

I.Ch 5 Input and Output

A.Competencies

- 1.Describe input.**
- 2.Describe keyboard entry, pointing devices, and scanning devices.**
- 3.Discuss image capture, digitizing, and audio input devices.**
- 4.Discuss output.**
- 5.Describe monitors, printers, and audio output.**
- 6.Discuss combination input and output devices.**

B.Introduction

- Computer input and output devices are essentially translators.
- Input devices translate numbers, letters and actions that people understand into a form that the computer can process.
- Output devices translate the machine language the computer can process back into letters, numbers, sounds, and images that people can understand.
- Competent end users need to know about the most common input devices such as keyboards, mice, scanners, digital cameras, digitizing tablets, voice recognition devices, and MIDI.
- They also need to know about the most common output devices such as monitors, printers, and audio output.
- They also need to know about combination input/output devices such as fax machines, Internet telephones, and terminals.

C.What is Input?

- Input is any data or instructions that are used by a computer.
- They can come directly from you or from other sources in the form of text, numbers, pictures, voice.
- Input devices are hardware used to translate words, sounds, images, and actions that people understand into a form that the computer can process.

D.Keyboard Entry

- Keyboards convert numbers, letters, and special characters into electronic signals.
- Traditional, ergonomic, flexible and folding are types of keyboards.

Computing Essentials 2004

Chapter 5 Input and Output

1.Keyboards

- *Traditional keyboards*: full-sized, rigid, rectangular keyboards that include function, navigational, and numeric keys.
- *Flexible keyboards*: fold or roll up for easy packing and storage for mobile users.
- *Ergonomic keyboards*: similar to traditional, but designed to specifically alleviate wrist strain associated with repetitive movements of typing.
- *Wireless keyboards*: more expensive than traditional keyboards, but give the flexibility of un-tethering the cord.
- *PDA keyboards*: miniature keyboards for PDAs for sending email, etc.

2.Features

- Numeric keypads: easier entry of numbers and arithmetic symbols
- **Toggle keys**: turn a feature ON and OFF like *Caps / Num Lock* keys.
- **Combination keys**: perform action when held down in combination with another key like *Shift / Ctrl* keys.
- **Escape key**: *cancels* a selection or a procedure.
- **Function keys**: *shortcut* for particular tasks, example F1 displays online Help.
- **Navigation keys**: controls the movement of cursor on the screen.

E.Pointing Devices

1.Mouse

- A *mouse* controls the pointer displayed on the monitor
- The mouse pointer usually appears in the shape of an **arrow**.
- The mouse shape can change depending on the application and status of the application.
- A mouse can have one, two, or more buttons used to select command option.
- The three basic types of mouse designs are:
 - **Mechanical mouse**: traditional mouse with a *rotating ball* in the bottom and cord connecting it to the system unit. The movement of the mouse causes the roller ball to rotate and that moves the pointer on the screen.
 - **Optical mouse**: Have no moving parts – it emits and senses *light* to detect mouse movement. Optical mouse is better than mechanical mouse as it can be used on any surface, is more precise, and does not require periodic cleaning.
 - **Cordless or wireless mouse**: a *battery operated* device that typically uses radio waves or infrared light waves to communicate with the system. This mouse does not use any cords.
- Other devices similar to mouse include:

Computing Essentials 2004

Chapter 5 Input and Output

- **Trackball** (aka **Roller Ball**) – controls the pointer movement by rotating the ball with your thumb.
- **Touch surfaces** (aka **Touch Pads**) – controls the pointer movement by moving and tapping your fingers on the surface of a pad.
- **Pointing stick** (aka Track Point) – controls the pointer movement by directing the stick with your finger.

2.Joystick

- Most popular input device for *computer games* used to control game actions by varying the pressure, speed, and direction of the joystick.

3.Touch Screen

- A kind of monitor screen with a touch sensitive plastic screen behind which are crisscrossed invisible beams of *infrared light*.
- Commands or actions are selected by touching the screen with finger.
- Typically used for restaurants, ATMs and information centers

4.Light Pen

- A *light sensitive* pen-like device placed against the monitor causing it to close a photo electric circuit and identifies the spot for entering the data.
- Typically used for editing digital images.

5.Stylus

- A pen-like device that uses pressure to draw images on a screen
- Typically used with Tablet PCs and PDAs.
- Handwriting recognition software translates handwritten notes into a form the computer can use.
- Graphics tablets use a special graphics surface or tablet and a stylus, typically used by artists, mapmakers, and/or engineers for electronic drawings.

F.Scanning Devices

- Scanning devices convert scanned text and images into a form that the system unit can process.
- Scanners can read data from written document, a price tag, an image or a photograph.

1.Optical Scanners

- An **optical scanner** (aka **scanner**) accepts documents consisting of text and/or images and converts them to machine readable form.
- They work by recognizing light, dark, and colored areas that make up individual letters or images.
- Two basic types of scanners are:
 - **Flatbed scanner**: works like a copy machine where the image to be scanned is kept on the glass surface.

