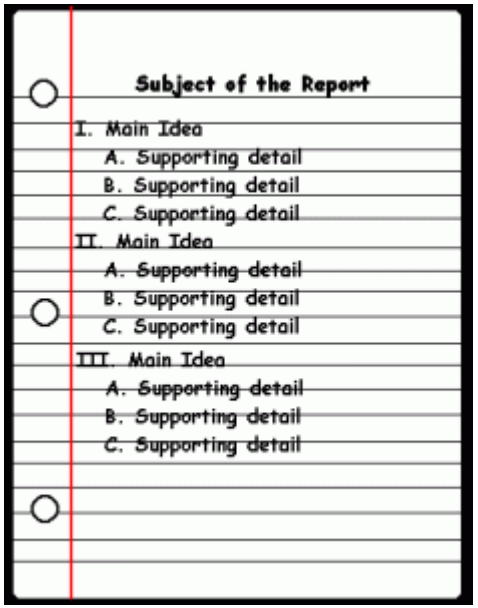
Hard Drive Basics

Course Outline

- Terminology
- Handling
- Packaging/Shipping
- What's Inside
- Sounds
- File Systems
- FAQs
- Disclaimer



Terminology

Byte

A byte is a specific number of consecutive bits, usually 8. A byte represents a unit of binary coded information, such as a single character or number.

Sector

A sector is the smallest block of data (typically 512 bytes) that can be accessed on disk storage. All of the bytes within a sector must be read sequentially. The term sector was used for hard drives that were 504 megabytes or smaller but has since been replaced by the term and unit known as Logical Block Addressing or 'LBA".

Logical Block Address (LBA)

Logical Block Addressing (LBA) is a method of addressing hard disk drives. Replaced the term 'sector' as a means of defining the data blocks on a hard drive.

Data

Data is usable information stored in the sector/LBA. It is stored in byte units.

Capacity

Capacity refers to the number of bytes the device can store. Some devices can store as little as 1.44 megabytes (3.5" floppy disk) of data or as much as 4000 gigabytes or 4 terabytes. Capacity is one of the primary characteristics of a disk storage device a customer considers when deciding which class of disk storage device to use.

PATA

Parallel ATA interface. This drive is sometimes referred to as 'IDE' and it typically found in desktop and laptop computers. The interface is still prevalent but has been replaced by the faster Serial ATA interface.

SATA

Serial ATA interface. This drive replaced the PATA interface with its major advantage being speed. This drive can be found in desktop, laptops, and servers.

Handling Hard Disk Drives

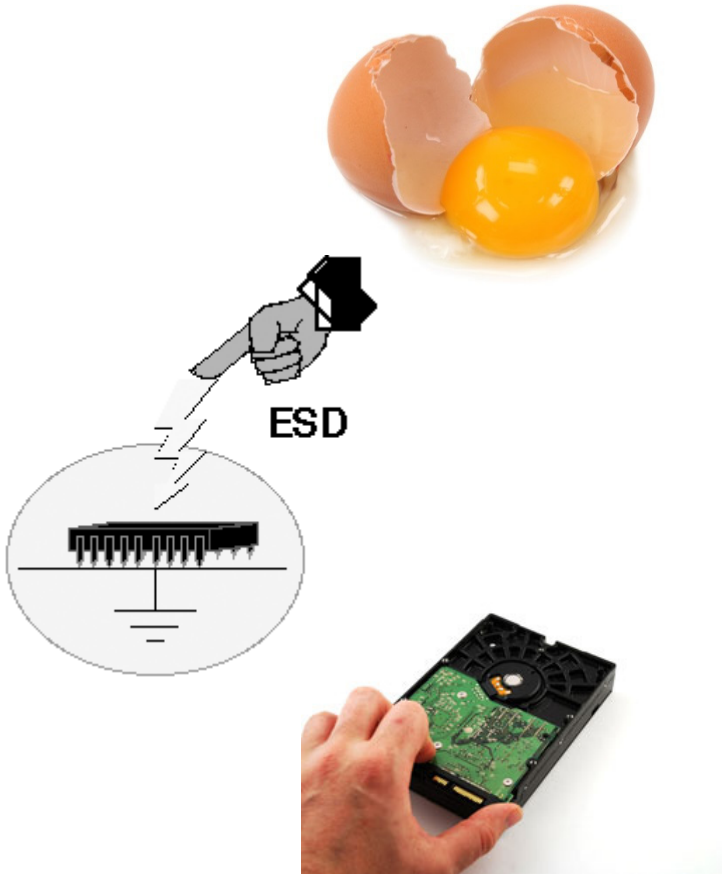
Drive Handling

Hard drives, even damaged ones, should be handled with care.

Always handle a hard drive like an egg…gently and carefully!

