

SHELLY CASHMAN SERIES®

Discovering Computers

Concepts for a Digital World
Web and XP Enhanced

Chapter 7 Storage

Discovering Computers 2003
Concepts for a Digital World
Web and XP Enhanced

Chapter 7 Objectives

- Differentiate between storage and memory**
- Identify various types of storage media and storage devices**
- Explain how a floppy disk stores data**
- Identify the advantages of using high-capacity disks**
- Describe how a hard disk organizes data**
- Identify the advantages of using an Internet hard drive**
- Explain how a compact disc stores data**
- Understand how to care for a compact disc**
- Differentiate between CD-ROMs, CD-RWs, DVD-ROMs and DVD+RWs**
- Identify the uses of tape**
- Understand how an enterprise storage system works**
- Explain how to use PC Cards and other miniature storage media**
- Identify uses of microfilm and microfiche**

Next p.7.2

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Memory Versus Storage

What is storage?

- Media and devices used to store and retrieve data, instructions, and information

Storage

Next p.7.1

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Memory Versus Storage

How does storage differ from memory?

- Stores items for future use, rather than temporarily
- Storage is nonvolatile, rather than volatile

When you want to work with a file, you read it from storage and place it in memory

When you are finished with the file, you write it from memory into storage

Next p.7.4

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Memory Versus Storage

How does volatility compare?

State of Computer	Screen Display	Contents of Memory (most RAM)	Contents of Storage
	Volatile	Volatile	Nonvolatile
ON		C6578 print cartridge \$30.25 per cartridge 2 cartridges \$60.50 total due	
OFF		Screen display and contents of most RAM (memory) erased when power is off	Contents of storage retained when power is off

Next p.7.4 Fig. 7.2

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Memory Versus Storage

What is a storage device and a storage medium?

storage device

Hardware that records and retrieves items to and from a storage medium

storage medium

Physical material on which a computer keeps data, instructions, and information

Next p.7.4

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Memory Versus Storage

What is reading and writing?

reading

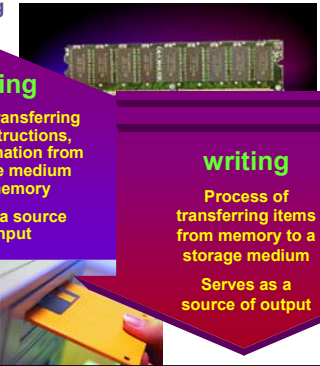
Process of transferring data, instructions, and information from a storage medium into memory

Serves as a source of input

writing

Process of transferring items from memory to a storage medium

Serves as a source of output



Next
p. 7.4

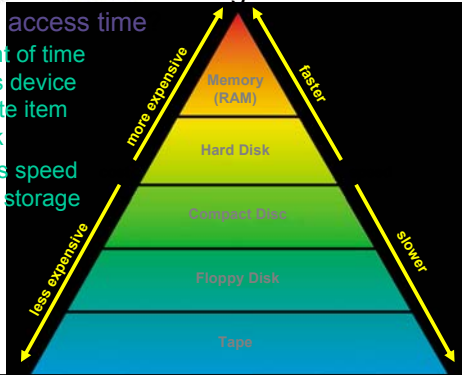
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Memory Versus Storage

What is access time

- Amount of time it takes device to locate item on disk
- Defines speed of disk storage device



Next
p. 7.4 Fig. 7.4

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Memory Versus Storage

What is capacity?

- Number of bytes (characters) storage medium can hold

Storage Term	Abbreviation	Number of bytes
Kilobyte	KB	1 thousand
Megabyte	MB	1 million
Gigabyte	GB	1 billion
Terabyte	TB	1 trillion
Petabyte	PB	1 quadrillion

Next
p. 7.5 Fig. 7.3


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Floppy Disk

What is a floppy disk?

- Portable, inexpensive storage medium
- Today's standard disk is 3.5" wide



Next
p. 7.6

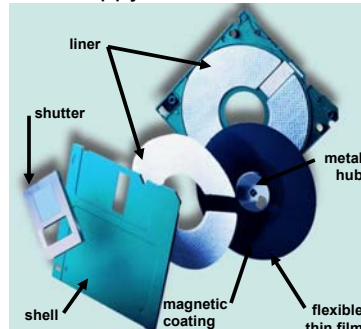
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Floppy Disks

What are the parts of a floppy disk?

- Thin, circular, flexible film enclosed between two liners




Next
p. 7.6 Fig. 7.5

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Floppy Disks

How are floppy disk drives designated?



One floppy drive
drive A



Two floppy drives
drive A
drive B

Next
p. 7.6

Discovering Computers 2003 Floppy Disks

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How does a floppy disk drive work?