Computing Essentials 2004

Chapter 5 Input and Output

- **Portable scanner:** often is a hand held device that slides across the document being scanned, making direct contact
- Typical use is by advertising professionals who scan images and combine them with text.

2.Bar Code Readers

- Bar code readers/scanners contain photoelectric cells that read **bar codes** – vertical zebra-striped marks printed on product containers.
- Typical uses are in grocery stores that use **Universal Product Codes** (UPC) which match up the product with a database entry containing product information such as price.
- These devices are either handheld **wand readers** or **platform scanners**.

3.Character and Mark Recognition Devices

- These devices read *special characters* and *marks*.
- Three types include:
 - **Magnetic Ink Character Recognition (MICR):** used by *banks* for reading numbers at bottom of checks. Special reader/sorter machines reads characters made of ink containing magnetized particles.
 - **Optical Character Recognition (OCR):** use special pre-printed characters that can be read by a light source, and changed into machine-readable code. Retail stores frequently used these types of scanners.
 - **Optical Mark Recognition (OMR) aka Mark Sensing:** senses the presence or absence of a mark, such as pencil mark. It is frequently used to score multiple choice tests marked by pencil on a form.

G.Image Capturing Devices

- These focus on capturing just images rather than the text/image capturing by flatbed scanners.

1.Digital Camera

- The image is captured by CCD or CMOS sensors, and stored electronically where it can be downloaded to a computer.

2.Digital Video Camera

- Similar to a camcorder, only the signals are captured in digital rather than analog format.
- WebCams (Web Cameras) are inexpensive digital (video) cameras that are used for video conferencing.
- See the text's CD and/or Web site to learn how you can videoconference using this type of technology.

H.Audio Input Devices

- Converts sound into digital format

Computing Essentials 2004

Chapter 5 Input and Output

1.Voice

- Voice Recognition Systems use a microphone for input, and a special sound card and software translates the analog signals into digital signals that can be processed and stored.
- Many applications now support voice recognitions.
- Using a “language bar” you can switch between “voice command mode” – allowing you to control menu options, and “dictation mode” – allowing you to enter content text into a document.

2.Music

- Musical Interface Digital Interface (MIDI) is a standard that allows musical instruments to connect to a computer.
- MIDI devices are specialized musical instruments that provide input in the form of encoded digital signals representing musical sounds.
- Electronic keyboards are the most commonly used MIDI devices.

I.Making IT Work for You – WebCams and Instant Messaging page 188-189

- This section covers the use of simple digital cameras and software to chat to friends on line. This section uses the “Windows Messenger” service and demonstrates how you can start:
 - A.Sending Messages and Transferring Files
 - B.Using a WebCam
 - C.Sharing an Application

J.What is Output? Page 190

- Output is processed data or information
- Typically takes the form of text, graphics, photos, or images.
- Output devices are any hardware used to provide or create output from the computer, for example monitors, printers, speakers, etc.

K.Monitors page 191

- Also known as display screens or screens
- Output is sometimes called softcopy (as opposed to printed hardcopy)

1.Features

- Clarity: the quality and sharpness of a monitor; depends on:
- Resolution: measured in Pixels (Picture Elements) e.g. a 1,280 x 1,024 resolution screen displays 1,310,720 pixels. The greater the number of pixels, the better the resolution.

Computing Essentials 2004

Chapter 5 Input and Output

- Dot Pitch: the distance between pixels, typically measured in millimeters. Most monitors have a dot pitch less than 0.3 mm. The smaller the dot pitch, the better the clarity.
- Refresh Rate: how often the image is “re-drawn” on the monitor. Most monitors have a refresh rate of 75 Hz or better (image refreshes 75 times every second). The faster the rate, the better the image
- Size or Viewable Size: the diagonal length of the monitor’s viewing area. Common sizes are 15, 17, 19, and 21 inches. Smaller monitors have better image quality, but it’s also smaller to view.

2.Cathode-Ray Tube

- Most common type of desktop monitor.
- Uses similar technology as standard TV screens
- Advantage is they are relatively inexpensive and have a high quality image display.
- Disadvantage is they take up a lot of room

3.Flat-Panel Monitor page 192

- The advantage is they take up less room (thinner) and require less power than CRTs
- They are frequently used on desktop, tablet PC, and handheld computers.
- Two basic types are:
 - Passive matrix (dual scan monitors): lower power, but poorer clarity
 - Active matrix (TFT: Thin Film Transistor): costs more, uses more power, but produces a much better image.

4.Other Monitors

- E-books (aka e-book readers) are PDA sized devices that display text and graphics. These have not had a lot of commercial success, yet it is possible to download e-books onto computers.
- Data projectors: project the output onto a screen for a large audience.
- High Definition TeleVision (HDTV): a merger of microcomputers and television (PC/TV) offers much clearer and more detailed wide screen pictures than a standard TV (but currently at more cost). Since images are digital, they can be stored and edited.

