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## GLOSSARY

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### A

**ACCESS** – (v) Read, write, or update information on some storage medium, such as a disk. (n) One of these operations.

**ACCESS TIME** – The interval between the time a request for data is made by the system and the time the data is available from the drive. Access time includes the actual seek time, rotational latency, and command processing overhead time. See also seek, rotational latency, and overhead.

**ACTUATOR** – Also known as the *positioner*. The internal mechanism that moves the read/write head to the proper track. The Quantum actuator consists of a rotary voice coil and the head mounting arms. One end of each head mounting arm attaches to the rotor with the read/write heads attached at the opposite end of each arm. As current is applied to the rotor, it rotates, positioning the heads over the desired cylinder on the media.

**AIRLOCK** – A patented Quantum feature that ensures durable and reliable data storage. Upon removal of power from the drive for any reason, the read/write heads automatically park and lock in a non data area called the landing zone. AIRLOCK allows the drive to withstand high levels of non-operating shock. When power is applied to the drive, airflow created from the spinning disks causes the AIRLOCK arm to swing back and unlock the actuator, allowing the heads to move from the landing zone. Upon power down, the AIRLOCK swings back to the locked position, locking the heads in the landing zone. A park utility is not required to park the heads on drives equipped with AIRLOCK (all Quantum drives).

**ALLOCATION** – The process of assigning particular areas of the disk to particular files. See also allocation unit.

**ALLOCATION UNIT** – An allocation unit, also known as a *cluster*, is a group of sectors on the disk that can be reserved for the use of a particular file.

**AVERAGE SEEK TIME** – The average time it takes for the read/write head to move to a specific location. To compute the average seek time, you divide the time it takes to complete a large number of random seeks all over the disk by the number of seeks performed.

### B

**BACKUP** – A copy of a file, directory, or volume on a separate storage device from the original, for the purpose of retrieval in case the original is accidentally erased, damaged, or destroyed.

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

**BAD TRACK TABLE** – A label affixed to the casing of a hard disk drive that tells which tracks are flawed and cannot hold data. The listing is typed into the low-level formatting program when the drive is being installed. Because Quantum disk drive's defect-management scheme handles all such flaws automatically, there is no need to concern yourself with bad track tables.

**BIT** – Abbreviation for binary digit. A binary digit may have one of two values—1 or 0. This contrasts with a decimal digit, which may have a value from 0 to 9. A bit is one of the logic 1 or logic 0 binary settings that make up a byte of data. See also byte.

**BLOCK** – A sector or group of sectors. By default, a block of data consists of 512 bytes.

**BPI** – Abbreviation for *bits per inch*. A measure of how densely information is packed on a storage medium. Flux changes per inch is also a term commonly used in describing storage density on a magnetic surface.

**BUFFER** – An area of RAM reserved for temporary storage of data that is waiting to be sent to a device that is not yet ready to receive it. The data is usually on its way to or from the disk drive or some other peripheral device.

**BUS** – The part of a chip, circuit board, or interface designed to send and receive data.

**BYTE** – The basic unit of computer memory, large enough to hold one character of alphanumeric data. Comprised of eight bits. See also bit.

## C

**CACHE** – Random-access memory used as a buffer between the CPU and a hard disk. Information more likely to be read or changed is placed in the cache, where it can be accessed more quickly to speed up general data flow.

**CAPACITY** – The amount of information that can be stored on a disk drive. The data is stored in bytes, and capacity is usually expressed in megabytes.

**CDB** – Command Descriptor Block. The SCSI structure used to communicate requests from an initiator (system) to a target (drive).

**CLEAN ROOM** – An environmentally controlled dust-free assembly or repair facility in which hard disk drives are assembled or can be opened for internal servicing.

**CLUSTER** – A group of sectors on a disk drive that is addressed as one logical unit by the operating system.

**CONTROLLER** – Short form of *disk controller*. The chip or complete circuit that translates computer data and commands into a form suitable for use by the disk drive.

**CONTROLLER CARD** – An adapter holding the control electronics for one or more hard disks, usually installed in a slot in the computer.

**CPU** – Acronym for *Central Processing Unit*. The microprocessor chip that performs the bulk of data processing in a computer.

**CRC** – Acronym for *Cyclic Redundancy Check*. An error detection code that is recorded within each sector and is used to see whether parts of a string of data are missing or erroneous.