- 1: Shutter moves to expose recording surface on disk
- 2: Signal sent to control movement of read/write heads and disk
- 3: If write instruction, circuit board verifies whether disk can be written to
- 4: Motor causes floppy disk to spin
- 5: Motor positions read/write heads over correct location on disk
- 6: Read/write heads read data from or write data on the floppy disk

Next
p. 7.7 Fig. 7-7

Discovering Computers 2003 Floppy Disks

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What are tracks and sectors?

- Track is narrow recording band that forms full circle on disk surface
- Sector can store up to 512 bytes of data

Next
p. 7.8 Fig. 7-8

80 tracks per side X 18 sectors per track X 2 sides per disk X 512 bytes per sector = 1,474,560 bytes

Discovering Computers 2003 Floppy Disks

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What is formatting?

- Process of preparing disk for reading and writing
- Formatting marks bad sectors as unusable

Capacity	1.44 MB
Sides	2
Tracks	80
Sectors per track	18
Bytes per sector	512
Sectors per disk	2880

Next
p. 7.8 Fig. 7-9

Discovering Computers 2003 Floppy Disks

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How do you care for a floppy?

- Proper care helps maximize disk's life
- Floppy disk can last at least seven years

- Avoid exposure to heat and cold
- Avoid exposure to magnetic fields
- Avoid exposure to contaminants such as dust, smoke, or salt air
- Never open the shutter and touch the disk's recording surface
- Keep disks in a storage tray when not using them

Next
p. 7.9

Discovering Computers 2003 Floppy Disks

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What is a write-protect notch?

- Small opening with a cover that you slide
- Protects floppy disks from being erased accidentally

notch open means you cannot write on the disk

notch closed means you can write on the disk

Next
p. 7.9 Fig. 7-10

Discovering Computers 2003 High-Capacity Disks

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What is a high-capacity disk drive?

- Uses disks with capacities of 100 MB and greater
- Primarily used to backup files and transfer files

Zip® drive

Uses a Zip® disk that can store 100 MB or 250 MB of data

Next
p. 7.9 Fig. 7-11

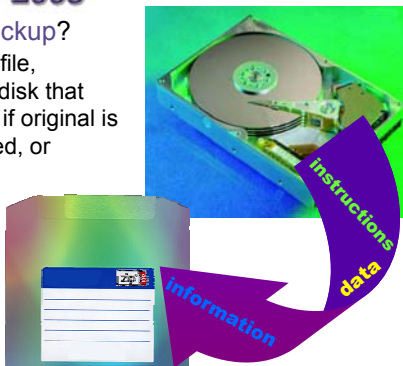
built in Zip® drive

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High-Capacity Disks

What is a **backup**?

- Duplicate of file, program, or disk that you can use if original is lost, damaged, or destroyed

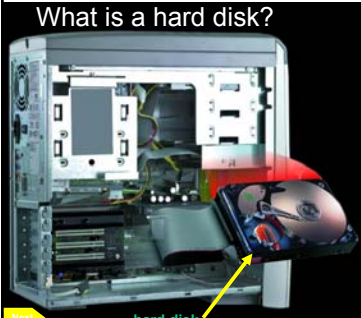


Next
p. 7.9

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Hard Disks

What is a hard disk?



- High-capacity storage
- Consists of several inflexible, circular platters that store items electronically
- Components enclosed in airtight, sealed case for protection

Next
p. 7.10 Fig. 7-12

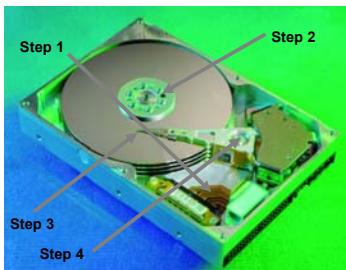
hard disk installed in system unit

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Hard Disks

How does a hard disk work?

- 1: Circuit board controls movement of head activator and small motor
- 2: Small motor spins platters
- 3: When software requests disk access, read/write heads determine location of data
- 4: Head actuator positions read/write head arms over correct location on platters to read or write data

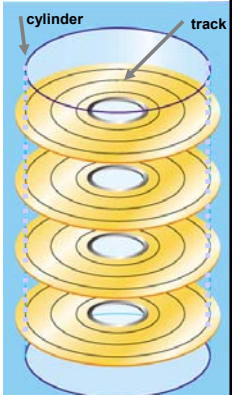


Next
p. 7.11 Fig. 7-13

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Hard Disks

What is a cylinder?



