

Common Definitions of Forensic Data Recovery Terms

Data recovery

Definition

Restoration in full or in part of the data stored in deleted or damaged data files. In case of file deletion, if the space originally occupied by the deleted file is not overwritten (or the disk is not reformatted after deletion) the file may be recoverable through common 'undelete' programs. In case of damaged files (or files stored on damaged media), custom-written software and sophisticated equipment is required for any extent of recovery.

<http://www.businessdictionary.com/definition/data-recovery.html>

Forensic data recovery

Definition

The forensic acquisition in full or in part of data stored on non-functioning storage media through the use of sophisticated equipment and techniques for the purpose of presenting the data in a legal forum.

Todd G. Shipley –Great Basin Data Recovery

Actuator

The Actuator in modern hard disks is called a "Voice coil actuator". It works by utilizing two powerful magnets that have their polarity manipulated by the VCM (Voice coil motor). By changing polarity in the magnets this causes the voice coil itself to change direction either away, or towards the magnets. This mechanism works at extreme speed, but accuracy is not achieved without help from the servo (also known as Servo data, or PES (positional error system))

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Actuator Arm

The actuator arm extends out enough so that the heads at the tip can read the inner most tracks on the drive. The preamp on most modern drives is located on the Arm. The arm can actually be very complex on higher capacity drives where there are many platters.

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Actuator Axis

Just like an Axle on a car; the axis is in the middle of the Actuator arm; and holds the head assembly in place. If this becomes unaligned, or bends; this can be catastrophic to the drive

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Adaptives

This is the term used to identify the unique characteristics of a hard drive as defined in the firmware located in the ROM or RAM chip of the PCB and the modules found in the Service Area of the hard disk drive.

Analog signals

The Signals which come directly from the read/write heads, before digitalization..

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Areal Density

The number of bits of data that can be recorded onto the surface of a disk or platter usually measured in square inches. Areal density, also sometimes called bit density, refers to the amount of data that can be stored in a given amount of hard disk platter "real estate". Since disk platters surfaces are of course two-dimensional, areal density is a measure of the number of bits that can be stored in a unit of area. It is usually expressed in bits per square inch (BPSI).

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

AT/ATA

Advanced Technology Attachment is the name of the standard interface and protocol for the connection of hard drives to computers.

Bad Block

A block (usually the size of a sector) that cannot reliably hold data because of a media flaw or damaged format markings.

<http://www.datarecoverygroup.com/faq-glossary/glossary.htm>

Backup

A copy of inactive data created as a precaution against the loss or damage of the original data.

www.krollontrack.com/resource-library/glossary/legal/

Binary

Mathematical base two, or numbers composed of a series of zeros and ones. Since

zeros and ones can be easily represented by two voltage levels on an electronic device, the binary number system is widely used in digital computing.

www.krollontrack.com/resource-library/glossary/legal/

Bit

The smallest unit measurement of data. A bit is either the "1" or "0" component of the binary code. A collection of bits is put together to form a byte.

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Byte

A byte consists of eight bits. A byte is a collection of bits used by computers to represent a character (e.g. "a", "1" or "&"). A "megabyte" is roughly one million bytes (1,048,576 actual bytes) and a "gigabyte" is roughly one billion bytes (1,073,741,824 actual bytes).

1 kilobyte = 1,024 bytes (usually referred to as 1,000 bytes)

1 megabyte = 1,024 kilobytes (usually referred to as 1,000 kilobytes)

1 gigabyte = 1,024 megabytes (usually referred to as 1,000 megabytes)

1 terabyte = 1,024 gigabytes (usually referred to as 1,000 gigabytes)

1 petabyte = 1,024 terabytes (usually referred to as 1,000 terabytes)

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CERT

Clean environment

A Clean environment is a dust controlled environment that meets a standard of less than one hundred particles larger than 0.5 microns in each cubic foot of air space. Clean environments are often Laminar flow hoods that are used to open hard drives in a dust limited environment for the purpose of their internal repair.

Clean room

A Clean room is an environmentally controlled, dust-free environment in which hard drives are assembled or opened for internal inspection or servicing. These are the facilities used to assemble or service hard disks.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Cluster

A cluster is defined as an allocation unit. It is a group of sectors. Most file systems group sectors together and handle the group as one unit. The cluster size (number of sectors per cluster) varies with the storage media and is fixed at time of format. At least one cluster is allocated to each file, regardless of the file's size, that is stored in the DOS environment. Windows allocates space to files in units called clusters. Each cluster contains from 1 to 64 sectors, depending on the type and size of the disk. A cluster is the smallest unit of disk space that can be allocated for use by files

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Clone

A hard drive containing a duplication of the data found on the Source drive. Source drive functionality will determine whether or not the drive is duplicated bit for bit. The clone drive contains the recoverable data copied from the Source drive after repair.

