



Linux Ubuntu On HighPoint NVMe RAID AIC Installation Guide

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1 Overview

The purpose of this document is to provide clear instructions on how to install Linux Ubuntu to an SSD or RAID array hosted by HighPoint NVMe AICs.

The following is a list of NVMe AICs and systems.

Supported System	Ubuntu 20.04 Ubuntu 20.04.1 Ubuntu 20.04.2 Ubuntu 20.04.3 Ubuntu 20.04.4 Ubuntu 20.04.5 Ubuntu 20.10 Ubuntu 22.04 Ubuntu 22.04.1 Ubuntu 22.10
Supported AIC	SSD7202 SSD7105 SSD7505 SSD7502 SSD7540 SSD7580A SSD7580B SSD7580C SSD7749M2 RocketAIC 7505HW Series RocketAIC 7540HW Series RocketAIC 7749EW Series

	RocketAIC 7502HW Series RocketAIC 7105HW Series RocketAIC 7749MW Series
--	---

2 Installing Linux Ubuntu on NVMe AIC

If you would like to install Linux Ubuntu onto drives attached to the NVMe AIC, please perform the following operations:

Step 1 Prepare Your Hardware for Installation

After you attach your NVMe SSD to the NVMe AIC, you can use **EFI Utility** to configure your NVMe SSDs into RAID arrays, or just use them as single disks.

Before installation, you must remove all the NVMe SSDs, that are not physically attached to the NVMe AIC, from your system.

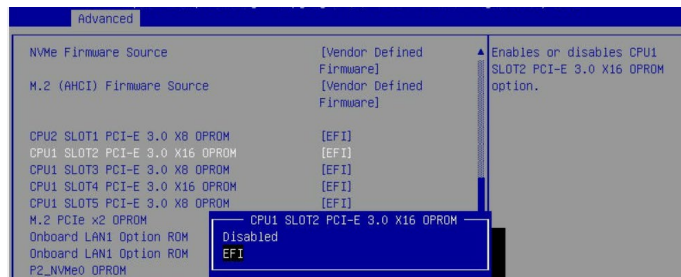
Note

NVMe AICs only support EFI boot. If you have other SCSI adapters installed, you must make sure the NVMe AIC EFI will be loaded first. If not, try to move it to another PCI slot. Otherwise, you may be unable to boot up your system.

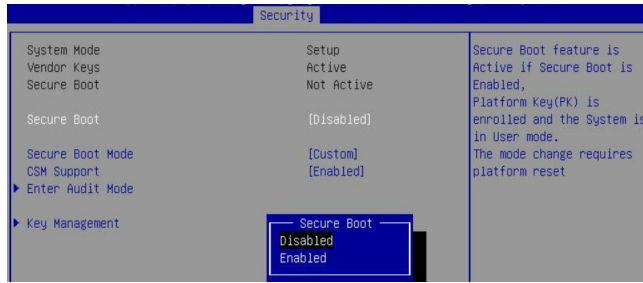
Step 2 Check System EFI Settings

In your system's EFI SETUP menu, change **Boot Sequence** in such a way that the system will first boot from **EFI CDROM** or **EFI** a Bootable USB drive; after you finish installation, set the NVMe AIC as the first boot device to boot up the system. Refer to your motherboard EFI manual to see how to configure the boot sequence.

1. Set UEFI setting with SuperMicro X11DPi-NT motherboard as an example.
 - a. "**Advanced->PCIe/PCI/PnP Configuration->CPUSlot PCI-E OPROM**" to "**EFI**". Suppose NVMe AIC is connected to motherboard CPU1 Slot 2 PCI-E X16, then you should set "CPU1 Slot 2 PCI-E X16 OPROM" to "EFI";

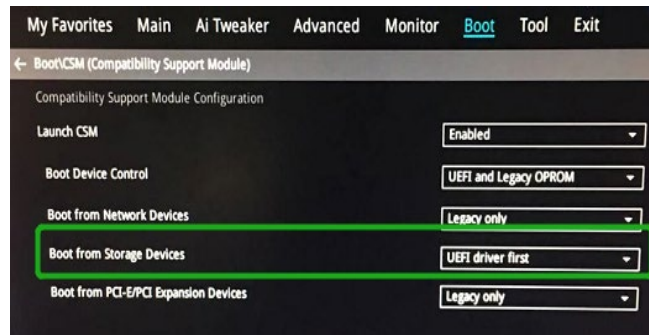


- b. Disable "Secure Boot", and set "Attempt Secure Boot" to "Disabled".