**CYLINDER** – On a disk drive that has more than one recording surface and heads that move to various tracks, the group of all tracks located at a given head position. The number of cylinders times the number of heads equals the number of tracks per drive.

## D

**DATA SEPARATOR** – On a disk drive that stores data and timing information in an encoded form, the circuit that extracts the data from the combined data and clock signal.

**DEDICATED SERVO** – A surface separate from the surface used for data that contains only disk timing and positioning information and contains no data.

**DEFECT MANAGEMENT** – A method that is implemented to ensure long term data integrity. Defect management eliminates the need for user defect maps. This is accomplished by scanning the disk drives at the factory for defective sectors. Defective sectors are deallocated prior to shipment. In addition, during regular use, the drive continues to scan and compensate for any new defective sectors on the disk.

**DISK** – In general, any circular-shaped data-storage medium that stores data on the flat surface of the platter. The most common type of disk is the magnetic disk, which stores data as magnetic patterns in a metal or metal-oxide coating. Magnetic disks come in two forms: floppy and hard. Optical recording is a newer disk technology that gives higher capacity storage but at slower access times.

**DISK CONTROLLER** – A plug-in board, or embedded circuitry on the drive, that passes information to and from the disk. The Quantum disk drives all have controllers embedded on the drive printed-circuit board.

**DISKWARE** – The program instructions and data stored on the disk for use by a processor.

**DMA** – Acronym for *direct memory access*. A process by which data moves directly between a disk drive (or other device) and system memory without passing through the CPU, thus allowing the system to continue processing other tasks while the new data is being retrieved.

**DRIVE** – Short form of *disk drive*.

**DRIVE GEOMETRY** – The functional dimensions of a drive in terms of the number of heads, cylinders, and sectors per track. See also logical format.

## E

**ECC** – Acronym for *error correction code*. The recording of extra verifying information encoded along with the disk data. The controller uses the extra information to check for data errors, and corrects the errors when possible.

**EMBEDDED SERVO** – A timing or location signal placed on the disk's surface on the tracks that also store data. These signals allow the actuator to fine-tune the position of the read/write heads.

**ENCODING** – The protocol by which particular data patterns are changed prior to being written on the disk surface as a pattern of On and Off or 1 and 0 signals.

**EXTERNAL DRIVE** – A drive mounted in an enclosure separate from the PC or computer system enclosure, with its own power supply and fan, and connected to the system by a cable.

## F

**FAT** – Acronym for *file allocation table*. A data table stored on the outer edge of a disk that tells the operating system which sectors are allocated to each file and in what order.

**FCI** – Acronym for *flux changes per inch*. See also BPI.

**FILE SERVER** – A computer that provides network stations with controlled access to shareable resources. The network operating system is loaded on the file server, and most shareable devices (disk subsystems, printers) are attached to it. The file server controls system security and monitors station-to-station communications. A dedicated file server can be used only as a file server while it is on the network. A non dedicated file server can be used simultaneously as a file server and a workstation.

**FLUX DENSITY** – The number of magnetic field patterns that can be stored in a given length of disk surface. The number is usually stated as flux changes per inch (FCI), with typical values in the thousands.

**FLYING HEIGHT** – The distance between the read/write head and the disk surface caused by a cushion of air that keeps the head from contacting the media. Smaller flying heights

permit more dense storage of data, but require more precise mechanical designs.

**FORMAT** – To write onto the disk surface a magnetic track pattern that specifies the locations of the tracks and sectors. This information must exist on a disk before it can store any user data. Formatting erases any previously stored data.

**FORMATTED CAPACITY** – The amount of room left to store data on the disk after the required space has been used to write sector headers, boundary definitions, and timing information generated by a format operation. All Quantum drive capacities are expressed in formatted capacity.

**FORM FACTOR** – The physical outer dimensions of a device as defined by industry standard. For example, most Quantum disk drives use a 3 1/2-inch form factor.

## G

**GIGABYTE (GB)** – One billion bytes (one thousand megabytes).

**GUIDE RAILS** – Plastic strips attached to the sides of a disk drive mounted in an IBM AT and compatible computers so that the drive easily slides into place.

## H

**HALF HEIGHT** – Term used to describe a drive that occupies half the vertical space of the original full size 5 1/4-inch drive. 1.625 inches high.