L.Printers page 193

- Printer output is often called hard copy.

Computing Essentials 2004

Chapter 5 Input and Output

1.Features

- Resolution: measured in Dots Per Inch (DPI), typically 300, 600, or 1,200 in modern printers. The more dots, the better the image, but the more ink that is used. Photo printing uses even higher dpi printers (2,400 & 4,800 dpi)
- NOTE: you can save ink if you adjust the settings to a lower DPI setting – 300 or 600 DPI often works well for plain text.
- Color capability: Black & White or color
- Speed: typically measured in Pages Per Minute (ppm). Personal printers typically print 10-15 ppm for a single color (black) and 5-10 color
- Memory: most printers have on-board RAM to buffer the print so the computer is free to do other tasks.

2.Ink-Jet Printer page 194

- Widely used technology that sprays ink onto paper.
- They are relatively inexpensive, quiet, and reliable.
- Typical inkjet printers can print 17-19 ppm B/W and 13-15 ppm of color.

3.Laser Printer

- Use technology similar to a photocopier
- Personal laser printers are cheaper, but usually don't support color. They typically print 15 to 17 ppm.
- Office printers may print color, and print at high speeds, over 50 ppm.

4.Thermal Printer page 195

- Not as common as Ink-Jet and Laser printers
- Used for high end artwork and image reproduction

5.Other Printers

- Dot matrix printers: older technology, but good for multipart forms
- Plotters: special purpose for making maps, images, drawings
- Photo printers: special purpose for higher quality images on photo stock.
- Portable printers: designed for travel; typically connect via USB port.

M.Audio Output Devices page 196

- Most widely used devices are speakers and headphones
- These must be connected to a sound card in the system unit.
- Many systems support 5.1 digital sound
- Creating voice output is easier than recognizing voice input, and is used for many applications such as soda machines, telephones, and cars.

N. Combination Input and Output Devices

1. Fax machines

- Also known as Facsimile Transmission Machines, it's an older technology used to transmit a "picture" of a document.

2. Multifunction Devices (MFD) aka All In One (AIO) devices

- These devices combine the functions of a printer, scanner, copier, and fax into one unit.
- The advantage is it can save cost over buying separate units, as well as space.
- The disadvantage is the functionality may not be as good as separate machines, and if one goes bad, you may need to replace the whole device.

3. Internet Telephone page 197

- Internet telephones typically connect to a system unit through a USB port and operate like a traditional telephone.
- Telephony, also known as Internet telephony, IP telephony and Voice Over IP (VoIP) – Note: IP = Internet Protocol uses the Internet rather than traditional communication lines to support voice communication.
- Convert analog voice into digital, and utilizes the Internet Protocol to send the digital signals.
- This technology is proving to be a popular, cost saving tool for both businesses and home users.
- Three popular approaches include:
 - Computer to computer: allow users to place free long distance phone calls, e.g. MSN Explorer
 - Computer to traditional telephone: users can call virtually any telephone user from the computer.
 - Traditional telephone to traditional telephone: do not require a computer
- Internet supported calls may have lower sound quality.

4. Terminals

- Older technology often used to connect to a mainframe or host/server computer.
- Dumb terminals: only provide input and output to the host
- Intelligent terminals (Smart terminals) can do some processing at the terminal – an example would be a PC hooked up to act as a terminal as well. Net PC (aka Net Personal Computer) is a low cost limited microcomputer with only a hard drive, sealed system unit and no expansion slots.

Computing Essentials 2004

Chapter 5 Input and Output

- Network terminal (aka thin client or network computer) is a low cost alternative to an intelligent terminal. Most don't have storage capabilities, but are able to do some local processing. Sun Microsystems has tried to push this model of computing for years.
- Internet terminal (aka web terminal or web appliance) is designed to provide inexpensive, easy access to the Internet.

O.A Look to the Future page 199

- Electronic Translators May Be In Your Future
- This section discusses technology that can be used to interpret foreign languages.
- Prototype portable handheld electronic interpreters are currently in a testing phase at the U.S. Office of Naval Research.
- The company SpeechGear developed a machine called Interact that takes verbal statements in one language, converts the statements to text, translates the text into another language, and then vocalizes the translated text in about two seconds.
- Problems with context still exist, but the technology is improving.