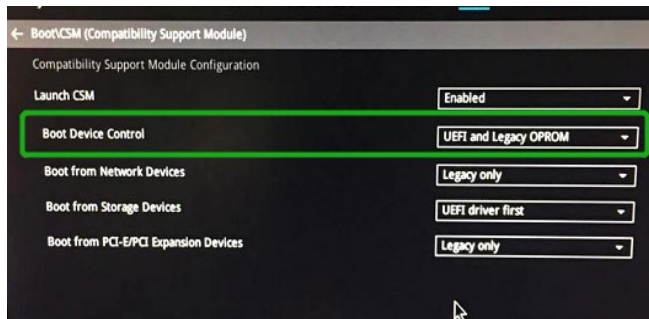


2. Configuring the UEFI settings (using an ASUS PRIME X299 -DELUXE motherboard as an example):

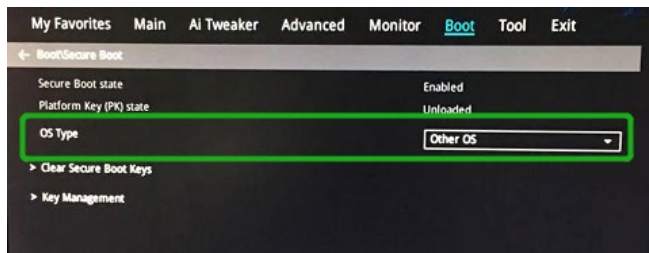
- a. Set "Boot from Storage Devices" to "UEFI driver first";



- b. And "Boot Device Control" to "UEFI Only" or "UEFI and Legacy OPROM";



- c. Set "OS Type" to "Other OS".



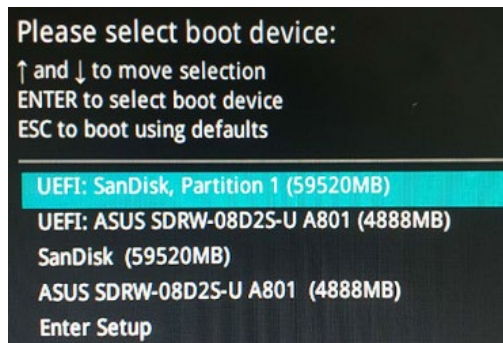
Step 3 Flash UEFI ROM to NVMe AIC

Example: SSD7505

For other products, please refer to: [Update UEFI ROM](#)

Note: *Make sure your USB flash partition format is FAT32.*

- a. Unzip the SSD7505 UEFI package to the root dir(/) of a USB flash drive, and connect the USB flash drive to the motherboard;
- b. Boot from the UEFI USB flash and enter the UEFI environment;



- c. Use the command “go.nsh” to flash UEFI ROM to the SSD7505 and reboot the system.



- d. Use the “exit” command to exit the utility.

Step 4 Create Array

Note: RocketAIC series NVMe drives are already pre-configured with RAID0. You can skip this step. If you want to use another type of RAID array for a Boot-RAID configuration, you can refer to the following steps.

- a. Attach NVMe SSDs to the NVMe AIC.
- b. Boot, enter the motherboard's Boot List, and select start from UEFI USB flash.

```

Boot Override
UEFI: USB, Partition 1
(B97/D0/F0) UEFI PXE: IPv4 Intel(R) I350 Gigabit Network
Connection(MAC:3cecef40a1dc)

```

- c. Use the command “ArrayCreate.efi” to enter the Utility:

```

FS1:\> ArrayCreate.efi
Highpoint RAID utility for UEFI (version: 20200306)
==== Controller information:
      Vendor: HighPoint Technologies, Inc.
      Product: SSD7505 (7505)

==== Physical device list(count 2):
1/1 Seagate FireCuda 530 2P1000GM30013-7VQ0097S, 1000123MB(MaxFree 1000123MB), Normal
1/2 Seagate FireCuda 530 2P1000GM30013-7VQ02MFJ, 1000123MB(MaxFree 1000123MB), Normal

==== Logical device list(count 0):
-----
>>> Please specify command to execute:
<<< _