**HARD DISK** – A type of storage medium that retains data as magnetic patterns on a rigid disk, usually made of an iron oxide or alloy over a magnesium or aluminum platter. Because hard disks spin more rapidly than floppy disks, and the head flies closer to the disk, hard disks can transfer data faster and store more in the same volume.

**HARD ERROR** – A repeatable error in disk data that persists when the disk is reread, usually caused by defects in the media surface.

**HEAD** – The tiny electromagnetic coil and metal pole piece used to create and read back the magnetic patterns (write and read information) on the media.

**HIGH-CAPACITY DRIVE** – By industry conventions typically a drive of 1 gigabytes or more.

**HIGH-LEVEL FORMATTING** – Formatting performed by the operating system's format program. Among other things, the formatting program creates the root directory and file allocation tables. See also low-level formatting.

**HOME** – Reference position track for recalibration of the actuator, usually the outer track (track 0).

**HOST ADAPTER** – A plug-in board that forms the interface between a particular type of computer system bus and the disk drive.

## I

**INITIALIZE** – See low level formatting.

**INITIATOR** – A SCSI device that requests another SCSI device to perform an operation. A common example of this is a system requesting data from a drive. The system is the initiator and the drive is the target.

**INTERFACE** – A hardware or software protocol, contained in the electronics of the disk controller and disk drive, that manages the exchange of data between the drive and computer.

**INTERLEAVE** – The arrangement of sectors on a track. A 1:1 interleave arranges the sectors so that the next sector arrives at the read/write heads just as the computer is ready to access it. See also interleave factor.

**INTERLEAVE FACTOR** – The number of sectors that pass beneath the read/write heads before the next numbered sector arrives. When the interleave factor is 3:1, a sector is read, two pass by, and then the next is read. It would take three revolutions of the disk to access a full track of data. Quantum drives have an interleave of 1:1, so a full track of data can be accessed within one revolution of the disk, thus offering the highest data throughput possible.

**INTERNAL DRIVE** – A drive mounted inside one of a computer's drive bays (or a hard disk on a card, which is installed in one of the computer's slots).

## J

**JUMPER** – A tiny box that slips over two pins that protrude from a circuit board. When in place, the jumper connects the pins electrically. Some board manufacturers use Dual In-Line Package (DIP) switches instead of jumpers.

## K

**KILOBYTE (K)** – A unit of measure consisting of 1,024 ( $2^{10}$ ) bytes.

## L

**LANDING ZONE** – A position inside the disk's inner cylinder in a non data area reserved as a place to rest the heads during the time that power is off. Using this area prevents the heads from touching the surface in data areas upon power down, adding to the data integrity and reliability of the disk drive.

**LATENCY** – The period of time during which the read/write heads are waiting for the data to rotate into position so that it can be accessed. Based on a disk rotation speed of 3,662 rpm, the maximum latency time is 16.4 milliseconds, and the average latency time is 8.2 milliseconds.

**LOGICAL FORMAT** – The logical drive geometry that appears to an AT system BIOS as defined by the drive tables and stored in CMOS. With an installation program like Disk Manager, the drive can be redefined to any logical parameters necessary to adapt to the system drive tables.

**LOOK AHEAD** – The technique of buffering data into cache RAM by reading subsequent blocks in advance to anticipate the next request for data. The look ahead technique speeds up disk access of sequential blocks of data.

**LOW-LEVEL FORMATTING** – Formatting that creates the sectors on the platter surfaces so the operating system can access the required areas for generating the file structure. Quantum drives are shipped with the low-level formatting already done.

**LOW PROFILE** – Describes drives built to the 3 1/2-inch form factor, which are only 1 inch high.

## M

**MB** – See megabyte.

**MEDIA** – The magnetic film that is deposited or coated on an aluminum substrate which is very flat and in the shape of a disk. The media is overcoated with a lubricant to prevent damage to the heads or media during head take off and landing. The media is where the data is stored inside the disk in the form of magnetic flux or polarity changes.

**MEGABYTE (MB)** – A unit of measurement equal to 1,024 kilobytes, or 1,048,576 bytes except when referring to disk storage capacity.

1 MB = 1,000,000 bytes when referring to disk storage capacity.

See also kilobyte.

**MEGAHERTZ** – A measurement of frequency in millions of cycles per second.

**MHz** – See megahertz.

**MICROPROCESSOR** – The integrated circuit chip that performs the bulk of data processing and controls the operation of all of the parts of the system. A disk drive also contains a microprocessor to handle all of the internal functions of the drive and to support the embedded controller.

