



# AMD NVMe/SATA RAID Quick Start Guide for Windows Operating Systems

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## Revision History

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<b>Date</b>	<b>Revision</b>	<b>Description</b>
August 2020	1.04	Remove Web GUI to just GUI. Replaced 6.1 and 6.12 with 4.4.2-4.4.4 from the RAIDXpert2 UG. In 6.1.3 removed list under step 4, removed step 5 Added new section 3.5.
August 2019	1.03	Second public release. Updated steps in Chapter 3. Updated title in Chapters 4. Updated 6.1 and 6.1.1.
April 2018	1.02	First public release.
March 2018	1.01	2 <sup>nd</sup> NDA release. Updated Supported Configuration and minor edits.
February 2018	1.00	Initial NDA release.

# Chapter 1 General Information

## 1.1 Purpose

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

- Copy AMD RAID device drivers to removable storage media for the following operating system:
  - Microsoft® Windows 10 x64
- Load AMD RAID device drivers on a system at the time during Windows 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: 2 at 8 GB, for a total of 16 GB Recommended: 4 at 8 GB, for a total of 32 GB
Hard Disk, SSD	One to Fourteen SATA HDD's, SATA SSD's or NVMe
Max number of NVMe devices	10
Max Controller Count	11 (Two controllers with Device ID 0x7917, one controller with device ID 0x43BD and NVMe (one controller per NVMe) 11 (One controller with Device ID 0x7916, one controller with device ID 0x43BD and NVMe (one controller per NVMe)
Supported AMD Processors	3 <sup>rd</sup> Gen AMD Ryzen™ Threadripper Processor 3 <sup>rd</sup> Gen AMD Ryzen™ Desktop Processor 2 <sup>nd</sup> Gen AMD Ryzen™ Threadripper™ Processor 2 <sup>nd</sup> Gen AMD Ryzen™ Desktop Processor AMD Ryzen™ Threadripper™ Processor AMD Ryzen™ Desktop Processor AMD Ryzen™ Desktop Processor with Radeon™ Vega Graphics
Supported AMD Chipsets	AMD X570 Chipset AMD X470 Chipset AMD X399 Chipset AMD B450 Chipset AMD X370 Chipset AMD B350 Chipset AMD A320 Chipset

**Table 2. Information about Supported Configuration by Installer**

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

**Maximum Device Support:**

- Max support of 14 including ATAPI, SATA and NVMe
- RAID5 - with the standard sTRX4 statement.

## 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 the BIOS settings as outlined in Section 3.1 to enable RAID Mode on the system.
  - b. This enables the loading of 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 4.1*)
6. Load the **AMD-RAID** drivers during the 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 6.1*)

**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 driver 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.*

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## Chapter 2 Bootable Arrays

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

*Note: Windows: Removable storage (Flash Drive) required for Copying AMD-RAID drivers*

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

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

1. Power-on the system.
2. Locate and use a system that is running a Windows operating system and has a CD DVD drive or an I/O port for removable storage media (such as a USB flash drive).
3. Insert the storage medium into the system:  
*Note: Windows 10: Connect a USB flash drive to a USB I/O port, or insert a blank CD-DVD disk into the applicable drive.*
4. Go to a browser and access the web site of your system supplier or motherboard vendor.
5. Download the AMD-RAID drivers from the web site to the appropriate removable storage medium.
6. Proceed to Windows Install and load AMD-RAID drivers during a Windows OS installation.



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## Chapter 3 Pre-Installation Steps

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### 3.1 Enable RAID for the x570/590 AMD Socket AM4/SP3-Series Compatible Processors

Following are the pre-installation steps:

*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.*

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 **X570/590 Chipset Common Options**, then press **Enter**.
  - d. Select **X570/590 Chipset SATA Configuration Options**, then press **Enter**.
  - e. Set **X570/590 Chipset SATA0 Enable** to **Enabled**, then press **Enter**.
  - f. Set **X570/590 Chipset SATA1 Enable** to **Enabled**, then press **Enter**.
  - g. Set **X570/590 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.