P.Visual Summary at a glance Input and Output page 200

1.Input

a)Keyboards

(1)Traditional

(2)Flexible

(3)Ergonomic

(4)Wireless

(5)PDA

b)Pointing devices

(1)Mouse

(2)Joysticks

(3)Touch Screens

(4)Light Pens

(5)Stylus

Computing Essentials 2004
Chapter 5 Input and Output

2.Input

a)Scanners

(1)Optical scanners

(2)Bar code readers

(3)Character and mark recognition devices

3.Input

a)Image capturing Devices

(1)Digital cameras

(2)Digital video cameras

b)Audio Input Devices

(1)Voice - Voice recognition systems

*(2)Music - Musical Instrument Digital Interface
(MIDI)*

4.Output

a)Monitors

(1)Cathode ray tubes (CRTs)

(2)Flat-panel monitors

5.Output

a)Printers

(1)Ink-jet printers

(2)Laser printers

(3)Thermal printers

b)Audio Output Devices

(1)Speakers

Computing Essentials 2004

Chapter 5 Input and Output

(2)Headphones

6.Combination Devices

a)Fax Machines

b)Multifunction Devices (MFD, AIO)

c)Internet Telephones

(1)Internet telephones

(2)Telephony (Internet Telephony, IP Telephony, Voice-over IP, VoIP)

d)Terminals

(1)Dumb

(2)Intelligent

(3)Network (thin client or network computer)

(4)Internet (Web terminal or Web Appliance)

Q.Key Terms page 203

1	active-matrix monitor		aka TFT monitor; laptop LCD screen type with higher power consumption, but better clarity
2	all in one device	AIO	aka Multifunction Device (MFD) a single unit that offers scanning, copying, printing and faxing
3	audio input		a way to convert sounds into bits that the computer can process
4	audio input device		microphone
5	audio output device		speakers
6	bar code		printed series of lines that the computer can recognize as different characters, e.g. a UPC bar code used in grocery stores
7	bar code reader		specialized input device to scan information such as Universal Product Codes (UPC) on grocery items
8	bar code scanner		specialized input device (typically handheld) to scan information such as retail price tags
9	cathode ray tube		
10	monitor	CRT	traditional, TV like picture tube offers high quality at a low price, but tends to be bulky
11	character recognition device		generic term used for a variety of electronic character readers such as OCR , OMR or MICR
12	Clarity		the quality of resolution, depends on factors such as number of pixels
13	color capability (printer)		the ability to print in color, typically via ink-jet or laser print technology
14	combination device		a device that acts as both input and output e.g. FAX machine, MFD, IP phones
15	combination key		keys such as <Ctrl> or <Alt> that are typically used in combination with another key for executing different keyboard functions
16	cordless mouse		battery operated mouse that uses wireless signals to transmit location to the computer
17	data projector		book sized projector for displaying computer images on a screen for presentation purposes
18	dictation mode		ability to enter text in a document via voice
19	digital camera		camera that stores images electronically rather than on film
20	digital video camera		video camera that stores images in digital (computer ready) format rather than analog format
21	dot pitch		the space between pixels on a monitor - typically less than .30 mm

Computing Essentials 2004

Chapter 5 Input and Output

21	dot-matrix printer		older technology for printers, used small pins that would strike a ribbon to form characters
22	dots-per-inch	dpi	measurement for print quality, typically 300 x 300 up to 4800 x 4800 dpi
23	download		transfer a file or data from a server computer to the one you are working on
24	dual-scan monitor		aka passive matrix monitor, require low power and scan down the screen
25	dumb terminal		simple input (keyboard) output (monitor) device often used with mainframe systems
26	e-book		aka electronic book - the contents of which can be shown on a computer/e-book display
27	e-book reader		the device (separate hardware or a PC) and software that is used to display electronic books
28	ergonomic keyboard		similar to traditional keyboard, but is designed specifically to alleviate wrist strain
29	facsimile machine	fax	aka FAX, essentially a low resolution picture of a document that can be transmitted electronically
30	flatbed scanner		book sized unit used to digitize full sized documents
31	flat-panel monitor		aka LCD monitor, often used with laptop computers, take up less space, but tend to be more expensive than CRT monitors
32	flexible keyboard		similar to traditional keyboard, but is designed specifically fold for portable devices e.g. PDA
33	graphics tablet		input device to allow hand written or draw images to be converted to digital format the computer can use
34	handwriting recognition software		programs used to convert a person's handwriting into digitized text, often used with PDAs and Tablet PCs
35	hard copy		generic term for printed copy (permanent copy)
36	Headphones		small speakers that can be worn by the user
37	high-definition television	HDTV	newer technology TV system offering better quality pictures
38	host computer		aka mainframe computer or central computer - the main server of data and applications
39	image capturing device		generic term for digital cameras or digital video cameras
40	ink-jet printer		printer technology which sprays small drops of ink onto paper to build up the image or text of a document
41	input		the process of taking end user information and digitizing it so the computer can use it
42	input device		any type of equipment used to convert information from an end user into something the computer can process
43	intelligent terminal		similar to a dumb terminal, yet it can do some processing without the host
44	Internet telephone		newer technology that allows telephones to send voice via Internet Protocol
45	Internet telephony		term used to describe the use of computer connectivity to make phone calls
46	Internet terminal		aka web terminal or web appliance, it provides a way to access the Internet using a television for output
47	IP Telephony		term used to describe the use of computer connectivity to make phone calls
48	Joystick		input device for gaming
49	Keyboard		input device to enter alphanumeric characters
50	Language bar		allows you to switch between voice command mode and dictation mode when using voice input
51	laser printer		printer technology which works like a copy machine
52	light pen		input device for drawing images
53	magnetic-ink character recognition	MICR	input technology used for processing bank checks
54	mark recognition device		input technology used for reading pencil marks on a form, such as a standardized test form
55	mark sensing		input technology used for reading pencil marks on a form, such as a standardized test form
56	mechanical mouse		traditional mouse, uses a roller ball on the bottom to move sensors that pick up the location
57	memory (printer)		chips to temporarily store the document before it's actually printed (used to speed up the print process)
58	MIDI		Musical Instrument Digital Interface - standard that allows musical instruments to connect to a computer
59	MIDI device		computer input for musical instruments, typically set up with a piano keyboard
60	Monitor		output screen for a computer, usually refers to a CRT display
61	Mouse		input device to allow the user to "move around" on a computer screen using a GUI interface
62	mouse pad		smooth pad to move a mouse on
63	mouse pointer		the cursor for a mouse as it appears on the screen
64	multifunction device	MFD	aka All In One device (AIO) a single unit that offers scanning, copying, printing and faxing
65	Musical Interface		
65	Digital Interface	MIDI	computer input for musical instruments, typically set up with a piano keyboard
66	Net Personal Computer	Net PC	an low cost alternative to intelligent terminal, it provides input and output to a host server, but can do some processing
67	network computer		an low cost alternative to intelligent terminal, it provides input and output to a host server, but can do some processing
68	network terminal		an low cost alternative to intelligent terminal, it provides input and output to a host server, but can do some processing