- Location of a single track through all platters
- Single movement of read/write head arms can read same track on all platters

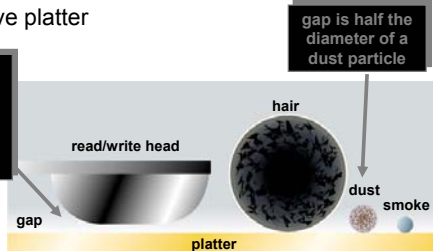
Next
p. 7.11 Fig. 7-14

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Hard Disks

What is a **head crash**?

- Occurs when read/write head touches platter surface
- Spinning creates cushion of air that floats read/write head above platter



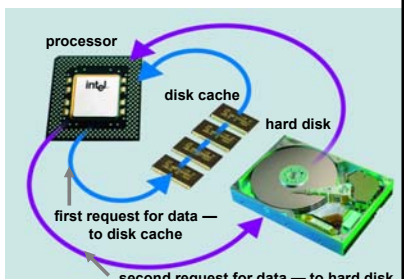
Next
p. 7.12 Fig. 7-15

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Hard Disks

What is a **disk cache**?

- Portion of memory processor uses to store frequently accessed items



Next
p. 7.12 Fig. 7-16

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Hard Disks

What is a **partition**?

- Formatted hard disk divided into separate areas called partitions
- Each partition functions as if it were a separate hard disk drive

one hard disk divided into two partitions

drive C
Designation for first partition or for a single partition on hard disk

drive D
Designation for second partition on hard disk

Next
p. 7.12

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Hard Disks

What is a **removable hard disk**?

- Disk drive in which a plastic or metal case surrounds the hard disk so you can remove it from the drive
- Used for backup or to transfer files

Peerless stores up to 20 GB

Jaz stores up to 2 GB

Next
p. 7.13 Fig. 7-17

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Hard Disks

How does **RAID** work?

- Disk system that duplicates data, instructions, and information to improve data reliability
 - Mirroring has one backup disk for each disk
 - Striping stores data across multiple disks

mirroring (RAID Level 1)

striping

Next
p. 7.14 Fig. 7-19

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Hard Disks

What Windows utilities maintain a hard disk drive?

Windows XP Utility	Function
Backup	Creates a copy of files on a hard disk in case the original is damaged or destroyed.
Disk Cleanup	Frees up space on a hard disk by listing files that can be deleted safely.
Disk Defragmenter	Reorganizes files and unused space on a hard disk so programs run faster.
Scheduled Tasks	Automatically runs a utility at a specified time.
System Restore	Restores backup files to a new hard disk.

System Tools

Next
p. 7.15 Fig. 7-20

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Hard Disks

What is an **Internet hard drive**?

- Service on Web that provides storage to computer users
- Most offer free storage
- Revenues come from advertisers

driveaway.com

Next
p. 7.16 Fig. 7-21

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Hard Disks

What are advantages of an Internet hard drive?

Large audio, video, and graphics files can be downloaded to an Internet hard drive instantaneously

Files can be accessed from any computer or device with Web access

Others can be authorized to access data from your Internet hard drive

Allows offsite backups of data

Next
p. 7.16

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Compact Discs

What is a compact disc (CD)?

- Storage medium
- Most PCs include some type of compact disc drive
- Available in variety of formats

CD-ROM
CD-RW
CD-R
DVD+RW
DVD-ROM



Next
p. 7.17

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Compact Discs

How do you use a compact disc?

- CD drives can read compact discs, including audio discs



Push button to slide out the tray
Insert disc, label side up
Push the same button to close the tray

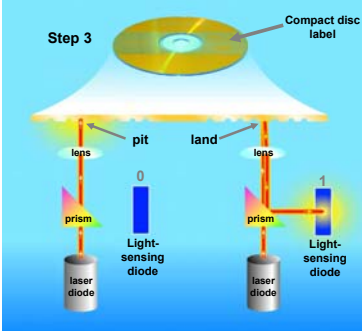
Next
p. 7.17 Fig. 7-22

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Compact Discs

How does a laser read data on a compact disc?

- Laser diode shines light beam toward compact disc
- If light strikes pit, it scatters. If light strikes land, it is reflected back toward laser diode.
- Reflected light deflected to light-sensing diode, which sends digital signal of 1. Absence of reflected light read as digital signal of 0.



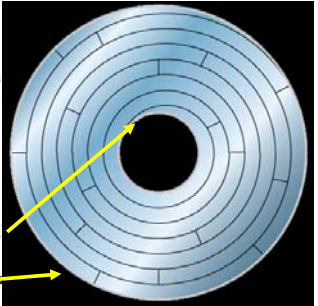
Next
p. 7.18 Fig. 7-23

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Compact Discs

How is data stored on a compact disc?