```

- d. Use the command “create RAID0”.
This will create a RAID0 array using all of the NVMe SSDs, and the maximum available capacity.

```

<<< create RAID0
Creating array: RAID0_000041A7.
Array created successfully.
=====
==== Physical device list(count 2):
1/1 Seagate FireCuda 530 2P1000GM30013-7VQ0097S, 1000123MB(MaxFree 0MB), Normal
1/2 Seagate FireCuda 530 2P1000GM30013-7VQ02MFJ, 1000123MB(MaxFree 0MB), Normal

==== Logical device list(count 1):
1 [VD1] RAID0_000041A7 (RAID0), 2000246MB (Stripe 512KB), Normal
   1/1 Seagate FireCuda 530 2P1000GM30013
   1/2 Seagate FireCuda 530 2P1000GM30013
-----
>>> Please specify command to execute:
<<< _

```

- e. Use the “exit” command to exit the utility.
- f. For additional command lines, refer to [Appendix A](#).

Step 5 Prepare the Driver Diskette

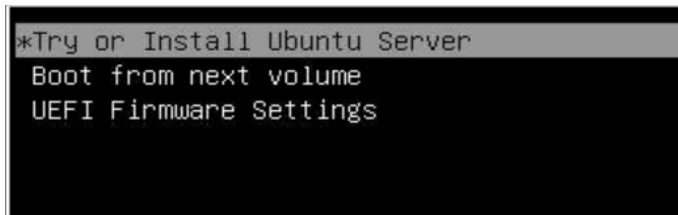
Extract **HighPoint_NVMe_Ubuntu $xx.xx$ _x86_64_vx.x.x_xx_xx_xx.tar.gz** to the top(/) directory of a USB flash drive. It will look like:

```
root@test:/home# tar zxvf HighPoint_NVMe_ubuntu22.10_x86_64_v1.5.1_23_02_27.tar.gz
hptdd/
hptdd/preinst.sh
hptdd/postinst.sh
hptdd/postinst2.sh
hptdd/hptdrv
hptdd/hptblock
hptdd/boot/
hptdd/boot/hptnvme5.19.0-21-genericx86_64.ko.gz
hptdd/60-persistent-storage-hptblock.rules
hptdd/readme.txt
```

Step 6 Install Linux Ubuntu

Example: Ubuntu22.10 server

- a. Before starting the installation procedure, verify the status of your network environment.
To ensure Ubuntu is successfully installed to the RAID array, we recommend that the system is disconnected from the internet and any local network.
- b. Insert the USB flash drive into the target system.
- c. Boot the system using a bootable USB drive.
- d. When the Installation screen appears, press ‘e’ to edit the boot command line option.



```
*Try or Install Ubuntu Server
Boot from next volume
UEFI Firmware Settings
```

On the edit command window, move the cursor to the end of the line "linux /install/vmlinuz...", and append "**modprobe.blacklist=nvme**" (do not include the quotation marks).

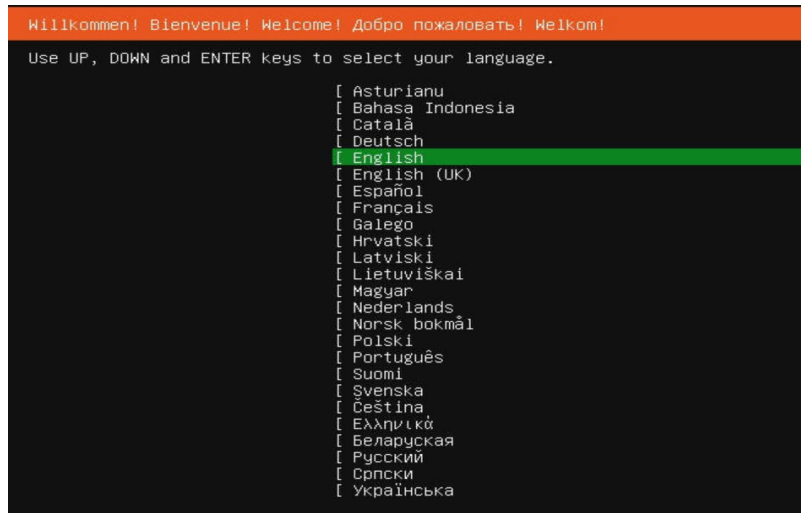


```
setparams 'Try or Install Ubuntu Server'

set gfxpayload=keep
linux /casper/vmlinuz --- modprobe.blacklist=nvme
initrd /casper/initrd
```

Press **CTRL+X** or **F10** to start the system.

e. When the following window appears during the installation process,



Press "**ALT+F2**" to switch to the shell on console 2, and press **ENTER** to activate this console.

