

**Discovering Computers 2003** Chapter 6 Objectives  
Concepts for a Digital World Web and XP Enhanced

- Define the four categories of output
- Describe the uses of speakers and headsets
- Identify the different types of display devices
- Identify the purpose of data projectors, fax machines, and multifunction devices
- Describe factors that affect the quality of a display device
- Explain how a terminal is both an input and output device
- Identify monitor ergonomic issues
- Identify output options for physically challenged users
- Explain the differences among various types of printers

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**Discovering Computers 2003** What is Output?  
Concepts for a Digital World Web and XP Enhanced

### What is output?

- Data that has been processed into a useful form, called information

Next p. 62 Fig. 6-1

**Discovering Computers 2003** What Are Output Devices?  
Concepts for a Digital World Web and XP Enhanced

### What is an output device?

- Any hardware component that can convey information to a user

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

### What is a display device?

- Television-like
- Information on a display device sometimes is called soft copy

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**Discovering Computers 2003** Display Devices  
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### What is a CRT monitor?

- Large sealed, glass screen
- Screen coated with tiny dots of phosphor material
- Pixel, or picture element, is single point in electronic image
- Three dots (red, blue, and green) combine to make up each pixel

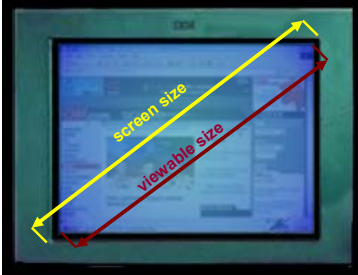
Next p. 65 Fig. 6-3

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**Discovering Computers 2003** Display Devices  
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What are typical sizes for CRT monitors?

- 15, 17, 19, 21, and 22 inch screen size
- Viewable size is diagonal measurement of actual viewing area provided by the monitor




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**Discovering Computers 2003** Display Devices  
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What is a liquid crystal display (LCD) monitor?

- Type of flat-panel display
- Uses liquid crystals between two sheets of material to present information on screen
- Electric current passes through crystals, which creates images on the screen



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p. 65 Fig. 64

**Discovering Computers 2003** Display Devices  
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Where are some features of LCD screens?

- Lightweight and compact
- Consumes less than one-third of the power than does a CRT monitor
- Ideal for notebook and handheld computers



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p. 66 Fig. 65

**Discovering Computers 2003** Display Devices  
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What is a Web-enabled device?

- Allows access to the Web or e-mail
  - Cellular telephones
  - Pagers
- Many use monochrome LCD displays to save battery power




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**Discovering Computers 2003** Display Devices  
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What is an electronic book (e-book) ?

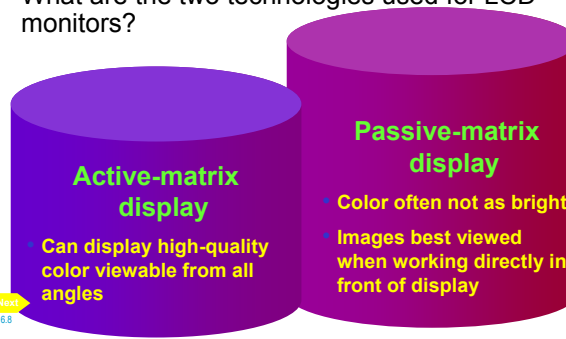
- Small, book-sized computer that uses an LCD screen
- Allows users to read, save, highlight, bookmark, and add notes to online text
- Download new book content from Web



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**Discovering Computers 2003** Display Devices  
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What are the two technologies used for LCD monitors?




- Active-matrix display**
  - Can display high-quality color viewable from all angles
- Passive-matrix display**
  - Color often not as bright
  - Images best viewed when working display directly in front of display

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

What is a **gas plasma monitor**?

- Flat-panel display uses layer of gas plasma between two sheets of material
  - Larger screen sizes and higher display quality than LCD, but much more expensive



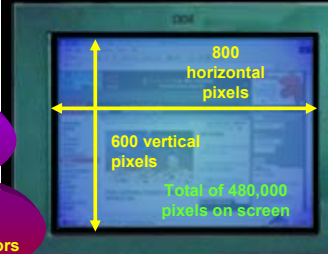
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p. 6.8 Fig. 6.8

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

What is **display resolution**?

