

Western Digital Red Plus User Manual



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The WD Red Hard Disk Drive (HDD) is a highly performant and reliable HDD designed for continuous operation. In this user manual you will find a comprehensive technical analysis of the drive's internal components, followed by step-by-step instructions for safe installation.

Part 1: Technical description

Hard Disk Drives (HDDs) are electro-mechanical data storage devices used for storing and retrieving digital information. The first commercial HDD, the Model 350, was shipped in 1956 developed by a team at the IBM R&D Laboratory. (Computer History Museum, 2018). While the original unit was the size of two refrigerators and stored only 3.75 MB of data, modern drives like the WD Red Plus can store 12TB of data or more (Computer History Museum, 2018).

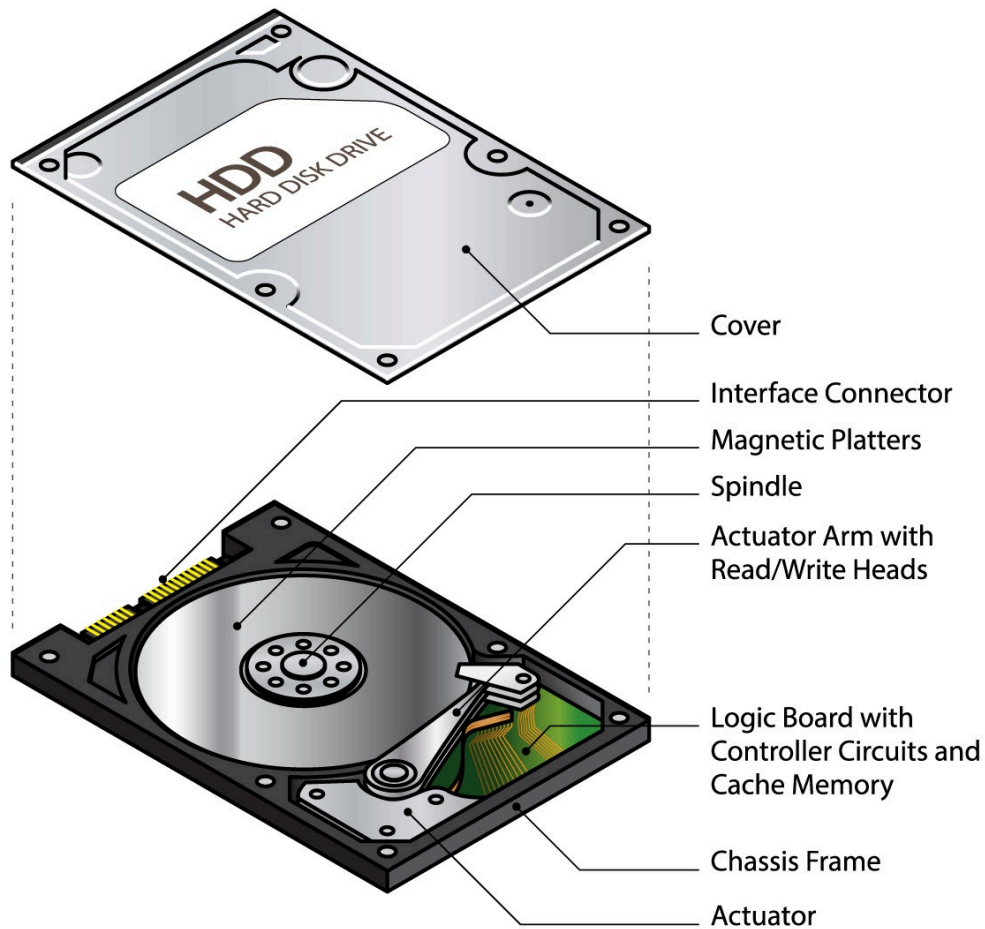
The Western Digital (WD) Red Plus is a specialized evolution of this technology. It is designed with reliability, performance, and 24/7 operation in mind. Unlike standard consumer drives designed for intermittent use, the WD Red Plus is designed for continuous use in Network Attached Storage (NAS) environments or similar usage.