**MICROSECOND (μs)** – One millionth of a second (.000001 sec.).

**MILLISECOND (ms)** – One thousandth of a second (.001 sec.).

**MTBF** – Mean Time Between Failure. Used as a reliability rating to determine the expected life of the product expressed in power on hours (POH). There are several accepted methods for calculating this value that produce very different results and generate much confusion

in the industry. When comparing numbers you should first verify which method was used to calculate the values.

**MTTR** – Mean Time To Repair. The average time it takes to repair a drive that has failed for some reason. This only takes into consideration the changing of the major sub-assemblies such as circuit board or sealed housing. Component level repair is not included in this number as this type of repair is not performed in the field.

## O

**OVERHEAD** – The processing time of a command by the controller, host adapter or drive prior to any actual disk accesses taking place.

**OVERWRITE** – To write data on top of existing data, erasing it.

**OXIDE** – A metal-oxygen compound. Most magnetic coatings are combinations of iron or other metal oxides, and the term has become a general one for the magnetic coating on tape or disk.

## P

**PARTITION** – A portion of a hard disk devoted to a particular operating system and accessed as one logical volume by the system.

**PERFORMANCE** – A measure of the speed of the drive during normal operation. Factors affecting performance are seek times, transfer rate and command overhead.

**PERIPHERAL** – A device added to a system as an enhancement to the basic CPU, such as a disk drive, tape drive or printer.

**PHYSICAL FORMAT** – The actual physical layout of cylinders, tracks, and sectors on a disk drive.

**PLATED MEDIA** – Disks that are covered with a hard metal alloy instead of an iron-oxide compound. Plated disks can store greater amounts of data in the same area as a coated disk.

**PLATTER** – An disk made of metal (or other rigid material) that is mounted inside a fixed disk drive. Most drives use more than one platter mounted on a single spindle (shaft) to provide more data storage surfaces in a small package. The platter is coated with a magnetic material that is used to store data as transitions of magnetic polarity.

**POH** – Acronym for *power on hours*. The unit of measurement for Mean Time Between Failure as expressed in the number of hours that power is applied to the device regardless of the amount of actual data transfer usage. See MTBF.

**POSITIONER** – See actuator.

## R

**RAM** – Acronym for *random access memory*. An integrated circuit memory chip which allows information to be stored and retrieved by a microprocessor or controller. The information may be stored and retrieved in any order desired, and the address of one storage location is as readily accessible as any other.

**RAM DISK** – A “phantom disk drive” for which a section of system memory (RAM) is set aside to hold data, just as if it were a number of disk sectors. The access to this data is extremely fast but is lost when the system is reset or turned off.

**READ AFTER WRITE** – A mode of operation that has the computer read back each sector on the disk, checking that the data read back is the same as recorded. This slows disk operations, but raises reliability.

**READ VERIFY** – A disk mode where the disk reads in data to the controller, but the controller only checks for errors and does not pass the data on to the system.

**READ/WRITE HEAD** – The tiny electromagnetic coil and metal pole piece used to create and read back the magnetic patterns (write or read information) on the disk. Each side of each platter has its own read/write head.

**REMOVABLE DISK** – Generally they are disk drives where the disk itself is meant to be removed, and in particular of hard disks using disks mounted in cartridges. Their advantage is that multiple disks can be used to increase the amount of stored material, and that once removed, the disk can be stored away to prevent unauthorized use.

**RLL** – Run Length Limited. A method used on some hard disks to encode data into magnetic pulses. RLL requires more processing, but stores almost 50% more data per disk than the MFM method.

**ROM** – Acronym for *read only memory*. Usually in the form of a ROM in the controller that contains programs that can be accessed and read but not modified by the system.

**ROTARY ACTUATOR** – The rotary actuator replaces the stepper motor used in the past by many hard disk manufacturers. The rotary actuator is perfectly balanced and rotates around a single pivot point. It allows closed-loop feedback positioning of the heads, which is more accurate than stepper motors.

**ROTATIONAL LATENCY** – The delay between when the controller starts looking for a specific block of data on a track and when that block rotates around to where it can be read by the read/write head. On the average, it is half of the time needed for a full rotation (about 8 ms.).