- Describes the sharpness and clarity of image
- The higher the resolution, the sharper the image and the more that can display on the monitor

- 800 x 600 most common
- 1280 x 1024 maximum resolution of most monitors
- 2048 x 1536 maximum for high-end monitors

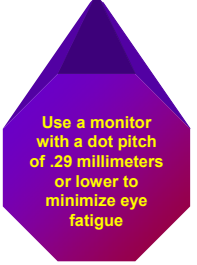


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**Discovering Computers 2003** Concepts for a Digital World Web and XP Enhanced **Display Devices**

What is **dot pitch**?

- Measure of the distance between pixels
- Sometimes called **pixel pitch**
- Smaller the distance between the pixels, the sharper the image




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

What is **refresh rate**?

- Speed at which monitor redraws images on the screen

- Should be fast enough to maintain a constant, flicker-free image
- High-quality monitor will provide refresh rate of at least 75 hertz
- Image on the screen redraws itself 75 times per second




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

What is a **video card**?

- Converts digital output from computer into analog video signal
- Controls how display device produces picture
- Also called **graphics card** or **video adapter**

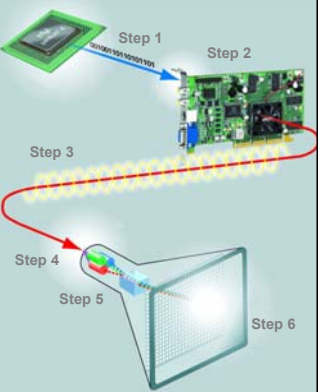


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**Discovering Computers 2003** Concepts for a Digital World Web and XP Enhanced **Display Devices**

How does video travel from the processor to a CRT monitor?

- 1: Processor sends digital data to video card
- 2: Video card converts digital data to analog signal
- 3: Analog signal sent via cable to CRT monitor
- 4: CRT separates signal into red, green, and blue signals
- 5: Electron guns fire color signals to front of CRT
- 6: Image displays



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p. 6.10 Fig. 6-10

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## Display Devices

### What is bit depth?

- Number of bits a video card uses to store information about each pixel
- Also called **color depth**
- Determines number of colors a video card can display
- Greater the number of bits, better the resulting image

**8-bit video card**       $2^8 =$   
 $2 \times 2 \times$   
 $2 \times 2 \times$   
 $2 \times 2 \times$   
 $2 \times 2 =$   
**256**  
**colors**

Uses 8 bits to store information about each pixel  
Can display 256 different colors

**24-bit video card**       $2^{24} =$   
**16.7 million**  
**colors**

Uses 24 bits to store information about each pixel  
Can display 16.7 million colors

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## Display Devices

### What are video standards?

- Video Electronics Standards Association (VESA) develops video standards

Standard	Suggested Resolution	Possible Simultaneous Colors
Monochrome Display Adapter (MDA)	720 x 350	1 for text
Video Graphics Array (VGA)	640 x 480	16
	320 x 200	256
Extended Graphics Array (XGA)	1024 x 768	256
	640 x 480	65,536
Super Video Graphics Array (SVGA)	800 x 600	16.7 million
	1024 x 768	16.7 million
	1280 x 1024	16.7 million
	1600 x 1200	16.7 million
Beyond SVGA	1920 x 1440	16.7 million
	2048 x 1536	16.7 million

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## Display Devices

### What are various video card configurations?

Video Memory	Color Depth	Number of Colors	Resolution
1 MB	8-bit	256	1024 x 768
	16-bit	65,536	800 x 600
2 MB	8-bit	256	1024 x 768
	16-bit	65,536	1280 x 1024
4 MB	24-bit	16.7 million	800 x 600
	24-bit	16.7 million	1024 x 768
6 MB	24-bit	16.7 million	1280 x 1024
8 MB	32-bit	16.7 million	1600 x 1200
16 MB	32-bit	16.7 million	1920 x 1440
32 MB	32-bit	16.7 million	2048 x 1536

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## Display Devices

### What is electromagnetic radiation (EMR)?

- Magnetic field that travels at speed of light
- Small amount produced by all CRT monitors

Sit at arm's length from CRT

EMR is greatest on sides and back of CRT monitor

LCD monitors do not pose this risk


Next p. 6.11

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## Display Devices

### What is the ENERGY STAR® program?

- Program to encourage manufacturers to create energy-efficient devices that require little power when not in use
- Monitors and devices meeting guidelines display ENERGY STAR® label



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## Display Devices

### What is Interactive TV?

- Two-way communications technology in which users interact with television programming
- HDTV works directly with interactive TV

Select a movie from a central library of movies

Bank

Play games

Vote or respond to network questionnaires

Shop


Next p. 6.12

**Discovering Computers 2003** Printers  
Concepts for a Digital World  
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### What is a printer?