If you use Ubuntu Desktop, please press **CTRL+ALT+F3** to switch to the shell on console 2 and press **ENTER** to activate this console.

Ubuntu login: ubuntu

```
Welcome to Ubuntu 20.04.5 LTS (GNU/Linux 5.4.0-125-generic x86_64)

* Documentation:  https://help.ubuntu.com
* Management:    https://landscape.canonical.com
* Support:        https://ubuntu.com/advantage

System information as of Thu Mar  9 01:35:21 UTC 2023

System load:   1.77      Memory usage: 1%    Processes:    781
Usage of /home: unknown  Swap usage:  0%    Users logged in: 0

0 updates can be applied immediately.

The list of available updates is more than a week old.
To check for new updates run: sudo apt update

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

ubuntu-server@ubuntu-server:~$ _
```

Next, execute the following commands:

- # mkdir /hptdd** ← Create a mount point for the USB flash drive
- # mount /dev/sda1 /hptdd/** ← Mount the USB flash drive to /hptdd
- # cp -a /hptdd/hptdd /tmp/** ← Copy the driver installation file to the system's

temporary directory

umount /hptdd

← Unmount the USB flash drive

```
root@ubuntu-server:/home/ubuntu-server# mkdir /hptdd
root@ubuntu-server:/home/ubuntu-server# mount /dev/sda1 /hptdd/
root@ubuntu-server:/home/ubuntu-server# cp -a /hptdd/hptdd/ /tmp/
root@ubuntu-server:/home/ubuntu-server# umount /dev/sda1
```

When the USB flash drive is unmounted, please unplug the USB flash drive from the system. Next, execute the following commands to install the driver for Linux Ubuntu.

sh /tmp/hptdd/preinst.sh

← Load NVMe AIC driver.

```
root@ubuntu-server:/home/ubuntu-server# sh /tmp/hptdd/preinst.sh
This step succeeded!
root@ubuntu-server:/home/ubuntu-server#
```

- f. Then press “**ALT+F1**” to switch back to the installation screen and continue the installation as usual.
- g. When the screen shows that “**install complete**”.

```
acquiring and extracting image from cp:///tmp/tmp0az71fu/mount
executing curtin install curthooks step
curtin command install
  configuring installed system
    running 'mount --bind /cdrom /target/cdrom'
    running 'curtin in-target -- setupcon --save-only'
  curtin command in-target
    running 'curtin curthooks'
  curtin command curthooks
    configuring apt
    configuring apt
    installing missing packages
    installing packages on target system: ['efibootmgr', 'grub-efi-amd64', 'grub-efi-amd64-signed', 'shim-signed']
    configuring iscsi service
    configuring raid (mdadm) service
    installing kernel
    setting up swap
    apply networking config
    writing etc/fstab
    configuring multipath
    updating packages on target system
    configuring pollinate user-agent on target
    updating initramfs configuration
    configuring target system bootloader
    installing grub to target devices
final system configuration
  configuring cloud-init
  calculating extra packages to install
  restoring apt configuration
subiquity/late/run
[ View full log ]
[ Reboot Now ]
```

press “**ALT+F2**” to the shell and type the following commands:

sh /tmp/hptdd/postinst.sh ← Install NVMe AIC driver.

A message will be displayed that the driver has been installed successfully.

```
root@ubuntu-server:/home/ubuntu-server# sh /tmp/hptdd/postinst.sh
W: Possible missing firmware /lib/firmware/ast_dp501_fw.bin for module ast
Sourcing file `/etc/default/grub'
Sourcing file `/etc/default/grub.d/90_iommuoff.cfg'
Sourcing file `/etc/default/grub.d/init-select.cfg'
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-5.19.0-21-generic
Found initrd image: /boot/initrd.img-5.19.0-21-generic
Warning: os-prober will be executed to detect other bootable partitions.
Its output will be used to detect bootable binaries on them and create new boot entries.
Found FreeDOS on /dev/sda1
done
setdefaultkernel:No change.
We have completed the driver installation.
root@ubuntu-server:/home/ubuntu-server#
```