Computing Essentials 2004

Chapter 5 Input and Output

69	numeric keypad		separate keys on a keyboard to allow fast entry of numbers
70	optical mouse		mouse that uses light to determine location rather than a roller ball
71	optical scanner		generic term for devices that digitize printed documents into computer ready format
72	optical-character recognition	OCR	input technology to scan in printed characters and translate them into alphanumeric characters
73	optical-mark recognition	OMR	input technology used for reading pencil marks on a form, such as a standardized test form
74	output		term used to describe the conversion of computer data into end user understandable data
75	output device		any equipment to present information in a form the end user can use, e.g. printers, monitors, speakers
76	passive-matrix monitor		aka dual scan monitor, require low power and scan down the screen
77	PC/TV		a merger of microcomputers and televisions, allowing you to digitally record images
78	PDA keyboard		miniature keyboards for PDAs used to send e-mail, create documents, and more
79	personal laser printer		lower priced (and typically lower capacity) laser printer
80	photo printer		specialized printer for printing photos directly from a digital camera
81	pixel (picture element)		unit of measure for an image or monitor - the more pixels, the higher the quality of the display
82	platform scanner		aka flatbed scanner, scans in and digitizes full size printed documents
83	plotter		output device for map making or drawings
84	pointing device		an input device to point to an item on a screen, e.g. a mouse
85	pointing stick		aka trak point, a small device in the middle of a keyboard that you use like a small joystick
86	portable printer		output device to create hard copy or permanent copy, designed to be lightweight for travel
87	portable scanner		aka wand reader, it is used to get input from pre-printed forms or to read in small amounts of text
88	Printer		output device to create hard copy or permanent copy
89	reader/sorter		a special machine to scan in an separate MICR encoded documents such as bank checks
90	refresh rate		the number of times a monitor screen is "re scanned" to display the image - typically over 70 Hz (70 x per second)
91	resolution (monitor)		the quality of the display, depends on pixels, refresh rate, etc.
92	resolution (printer)		the quality of the printer, measured in dots per inch, e.g. 300 x 300 dpi is common for lower quality print
93	roller ball		rubberized globe in a computer mouse that moves to activate sensors that relay position on the screen
94	Scanner		term used to describe equipment used to read printed documents and convert them to digital data
95	scanning device		term used to describe equipment used to read printed documents and convert them to digital data
96	Screen		aka monitor
97	shared laser printer		a networked printer that several users may use
98	size (viewable size)		measurement for monitors, it is measured diagonally in inches, e.g. a 15 monitor may have a 13.7 inch viewable size
99	soft copy		term used to describe temporary output such as that from monitors and speakers
100	Speakers		reproduce sounds from electronic signals
101	speed (printer)		printer speed is typically measured in ppm - pages per minute e.g. 6 ppm color 12 ppm B/W
102	Stylus		input device to press on a computer screen for selecting commands and/or entering text
103	Telephony		term used to describe the use of computer connectivity to make phone calls
104	Terminal		device used for simple input and output of computer data
105	thermal printer		specialized printer used for high quality images
106	thin client		an low cost alternative to intelligent terminal, it provides input and output to a host server, but can do some processing
107	thin film transistor monitor	TFT	aka active matrix monitor; laptop LCD screen type with higher power consumption, but better clarity
108	toggle key		key on a keyboard that you turn on and off, e.g. Caps Lock or Num Lock
109	touch pad		sensitive area on some keyboards that you can use as a mouse
110	touch screen		specialized monitor that you can touch to activate functions, often used on information kiosks or ATM machines
111	touch surface		sensitive area on some keyboards that you can use as a mouse
112	Trackball		"upside down" mouse
113	traditional keyboard		input device for text using QWERTY key layout
114	Universal Product code	UPC	special bar code often used in the grocery industry for product pricing
115	voice command mode		ability to enter program commands via spoken voice
116	voice recognition system		system used to convert spoken words into digital information
117	Voice-over IP	VoIP	aka IP telephony, the use of Internet protocols to transmit phone calls