- Typically stores items in single track
- Track divided into evenly sized sectors that store items



Single track spirals to edge of disc
Compact disc sectors

Next
p. 7.18 Fig. 7-24

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Compact Discs

What is a jewel box?

- Protective case for compact disc



jewel box

Next
p. 7.19 Fig. 7-25

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Compact Discs

How should you care for a compact disc?

- Do not expose to excessive heat or sunlight
- Do not eat, smoke, or drink near a disc
- Do not stack
- Do not touch underside
- Store in jewel box when not in use
- Hold disc by its edges




Next
p. 7.19 Fig. 7-26

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CD-ROMs

What is a CD-ROM?

- Compact disc that uses same laser technology as audio CDs for recording music
- Cannot erase or modify contents
- Typical CD-ROM holds about 650 MB
- Commonly used to distribute software and games



Next
p. 7.20

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CD-ROMs

What is the data transfer rate of a CD-ROM drive?

40X
 $40 \times 150 \text{ KB per second} = 6,000 \text{ KB per second or } 6 \text{ MB per second}$

75X
 $75 \times 150 \text{ KB per second} = 11,250 \text{ KB per second or } 12.25 \text{ MB per second}$

Next
p. 7.20

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CD-R and CD-RW

What is a CD-R (compact disc-recordable)?

- Compact disc onto which you can record text, graphics, and audio
- Write on CD-R using CD burner (recorder) or CD-R drive and special software

- ⊕ CD-R drive can read and write both audio CDs and standard CD-ROMs
- ⊕ Cannot erase disc's contents




Next
p. 7.22

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CD-R and CD-RW

What is a CD-RW (compact disc-rewritable)?

- Erasable disc you can write on multiple times
- Must have a CD-RW disc, CD-RW software, and CD-RW drive



Next
p. 7.22

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CD-R and CD-RW

How is an audio CD created?

Step 1: Artist composes song and creates CD

Step 2a: Song stored on audio CD and purchased by user

OR

Step 2b: Song compressed and stored on Internet


Step 3a: User inserts audio CD into CD-ROM drive, plays song, and copies it to hard disk

OR

Step 3b: User downloads song as audio file to hard disk

Step 4: User copies file to CD-RW disc

Step 5: User listens to song on personal computer or removes CD and listens to song on portable CD player




Next
p. 7.23 Fig. 7-29

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DVD-ROMs

What is a DVD-ROM (digital video disc-ROM)?

- High capacity compact disc capable of storing from 4.7 GB to 17 GB
- Must have DVD-ROM drive or DVD player to read DVD-ROM
- Primarily used for movies
- Next-generation software will be delivered on DVD



Next
p. 7.24 Fig. 7-30

Discovering Computers 2003 DVD-ROMs

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How does a DVD-ROM store data?

- Two layers of pits are used, where lower layer is semitransparent
- Laser can read through it to upper layer
- DVD+RW is a rewritable DVD

Sides	Layers	Storage Capacity
1	1	4.7 GB
1	2	8.5 GB
2	1	9.4 GB
2	2	17 GB

Next
p. 7.25 Fig. 7-31

Discovering Computers 2003 Tapes

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What is **tape**?

- Magnetically coated ribbon of plastic capable of storing large amounts of data and information at a low cost
- Primarily used for backup



Next
p. 7.26 Fig. 7-32

Discovering Computers 2003 Tapes

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What is sequential access versus direct access?

sequential access

Reading and writing data consecutively
Method used for tape

direct access

You can locate a particular data item or file immediately
Method used for floppy disks, hard disks, and compact discs
Also called random access

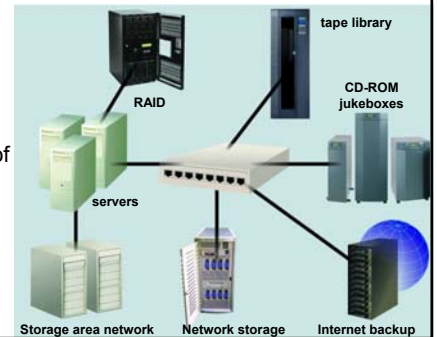
Next
p. 7.26

Discovering Computers 2003 Enterprise Storage Systems

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What is an enterprise storage system?

- Strategy that focuses on availability, protection, organization, and backup of storage in a company



Next
p. 7.27 Fig. 7-34

Discovering Computers 2003 PC Cards

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What are uses of PC Cards?