Description of Parts and Their Function

The WD Red Plus HDD is composed of several high-precision mechanical and electronic components enclosed in a sealed aluminum chassis.

1. **The Platters:** The platters are metallic circular disks coated with a layer of magnetic material where data is physically stored. This model utilizes Conventional Magnetic Recording (CMR) which ensures no data overlap on the platter which is essential for preserving write speeds and maintaining reliability long-term.
2. **The Spindle Motor:** The spindle motor rotates the platters at a precise, consistent speed of 5400 RPM. This speed balances both high performance (215 MB/S) with power efficiency, low operating temperature, and low operating noise level.
3. **Actuator Arm and Read/Write Heads:** The actuator arm is a mechanical lever which moves across the spinning platters to read the data. At the tip of the arm is a Read/Write Head. This head sits nanometers above the surface on a cushion of air. This air-cushion ensures reliability even in high vibration environments such as a NAS in a RAID set-up.
4. **Dual-Plane Balance Control:** HDDs that are not balanced are subject to excessive vibration in multi-drive systems such as a RAID setup. The WD Red Plus utilizes dual-plane balance control technology which improves drive performance and reliability by stabilizing these platters.

Figure 1: A dissected HDD



Operating Cycle

The operating cycle of the WD Red Plus begins immediately after the OS mounts the drive.

1. The spindle motor accelerates to the operating speed of 5400 RPM
2. The rapid acceleration creates an air-cushion that lifts the heads off the platter.
3. Before accessing the platters, the drive checks the DRAM cache to see if the data is already there allowing for faster performance.
4. When the system requests data, the motor moves the actuator arm to the correct track.

5. As the correct sector spins below the head, the drive magnetically reads or writes the data to the drive.

Conclusion

The WD Red Plus HDD is a highly performant and reliable storage solution. It is designed for the rigorous demands of NAS storage, but has utility far beyond a NAS setup. Maybe you are a small or medium sized business who needs reliable and fast company storage. Maybe you are a tinkerer with a passion for self-hosting. No matter the application, the WD Red Plus is built to keep your data safe and quickly accessible.

Part 2: Instructions for Use

These instructions list the steps needed to physically set up the device and install it in a standard desktop computer. Correct installation is critical for long-term reliability and to ensure the drive is recognized by the operating system.

Safety Warnings:

- Electrostatic Discharge(ESD): Static electricity can permanently damage the HDD. To ensure drive health wear anti-static gloves or wrist straps. Do not assemble the drive on a carpet.
- Ensure you do not touch the green circuit board of the HDD located at the bottom of the HDD.
- Ensure the computer is powered off when connecting power cables and data cables to prevent damage to the internal components

List of Equipment:

1. WD Red Plus 3.5-inch HDD
2. Phillips-head screwdriver
3. SATA Data Cable
4. SATA Power Cable
5. Computer Chassis
6. Mounting screws