Computing Essentials 2004

Chapter 5 Input and Output

118	wand reader	handheld device used to scan in bar codes or optical characters
119	Web appliance	aka web terminal or internet terminal, it provides a way to access the Internet using a television for output
120	Web camera	aka Webcam; small device used to capture digital images for video conferencing via the Web
121	Web terminal	aka internet terminal or web appliance, it provides a way to access the Internet using a television for output
122	WebCam	aka Web camera; small device used to capture digital images for video conferencing via the Web
123	wheel button	found on a mouse allowing you to scroll through a screen of information
124	wireless keyboard	similar to a traditional keyboard, only it doesn't require a cable to connect it to the system
125	wireless mouse	battery operated mouse that uses wireless signals to transmit location to the computer

R.Chapter Review page 204

1.Crossword

a)Across

3	UPC	Bar code system used in supermarkets
5	OMR	Used to grade multiple choice exams
6	TOGGLE	Keys that turn features on and off
9	GRAPHICSTABLET	Use special surface and stylus to create digital illustrations
10	DPI	Measure of resolution
13	JOYSTICK	Most popular input device used for computer games
14	FLEXIBLE	Keyboard that rolls up for storage and transport
15	WHEELBUTTON	Button rotated to scroll through information displayed on the monitor
16	HDTV	Delivers much clearer picture than regular TV
17	KEYBOARD	Most commonly used way to input data
18	DOTPITCH	The distance between each pixel
19	REFRESHRATE	Number of times a screen is redrawn each second

b)Down

1	PRINTER	Translates processed information into hard copy
2	SOFTCOPY	Description of monitor output
4	PIXEL	Resolution is expressed as a matrix of these dots
7	TEXT	Letters, words, sentences, and paragraphs
8	DIGITALCAMERA	Records images digitally on a disk
10	DUMB	Type of terminal that does no processing
11	MECHANICALMOUSE	Most widely used type of mouse
12	WEBCAM	Specialized digital camera that broadcasts images over the Internet

2.Multiple Choice page 205

1	E	Optical
2	B	Touch pad
3	B	Bar code
4	C	WebCams
5	A	Sound card
6	B	E-book
7	B	Hard copy
8	A	Laser printers
9	D	Telephony
10	A	Thin client

Computing Essentials 2004

Chapter 5 Input and Output

3. Matching page 206

TERM	MATCH	NUMBER	HINT
input	H	1	Any data or instruction used by a computer
ergonomic			
keyboard	F	2	Alleviates wrist strain from typing
toggle	R	3	These keys turn a feature on or off
cordless mouse	B	4	Also known as a wireless mouse.
pointing stick	M	5	Similar to a mouse, this device is located in the middle of the keyboard
joystick	I	6	A pointing device widely used for computer games
stylus	N	7	Pen-like device commonly used with tablet PCs and PDAs
wand reader	T	8	Scanners with photoelectric cells that read bar codes
UPC	S	9	Type of bar code used in supermarkets
digital camera	D	10	Similar to traditional cameras except that images are recorded digitally
output	K	11	Processed data or information from a computer
clarity	A	12	Indicated by resolution and measured in pixels
CRT	C	13	Type of monitor similar to a television set
MFD	J	14	Multifunctional device
TFT (Thin Film Transistor)	O	15	Monitors that have independently activated pixels
HDTV	G	16	Delivers a much clearer wide-screen picture than regular television
dpi	E	17	Measurement used to determine a printer's resolution
thermal	P	18	Printer that uses heat to produce images on heat-sensitive paper
plotter	L	19	Used to create maps, architectural and engineering drawings
thin client	Q	20	Terminal that relies on host computer or server for software

4. Open-ended

a) Describe the most common types of keyboards.

- Traditional:
- Flexible:
- Ergonomic:
- Wireless:
- PDA:

b) Describe the different types of pointing devices.

