AMD-RAID™ Quick Start Guide for Ubuntu Operating Systems

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Advanced Micro Devices

Trademarks

Contents

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Revision History

Date	Revision	Description
September 2021	0.51	• Updated system requirements in Table 1. • In Section 2.1, "Copy AMD-RAID Drivers to a Removable Storage Medium: Ubuntu," added `driver_sdk` requirement for installations. • In Chapter 4, "Create the Bootable Virtual Disk," added recommendation not to use SMR hard drives with AMD RAID systems. • Added Section 5.1, "Secure Boot Enablement." • Updated Section 5.2, "Ubuntu: Install AMD-RAID Driver during Ubuntu Desktop OS Installation": – General updates for Ubuntu version – Minor clarifications and corrections – New steps for when secure boot is enabled • Updated a directory location in Section 5.3, "Install the AMD-RAIDXpert2 Management Application."
September 2020	0.50	Initial preliminary release.

Chapter 1 General Information

1.1 Purpose

This Quick Start Guide is designed to assist with system setup in **RAID Mode** by performing the following general procedures:

- Copy the AMD RAID device drivers to removable storage media for the following operating system:
  - Ubuntu®
- Load the AMD RAID device drivers on a supported AMD system during the Ubuntu operating system installation.
- Install the AMD-RAIDXpert2 (GUI) for RAID array management.

1.2 System Requirements

Table 1. System Requirements

Component	Requirements
Memory (RAM)	Minimum: 16 GB total for AMD Ryzen® processors and AMD Ryzen® desktop processors. Recommended: 32 GB total for AMD Ryzen® processors and AMD Ryzen® desktop processors.
Hard Disk, SSD	Total 14 devices Support includes ATAPI DVD, SATA drives, SATA SSD drives, M.2 SATA drives, NVMe M.2 devices, NVMe HHHL devices or NVMe U.2 devices. The number of disks depends on the number, type, and capacity of the arrays to be created.
Max number of NVMe devices	10
Max Controller Count	11 Two controllers with Device ID 0x7917 and NVMe (one controller per NVMe)
Supported AMD Processors	3rd Gen AMD Ryzen™ Threadripper Processors
Supported AMD Chipsets	TRX40/WRX80

The maximum number of devices supported is 14, including ATAPI, SATA and NVMe.

Table 2. Information about BIOS Configuration for Platform RAID Support

SoC SATA Mode	Chipset SATA Mode	NVMe RAID Mode	SATA RAID Support	NVMe RAID Support
AHCI / Auto	AHCI / Auto	Disabled	No	No
RAID	RAID	Enabled	Yes	Yes

1.3 Generic System Setup

A generic system setup process is described below:

1. Copy the **AMD-RAID** drivers to a removable storage medium. *(Refer to Section 2.1)*
2. Power-on the system.
3. Access the platform BIOS window for the system.
   a. Configure BIOS settings as outlined in Section 3.1 to enable RAID Mode on the system.
   b. This enables the Platform BIOS to be configured in RAID mode by loading the **AMD-RAID UEFI** driver.
4. Initialize the disks, using the RAIDXpert2 Configuration Utility (HII) or UEFI shell.
5. Create arrays, using the HII Configuration Utility or UEFI shell. (*Refer to Section 0*)
6. Load the **AMD-RAID** drivers during operating system installation. *(Refer to Section 5.1)*
7. Complete the rest of the operating system installation.
8. Install the OS RAID Management GUI (AMD RAIDXpert2). *(Refer to Section 5.3)*

IMPORTANT: *To protect your data, always perform a backup prior to installing any new, major hardware or software. If you are adding NVMe as RAID to your existing RAID arrays, then update all existing RAID controller drivers to the latest version and reboot the system. Later, connect NVMe and install RAID drivers on the NVMe devices or download driver software from the vendor support page.*

Note: *A Native AHCI installation does not boot into the OS after you change the BIOS setting to RAID mode.*

Chapter 2 Bootable Arrays

Note: *Before beginning, have the Ubuntu® operating system installation media available and ready to install.*

2.1 Copy AMD-RAID Drivers to a Removable Storage Medium: Ubuntu

A removable storage medium is needed to copy **AMD RAID** drivers required for OS installation onto an **AMD-RAID** bootable array.