Computer Forensics

The use of specialized techniques for recovery, authentication and analysis of electronic

data when a case involves issues relating to reconstruction of computer usage, examination of residual data, authentication of data by technical analysis or explanation of technical features of data and computer usage. Computer forensics requires specialized expertise that goes beyond normal data collection and preservation techniques available to end-users or system support personnel.

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Cover Mounting Holes

This is where the screws that hold the cover in place are inserted. Usually there are at minimum seven of these.

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CRC

Acronym for Cyclic Redundancy Check. The CRC is used to verify data block integrity. In a typical scheme, 2 CRC bytes are added to each user data block. The 2 bytes are computed from the user data, by digital logical chips. The mathematical model is made up of polynomials with binary coefficients. When reading back data, the CRC bytes are read and compared to new CRC bytes computed from the read back block to detect a read error. The read back error check process is mathematically equivalent to dividing the read block, including its CRC, by a binomial. If the division remainder is zero, the data is error free.

<http://www.datarecoverygroup.com/faq-glossary/glossary.htm>

Cylinder

On a disk, all tracks with the same radius are referred to as a cylinder. The cylindrical surface formed by identical track numbers on vertically stacked discs. At any location of the head positioning arm, all tracks under all heads are the cylinder. The cylinder number is one of the three address components required to find a specific address. The other two are head number and sector number.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Data

Information stored on the computer system and used by applications to accomplish tasks.

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Dedicated Servo

A technology in which timing or positioning signals are located on a dedicated disk containing no user data. These signals provide the information the actuator needs to fine-tune the position of the read/write heads.

<http://www.datarecoverygroup.com/faq-glossary/glossary.htm>

Defect Management

A general methodology of eliminating data errors on a recording surface by mapping out known defects on the media. The defective areas are rendered inaccessible, so that when information is written to the disk, it is stored to non-defective locations on the disk. See G-List and P-List. A technique ensuring long-term data integrity. Defect management consists of scanning disk drives both at the factory and during regular use, deallocating defective sectors before purchase and compensating for new defective sectors afterward.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Disk

Used synonymous with hard disk. Refers to the most common form of data storage that uses disks of magnetized materials to save data. Can be used about any storage media where the actual media is a circular disc - hard or soft kernel, magnetic or optical technology. Circular platters. The actual media. See platter.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Digital Forensics

The broader term related to the forensic examination of various devices or media containing digital evidence. Computer forensics is a subset of digital forensics.

Donor Drive

A donor is a drive used to obtain physical parts or firmware for the repair of the Source drive. Manufacturers have specific codes, numbers, and letters that identifying a drives unique characteristics. The Donor hard drive must match these unique characteristics to be useful in the forensic data recovery process.

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ECC

Acronym for Error Correction Code. The incorporation of extra parity bits in transmitted data in order to detect errors that can be corrected by the controller.

<http://www.datarecoverygroup.com/faq-glossary/glossary.htm>

EEPROM

Electronically Erasable Programmable Read-Only Memory. This is a form of flash memory which can withhold important "adaptive data" for the HDD. This data is vital to the hard drive's ability to function, and without it a drive will not work. The EEPROM is like a fingerprint. Every single drive has different data stored within.

<http://www.datarecovery-terms.com/>

EIDE

Stands for enhanced integrated drive electronics. A specific type of attachment interface specification that allows for high-performance, large-capacity drives. See also IDE.

www.krollontrack.com/resource-library/glossary/technical/

Embedded Servo - A method of using the space between sectors (intersector gaps) on each data surface of a disc drive to provide servo-positioning information. This method uses the same head to read both servo and data information, allowing all surfaces to be used for data storage.

<http://www.datarecoverygroup.com/faq-glossary/glossary.htm>

Evidence Preservation Drive

The hard drive to which the forensic image file, or hashing output of files, from Logical storage drive are stored for long term archival (this data can be sent to the Target drive if that drive contains sufficient space).

Firmware

Software contained in a read-only memory (ROM) device.

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Flying Height

The distance between the read/write head and the disk surface, made up of a cushion of air that keeps the head from contacting the media.

<http://www.datarecoverygroup.com/faq-glossary/glossary.htm>

Forensic Image

A **Forensic image** is a single file or files on a storage device containing the complete contents of the user accessible area of a hard drive. The image is obtained using tools that allow the copying of the data without making changes to the data. Often hashing algorithms are applied to verify the image copy against the original.

Formatted Capacity

The actual capacity available to store data in a mass storage device. The formatted capacity is the gross capacity minus the capacity taken up by the overhead data required for formatting the media.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Fragmented Data

Live data that has been broken up and stored in various locations on a single hard drive or disk.