- Mouse (touch pad, track point/pointing stick):
- Joystick:
- Touch Screen:
- Light Pen:

c) Discuss the advantages and disadvantages of the three basic designs for the mouse

- Mechanical: the standard mouse, it's cheap, reliable
- Optical: little more expense, but doesn't require moving parts so the ball won't slip

Computing Essentials 2004

Chapter 5 Input and Output

- Wireless (or Cordless): most expensive, and requires a receiver attached to your computer, it frees you from needing a cable attached to the computer
- You may want to consider a different pointing device such as a track pad or pointing stick so you don't have a separate device.

d)Describe the three categories of output devices.

- Monitors: the screen that you see characters and images
- Printers: how to get hard copy printed on paper
- Audio: speakers for voice & music

e)Discuss the different types of printers.

- Ink-Jet: most common for personal use, work well for color and Black & White
- Laser: often used for high quantity output, speeds tend to be faster, but the printers cost more
- Thermal: specialty printers for large sheets of paper
- Other: plotters, again, specialty output

f)What are combination input and output devices? Describe four such devices.

- Fax: a low resolution "picture" of a document that can be transmitted electronically
- MFD: Multifunction Devices – combine a printer, scanner, copier and fax
- IP Phones: Internet Protocol telephones – use the Internet to transmit messages
- Terminals: connect to a host computer or server

S.Using Technology page 207

1.WebCams and Instant Messaging

- This section refers you to Making IT Work for You: WebCams and Instant Messaging
- Answers to the questions depend on the type of messaging service you are using
- Typical hardware required is a computer with an inexpensive digital camera
- Software can be downloaded from the messaging service, e.g. AIM – AOL Instant Messenger

2.Internet Telephones

- This section directs students to learn something about Internet Telephony, starting with the text's CD and/or Web site.

Computing Essentials 2004

Chapter 5 Input and Output

- The technology depends on the types of services used, but most are similar to traditional telephones.

T.Expanding Your Knowledge page 208

1.Digital Cameras

- View the animation “How digital cameras work” on the text’s CD and/or Web site
- Respond to questions such as
 - What is a CCD – Charge Couple Device – used to record the image (the different colors)
 - What is an ADC – Analog to Digital Converter – helps to measure the amount of light
 - How are images transported from the camera to the computer? – download them via a USB or FireWire cable

2.How Internet Telephones Work

- Have students view the animation “How Internet Telephony Works” from the text’s CD and/or Web site.
- Respond to the following questions
 - What input & output devices are used? – a handset for speaking and listening to the call (or a microphone & speakers can be used)
 - What advantages & disadvantages are there? – if you already have a computer, this can be an inexpensive way to make calls
 - Would you incur long distance charges? – depends on the service, but there are many that you can use for free

U.Building Your Portfolio page 209

1.Digital Input

- Students are asked to write a one page paper titled “Digital Input” and answer questions discussed in the text, such as a) Define digitizer, digital camera, etc.
- May recommend that students research these topics on line – look at some electronic retailer sites to learn about the costs and features of some of these items.

2.Electronic Security

- Students are asked to write a one page summary about common applications of electronic monitoring; what have they seen, does it make them feel more secure, or is it an invasion of their privacy?
- May be a good time to discuss how this has changed over the years, especially in light of the PATRIOT Act.

II. Concept Checks at a glance

A.Ch 7 page 181

1. What is input? What are input devices?

- Input is any data or instructions that are used by a computer. They come from an end user, and must be translated into digital codes that the computer can process.
- Input devices are hardware used to translate words, sounds, images, and actions that end users produce into a digital format the computer can process.
- Examples of input devices include keyboards, a mouse, a microphone, etc.

2. Discuss five common types of keyboard designs.

- Traditional keyboards: full-sized, rigid, rectangular keyboards that include function, navigational, and numeric keys.
- Flexible keyboards: fold or roll up for easy packing and storage for mobile users.
- Ergonomic keyboards: similar to traditional, but designed to specifically alleviate wrist strain associated with repetitive movements of typing.
- Wireless keyboards: more expensive than traditional keyboards, but give the flexibility of un-tethering the cord.
- PDA keyboards: miniature keyboards for PDAs for sending email, etc

3. What are some common keyboard features?

- Numeric keypads: easier entry of numbers and arithmetic symbols
- Toggle keys: on off keys for such things as <Caps Lock> and <Scroll Lock>
- Combination keys: perform an action when combined with other keys, e.g. <Ctrl> key or <Alt> key

B.Ch 7 page 184

1. What is a pointing device? Discuss five pointing devices.

- A pointing device provides a comfortable interface with the system unit, by accepting pointing gestures and converting them into machine-readable input.
- Five types include:

Computing Essentials 2004

Chapter 5 Input and Output

a)Mouse

- A mouse controls the pointer displayed on the monitor
- The mouse pointer usually appears in the shape of an arrow
- Mechanical mouse: traditional mouse with a ball in the bottom and cord connecting it to the computer
- Optical mouse: has no moving parts – it emits and senses light to detect mouse movement.
- Cordless or wireless mouse: a battery operated device that typically uses radio waves or infrared light waves to communicate with the system.
- Other similar pointing devices include:
 - Trackball (aka Roller Ball)
 - Touch surfaces (aka Touch Pads)
 - Pointing stick (aka Trak Point)

b)Joystick

- Most popular input device for computer games

c)Touch Screen

- Monitor with a touch sensitive plastic screen
- Typically used for restaurants, ATM's and information kiosks

d)Light Pen

- A light sensitive pen-like device
- Typically used for editing digital images.
- They can include both wired and wireless technologies

e)Stylus

- A pen-like device commonly used with Tablet PCs or PDAs
- Require a touch sensitive input device such as a writing pad
- Typically used for entering menu choices or text via handwriting.