Be careful when you set a hard drive down and when you pick it up. Always ensure you have a firm grip. When setting the drive down, always let the table hit your fingers first.

Electrostatic Discharge (ESD) is a serious and potentially damaging occurrence. Damage from ESD may be instantaneous or may cause problems which do not immediately present themselves.



Shipping a Hard Drive

When possible, use original packaging when shipping a hard drive for data recovery. In the case where original packaging is not available, the following guidelines should be followed:

1. The shipping carton should be larger than the drive so that the drive may be suspended in the center of the carton.
2. Use packing material like bubble wrap or Styrofoam packed around the drive in the shipping carton. Pack the material tightly around the drive to ensure that the drive will remain suspended during transit. No part of the drive should directly contact the outer shipping carton.
3. If you must ship a desktop computer or laptop use extreme care and enough packing material to adequately cushion and protect the system.

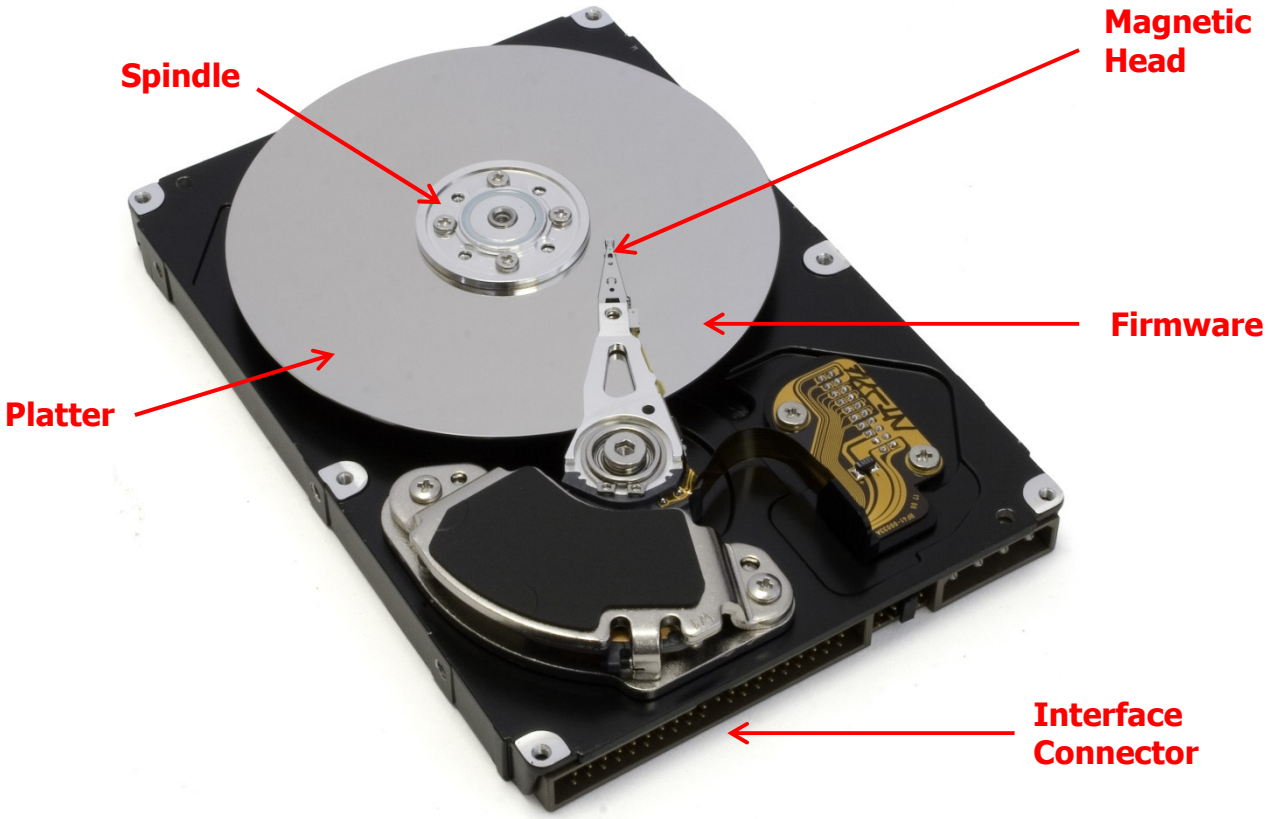
Call or Email CPR Tools for a box

CPR Tools will supply a box for you to ship the hard drive, data dump drive, even a computer or laptop.

If you are returning an Advanced or Advanced Plus Recovery to CPR Tools, call or send us a request and we will ship one out to you that day!

How Hard Drives Work

What's inside?