- Output device that produces text and graphics on paper
- Result is **hard copy**, or **printout**
- Two orientations

portrait orientation



**Play Auditions...  
... for Grease!**

**HARBOR THEATRE COMPANY**  
The Harbor Theatre Company will be holding auditions.

Lilo Power Company				
Quarterly Company Receipts and Expenditures				
	Q1	Q2	Q3	Q4
Revenue	\$1,200,000	\$1,300,000	\$1,400,000	\$1,500,000
Expenses	\$800,000	\$850,000	\$900,000	\$950,000
Profit	\$400,000	\$450,000	\$500,000	\$550,000
Assets	\$200,000	\$250,000	\$300,000	\$350,000
Liabilities	\$200,000	\$250,000	\$300,000	\$350,000
Equity	\$0	\$0	\$0	\$0
Total	\$400,000	\$450,000	\$500,000	\$550,000


landscape orientation

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**Discovering Computers 2003** Printers  
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### What is an impact printer?

- Forms characters by striking a mechanism against ink ribbon that physically contacts paper
- Ideal for printing multipart forms
- Can withstand dusty environments, vibrations, and extreme temperatures




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**Discovering Computers 2003** Printers  
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### What is a dot-matrix printer?

- Impact printer that produces printed images when tiny wire pins on print head mechanism strike inked ribbon
- Most use continuous-form paper



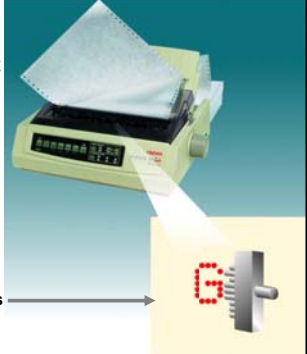
continuous-form paper

**Next**  
p. 6.14 Fig. 6-17

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### How does a dot-matrix printer work?

- When ribbon presses against paper, it creates dots that form characters and graphics
- A higher number of pins (9 to 24) means printer prints more dots per character, which results in higher print quality




dots form characters

**Next**  
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### What is a line printer?

- High-speed impact printer that prints entire line at a time
- Speed measured by number of lines per minute (lpm) it can print
- **Band printer** prints fully-formed characters using a hammer mechanism
- **Shuttle-matrix printer** is high-speed printer that works more like a dot-matrix printer




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### What is a non-impact printer?

- Forms characters and graphics on piece of paper without actually striking paper


ink-jet printer



thermal printer



laser printer




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### What is an ink-jet printer?

- Nonimpact printer forms characters and graphics by spraying tiny drops of liquid ink onto piece of paper
- Most popular type of color printer for home use

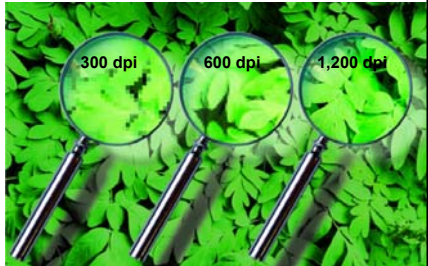


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### What is the resolution of a printer?


- Sharpness and clarity of characters
- Measured by number of dots per inch (dpi) printer can output



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### How does an ink-jet printer work?



**Print cartridge**  
**nozzle print head**  
**firing chamber**  
**resistor**

- 1: Small resistor heats ink, causing ink to boil and form vapor bubble
- 2: Vapor bubble forces ink through nozzle
- 3: Ink drops onto paper
- 4: As vapor bubble collapses, fresh ink is drawn into firing chamber



**ink dot**  
**bubble**  
**nozzle**  
**ink**  
**paper**

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### What is a laser printer?