1. Locate and use a system that is running a Windows/Linux operating system with an I/O port for removable storage media (such as a USB flash drive formatted as FAT32).
2. Insert the storage medium into the system.
3. Go to a browser and access the website of your system supplier or motherboard vendor.
4. Download the AMD-RAID drivers from the website to the appropriate removable storage medium.
5. Copy driver files in the `dd-rcraid-Ubuntu [Ubuntu version number].w.x-yz` folder into a folder named `dd`, located on a root path of the USB flash drive. For example:

   `dd`
   - `driver_sdk`
   - `load_amdraid`
   - `post_install`
   - `post_install2`
   - `pre_install`
   - `rcraid.ko`
   - `rcraid_generic.ko`
   - `readme`

6. Proceed to Ubuntu Install and load the AMD-RAID drivers during an Ubuntu OS installation.

Chapter 3 Pre-Installation Steps

3.1 Enable RAID for the AMD Ryzen™ SP3-Series Processor

Note: *The steps to configure a system to RAID mentioned here are specific to **AMD NDA BIOS** based off the **AMI BIOS**. The steps for other BIOS vendors are different.*

Complete the following pre-installation steps:

1. Power-on the system.
2. Press **ESC** to enter the System BIOS setup page.
3. In the BIOS setup:
   a. Select the **Advanced** tab.
   b. Select **CSM Configuration**, then press **Enter.**
   c. Set **CSM Support** to **Enabled**, then press **Enter.**
   d. Set **Boot option filter** to **UEFI** only, then press **Enter.**
   e. Set **Storage** to **UEFI**, then press **Enter.**
4. In the BIOS setup:
   a. Select the **Advanced** tab.
   b. Select **AMD CBS**, then press **Enter.**
   c. Select **FCH Common Options**, then press **Enter.**
   d. Select **SATA Configuration Options**, then press **Enter.**
   e. Set **SATA Enable** to **Enabled**, then press **Enter.**
   f. Set **SATA Mode** to **RAID**, then press **Enter.**
5. In the BIOS setup:
   a. Select the **Advanced** tab.
   b. Select **AMD CBS**, then press **Enter.**
   c. Select **Chipset Common Options**, then press **Enter.**
   d. Select **Chipset SATA Configuration Options**, then press **Enter.**
   e. Set **Chipset SATA0 Enable to Enabled**, then press **Enter.**
   f. Set **Chipset SATA1 Enable to Enabled**, then press **Enter.**
   g. Set **Chipset SATA Mode to RAID**, then press **Enter.**
6. In the **BIOS** setup:
   a. Select the **Advanced** tab.
   b. Select **AMD PBS** tab, then press **Enter.**
   c. Set the **NVMe RAID Mode** to **Enabled,** then press **Enter.**
7. Save (**F4**) the settings and restart the system.

Chapter 4 Create the Bootable Virtual Disk

You can create a bootable virtual disk using the RAIDXpert2 Configuration Utility (HII mode) or by command line (UEFI mode).

Note: *The steps to configure arrays in RAID mode mentioned here are specific to **AMD NDA BIOS** and are based off **AMI BIOS**.*

Note: *AMD recommends not using SMR hard drives with AMD RAID systems because it can cause poor performance or failures. SMR drives are not suitable for workloads that require many random writes (such as boot drive). If used with RAID, the multiple SMR drives and background RAID tasks (such as creates and rebuilds) compound any issues or problems.*

4.1 RAIDXpert2 Configuration Utility (HII Mode) for the AMD Ryzen™ SP3-Series Processor

4.1.1 Use the Configuration Utility (HII) to Create a Bootable Virtual Disk

1. Power-on the system.
   a. Press **ESC** or **DEL** to get into the **Platform BIOS.**
   b. Select the **Advanced** tab.
   c. Select **RAIDXpert2 Configuration Utility**, then press **Enter.**
2. At the RAIDXpert2 Configuration Utility's Main Menu, use the arrow keys to select **Array Management**, then press **Enter**.
3. Use the **arrow keys** to select **Create Array**, then press **Enter.**
4. Select **RAID Level**, then press **Enter**.
   a. From the **Select RAID Level** drop-down menu, use the **arrow keys** to select the desired RAID level, then press **Enter**.
5. Select the disks with which to create the array:
   a. Use the arrow keys to select **Select Physical Disks**, then press **Enter.**
   b. To select individual disks, highlight a disk with the arrow keys, then press the **Space Bar** or **Enter**. Any number of disks may be selected using this method.
   c. To select all disks, use the arrow keys to select **Check All**, then press **Enter.**
   d. Use the arrow keys to select **Apply Changes**, then press **Enter**.

      Note: *"Apply Changes" might be off-screen until you use the arrow keys if the list of options is long.*

6. (Optional) Select an array size:
   a. Use the arrow keys to select **Array Size**, then press **Enter.**
   b. The array size defaults to the maximum size allowed by the number of physical disks and RAID level selected. If you want a smaller size array size, enter the desired value.
   c. Press **Enter** when the desired size is reached.
7. (Optional) Use the arrow keys to select **Cache Tag Size.**
   – Any Array with only HDD/SSD has the default CTS of 64 k.
   – Any Array with only NVMe has the default CTS of 256 k.
8. (Optional) Use the arrow keys to select **Read Cache Policy**, then press **Enter**.
   a. Select the desired read cache policy, then press **Enter.**
9. (Optional) Use the arrow keys to select **Write Cache Policy**, then press **Enter**.
   a. Select the desired write cache policy, then press **Enter.**
10. Use the arrow keys to select **Create Array**, then press **Enter.**
11. After completion of array creation, press **F4** to save and exit the BIOS.