The Interface

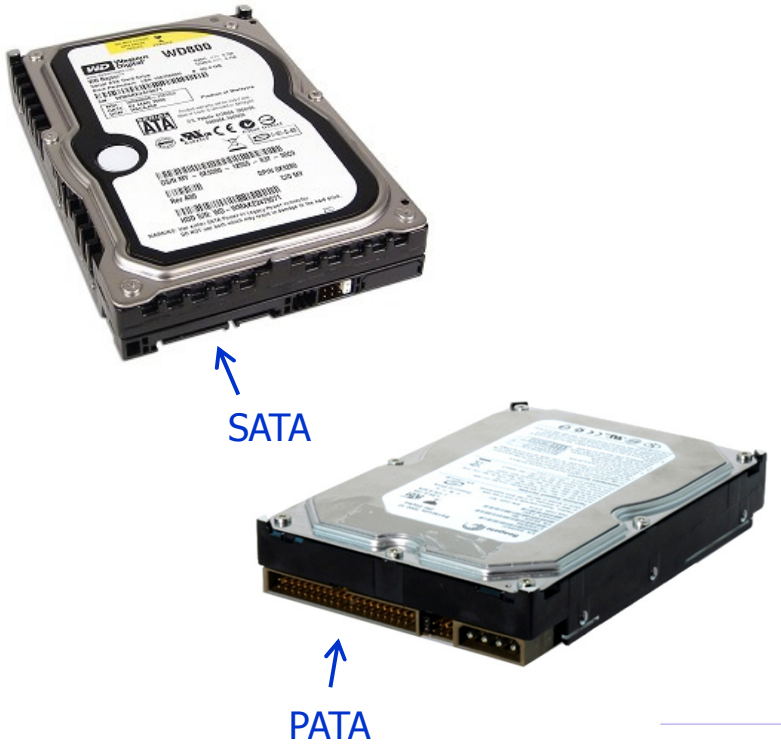
Interface Connection

There are many different types of hard drive interfaces. The two main interfaces associated with desktop computers and laptops are PATA and SATA interfaces.

These interfaces are described in the next two slides.

Failure Point:

Typically, the interface connection is not a failure point in data recovery.



PATA

Parallel ATA (PATA) is an older standard for connecting hard drives and optical drives. PATA is sometimes referred to as 'ATA' or 'IDE'.

PATA cables are flat cables with 40-pin connectors on either side of the cable. One end plugs into a port on the motherboard and the other into the back of a storage device like a hard drive.

PATA is slower than SATA which replaced it around 2003.

2.5 Inch Drive Referred to as a 'laptop drive'

PATA Cable

3.5 Inch Drive Typically found in desktop computers

SATA

Serial ATA (SATA) is a standard for connecting storage devices like hard drives and optical drives.

SATA data cables are typically red cables with 7-pin connectors on either side of the cable. SATA cables can either have separate data and power cables or be molded together.

SATA is much faster than PATA which it replaced around 2003.