Category	Thickness	Use
Type I	3.3 mm	RAM, SRAM, flash memory
Type II	5.0 mm	Modem, LAN, SCSI, sound, TV tuner, storage
Type III	10.5 mm	Rotating storage such as a hard disk





Next
p. 7.28 Fig. 7-36

Discovering Computers 2003 Miniature Mobile Storage Media

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What is miniature mobile storage media?

- Handheld devices use to augment internal storage

Device Name	Storage Capacity	Type, Use
CompactFlash 	40 MB	Cartridge Digital cameras, notebook computers
Memory Stick 	2 to 256 MB	Memory Card Digital cameras, handheld computers, notebook computers, printers, cellular telephones
Microdrive 	1 GB	Memory Card Digital cameras, handheld computers, music players, video cameras
SmartMedia 	2 to 128 MB	Memory Card Digital cameras, handheld computers, photo printers, cellular telephones

Next
p. 7.28 Fig. 7-37

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Miniature Mobile Storage Media

How is miniature storage media used?

- Handheld devices, such as players and wallets, read or display contents of miniature storage media such as memory cards




Next
 p. 7.29 Fig. 7-38

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Miniature Mobile Storage Media

What is a smart card?

- Stores data on thin microprocessor embedded in credit card



smart card

Next
 p. 7.29 Fig. 7-39

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Miniature Mobile Storage Media

What are the types of smart cards?

- Intelligent smart card contains processor and has input, process, output, and storage capabilities
- Memory card has only storage capabilities

- Store data such as photographs, music, books, and video clips
- Store a prepaid dollar amount that is updated when the card is used
- Store patient records, vaccination data, and other healthcare information
- Store tracking information such as customer purchases or employee attendance

Next
 p. 7.29

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Miniature Mobile Storage Media

What is electronic money?

- Means of paying for goods and services over the Internet
- Also called e-money or digital cash

- Bank issues unique digital cash numbers that represent an amount of money
- When you purchase digital cash, the amount of money is withdrawn from your bank account
- To use the card, swipe it through a card reader


Next
 p. 7.29

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Microfilm and Microfiche

What are microfilm and microfiche?

- Store microscopic images of documents on a roll or a sheet of film
- Images recorded using a computer output microfilm (COM) recorder



- Microfilm**
 Uses a 100- to 215-foot roll of film
- Microfiche**
 Uses a small sheet of film, usually 4" x 6"

Next
 p. 7.30 Fig. 7-40

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Microfilm and Microfiche


How do life expectancies of various media compare?

Media Type	Guaranteed Life Expectancy	Potential Life Expectancy
Tape	2 to 5 years	20 years
Compact Disc	5 years	50 to 100 years
Microfilm	100 years	200 years

Next
 p. 7.30 Fig. 7-41

Discovering Computers 2003 Summary
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What are suggested storage devices for the Home user?




Home

- 3.5-inch HD floppy disk drive
- 250 MB Zip® drive
- 40 GB hard disk
- Internet hard drive
- CD-ROM drive
- CD-RW/DVD drive

Next
 p. 7.31 Pg. 140

Discovering Computers 2003 Summary
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What are suggested storage devices for the SOHO user?




Small Office/Home Office

- 3.5-inch HD floppy disk drive
- 60 GB hard disk
- Internet hard drive
- CD-ROM drive
- CD-RW/DVD drive
- 20 GB Peerless drive

Next
 p. 7.31 Pg. 140

Discovering Computers 2003 Summary
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What are suggested storage devices for the Mobile user?




Mobile

- 3.5-inch HD floppy disk drive
- 10 GB hard disk
- 1 GB PC Card hard disk
- Internet hard drive
- CD-RW/DVD drive

Next
 p. 7.31 Pg. 140

Discovering Computers 2003 Summary
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What are suggested storage devices for the Large Business user?




Large Business

- 3.5-inch HD floppy disk drive
- 80 GB hard disk
- CD-ROM drive
- CD-RW/DVD drive
- Microfilm or microfiche
- Smart card reader
- RAID
- Tape drive
- Enterprise storage system

Next
 p. 7.31 Pg. 140

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What are suggested storage devices for the Power user?



Power

- 3.5-inch HD floppy disk drive
- DVD+RW drive
- 100 GB hard disk
- CD-ROM drive
- Internet hard drive
- 20 GB Peerless drive

Next
 p. 7.31 Pg. 140

Discovering Computers 2003 Summary of Storage
 Concepts for a Digital World
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- Memory versus storage
- Floppy disks
- High-capacity disks
- Hard disks
- Compact discs
- CD-ROMs
- CD-R and CD-RW

Next

(Continued)

- DVD+RW and DVD-ROM
- Tapes
- Enterprise storage systems
- PC Cards
- Miniature mobile storage media
- Microfilm and microfiche

Chapter 7 Complete