## S

**SCSI** – Acronym for *Small Computer System Interface*, an American National Standards Institute (ANSI) version of Shugart Associates' SASI interface between the computer and controller. SCSI has grown in popularity and is one of the most flexible and intelligent interfaces available.

**SECTOR** – A section of space along a track on the disk, or the data that is stored in that section. Hard disks most often have sectors that are 512 data bytes long plus several bytes overhead for error correcting codes. Each sector is preceded by ID data known as a header, which cannot be overwritten.

**SEEK** – A movement of the disk read/write head in or out to a specific track.

**SERVO DATA** – Magnetic markings written on the media that guide the read/write heads to the proper position.

**SERVO SURFACE** – A separate surface containing only positioning and disk timing information but no data.

**SETTLE TIME** – The interval between when a track to track movement of the head stops, and when the residual vibration and movement dies down to a level sufficient for reliable reading or writing.

**SHOCK RATING** – A rating (expressed in Gs) of how much shock a disk drive can sustain without damage.

**SOFT ERROR** – An error in reading data from the disk that does not recur if the same data is reread. Often caused by power fluctuations or noise spikes.

**SOFT SECTORED** – Disks that mark the beginning of each sector of data within a track by a magnetic pattern.

**SPINDLE** – The center shaft of the disk upon which the drive's platters are mounted.

**SPUTTER** – A type of coating process used to apply the magnetic coating to some high-performance disks. In sputtering, the disks are placed in a vacuum chamber and the coating is vaporized and deposited on the disks. The resulting surface is hard, smooth, and capable of storing data at high density. Quantum disk drives use sputtered thin film disks.

**STEPPER** – A type of motor that moves in discrete amounts for each input electrical pulse. Stepper motors used to be widely used for read/write head positioner, since they can be geared to move the head one track per step. Stepper motors are not as fast or reliable as the rotary voice coil actuators which Quantum disk drives use.

**SUBSTRATE** – The material the disk platter is made of beneath the magnetic coating. Hard disks are generally made of aluminum or magnesium alloy (or glass, for optical disks) while the substrate of floppies is usually mylar.

**SURFACE** – The top or bottom side of the platter which is coated with the magnetic material for recording data. On some drives one surface may be reserved for positioning information.

## T

**THIN FILM** – A type of coating, used for disk surfaces. Thin film surfaces allow more bits to be stored per disk.

**TPI** – Acronym for *tracks per inch*. The number of tracks or cylinders that are written in each inch of travel across the surface of a disk.

**TRACK** – One of the many concentric magnetic circle patterns written on a disk surface as a guide to where to store and read the data.

**TRACK DENSITY** – How closely the tracks are packed on a disk surface. The number is specified as tracks per inch (TPI).

**TRACK TO TRACK SEEK TIME** – The time required for the read/write heads to move to an adjacent track.

**TRANSFER RATE** – The rate at which the disk sends and receives data from the controller. Drive specifications usually reference a high number that is the burst mode rate for transferring data across the interface from the disk buffer to system RAM. Sustained data transfer is at a much lower rate because of system processing overhead, head switches, and seeks.

## U

**UNFORMATTED CAPACITY** – The total number of bytes of data that could be fit onto a disk. Formatting the disk requires some of this space to record location, boundary definitions, and timing information. After formatting, user data can be stored on the remaining disk space, known as formatted capacity. The size of a Quantum drive is expressed in formatted capacity.

## V

**VOICE COIL** – A type of motor used to move the disk read/write head in and out to the right track. Voice-coil actuators work like loudspeakers with the force of a magnetic coil causing a proportionate movement of the head. Quantum's actuator uses voice-coil technology, and thereby eliminates the high stress wearing parts found on stepper motor type actuators.

## W

**WEDGE SERVO** – The position on every track that contains data used by the closed loop positioning control. This information is used to fine tune the position of the read/write heads exactly over the track center.

**WINCHESTER DISKS** – Hard disks that use a technology similar to an IBM model using Winchester as the code name. These disks use read/write heads that ride just above the magnetic surface, held up by the air flow created by the turning disk. When the disk stops turning, the heads land on the surface, which has a specially lubricated coating. Winchester disks must be sealed and have a filtration system since ordinary dust particles are large enough to catch between the head and the disk.

**WRITE ONCE** – In the context of optical disks, technologies that allow the drive to store data on a disk and read it back, but not to erase it.