2.5 Inch Drive Referred to as a 'laptop drive'

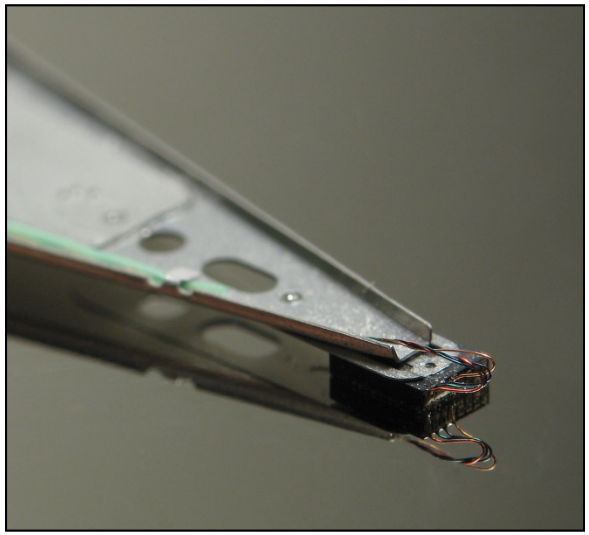
SATA Data and Power Cable

3.5 Inch Drive Typically found in desktop computers

The Magnetic Heads

Magnetic Heads

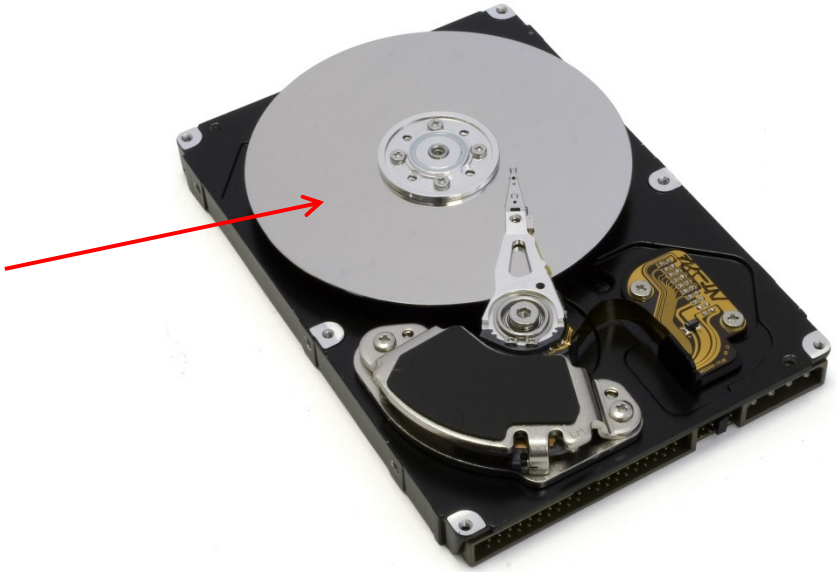
Hard drive read/write heads are responsible for reading and writing bits of information in the form of magnetic pulses on the platters.



Failure Point:

Bad heads are failure points for hard drives and require a clean room environment to fix.

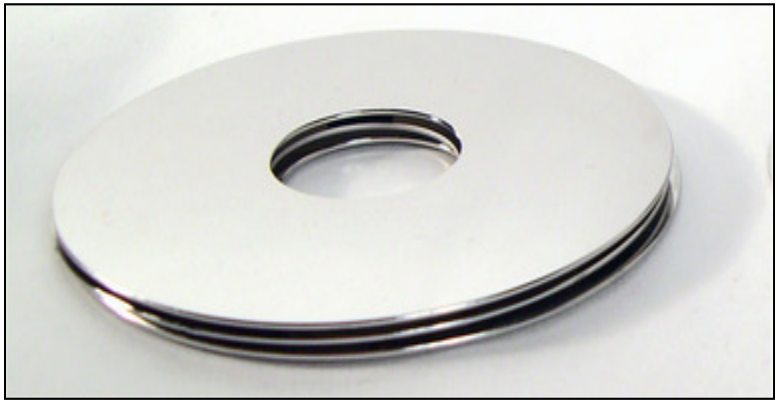
Typical symptoms include a clicking sound when the drive is powered up.



The Platter

The Platter

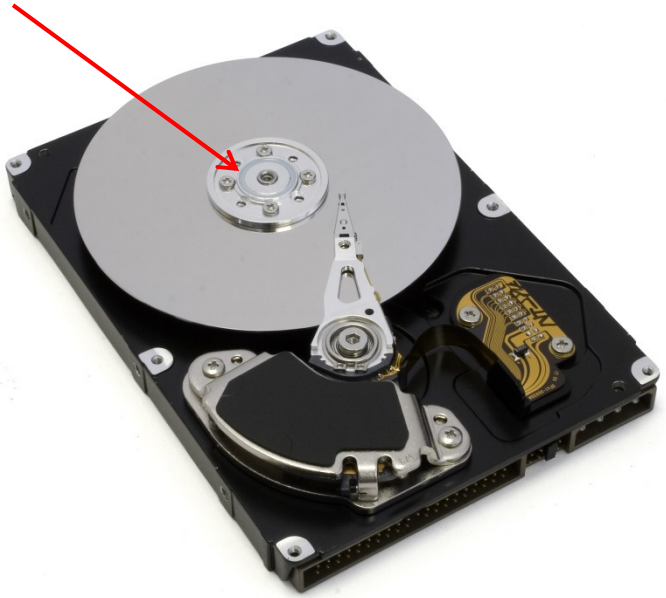
The platters are where the data is stored. User data, firmware, and position data (servo) is stored on the platters.



Failure Point:

Platters are failure points because they can be easily damaged if touched by the magnetic heads, fingers, or any time they are exposed to contamination. Opening a drive outside of a clean room will expose the platters to such contamination.

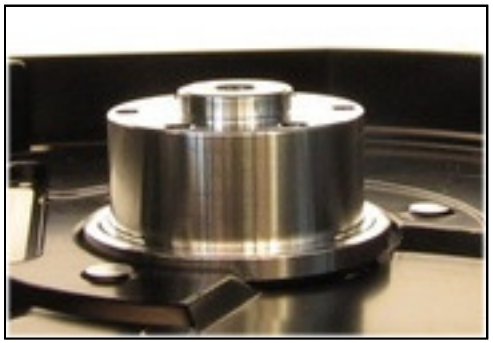
Typical symptoms include a clicking or grinding sound when the drive is powered up.