## **3.2 Enable RAID for the 300/400/500 AMD Socket AM4-Compatible Processors**

*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.*

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 **300/400/500 Chipset Common Options**, then press **Enter**.
  - d. Select **300/400/500 Chipset SATA Configuration Options**, then press **Enter**.
  - e. Set **SATA Mode** to **RAID**, then press **Enter**.
6. In the BIOS setup:
  - a. Select the **Advanced** tab.
  - b. Select **AMD-PBS**, then press **Enter**.
  - c. Set **NVMe RAID Mode** to **Enabled**, then press **Enter**.
7. Save (**F4**) the settings and restart the system.

### 3.3 Enable RAID for the AMD SP3-Series Chipsets

*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.*

1. Power-on the system.
2. Press **Delete** or **ESC** to enter the **System BIOS** setup page.
3. In the BIOS setup:
  - a. Select the **Advanced** tab, then press **Enter**.
  - b. Select the **AMD PBS** tab, then press **Enter**.
  - c. Set **NVMe RAID Mode** to **Enabled**.
4. In the BIOS setup:
  - a. Select the **Advanced** tab, then press **Enter**.
  - b. Select the **AMD CBS** tab, then press **Enter**.
  - c. Select **FCH Common Options**, then press **Enter**.
  - d. Select **SATA Configuration Options**, then press **Enter**.
  - e. Set **SATA Controller** to **Enabled**.
5. In the BIOS setup:
  - a. Select the **Advanced** tab, then press **Enter**.
  - b. Select the **AMD CBS** tab, then press **Enter**.
  - c. Select **FCH Common Options**, then press **Enter**.
  - d. Select **SATA Configuration Options**, then press **Enter**.
  - e. Set **SATA Mode** to **RAID**.
6. In the BIOS setup:
  - a. Select the **Advanced** tab, then press **Enter**.
  - b. Select **Promontory Common Options**, then press **Enter**.
  - c. Select **PT SATA Configuration Options**, then press **Enter**.
  - d. Set **PT SATA Port Enable** to **Enabled**.
7. In the BIOS setup:
  - a. Select the **Advanced** tab, then press **Enter**.
  - b. Select **Promontory Common Options**, then press **Enter**.
  - c. Select **PT SATA Configuration Options**, then press **Enter**.
  - d. Set **PT SATA Mode** to **RAID**.
8. In the BIOS setup:
  - a. Select the **Advanced** tab, then press **Enter**.
  - b. Select **CSM Configuration**, then press **Enter**.

- c. Set **CSM Support** to **Enabled**.
  - d. Set **Boot Option Filter** to **UEFI Only**.
  - e. Set **Storage** to **UEFI**, then press **Enter**.
9. Save (**F4**) the setting and restart the system.

### **3.4 Enable RAID for the AMD Socket AM4-Compatible Processors**

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

1. Press **ESC** to enter the **System BIOS** setup page.
2. Select **Setup Utility**, then press **Enter**.
3. In the BIOS setup:
  - a. Select the **Advanced** tab.
  - b. Select **IDE Configuration**, then press **Enter**.
  - c. Set **SATA Configure As** to **RAID**, then press **Enter**.
  - d. Set **Force RAID Mode** to **Enabled**, then press **Enter**.
4. In the BIOS setup:
  - a. Select the **Boot** tab.
  - b. Set **Boot Type** to **Dual** or **UEFI Boot Type**, then press **Enter**.
  - c. Set **EFI Device First** to **Enable**, then press **Enter**.
5. In the BIOS setup:
  - a. Select the **AMD-PBS** tab.
  - b. Set **NVMe RAID Mode** to **Enabled**, then press **Enter**.
6. In the BIOS setup:
  - a. Select the **AMD-CBS** tab.
  - b. Select **SATA Configuration Options**, then press **Enter**.
  - c. Set **SATA Controller** to **Enabled**, then press **Enter**.
  - d. Set **SATA Mode** to **RAID**, then press **Enter**.
7. In the BIOS setup:
  - a. Select the **AMD-CBS** tab.
  - b. Select **Promontory Common Options**, then press **Enter**.
  - c. Select **PT SATA Configuration Options**, then press **Enter**.
  - d. Set **PT SATA Port Enable** to **Enabled**, then press **Enter**.
  - e. Set **PT SATA Mode** to **RAID**, then press **Enter**.
8. Save (**F10**) the settings, then restart the system.

