AHCI and SCU controllers, LSI 2308 controller.

Enabling the EFI Drivers

Use the following procedure to enable the EFI driver pre-OS for the different storage controllers.

Note: These instructions are for v02.07 BIOS. In earlier BIOS versions, the controller settings might be listed separately.

1. Press <F10> to enter the BIOS setup menu.
2. On the Main menu of the BIOS-based configuration utility, navigate to the Advanced menu item using the arrow keys.
3. Navigate to the sub menu item Device Options using the arrow keys and press [Enter](#) to access the Device Options menu screen.
4. On the Device Options screen, navigate to the Mass Storage Option ROMs item using the arrow keys.
5. Use the right or left arrow keys to change the selection from Legacy to EFI.
6. Press <F10> twice to go back to the File menu and make sure Save Changes and Exit is highlighted.
7. Press [Enter](#) to bring up the Save Changes and Exit confirmation. Make sure Yes is selected and press [Enter](#). The system will reboot.



Creating a bootable UEFI USB key

A BSD licensed x64 UEFI shell can be downloaded from the Intel Tianocore EDK2 project on Sourceforge.net.
https://edk2.svn.sourceforge.net/svnroot/edk2/trunk/edk2/EdkShellBinPkg/FullShell/X64/Shell_Full.efi

1. Create the following path in the root of the USB key:

\EFI\boot

2. Place the downloaded .efi shell file in the \EFI\boot folder named as:

bootx64.efi

3. Copy the following files to the root folder of the USB key:

RCfgSata.efi (For Intel AHCI controller)
RCfgScu.efi (For Intel SCU controller)
sas2ircu.efi (For LSI SAS controller)

These configuration tools are part of the driver package for the Storage Controllers that can be downloaded from hp.com.

Booting to the UEFI Shell

1. Plug the bootable USB key into a USB port on the Workstation.
2. Power on the PC and press <F9> after the first messages appear. A message should appear at the bottom of the screen similar to **Entering Boot Menu....** (You might not see this message if you have full OROM screens enabled.)
3. After some system messages you will be presented with a Boot Menu where you can use the arrow keys to select your boot device. Use the up and down arrows to select your USB key from the devices under UEFI Boot Sources and press **Enter**.
4. You should now have a **Shell>** prompt.
5. Helpful commands:
 - a. Help – displays a list of standard shell commands. (Use **Page Up** and **Page Down** to view all of the commands.)
 - b. **ls** – Displays a list of files and subdirectories in a directory. For example:
 - **ls fs0:** (shows the Directory of: fs0:\ which includes the EFI directory.
 - **ls fs1:** (shows the contents of the root directory where you saved the configuration tools.

Creating RAID arrays on the Intel C602 AHCI and SCU controllers

Use the following procedure to create data RAID arrays or boot RAID arrays prior to OS install.

Note: RAID arrays cannot span different controllers.

1. Using a USB key, boot to the EFI shell.
2. Execute either RCfgSata.efi (AHCI) or RCfgScu.efi (SCU) depending on which controller you are targeting for the RAID array.
3. Creating RAID arrays in EFI mode is a manual command line operation. Below are examples of using the command line configuration utilities to create basic arrays. The process is similar for SCU and AHCI controllers.

Example 1 – To display a list of available commands for the configuration utility use:

```
Shell> rcfgsata
```

Or

```
Shell> rcfgsata /?
```

Example 2 – To display a list of available commands for RCfgScu.efi:

```
Shell> rcfgscu
```

Results in:

```
Intel(R) UEFI RAID Utility for SCU - v3.6.0.1006
```

```
RCfgScu.efi [/?] [/Y] [/Q] [/C:vol_name] [/SS:strip_size] [/L:raid_level]  
[/S:vol_size] [/DS:disk_id] [/D:vol_name] [/X] [/I] [/P] [/U] [/ST] [/SP] [/V]
```

```
/? Displays Help Screen. Other options ignored.  
/Y Suppress any user input. Used with options /C, /D, & /X.  
/Q Quiet mode / No output. Should not be used with status commands.
```

```
COMMANDS - Only one at a time.  
/C Create a volume with the specified name.  
/S, /DS, /SS, & /L can be specified along with /C.  
/SS Specify strip size in KB. Only valid with /C.  
/L Specify RAID Level (0, 1, 10, or 5). Only valid with /C.  
/S Specify volume size in GB or percentage if a '%' is appended.  
Percentage must be between 1-100. Only valid with /C.  
/DS Selects the disks to be used in the creation of volume.  
List should be delimited by spaces.  
/D Delete Volume with specified name.  
/X Remove all metadata from all disks. Use with /DS to delete  
metadata from selected disks.  
/I Display All Drive/Volume/Array Information. /P can be specified.  
/P Pause display between sections. Only valid with /I or /ST.  
/U Do not delete the partition table. Only valid with /C on RAID 1  
volumes.  
/ST Display Volume/RAID/Disk Status.  
/SP Marks the selected drive(s) as spare(s). Use with /DS  
/V Display version information
```

```
Shell>
```