The Spindle

The Spindle

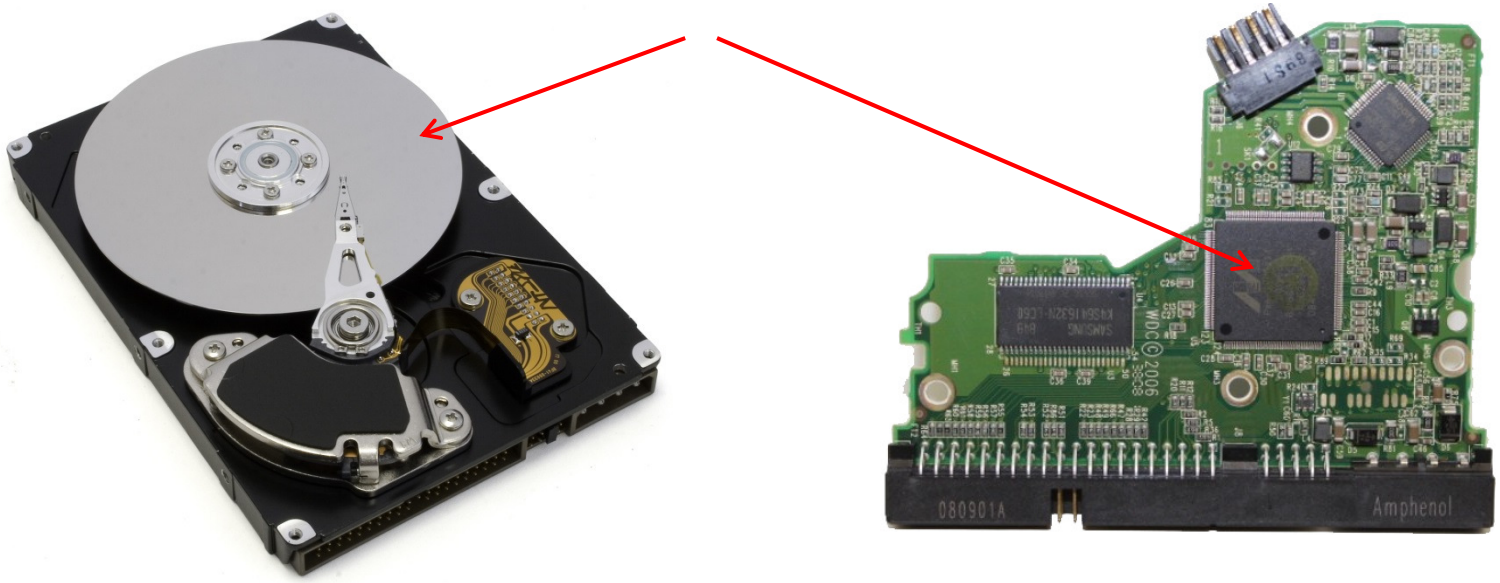
The spindle is what causes the platters to rotate. Platters rotate at different speeds; typically 5400, 7200, and 10,000 RPM.



Failure Point:

A common failure concerning the spindle is when it becomes "seized". This typically occurs when a drive has been dropped. This type of failure requires a cleanroom to fix.

Typical symptoms include a humming or beeping sound when the drive is powered up.



The Firmware

Firmware

Drive firmware (the operating system for the hard drive) is typically stored in two places on a hard drive:

1. a ROM chip on the Printed Circuit Board (PCB)
2. on the platter in the area referred to as the 'service area'