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G-List

Growing Defect List. List of blocks/sector of a disk that has become defective during the lifetime of the disk. The list is updated by the drive itself and stored internally on the disk. The information in this list may indicate the current state of the drive.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Hard disk drive:

Abbreviated as HDD and also referred to as a drive, hard drive, disk or hard disk, a hard disk drive is the component of your computer where data is stored. The data is stored on a disk or platter and accessed by the read/write heads.

<http://www.articlesbase.com/data-recovery-articles/raid-array-terms-and-definitions-4520354.html#ixzz1WYJI7BYO>

Hard Drive Mechatronics

Hard drive mechatronics is the combination of Mechanical engineering, Electronic engineering, Computer engineering, Software engineering, Control engineering, and Systems Design engineering in order to design and manufacture hard disk drives.

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Hash

A document's unique numerical value that can be used to validate whether a copy is an exact replica. The hash value is derived by applying a mathematic formula to a long string of characters. If any characters are changed, the resulting hash value would change, indicating that the document has been modified.

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HDA

Head Disk Assembly. For today's drives this corresponds to the hard disk without the PCB. The mechanical portion of a rigid, fixed hard drive. It usually includes disks, heads, spindle motor, and actuator.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

HDD (Hard Disk Drive)

See Hard Drive.

Head Crash

A head crash is the damage caused by the heads coming in contact with the magnetic surface of the media (platters). The crash causes damage to the read heads and scratches in the magnetic coating. Data that was stored in the scratched area cannot be

recovered. Shavings and dust from one head crash may cause crashes on the other surfaces.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Head

A small electromagnetic device inside a drive that reads, writes, and erases data on the drive's media.

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IDE

Stands for Integrated Drive Electronics. Describes a hard disk with the disk controller integrated within it. See also EIDE

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Jumper

A small, plastic-covered metal clip that slips over two pins protruding from a circuit board. When in place, the jumper connects the pins electronically and closes the circuit, turning it "on".

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Landing Zone

The designated radial zone of the disk, usually at the inner part of the disk, where the heads are stored to avoid contact with the data cylinders when power to the drive is off. The read/write heads inside a drive move over the spinning platter surfaces, in response to a BIOS Seek command. When they reach the specified cylinder address, they stop and are stationary while reading or writing data to a specific sector address. In response to a command, the heads may move to many different addresses to perform data storage or retrieval tasks.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Logical Recovery

The recovery work performed on a copy of the raw data from the damaged unit. The intention is to repair damages to the file system or files, and to make the files available to the customer.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Logical Storage Drive

The hard drive to which the recovered data files from the recovery process conducted on the Working drive are copied to.

Micro-jog

Micro-jog refers to the known off-set between the read head and the write head.

Modules

The term that refers to the software/firmware file found in the Service Area of hard disk drives.

Negative Tracks

Negative tracks are concentric circles numbered with a minus sign that are used to store the data found in the Service Area of some hard disk drives.

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NVRAM

Non-volatile random access memory. This memory basically serves the same function as an EEPROM. NVRAM is mostly found on Hitachi HDDs

<http://www.datarecovery-terms.com/>

Park Area

A designated save non-data landing area designated for the resting of read/write head when drive power is turned off and not in use. (See landing zone)

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

PCB

The PCB or "Printed Circuit Board" is where the power and data cables connect to on a HDD; the PCB also contains the HDD's CPU which controls all of the functions the hard drive performs. It also contains other components such as flash memory that can hold important information about the HDD

<http://www.datarecovery-terms.com/>

Platter

A platter is the disk where digital data is stored within the hard drive. The platter is comprised of a light nonmagnetic material such as aluminum or glass; which is then coated with a magnetic material older drives utilized "iron-oxide," but these days a cobalt based solution is used.

<http://www.datarecovery-terms.com/>

P-List

Primary Defect List. List of defective sectors in a hard drive. The defective sectors may not be used for storing data. The P-List is generated during fabrication. The disk itself stores it internally.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Power Connectors

The power connector is where the connector of the power supply is inserted to provide power to the HDD. Desktop drives utilize 12v and 5v circuits while notebook drives use only the 5v circuit. The connector usually comes in two forms; a standard "Molex connector" or the newer and increasingly more common "SATA connector."

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Preamp

The Preamp is a chip that controls the read/write functions of the head. It reads servo data and controls what head needs to be utilized; as well as the function being performed i.e. reading, writing. It also strengthens the signal being sent by the HDD CPU to insure the heads are receiving the signal properly.

