

**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  
Concepts for a Digital World Web and XP Enhanced

### 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  
Concepts for a Digital World  
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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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**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  
Concepts for a Digital World  
Web and XP Enhanced

What is an electronic book (e-book) ?

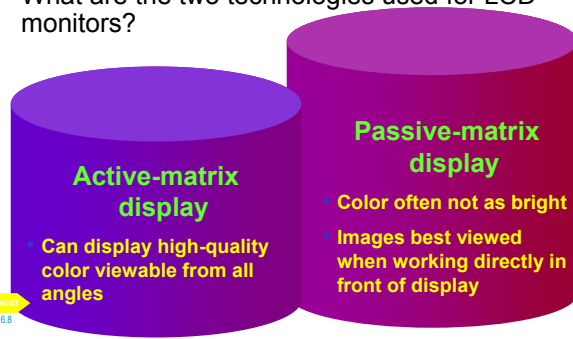
- Small, book-sized computer that uses an LCD screen
- Allows users to read, save, highlight, bookmark, and add notes to online text
- Download new book content from Web



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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

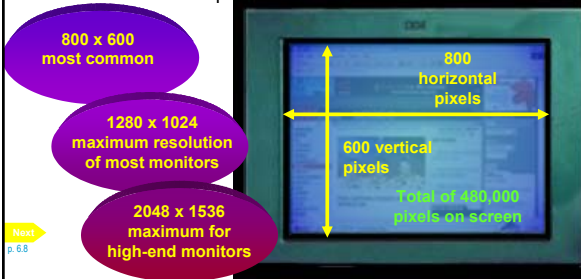


Next p. 6.8 Fig. 6.8

**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

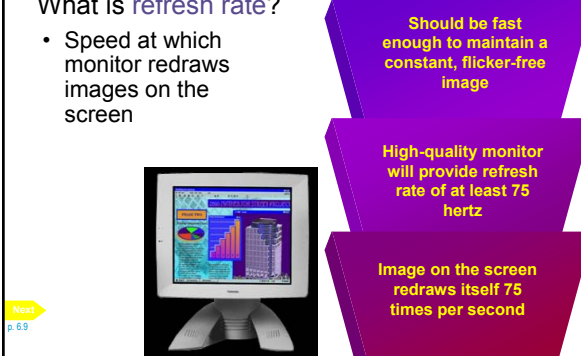


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**Discovering Computers 2003** Concepts for a Digital World Web and XP Enhanced **Display Devices**

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**

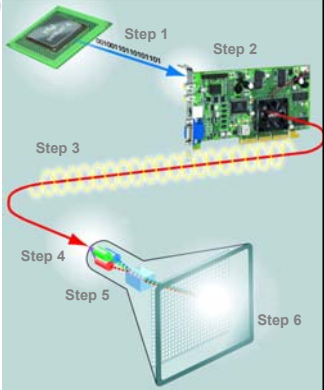


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**Discovering Computers 2003** Concepts for a Digital World Web and XP Enhanced **Display Devices**

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

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



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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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Fig. 6-12

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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


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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**  
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**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 2003     | Q2 2003     | Q3 2003     | Q4 2003     |
| 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   | \$200,000   | \$200,000   | \$200,000   |
| Equity                                      | \$0         | \$50,000    | \$100,000   | \$150,000   |
| Total                                       | \$400,000   | \$500,000   | \$600,000   | \$700,000   |


landscape orientation

**Next**  
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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



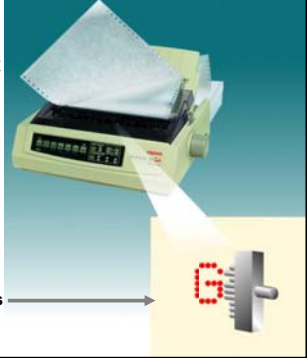
continuous-form paper

**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

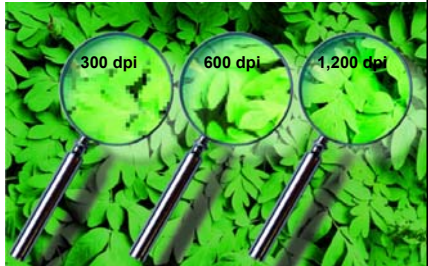


**Next**  
p. 6.15 Fig. 6-19

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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?



- 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

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### What is a laser printer?

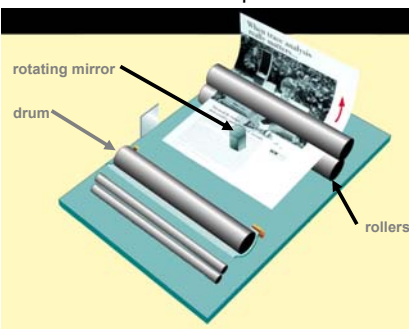
- High-speed, high-quality nonimpact printer
- Prints text and graphics in very high-quality resolution, ranging from 600 to 1,200 dpi
- Typically costs more than ink-jet printer, but is much faster



**Next**  
p. 6.16 Fig. 6-17

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### How does a laser printer work?




- 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



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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

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p. 6.21 Fig. 6-26

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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

Next  
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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  
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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


Next  
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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

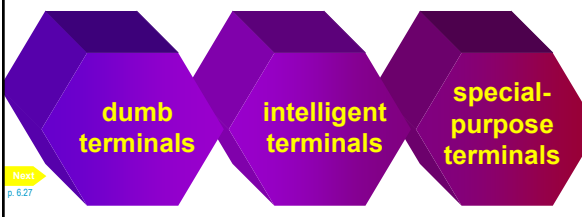
Next  
p. 6.26 Fig. 6-35

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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



Next p. 6.27 Fig. 6-36

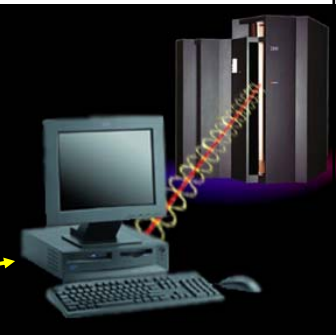
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### Terminals

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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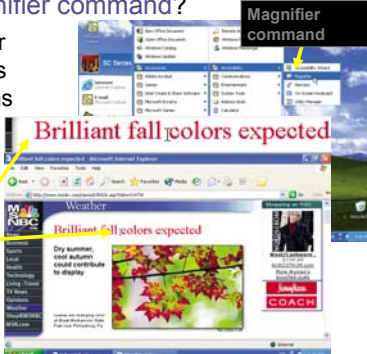
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### Output Devices for Physically Challenged Users

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

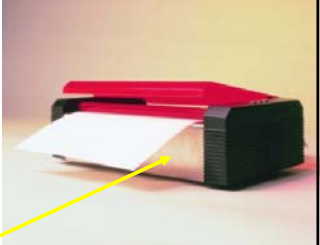
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### Output Devices for Physically Challenged Users

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

### Putting It All Together

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?

Small Office/Home Office



- 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

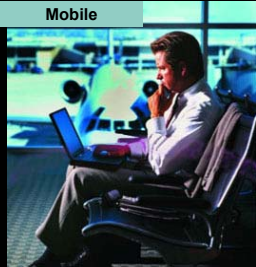
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**Discovering Computers 2003** Putting It All Together  
Concepts for a Digital World  
Web and XP Enhanced

### Putting It All Together

What are suggested output devices for the Mobile user?

Mobile



- 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

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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 Large Business user?

Large Business



- 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


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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

- 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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