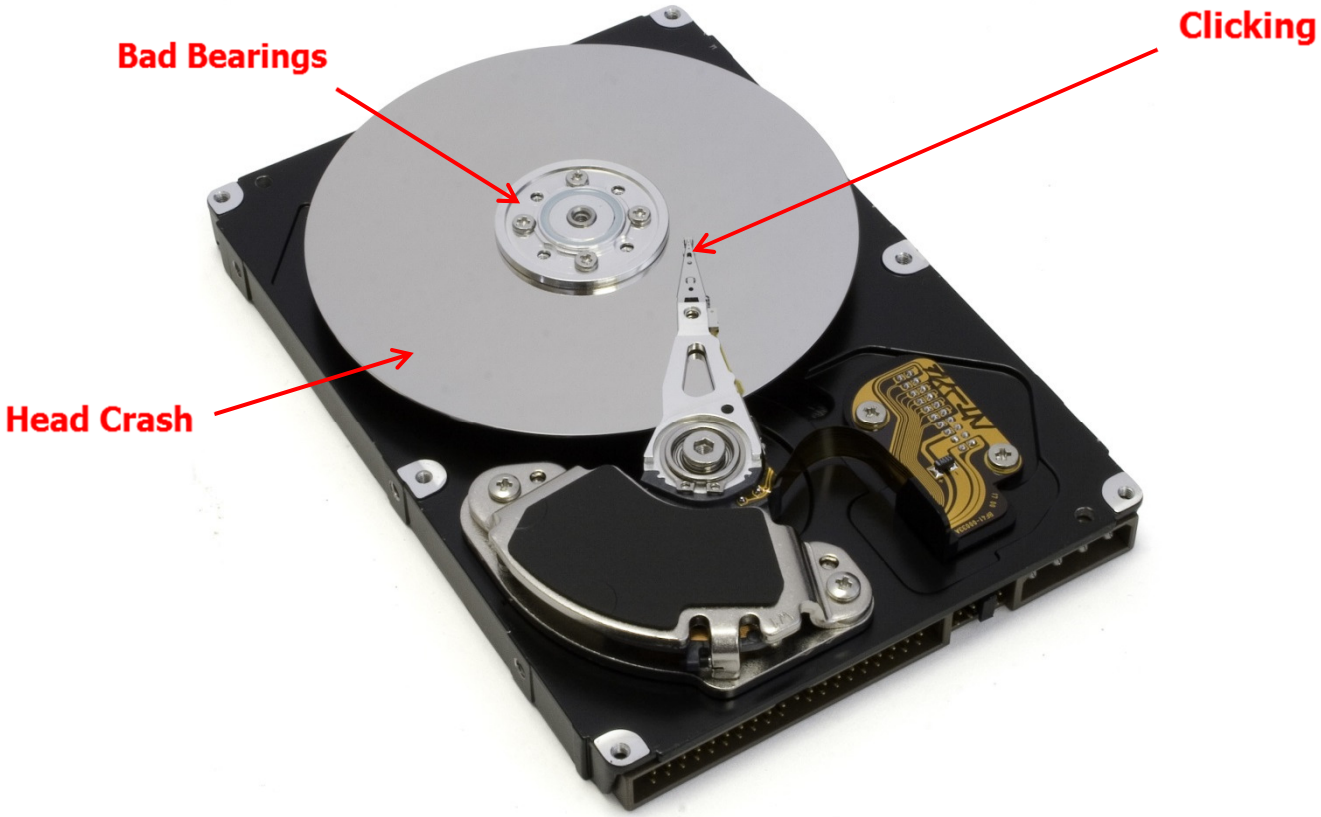
On startup, the drive reads the firmware and loads the information into RAM.

Failure Point:

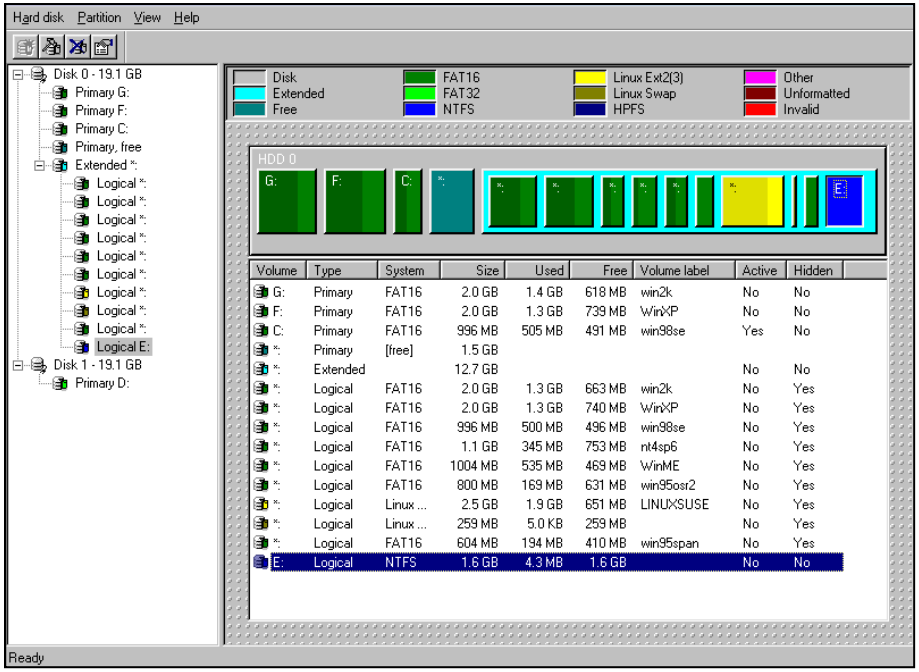
Information in the service area is critical to drive functionality, therefore any corruption can cause a drive to fail.

Symptoms include: drives spinning down, clicking, and identifying incorrectly (i.e. identifying as 0GB or as the wrong model number)

Sounds….



Move your mouse over the RED word to hear the sounds of data recovery



The File System

File Systems

When a hard drive is formatted, it becomes organized and prepared to store data.