- h. Press “**ALT+F1**” to switch back to the installation screen and finish the installation.
- i. If you want to boot from another kernel, please install the NVMe AIC driver after entering the system.
 - 1) use “**apt-get update**” to retrieve new lists of Ubuntu packages (**please connect to the internet**)

```
root@test:/home# apt-get update
Get:1 http://cn.archive.ubuntu.com/ubuntu kinetic InRelease [267 kB]
Get:2 http://cn.archive.ubuntu.com/ubuntu kinetic-updates InRelease [118 kB]
Get:3 http://cn.archive.ubuntu.com/ubuntu kinetic-backports InRelease [99.9 kB]
Get:4 http://cn.archive.ubuntu.com/ubuntu kinetic-security InRelease [109 kB]
Get:5 http://cn.archive.ubuntu.com/ubuntu kinetic/main amd64 Packages [1,384 kB]
Get:6 http://cn.archive.ubuntu.com/ubuntu kinetic/main amd64 c-n-f Metadata [30.2 kB]
Get:7 http://cn.archive.ubuntu.com/ubuntu kinetic/restricted amd64 Packages [120 kB]
Get:8 http://cn.archive.ubuntu.com/ubuntu kinetic/restricted amd64 c-n-f Metadata [488 B]
Get:9 http://cn.archive.ubuntu.com/ubuntu kinetic/universe amd64 Packages [14.5 MB]
Get:10 http://cn.archive.ubuntu.com/ubuntu kinetic/universe Translation-en [5,791 kB]
Get:11 http://cn.archive.ubuntu.com/ubuntu kinetic/universe amd64 c-n-f Metadata [291 kB]
Get:12 http://cn.archive.ubuntu.com/ubuntu kinetic/multiverse amd64 c-n-f Metadata [8,408 B]
Get:13 http://cn.archive.ubuntu.com/ubuntu kinetic-updates/main amd64 Packages [365 kB]
Get:14 http://cn.archive.ubuntu.com/ubuntu kinetic-updates/main Translation-en [98.0 kB]
```

- 2) Download the appropriate driver from the Software Downloads web page.
- 3) Extract the driver package:

tar zxvf HighPoint_NVMe_G5_Linux_Src_Src_vx.xx.xx_xx_xx_xx.tar.gz

- 4) Run the **.bin** file to install the driver package.

sh hptnvme_g5_linux_src_vxx.x.x_xx_xx_xx.bin or

./hptnvme_g5_linux_src_vxx.x.x_xx_xx_xx.bin

```
root@test:/home# ./hptnvme_g5_linux_src_v1.5.1_2023_02_21.bin
Verifying archive integrity... All good.
Uncompressing HighPoint NVMe RAID Uncontroller Linux Open Source package installer.....
Checking and installing required toolchain and utility ...
Installing program make ... done
Installing program gcc ... done
Found program perl (/usr/bin/perl)
Found program wget (/usr/bin/wget)
```

- j. Follow the prompts to complete the driver installation.

```
Sourcing file /etc/default/grub
Sourcing file /etc/default/grub.d/90_iommuoff.cfg
Sourcing file /etc/default/grub.d/init-select.cfg
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-5.19.0-21-generic
Found initrd image: /boot/initrd.img-5.19.0-21-generic
Warning: os-prober will be executed to detect other bootable partitions.
Its output will be used to detect bootable binaries on them and create new boot entries.
Found FreeDOS on /dev/sda1
Adding boot menu entry for UEFI Firmware Settings ...
done
Synchronizing state of hptdrv-monitor.service with SysV service script with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable hptdrv-monitor
update-rc.d: warning: enable action will have no effect on runlevel 1
Created symlink /etc/systemd/system/default.target.wants/hptdrv-monitor.service → /lib/systemd/system/hptdrv-monitor.service.

SUCCESS: Driver hptnvme is installed successfully for kernel 5.19.0-21-generic.
Please restart the system for the driver to take effect.
If you want to uninstall the driver from the computer please run hptuninhptnvme to uninstall the driver files.
```

- k. After Ubuntu has been installed, you can reconnect the system to the network/internet and update the system as needed.

3 Monitoring the Driver

Once the driver is running, you can monitor it through the Linux proc file system support. There is a special file under `/proc/scsi/hptnvme/`. Through this file, you can view the driver status and send control commands to the driver.

Note

The file name is the SCSI host number allocated by OS. If you have no other SCSI cards installed, it will be 0. In the following sections, we will use `x` to represent this number.