## 3.5 Enable RAID for the FP6 Processors

***Note:** Raid configuration support is restricted to Raid0 level only. The steps to configure a system to RAID mentioned here are specific to AMD NDA BIOS based off the Insyde BIOS.*

1. Power-on the system.
2. Press **ESC** to enter the System BIOS setup page.
3. In the **BIOS** setup:
  - a. Select **AMD PBS** tab, then press **Enter**.
  - b. Set the **NVMe RAID Mode** to **Enabled**, then press **Enter**.
4. Save (**F10**) the settings and restart the system.

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## Chapter 4 Create the Bootable Virtual Disk

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### 4.1 RAIDXpert2 Configuration Utility (HII Mode) For the AMD Ryzen™ Desktop Processor and AMD Ryzen Mobile Processor

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

1. Power-on the system.
  - a. Press **ESC** to get into the **Platform BIOS**.
  - b. Select **Device Management**, then press **Enter**.
  - 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**.

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 and 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**.
6. Select an array size by doing the following:
  - a. Use the **arrow keys** to select **Array Size**, then press **Enter**.
  - b. The Array size will default 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. Use the arrow keys to select **Cache Tag Size**.
  - a. Any Array with only HDD/SSD has the default CTS of 64 k.
  - b. Any Array with only NVMe or NVMe with HDD/SSD has the default CTS of 256 k.
8. Use the **arrow keys** to select **Read Cache Policy**, then press **Enter**.
  - a. Select the desired **Read Cache Policy**, then press **Enter**.

9. 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 the array creation, select **Save** and reboot the BIOS.

## 4.2 RAIDXpert2 Configuration Utility (HII Mode) For the AMD Ryzen™ SP3-Series Processor

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

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** and 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**.
6. Select an array size by doing the following:
  - 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. Use the arrow keys to select **Cache Tag Size**.
  - a. Any Array with only HDD/SSD has the default CTS of 64 k.
  - b. Any Array with only NVMe or NVMe with HDD/SSD has the default CTS of 256 k.
8. Use the **arrow keys** to select **Read Cache Policy**, then press **Enter**.
  - a. Select the desired Read Cache Policy, then press **Enter**.

9. Use the **arrow keys** to select **Write Cache Policy**, then press **Enter**.
  - a. Select the desired **Write Cache Policy**, then press **Enter**.
  - b. Use the **arrow keys** to select **Create Array**, then press **Enter**.
10. After completion of array creation save and reboot the BIOS.

## 4.3 UEFI Mode

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: the user 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**



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## Chapter 5 Install AMD-RAID Drivers

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### 5.1 Windows: Install AMD-RAID Drivers during an Windows OS Installation

Install the AMD-RAID drivers during the Windows® 10 OS Installation.

*Note 1: The windows described in this guide are typical. Path names and text can vary, depending on user-designated selections and other parameters.*

*Note 2: NVMe devices are listed in the “Where do you want to install Windows?”, do not delete any of the partitions or format the NVMe devices. Doing so deletes the **AMD-RAID** metadata and the desired RAID level. After the **AMD-RAID** drivers (*rcbottom* and *rcraid*) are loaded, a valid **AMD- RAID** Virtual Disk displays.*

1. Power-on the system.
2. Create a bootable array (see *Chapter 4*).
3. Insert the Microsoft Windows operating system CD-ROM or DVD into the CD or DVD drive.
4. Boot the system and allow it to access the Microsoft Windows operating system CD-ROM or DVD.
5. At the **Windows setup** window:
  - Select the **language**, **time** and **keyboard** options.
  - Select **Next**.
  - Select **Install Now** or similar.
  - If prompted, select the desired operating system.
  - Select **Next**.
  - Insert the storage medium with the **AMD-RAID** drivers into the USB port or applicable system drive.
  - Select **Browse**.
  - Navigate to the directory containing the saved **AMD-RAID** drivers.
  - Select **OK**.