<http://www.datarecovery-terms.com/>

Read/Write Head

Elements used to create and access the information stored magnetically on the platters/tape. A drive with several disk surfaces or platters will have a separate head for each data surface.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Reading Problems

Due to small damages in the magnetic coating of the platters, one or several sectors or groups of sectors may be damaged beyond rescue. This may be a result of rough handling of the disk during transport or installation.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Reserved Area

The area of the hard reserved for the remapping of bad sectors. This area is inaccessible to the user (see G-list).

Ribbon Cable

Connects HDA to logic board; all CPU instructions travel through this cable before reaching the preamp

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ROM

Read-Only Memory. A type of data storage device which is manufactured with fixed contents. The term is most often applied to semiconductor integrated circuit memories. ROM is inherently non-volatile storage - it retains its contents even when the power is switched off, in contrast to RAM. It is used in part for storage of the lowest level bootstrap software (firmware) in a computer.

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SAS

Serial Attached SCSI (SAS) is a computer bus technology primarily designed for transfer of data to and from devices like hard drives, CD-ROM drives and so on. SAS is a serial communication protocol for direct attached storage (DAS) devices. It is designed for the corporate and enterprise market as a replacement for parallel SCSI, allowing for much higher speed data transfers than previously available, and is backwards-compatible with SATA drives. Though SAS uses serial communication instead of the parallel method found in traditional SCSI devices, it still uses SCSI commands for interacting with SAS End devices.

www.krollontrack.com/resource-library/glossary/technical/

Serial ATA (SATA)

In computer hardware, Serial ATA is a computer bus technology primarily designed for transfer of data to and from hard disks and optical drives. It was designed as a successor to the legacy Advanced Technology Attachment standard (ATA), and is expected to eventually replace the older technology (retroactively renamed Parallel ATA or PATA). Serial ATA adapters and devices communicate over a high-speed serial link.

SCSI

SCSI (Small Computer System Interface) is a set of standards for physically connecting and transferring data between computers and peripheral devices. The SCSI standards define commands, protocols, and electrical and optical interfaces. SCSI is most commonly used for hard disks and tape drives, but it can connect a wide range of other devices, including scanners, and optical drives (CD, DVD, etc.). The SCSI standard contains definitions of command sets of specific peripheral device types; the presence of "unknown" as one of these types means that in theory it can be used to interface almost any device, but the standard is highly pragmatic and addressed toward commercial requirements.

www.krollontrack.com/resource-library/glossary/technical/

Sector

Smallest data unit accessible on disk. Normally 512 bytes. Tracks are divided into sections called sectors and the size of these sections are determining by the formatting. The standard sector stores one user record of data. Many factors, such as system type, the drive encoding method, interface and capabilities of the controller determine how many sectors per track are used. Sector and location refer to the sequence number of the sector around the track when the sector is used an address component.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Service Area

The Service Area is the area of the hard drive that contains the modules unique to the hard drive and required to boot the hard drive.

Shock damage

Shock to a hard drive may cause the platters to become displaced, or damage to heads or the magnetic coating of the platters. Dropping a hard drive may also damage to the mechanics within the drive such as the motor. As a consequence, the drive is unable to position the heads correctly along the recorded signals. A shock may later lead to a head crash.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

SMART

Self-Monitoring, Analysis, and Reporting Technology or S.M.A.R.T. is a monitoring system for computer hard disks to detect and report on various indicators of reliability, in the hope of anticipating failures.

http://www.wordiq.com/definition/Self-Monitoring%2C_Analysis_and_Reporting_Technology

Source Drive

The non-functioning hard drive from which data is to be recovered.

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Spindle Motor

The motor within a hard drive that rotates the platters. The motor that rotates the spindle and therefore the disks.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Stiction

The word is a contraction of Static Friction. It is used when the read/write head sticks to the platters lubricate coating. A term used to explain the amount of force needed to start to move an object. Usually higher than is needed to keep the same object moving at a content rate.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Storage Medium

Collective description of all types of media used for data storage. Examples: hard disk, floppy disk, MO, streamer tape, DAT, DLT, CD.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Stuff

A response given during the communication with a hard drive through the use of ATA commands.

Surface

The top or the bottom side of a platter coated with a magnetic material required recording data. A platter may use one or both surfaces to store data.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Target Drive

Drive to which data from the source drive is written to during the recovery process. This is not the same as the drive containing the forensic image.

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Track

Concentric circles where the data is stored, divided into sectors.

<http://datarecoverydoctor.co.uk/data-recovery-dictionary.html>

Track Zero (Maintenance Track)

A internally stored logical starting point on a hard disk used to perform sequential seek operations on target tracks of the disk

<http://www.datarecoverygroup.com/faq-glossary/glossary.htm>

Working Drive

The hard drive to which a forensic image is blown onto for data recovery processing.

Write-Protection

A mechanism that prevents modification or erasure of data. Write-protected files can be read, but not written to, edited, deleted or otherwise modified.

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