Example 3 – To display a list of drives on the targeted controller use:

```
Shell> rcfgscu /I
```

Results in:

```
--CONTROLLER INFORMATION--
```

```
Controller Name: SCU
```

```
Physical Disks Controlled by RAID on this controller:
```

```

Disk 1 / 2
Drive: WDC WD2500AAKX-603CA0
SerialNo:WD-WCAYU8520661
TotalBlks:0x000000001D1C5970
DeviceId:0x0 (Non-RAID Disk)
CfgStatus:(0) Ok
CheckBox:0x0
State:(0x450)    Array:0xFFFFFFFF
    DETECTED_DISK
    PASSTHRU_DISK
    DISK_SMART_EVENT_SUPPORTED
Disk 2 / 2
Drive: WDC WD2500AAKX-603CA0
SerialNo:WD-WCAYU8002779
TotalBlks:0x000000001D1C5970
DeviceId:0x1 (Non-RAID Disk)
CfgStatus:(0) Ok
CheckBox:0x0
State:(0x450)    Array:0xFFFFFFFF
    DETECTED_DISK
    PASSTHRU_DISK
    DISK_SMART_EVENT_SUPPORTED
-----
Total Physical Disks on SCU controller: 2
Total Missing Disks on SCU controller: 0

RAID Volumes
-----
Total Volumes = 0

RAID Arrays
-----
Total Arrays = 0

```

Shell>

Note the "DeviceId:" for each drive that you want to include in the array. These are HEX values.

Example 4 – To create a RAID 1 array on the SCU use:

```
Shell> rcfgscu /C MyRAID1 /L 1 /DS 0x0 0x1
```

Where:

- The name of the array is "MyRAID1"
- The RAID Level chosen is "1" for Mirrored
- The disks selected are "0x0" and "0x1" which came from the "DeviceId:" lines from the "rcfgscu /I" command of **Example 3** above.

This is a minimal command resulting in defaults being used for most parameters.

You should use this command unless you are an expert and wish to specify additional configuration parameters.

Results in:

Creating Volume...

```
Volume Name: "MyRAID1"
RAID Level: 1
Size:      226548 MB
Strip Size: 64KB
Ports Selected: Disk(ID:0x0) Disk(ID:0x1)
WARNING: All data on the selected disks will be lost.
Are you sure you want to create this volume?(y/n)
```

(User presses y then sees)

Creating Volume....Successfully created volume

You MUST restart your system for your changes to take effect.
Any drives you have created or changed must be formatted
AFTER you restart.

Shell>

Creating RAID arrays on the embedded LSI 2308 controller

Use the following procedure to create data RAID arrays or boot RAID arrays prior to OS install.

1. Using a USB key, boot to the EFI shell.
2. Execute sas2ircu.efi.
3. Creating RAID arrays in EFI mode is a manual command line operation. Following are examples of using the command line configuration utilities to create basic arrays.

Example 1 – To display a list of available commands for sas2ircu.efi:

Shell> sas2ircu

Results in:

```
LSI Corporation SAS2 IR Configuration Utility.
Version 14.00.00.00 (2012.07.04)
Copyright (c) 2009-2012 LSI Corporation. All rights reserved.
```

SAS2IRCUC: Disconnecting the EFI Driver.

SAS2IRCUC: No command specified.

sas2ircu <controller #> <command> <parameters> ...

where <controller #> is:

Number between 0 and 255

where <command> is:

DISPLAY	- display controller, volume and physical device info
LIST	- Lists all available LSI adapters (does not need ctrlr #>
CREATE	- create an IR volume
DELETE	- Delete entire RAID configuration on the selected controller
DELETEVOLUME	- Delete a specific RAID Volume on the selected controller
HOTSPARE	- make drive a hot spare
STATUS	- display current volume status info

```

CONSTCHK    - Start Consistency Check operation on the specified IR
               Volume
ACTIVATE     - Activate an Inactive IR volume
LOCATE       - Locate a disk drive on an enclosure
LOGIR        - Upload or Clear IR Log data
BOOTIR       - Select an IR Boot Volume as primary boot device
BOOTENCL     - Select an Enclosure/Bay as primary boot device
HELP         - Display help information
where <parameters> are:
  Command specific values; enter "sas2ircu <controller #> <command>"
  to get command specific help

```

SAS2IRCU: Reconnecting the EFI Driver. Please wait...