4.2 UEFI Mode

4.2.1 Use the Command Line to Create a Bootable Virtual Disk

1. At the system **Power-On Self-Test (POST)** screen, press **F7 / F12 / ESC** (or similar) to access the **UEFI Configuration Utility** (aka UEFI Boot Manager).
2. Boot to the **EFI Internal** shell.

   Note: *Obtain the rcadm.efi file from your system supplier or motherboard vendor and copy it onto a UEFI flash drive, in the root directory.*
3. Enter **fsx:** where *x* is the number of the UEFI Flash Drive.
4. Use **rcadm** to create the desired Boot Virtual Disk.

   Examples:

   Note*: You may have to press the page up key to see more of the information.*

   a. Query the devices connected in the system: (Output displays the UEFI Version, physical devices, and arrays):
      ```
      rcadm.efi –M -qa
      ```
   b. Create a RAID1 on disks 2, 3 with a max size available and enables Read/Write Cache – default cache setting:
      ```
      rcadm.efi –C –r1 –d 2 3
      ```
   c. Create a RAID0 on disks 1, 2 with a size of 100 Gbs and enables Read Cache:
      ```
      rcadm.efi –C –r0 –d 1 2 –s 100000 –ca r
      ```
   d. Create a RAID10 on disks 1, 2, 3, 4 with a size of 125 Gbs and enables Write Cache:
      ```
      rcadm.efi –C –r10 –d 1 2 3 4 –s 125000 –ca w
      ```

Chapter 5 Install the AMD-RAID Drivers

5.1 Secure Boot Enablement

Note: *If you do not want to enable Secure Boot, go to Section 5.2 to install AMD RAID drivers.*

Note: *These steps to enable Secure boot are specific to **AMD NDA BIOS** and based on **AMI BIOS**.*

5.1.1 Enable Secure Boot

1. Power-on the system.
2. Press **ESC**, to enter the platform BIOS.
3. Select the **Security** Tab
4. Select **Secure Boot**, then press **Enter**.
5. Select **Restore Factory Keys**, then press **Enter**.
6. Select **Yes**, then press **Enter**.
7. Select **Secure Boot**, then press **Enter**.
8. Select **Enable**, then press **Enter**.
9. Press **F4** to save and exit the BIOS.

5.2 Ubuntu: Install AMD-RAID Driver during Ubuntu Desktop OS Installation

Note: *Prior to starting this procedure, obtain the AMD-RAID drivers from your system supplier or motherboard vendor. (See Section: 2.1.)*

Note: *The Ubuntu driver CD-ROM .iso image contains all Linux variations for a release.*

Note: *Not all windows indicated in this procedure display during installation.*

Note: *AMD recommends a reset/reboot of the system if you are adding or moving a SATA M.2 SSD or NVMe device(s). To reset the system:*

1. *In the OS, issue a reset/reboot.*
2. *Wait for the AMD BIOS screen to display, press ESC to enter the BIOS.*
3. *Power off the system.*
4. *Install or remove the necessary device(s).*
5. *Power on the system and allow the OS to boot properly.*

5.2.1 Install the AMD-RAID drivers during the Ubuntu OS Installation

1. Power-on the system.

   Note: *For troubleshooting, you can remove the Ethernet Cable from the system to prevent the system from updating. Reinstall the Ethernet Cable after the install.*

2. Insert the **Ubuntu Desktop Linux** operating system CD-ROM or DVD into the system's CD or DVD drive.
3. Boot to the Ubuntu Desktop CD-ROM, DVD or USB Flash drive, this will bring you to the **GNU Grub** window.
   a. Use the arrow keys to select **Ubuntu**.
   b. Press the **e** key to edit the boot string.

      At the end of the Boot Options linux string, add the following:

      ```
      break=mount modprobe.blacklist=ahci,nvme
      ```

      Note: *The string should look like the following, with possible variation due to video card differences.*

      ```
      splash --- break=mount modprobe.blacklist=ahci,nvme
      ```

   c. Press **F10**.

      Note*: If the BusyBox shell doesn't appear (the screen is black) reset the system and try with the following settings:*

      Enter: `break=mount modprobe.blacklist=ahci,nvme nomodeset`

      The string should look like the following:

      ```
      splash --- break=mount modprobe.blacklist=ahci,nvme nomodeset
      ```

      Press **F10**.