Use the following command to show the driver status:

```
# cat /proc/scsi/hptnvme /x
```

This command will show the driver version number, physical device list, and logical device list.

4 Installing RAID Management Software

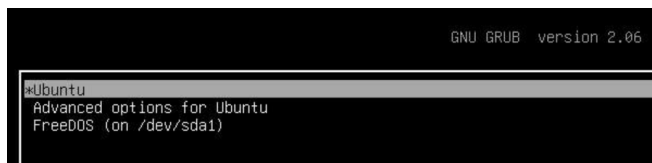
HighPoint's RAID Management Software can be used to check the status of the SSDs and RAID arrays hosted by the NVMe AIC. Installation of the management software is optional but recommended.

Please refer to HighPoint RAID Management Software documentation for more information.

5 Trouble Shooting

If you do not install the system or update the kernel according to the installation manual, the system will crash and you will not be able to enter. Please follow the steps below.

- a. Select the default (kernel: 5.19.0-21-amd64) and enter the system.



- b. Install Linux Opensource driver.
- c. Download the appropriate driver from the Software Downloads web page.

Run the `.bin` file to install the driver package.

```
sh hptnvme_g5_linux_src_vxx.x.x_xx_xx_xx.bin or
```

```
./hptnvme_g5_linux_src_vxx.x.x_xx_xx_xx.bin
```

```
root@test:/home# ./hptnvme_g5_linux_src_v1.5.1_2023_02_21.bin
Verifying archive integrity... All good.
Uncompressing HighPoint NVMe RAID Controller Linux Open Source package installer.....
Checking and installing required toolchain and utility ...
Installing program make ... done
Installing program gcc ... done
Found program perl (/usr/bin/perl)
Found program wget (/usr/bin/wget)
```

- d. Follow the prompts to complete the driver installation.

```
Bouncing file '/etc/default/grub'
Bouncing file '/etc/default/grub.d/90_iommuoff.cfg'
Bouncing file '/etc/default/grub.d/init-select.cfg'
Generating grub configuration file ...
Found linux image: /boot/vmlinuz-5.19.0-21-generic
Found initrd image: /boot/initrd.img-5.19.0-21-generic
Warning: os-prober will be executed to detect other bootable partitions.
Its output will be used to detect bootable binaries on them and create new boot entries.
Found FreeDOS on /dev/sda1
Adding boot menu entry for UEFI Firmware Settings ...
done
Synchronizing state of hptdrv-monitor.service with SysV service script with /lib/systemd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable hptdrv-monitor
update-rc.d: warning: enable action will have no effect on runlevel 1
Created symlink /etc/systemd/system/default.target.wants/hptdrv-monitor.service → /lib/systemd/system/hptdrv-monitor.service.

SUCCESS: Driver hptnvme is installed successfully for kernel 5.19.0-21-generic.
Please restart the system for the driver to take effect.
If you want to uninstall the driver from the computer please run hptuninhptnvme to uninstall the driver files.
```

- e. After the installation is complete, you can perform system update operations.

6 Rebuilding Driver Module for System Update

When the system updates the kernel packages, the driver module `hptnvme.ko` should be built and installed manually before rebooting.

Please refer to the README file distributed with the NVMe AIC open-source package on how to build and install the driver module.

7 Appendix A

Support command: help/info/quit/exit/create/delete.

- **Create Command**

Syntax

Create Array Type (RAID0/RAID1/RAID10) Member Disk list (1/1,1/2|*)
Capacity (100|*)

Examples

```
<<< create RAID0
```

```
<<< create RAID0 *
```

```
<<< create RAID0 * *
```

Create a RAID0 array with all disks and with maximum capacity.

```
<<< create RAID1 1/1, 1/3 10
```

Create a RAID1 array with disk 1/1 and 1/3 and with 10GB capacity.

```
<<< create RAID10
```

```
<<< create RAID10 *
```

```
<<< create RAID10 * *
```

Create a RAID10 array with all disks and with maximum capacity.

- **Delete Command**

Syntax

```
delete {array ID}
```

Examples

```
<<< delete 1
```

Delete the first array from the Logical device list.

```
<<< delete 2
```

Delete the second array from the Logical device list.

- **Info Command**

Syntax

```
info
```

Display physical device list and logical list

- **Exit Command**

Syntax

```
Q/q/quit/exit
```

Quit the application

- **Help Command**

Syntax

```
H/h/help
```

This is a help message.