Formatting can be compared to starting a library. You must install the catalogue system before any books are put in place. Once the system is ready, bring on the books!

Similarly, when formatting a disk we install a file system to make it ready to store data (files) in a logical and organized manner.

Common File Systems

FAT/FAT16
File Allocation Table is the original, old 16 bit DOS system and is probably used in the majority of all PC's. It is also called FAT16 to help distinguish it from one of its successors, FAT32.

FAT32
This was a new addition to FAT, which Microsoft introduced in December 1996 with Windows 95 B (OSR2). Performance enhancements were introduced to the FAT32 file system with Microsoft's release of Windows 98.

NTFS
A bit file system that replaced FAT. The NTFS file system implements many enhancements, some of which will be described later in this document.

EXT
EXT is the file system used in Linux and other Unix-like operating systems.

HFS
Developed in 1985 by Apple. HFS uses a B-tree structure that can be searched very quickly regardless of size.

Just the Facts

XDR Troubleshooting Help

Question 1

Question: Why is the XDR software reporting the following error when scanning for a recovery drive?

- *Error: Consistency Test Failed*
- *The source device has failed a consistency test and may be faulty.*

Answer: The drive is reporting too many errors during the consistency test.

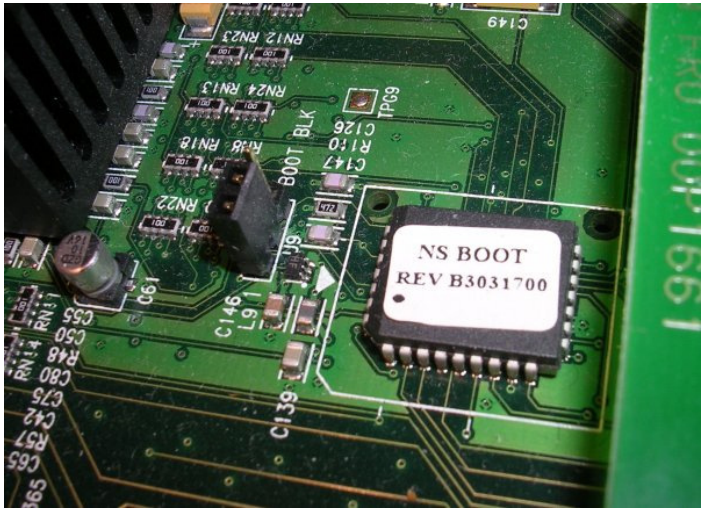
Recommended Action: The user should not continue with the recovery. It is recommended that this drive be treated as Advanced Hard Drive Recovery.

Question 2

Question: Why is the XDR software is reporting that the drive has a size of 0.0 GB in the source drive selection screen

Answer: The drive has failed to start up properly and is unable to properly process certain data requests.

Recommended Action: The user should not continue with the recovery. It is recommended that this drive be treated as Advanced Hard Drive Recovery.



Question 3

The XDR software is reporting a file system error

- Unable to find any file system on drive. This drive will need to be sent off for advanced recovery.
  - Make sure that the correct device is getting selected.
    - If they have the drive connected to the PSIClone have them look at the model number of the drive found in when scanning for recovery.
  - This drive is having problems reading the file system in mass storage mode.
    - The drive could have errors sectors that contain file system information on it. It is recommended that this drive be an Advance Hard Drive Recovery.
  - Ask if their customer knows if their system is a RAID or has encryption.
    - We will need them to send the system with their drives for advanced recovery.

Question 4

<u>The XDR software is stuck when scanning for devices</u>

- The XDR software is getting stuck trying to read a bad drive
  - It is recommended that this drive be an Advance Hard Drive Recovery

Question 5

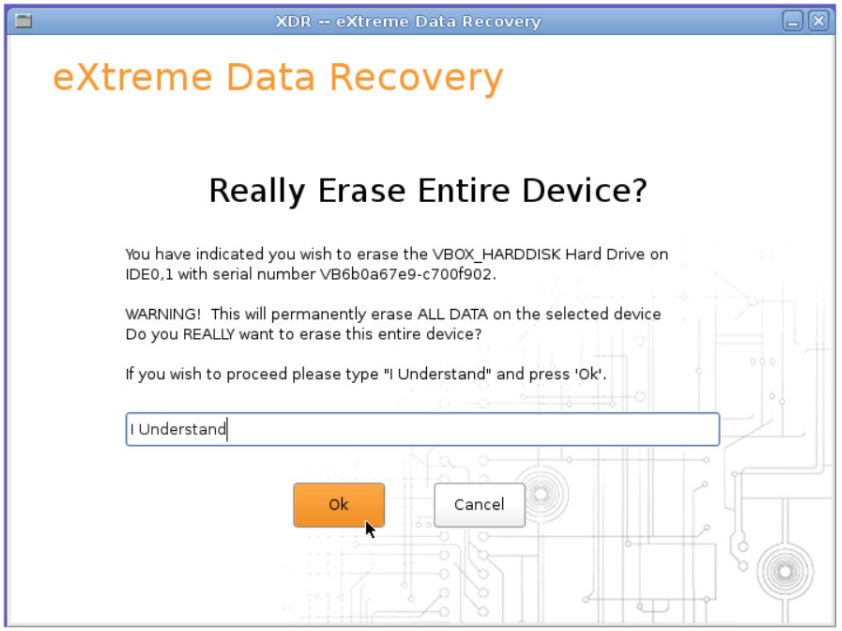
<u>The system starts to boot up and gets stuck on an iLook screen</u>