4. Complete the following when the BusyBox shell displays:
   a. Insert the USB flash drive.
   b. Press **Enter** to get a prompt.
   c. To mount the drive containing the RAID drivers:
      Enter: `mount -t vfat /dev/sdb1 /tmp`

      Note: *Instead of `/dev/sdb1`, you may need to enter `/dev/sdc1` or `/dev/sdd1`, depending on the number of devices. You can enter `ls /dev/sd*` to list possible entries.*

   d. Enter: `cp -ap /tmp/dd /`
   e. Enter: `/dd/pre_install` (Wait for the install to complete, this may take some time.)
   f. Enter: `umount /tmp`
   g. Remove the USB flash drive.
   h. Enter: **exit**.

5. Wait for the **Welcome** screen to load.

   Note: *If the Welcome screen isn't displayed, but the Ubuntu Desktop is displayed, double-click* ***Install Ubuntu*** *for desktop.*

6. On the Welcome screen, select **Install Ubuntu** for desktop.
7. Select the desired **Language** from the **Keyboard** layout window and select **Continue**.
8. *If your network does not connect*: On the **Wireless** window, select the desired options/configuration, then click **Continue**.
9. Select **Normal Installation** from the Updates and Other Software window and select **Continue**.
10. Select **Erase Disk and Install Ubuntu** from the Installation Type window and select **Install Now**.
11. On the **Write the changes to disks?** window, click **Continue**.
12. Select the desired **Time Zone** and select **Continue**.
13. Enter valid entries for **Who are you**? with the following:
    - Your name
    - Computer name
    - Username
    - Password
    - Confirm Password
    - Select Continue
14. When the **Installation Complete** window displays, complete the following:

    CAUTION: *Do* NOT *click "Restart Now."*

    a. Press **CTRL+ALT+F2**.
    b. From the Ubuntu Login prompt, enter **ubuntu**, then press **Enter.**

       Note: *If asked for a password, press* ***Enter*** *without entering a password.*

    c. Insert the USB flash drive used in a previous step.
    d. Press **Enter** to get a prompt.
    e. Mount the drive containing the RAID drivers:
       Enter: `sudo mount -t vfat /dev/sdb1 /mnt`

       Note: *Instead of* `/dev/sdb1`*, you may need to enter* `/dev/sdc1` *or* `/dev/sdd1`*, depending on the number of devices. You can enter* `ls /dev/sd*` *to list possible entries.*

    f. Enter: `sudo cp -ap /mnt/dd /`
    g. Enter: `sudo /dd/post_install`

       If prompted:
       For input password, enter a password, then press **Enter**. *Remember the password for later*.
       For input password again, re-enter the password to confirm it, then press **Enter**.

15. Wait for the message **Setup is Complete,** press **CTRL+ALT+F1**, select **Restart Now** to finish the installation.
16. Remove the installation media:
    - If prompted, remove the CD/DVD or DVD and USB flash drive.
    - When installation media is removed, press **Enter** or **Reboot** the system.
    - If you disconnected the Ethernet Cable, reconnect it now.
17. If prompted, finalize the kernel upgrade:
    a. Wait for the system to reboot. After the BIOS screen appears, the "Press any key to enter the MOK management" window is displayed. *Within 5 seconds*, press any key to enter MOK management.
    b. Select **Enroll MOK**, then press **Enter**.
    c. Select **Continue**, then press **Enter**.
    d. At the Enroll the Key(s), select **Yes**, then press **Enter**.
    e. At the password window, enter the password you used for Step 14g, then press **Enter**.
    f. Select **Reboot**, then press **Enter**.

5.3 Install the AMD-RAIDXpert2 Management Application

1. Contact your system supplier or motherboard vendor to obtain the new AMD-RAID Linux Management Application.
2. Copy the AMD-RAID 9.3.0-00xxx_linux_raidxpert2.tgz to a USB flash drive, formatted as FAT32.
3. Insert a USB flash drive containing the AMD-RAID 9.3.0-00xxx_linux_raidxpert2.tgz package.
4. Select **Files**:
   a. Select the USB that was inserted above.
   b. Locate and select the `AMD-RAID 9.3.0-00xxx_linux_raidxpert2.tgz` package and drag it to the **Desktop** directory icon.
   c. Right-click to open the **Terminal** or select the **Terminal** icon.
   d. Enter: `sudo tar xzvf 9.3.0-00xxx_linux_raidxpert2.tgz -C /opt`
5. To open the AMD RAIDXpert2 Management Application:
   a. Enter: `cd /opt/raidxpert2/bin`
   b. Enter: `sudo bash` (and provide user password).
   c. Enter: `./RAIDXpert2 &`