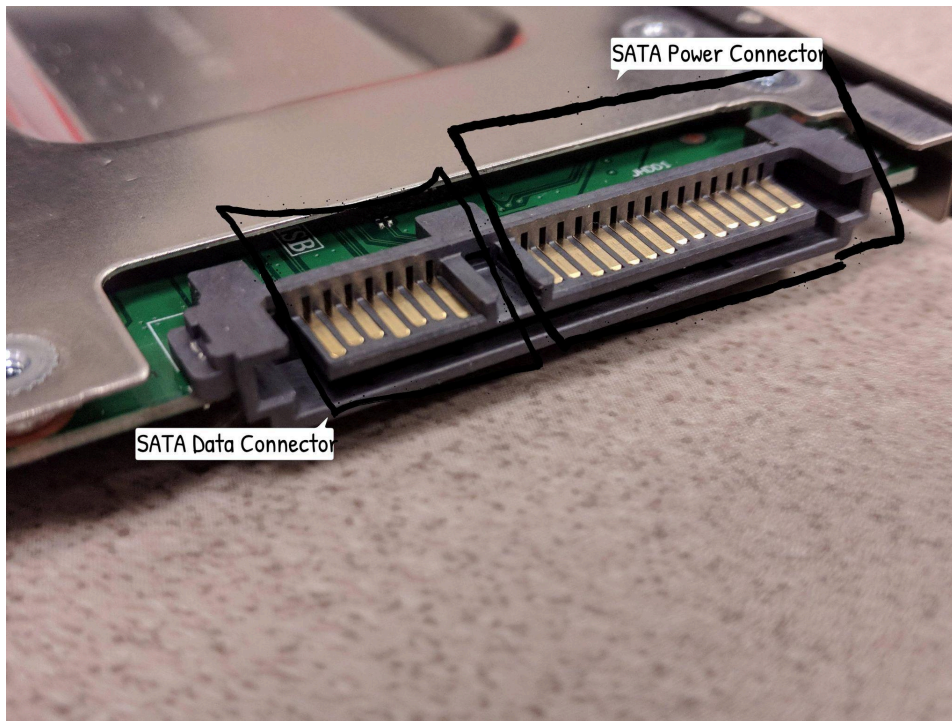
Directions:

Step 1: Power down the computer and unplug the power cord.

Step 2: Remove the side panel covering the computer case to expose the internal drive bays.

Step 3: Find an empty 3.5 inch drive bay and slide the WD Red Plus into the bay with the connector ports (Figure 2) facing outward towards you.

Figure 2: A SATA connection with the Data connector and Power Connector annotated



Step 4: Align the screw holes (Figure 3) on the drive with the slots in the bay.

Step 5: Secure the drive by screwing the four mounting screws through the drive bay and into the HDD.

Figure 3: Screw Location(circled in red) for HDD



Step 6: Locate the SATA data cable (Figure 4), and plug it into the smaller of the two connectors on the HDD (Data Connector on Figure 2).

Figure 4: SATA Data Cable



Step 7: Plug the other end of the SATA data cable (figure 4) into an available SATA port (Figure 7) on your motherboard.

Step 8: Locate the SATA power cable (Figure 5), and plug the wide end into the larger of the two connectors on the HDD(SATA Power connector on Figure 2).

Step 9: Plug the smaller connector on the SATA power cable directly into the computer power supply unit (PSU) (Figure 6).

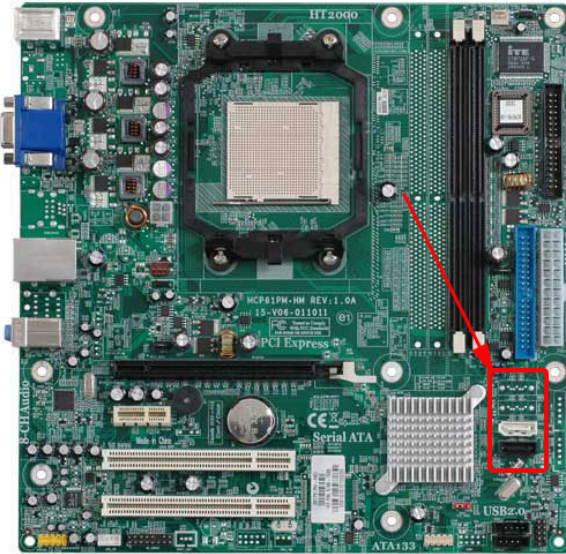
Figure 5: SATA Power Cable



Figure 6: Power Supply Unit (PSU)



Figure 7: A motherboard with a red arrow pointing to the SATA data connector



Step 10: Return the computer to its original state by screwing the side panel back on.

Step 11: Format the drive using your operating system's disk utility. Depending on the operating system the process to have the drive be formatted and recognized may change. Refer to the manual for "[Disk Management](#)" utility in Windows, "[Disk Utility](#)" in macOS to understand what you need to do to properly format your drive so that your OS can recognize it.

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