Shell>

Example 2 – LIST the adapters to get the adapter number that will be used in other commands:

Shell> sas2ircu list

Results in:

```

LSI Corporation SAS2 IR Configuration Utility.
Version 14.00.00.00 (2012.07.04)
Copyright (c) 2009-2012 LSI Corporation. All rights reserved.

```

SAS2IRCU: Disconnecting the EFI Driver.

Index	Adapter Type	Vendor ID	Device ID	Pci Address	SubSys Ven ID	SubSys Dev ID
0	SAS2308_1	1000h	86h	00h:02h:00h:00h	103Ch	158Bh

SAS2IRCU: Utility Completed Successfully.

SAS2IRCU: Reconnecting the EFI Driver. Please wait...

Shell>

Example 3 – DISPLAY physical device information that will be used to create the arrays:

Shell> sas2ircu 0 display

Where the controller # "0" is the Index resulting from the LIST command.

Results in:

```

LSI Corporation SAS2 IR Configuration Utility.
Version 14.00.00.00 (2012.07.04)
Copyright (c) 2009-2012 LSI Corporation. All rights reserved.

```

```

SAS2IRCU: Disconnecting the EFI Driver.
Read configuration has been initiated for controller 0

```

Controller information

Controller type	: SAS2308_1
BIOS version	: 7.23.02.00
Firmware version	: 12.00.02.00
Channel description	: 1 Serial Attached SCSI
Initiator ID	: 0
Maximum physical devices	: 255
Concurrent commands supported	: 3072
Slot	: 1
Segment	: 0
Bus	: 2
Device	: 0
Function	: 0
RAID Support	: Yes

IR Volume information

Physical device information

Initiator at ID #0

Device is a Hard disk

Enclosure #	: 1
Slot #	: 0
SAS Address	: 4433221-1-0000-0000
State	: Ready (RDY)
Size (in MB)/(in sectors)	: 715404/1465149167
Manufacturer	: ATA
Model Number	: WDC WD7500AALX-6
Firmware Revision	: 1H18
Serial No	: WDWCATR3740757
GUID	: 50014EE2AFBB4C36
Protocol	: SATA
Drive Type	: SATA_HDD

Device is a Hard disk

Enclosure #	: 1
Slot #	: 1
SAS Address	: 5000CCA-0-1215-EF49
State	: Ready (RDY)
Size (in MB)/(in sectors)	: 572325/1172123567
Manufacturer	: HITACHI
Model Number	: HUC106060CSS600
Firmware Revision	: HPH0
Serial No	: PPGD1YVB
GUID	: 5000CCA01215EF48
Protocol	: SAS

```

Drive Type                               : SAS_HDD

Device is a Hard disk
Enclosure #                             : 1
Slot #                                   : 2
SAS Address                             : 5000CCA-0-12BE-DF1D
State                                    : Ready (RDY)
Size (in MB)/(in sectors)               : 572325/1172123567
Manufacturer                            : HITACHI
Model Number                            : HUC106060CSS600
Firmware Revision                       : HPH0
Serial No                               : PPKBZ4PB
GUID                                     : 5000CCA012BEDF1C
Protocol                                : SAS
Drive Type                              : SAS_HDD

```

Enclosure information

```

Enclosure#                             : 1
Logical ID                             : 50014380:16A6D82B
Numslots                               : 8
StartSlot                              : 0

```

SAS2IRCU: Command DISPLAY Completed Successfully.

SAS2IRCU: Utility Completed Successfully.

SAS2IRCU: Reconnecting the EFI Driver. Please wait...

Shell>

Example 4 – Create a RAID 0 with two drives:

The format of the CREATE command is

```
sas2ircu <controller #> create <volume type> <size> <Encl:Bay> [Volume Name] [noprompt]
```

where <controller #> is:

A controller number between 0 and 255.

where <volume type> is:

The type of the volume to create and is either RAID1 (or)

RAID1E (or) RAID0 (or) RAID10.

where <size> is:

The size of the RAID volume in Mbytes or 'MAX' for the maximum size available.

where <Encl:Bay> is:

A list of Encl:Bay pairs identifying the disk drives you

wish to include in the volume being created. If the volume type is

'RAID1', the first drive will be selected as the primary and the

second as the secondary drive.

For a type 'RAID1' volume exactly 2 disks must be specified.

For a type 'RAID1E' volume min of 3 disks must be specified.