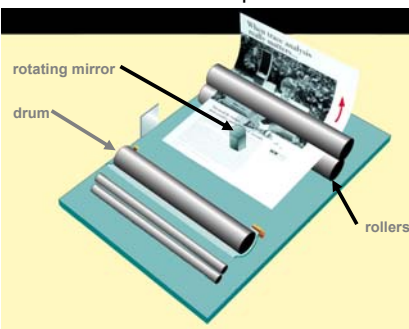
- High-speed, high-quality nonimpact printer
- Prints text and graphics in very high-quality resolution, ranging from 600 to 1,200 dpi
- Typically costs more than ink-jet printer, but is much faster



**Next**  
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### How does a laser printer work?



**rotating mirror**  
**drum**  
**rollers**


- 1: Drum rotates as paper is fed through
- 2: Mirror deflects laser beam across surface of drum
- 3: Laser beam creates charge that causes toner to stick to drum
- 4: As drum rotates, toner transfers from drum to paper
- 5: Rollers use heat and pressure to fuse toner to paper

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### What is a thermal printer?

- Generates images by pushing electrically heated pins against heat-sensitive paper
- Ideal for small devices, such as adding machines



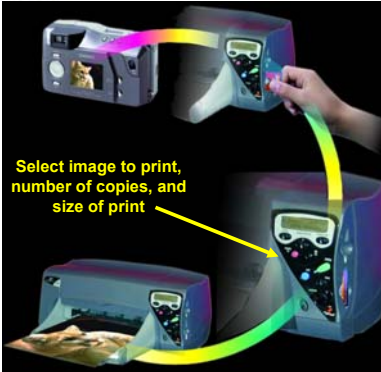
**Next**  
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**What is a photo printer?**

- Color printer that produces photo lab quality pictures and prints everyday documents

Select image to print, number of copies, and size of print



Next  
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**What is a label printer?**

- Small printer that prints on adhesive type material that can be placed on a variety of items
- Most also print bar codes and e-stamps




Next  
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**What is a portable printer?**

- Small, lightweight ink-jet or thermal printer that allows mobile user to print from notebook or handheld computer while traveling

portable printer



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**What is a plotter?**

- Sophisticated printer used to produce high-quality drawings
- Large-format printer similar to plotter and is used to print quality color prints

plotter



large-format printer



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**Discovering Computers 2003** Speakers and Headsets  
Concepts for a Digital World  
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**What is an audio output device?**

- Computer component that produces music, speech, and other sounds
- Speakers and headsets are common devices

speakers



woofer


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p. 6.23 Fig. 6-29

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**What is voice output?**

- Computer talks to you through speakers on computer

RealPlayer



link to audio broadcast

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### Speakers and Headsets

What is **Internet telephony**?

- Allows you to have a conversation over the Web, just as if you were talking on the telephone




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### Other Output Devices

What is a **data projector**?

- Device that takes image from a computer screen and projects it onto a larger screen



data projector


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### Other Output Devices

What is a **facsimile (fax) machine**?

- Device that transmits and receives documents over telephone lines



fax machine


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### Other Output Devices

What is a **fax modem**?

- Modem that allows you to send and receive electronic documents as faxes



external fax modem

internal fax modem card in system unit


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### Other Output Devices

What is a **multifunction device (MFD)**?

- Provides the functionality of a printer, scanner, copy machine, and fax machine



all in one

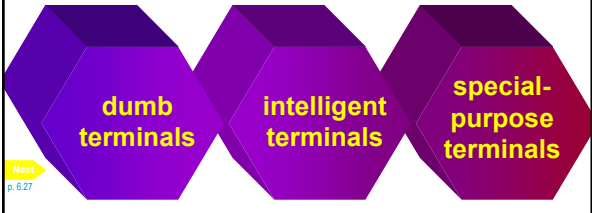
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### Terminals

What is a **terminal**?

- Device that performs both input and output



dumb terminals

intelligent terminals

special-purpose terminals

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

### Terminals

What is a **dumb terminal**?

- Has a keyboard and monitor, but no processor or memory
- Connects to host computer that performs processing and then sends output back

keyboard and monitor



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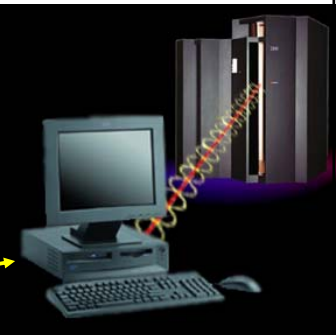
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### Terminals

What is an **intelligent terminal**?