- Do you have both the CD and the USB XDR boot thumb drive.
  - Only have one removable media in the system at boot up.

Question 6

<u>Trying to perform data eradication and I keep typing ‘I understand’ and it won’t work</u>

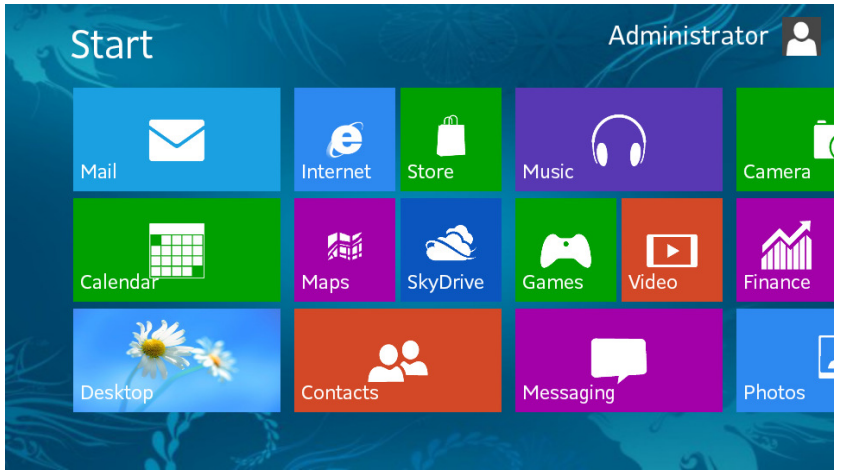
- Make sure you are typing the words exactly as they appear with a capital ‘I’ and a capital ‘U’
  - I Understand



Question 7

Why can't I boot a Windows 8 machine…I thought the operating system didn't matter?!

- It is not the operating system but rather the hardware that does not allow XDR to boot in the normal configuration.
- Most of the time the technician will have to start in Security Options so that Secure Boot can be disabled once they are in the BIOS.
- After Security Boot has been disabled, the technician will need to set Legacy Boot. If the Legacy Boot option is grayed out the user will have to enable the CSM (or Compatibility Support Module) and then set Legacy Boot.
- Settings for CSM and Legacy Boot are typically found under Security Options.

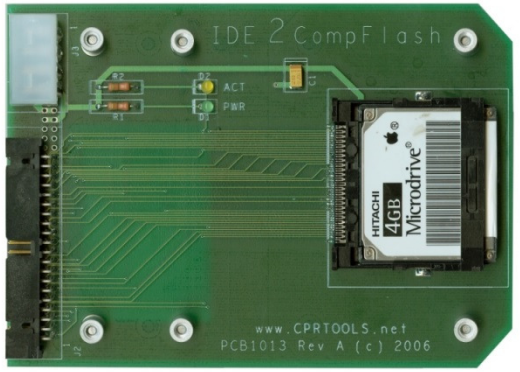


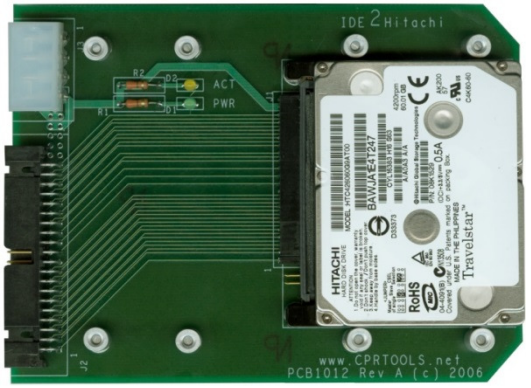
Question 8

I have a drive that came out of a laptop and the connector won't work with either cable we have

- It is most likely a 2.5 inch PATA drive
  - Go to the web page www.cprtools.net/omx and order the adapter
  - The available adapters are on the next page
  - The most common is the 2.5 inch PATA which we call "IDE 2 NOTEBOOK"

Available Adapters





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