*Note: If the installation has multiple controllers, there will be two or more *rcbottom.inf*'s listed.*

  - Select the first **AMD-RAID Bottom Device (rcbottom.inf)** driver in the list.
  - Select **Next**.

6. At the Load Driver Warning message:
  - Select **OK**.
7. At the Select the Driver to install window:
  - Select **Browse**.
  - Navigate to the directory containing the saved **AMD-RAID** drivers.
  - Select **OK**.
  - Select the **AMD-RAID Controller (rcraid.inf)** driver in the list.
  - Select **Next**.
  - Select (Check Mark) **I Accept the License Terms**.
  - Select **Next**.
  - Select **Custom: Install Windows Only (advanced)** or similar.
8. Once both drivers have been loaded, a valid Virtual Disk appears:
  - Select **Load Drivers**.
  - Select **Browse**.
  - Navigate to the directory containing the saved **AMD-RAID** drivers.
  - Select **OK**.
  - Select the **AMD-RAID Config Device (rccfg.inf)** driver from the list.
  - Select **Next**.
9. Select **Next** at the **Where do you want to install Windows** window.
10. Follow the on-screen instructions to complete the installation of the applicable Windows operating system.
11. After the OS is installed, open **Device Manager** and verify the following:
  - Expand Storage Controllers: there is an entry listed as **AMD-RAID Bottom Device**.
  - Expand Storage Controllers: there is an entry listed as **AMD-RAID Controller**.
  - Expand System Devices: there is an entry listed as **AMD-RAID Config Device**.
12. Remove the storage medium and Microsoft Windows OS CD-ROM or DVD from the applicable drive(s) or port.

Proceed Installing the **AMD RAIDXpert2 Management Suite for Windows®**. (Refer to Chapter 6)

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## Chapter 6      Install the AMD-RAIDXpert2 Management Suite and GUI

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### 6.1      Installing the AMD-RAIDXpert2 Management Suite for Microsoft Windows –

Install this software using one of the following:

- From the *Microsoft Store* at <https://www.microsoft.com/store/apps>.
- From the *AMD support* web site at <https://support.AMD.com>.
- From the RAIDXpert2 Management Suite Manual Installation.

#### 6.1.1      Windows – AMD-RAIDXpert2 Management Suite Desktop Application (Microsoft Store)

The procedure in this section describes how to install the software from the Microsoft Store.

1. Go to the *Microsoft Store* at <https://www.microsoft.com/store/apps>.
2. Select **Search**, type **AMD-RAIDXpert2**, and select the AMD-RAIDXpert2 Management Suite Desktop Application from the search results.
3. Select **Get**.
4. Sign in with your Microsoft account to finish downloading the application.
5. After the RAIDXpert2 software installation is completed, open the Windows menu and search for AMD RAIDXpert2, then click **Open**.

#### 6.1.2      Windows – AMD-RAIDXpert2 Management Suite

The procedures in this section describe how to install the software from the AMD support website.

1. Obtain the latest executable file from your system supplier, motherboard vendor, or from <https://www.amd.com/support>.
2. Download the file to the system desktop and run it, follow the resulting-screen prompts.
3. Double-click on the **RAIDXpert2** desktop icon.

#### 6.1.3      Windows – AMD RAIDXpert2 Management Suite Installation (Manually)

1. Obtain the AMD RAIDXpert2 Management Suite executable file (Setup.exe) from your system supplier or motherboard vendor.
2. Download **Setup.exe** to the desktop. (You can unblock the Windows Firewall at this step.)

3. Install the AMD RAIDXpert2 (setup.exe) by:
  - Open a command prompt (must be run as Administrator).
  - Type **cd C:\User\User\_Name\Desktop**
    - For silent installation, type: `setup.exe`
    - For GUI installation, type: `setup.exe -i gui`
4. Turn off the Windows Firewall (or unblock during step 2).
5. Double-click on the RAIDXpert2 Desktop Icon.