- Has monitor, keyboard, memory and processor
- Similar to a PC in that it can perform tasks independent of host computer
- Programmable

host computer



intelligent terminal

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### Terminals

What is a **point-of-sale (POS) terminal**?

- Records purchases at point where purchase is made
- Output from POS terminals serves as input to host computer

POS terminal in a grocery store



scanner and keyboard are input

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### Terminals

What is an **automated teller machine (ATM)**?

- Self-service banking machine that connects to host computer through telephone network



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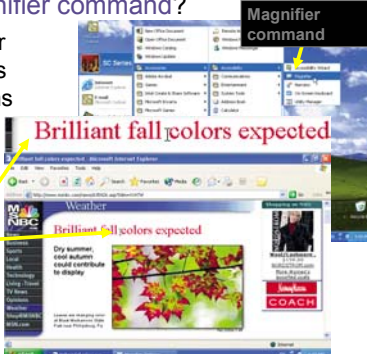
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### Output Devices for Physically Challenged Users

What is the **Magnifier** command?

- Windows Magnifier command enlarges text and other items in window on screen

Magnifier command



Location of mouse pointer magnified at top of screen

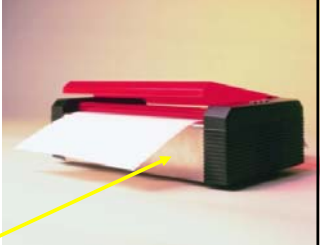
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### Output Devices for Physically Challenged Users

What other output options are available for visually impaired users?

- Change Window's settings such as increasing size or changing color of text to make words easier to read
- Blind users can work with voice output
- Braille printer outputs information in Braille onto paper




Braille printer

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

**Summary**  
 What are suggested output devices for the Home user?



Home


- 17- or 19-inch color CRT monitor
- High-definition television
- Ink-jet color printer; or photo printer; or label printer
- Speakers and headset

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**Discovering Computers 2003** Putting It All Together  
 Concepts for a Digital World  
 Web and XP Enhanced

**Putting It All Together**  
 What are suggested output devices for the SOHO user?

- 19- or 21-inch color CRT monitor
- Color LCD display for handheld computer
- Multifunction device; or ink-jet color printer; or laser printer, black and white
- Label printer
- Fax machine
- Speakers and headset



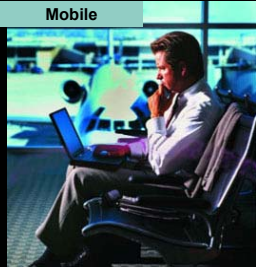
Small Office/Home Office

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**Discovering Computers 2003** Putting It All Together  
 Concepts for a Digital World  
 Web and XP Enhanced

**Putting It All Together**  
 What are suggested output devices for the Mobile user?

- 15.4-inch color LCD display with notebook computer
- 19-inch color CRT monitor for notebook computer docking station
- Color LCD display for handheld computer
- Portable printer
- Ink-jet color printer; or laser printer, black and white, for in-office use; or photo printer
- Fax modem
- Headset
- DL data projector



Mobile

Next  
 p. 6.30 Fig. 6-40

**Discovering Computers 2003** Putting It All Together  
 Concepts for a Digital World  
 Web and XP Enhanced

**Putting It All Together**  
 What are suggested output devices for the Large Business user?

- 19- or 21-inch color CRT or LCD monitor
- 15.4-inch color LCD display for notebook computer
- Color LCD display for handheld computer
- Laser printer, black and white
- Line printer (for large reports from mainframe)
- Label printer
- Fax machine or fax modem
- Speakers and headset
- DLP data projector
- Dumb terminal




Large Business

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**Discovering Computers 2003** Putting It All Together  
 Concepts for a Digital World  
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**Putting It All Together**  
 What are suggested output devices for the Power user?



Power

- 21-inch color LCD monitor
- Laser printer
- Plotter
- Photo printer; or dye sublimation printer
- Fax machine or fax modem
- Speakers and headset

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**Discovering Computers 2003** Summary of Output  
 Concepts for a Digital World  
 Web and XP Enhanced

**Summary of Output**

- What is output?
- What are output devices?
- Display devices
- Printers
- Speakers and headsets
- Other output devices
- Terminals
- Output devices for physically challenged users

**Chapter 6 Complete**

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