For a type 'RAID0' volume min of 2 disks must be specified.

For a type 'RAID10' volume min of 4 disks must be specified.

where [Volume Name] is an optional argument that can be used

to identify a Volume with a user specified Alpha-numeric string

where noprompt is an optional argument that eliminates

warnings and prompts

```
Shell> sas2ircu 0 create RAID0 MAX 1:1 1:2 MyRAID0
```

Results in:

```
LSI Corporation SAS2 IR Configuration Utility.  
Version 14.00.00.00 (2012.07.04)  
Copyright (c) 2009-2012 LSI Corporation. All rights reserved.
```

```
SAS2IRCU: Disconnecting the EFI Driver.  
You are about to create an IR volume.
```

```
WARNING: Proceeding with this operation may cause data loss or data  
corruption. Are you sure you want to proceed (YES/NO)? YES
```

```
WARNING: This is your last chance to abort this operation. Do you wish  
to abort (YES/NO) NO
```

```
Please wait, may take up to a minute...  
SAS2IRCU: Volume created successfully.  
SAS2IRCU: Command CREATE Completed Successfully.  
SAS2IRCU: Utility Completed Successfully.
```

```
SAS2IRCU: Reconnecting the EFI Driver. Please wait...
```

```
Shell>
```

Example 5 – Check your newly created array using the DISPLAY command:

```
Shell> sas2ircu 0 display
```

Note that the *IR Volume Information* section will now be populated and the state of the drives used in the array should change from *Ready (RDY)* to *Optimal (OPT)*.

Results in:

```
LSI Corporation SAS2 IR Configuration Utility.  
Version 14.00.00.00 (2012.07.04)  
Copyright (c) 2009-2012 LSI Corporation. All rights reserved.
```

```
SAS2IRCU: Disconnecting the EFI Driver.  
Read configuration has been initiated for controller 0
```

```
-----  
Controller information  
-----
```

Controller type	: SAS2308_1
BIOS version	: 7.23.02.00
Firmware version	: 12.00.02.00
Channel description	: 1 Serial Attached SCSI
Initiator ID	: 0
Maximum physical devices	: 255
Concurrent commands supported	: 3072
Slot	: 1
Segment	: 0

Bus	: 2
Device	: 0
Function	: 0
RAID Support	: Yes

IR Volume information

IR volume 1

Volume ID	: 323
Volume Name	: MyRAID0
Status of volume	: Okay (OKY)
Volume wwid	: 0AB1E3FAE1B36644
RAID level	: RAID0
Size (in MB)	: 1142500
Physical hard disks	:
PHY[0] Enclosure#/Slot#	: 4294967297:1
PHY[1] Enclosure#/Slot#	: 4294967297:2

Physical device information

Initiator at ID #0

Device is a Hard disk

Enclosure #	: 1
Slot #	: 0
SAS Address	: 4433221-1-0000-0000
State	: Ready (RDY)
Size (in MB)/(in sectors)	: 715404/1465149167
Manufacturer	: ATA
Model Number	: WDC WD7500AALX-6
Firmware Revision	: 1H18
Serial No	: WDWCATR3740757
GUID	: 50014EE2AFBB4C36
Protocol	: SATA
Drive Type	: SATA_HDD

Device is a Hard disk

Enclosure #	: 1
Slot #	: 1
SAS Address	: 5000CCA-0-1215-EF49
State	: Optimal (OPT)
Size (in MB)/(in sectors)	: 572325/1172123567
Manufacturer	: HITACHI
Model Number	: HUC106060CSS600
Firmware Revision	: HPH0
Serial No	: PPGD1YVB
GUID	: 5000CCA01215EF48
Protocol	: SAS
Drive Type	: SAS_HDD

Device is a Hard disk

Enclosure #	: 1
Slot #	: 2
SAS Address	: 5000CCA-0-12BE-DF1D
State	: Optimal (OPT)
Size (in MB)/(in sectors)	: 572325/1172123567
Manufacturer	: HITACHI
Model Number	: HUC106060CSS600
Firmware Revision	: HPH0
Serial No	: PPKBZ4PB
GUID	: 5000CCA012BEDF1C
Protocol	: SAS
Drive Type	: SAS_HDD

Enclosure information

Enclosure#	: 1
Logical ID	: 50014380:16A6D82B
Numslots	: 8
StartSlot	: 0

SAS2IRCU: Command DISPLAY Completed Successfully.

SAS2IRCU: Utility Completed Successfully.

SAS2IRCU: Reconnecting the EFI Driver. Please wait...

Shell>

4. Reboot the system to use the newly created RAID arrays.