2.Describe the three basic mouse designs. Describe trackballs, touch surfaces and pointing sticks.

- Mechanical mouse: traditional mouse with a ball in the bottom and cord connecting it to the computer
- Optical mouse: Have no moving parts – it emits and senses light to detect mouse movement.
- Cordless or wireless mouse: a battery operated device that typically uses radio waves or infrared light waves to communicate with the system.
- Other similar pointing devices include:
 - Trackball (aka Roller Ball)
 - Touch surfaces (aka Touch Pads)

- Pointing stick (aka Trak Point)

C.Ch 7 page 186

1.How are pointing and scanning devices different?

- A pointing device just changes your location on the screen (moves the cursor). A scanning device converts printed output into digital input for processing by the computer.

2.Describe three types of scanners.

- Scanning devices convert scanned text and images into a form that the system unit can process.

a)Optical Scanners

- An optical scanner (aka scanner) accepts documents consisting of text and/or images and converts them to machine readable form.
- They work by recognizing light, dark, and colored areas that make up individual letters or images.
- Flatbed scanner: works like a copy machine
- Portable scanner: often is a hand held device that slides across the document being scanned.
- Typical use is by advertising professionals who scan images and combine them with text.

b)Bar Code Readers

- Bar code readers/scanners contain photoelectric cells that read bar codes.
- Typical uses are in grocery stores that use Universal Product Codes (UPC) which match up the product with a database entry containing product information such as price.
- These devices are either handheld wand readers or platform scanners.

c)Character and Mark Recognition Devices

- These devices read special characters and marks.
- Three types include:
 - Magnetic Ink Character Recognition (MICR): used by banks for processing checks. Special reader/sorter machines process the checks much faster than the older manual methods
 - Optical Character Recognition (OCR): use special pre-printed characters that can be read by a light source, and are still understandable by human readers. Retail stores frequently used these types of scanners.

Computing Essentials 2004

Chapter 5 Input and Output

- Optical Mark Recognition (OMR) aka Mark Sensing: frequently used to score multiple choice tests marked by pencil on a form.

3.Describe three common character and mark recognition devices.

- Magnetic Ink Character Recognition (MICR): used by banks for processing checks. Special reader/sorter machines process the checks much faster than the older manual methods
- Optical Character Recognition (OCR): use special pre-printed characters that can be read by a light source, and are still understandable by human readers. Retail stores frequently use these types of scanners.
- Optical Mark Recognition (OMR) aka Mark Sensing: frequently used to score multiple choice tests marked by pencil on a form.

D.Ch 7 page 187

1.How are digital cameras different from traditional cameras?

- Digital cameras store the images electronically
- Traditional cameras use film

2.What is a WebCam?

- A small digital camera used to send images directly over the Internet.
- Typically used to conduct video conferencing or instant messaging

E.Ch 7 page 190

1.Describe voice recognition systems.

a)Voice recognition systems

- Voice Recognition Systems use a microphone for input, and a special sound card and software translates the analog signals into digital signals that can be processed and stored.
- Many applications now support voice recognitions.
- Using a “language bar” you can switch between “voice command mode” – allowing you to control menu options, and “dictation mode” – allowing you to enter content text into a document.

b)MIDI

- Musical Interface Digital Interface (MIDI) is a standard that allows musical instruments to connect to a computer.

Computing Essentials 2004

Chapter 5 Input and Output

- MIDI devices are specialized musical instruments that provide input in the form of encoded digital signals representing musical sounds.
- Electronic keyboards are the most commonly used MIDI devices.

F.Ch 7 page 193

1.What is output? What are output devices?

- Output is processed data or information
- It typically takes the form of text, graphics, photos, audio, or video
- Output devices are any hardware used to provide or create output from the computer, e.g. printers, monitors, speakers, etc.

2.Define these monitor features: resolution, dot pitch, refresh rate, and size.

- Clarity: the quality and sharpness of a monitor; depends on:
- Resolution: measured in Pixels (Picture Elements) e.g. a 1,280 x 1,024 resolution screen displays 1,310,720 pixels. The greater the number of pixels, the better the resolution.
- Dot Pitch: the distance between pixels, typically measured in millimeters. Most monitors have a dot pitch less than 0.3 mm. The smaller the dot pitch, the better the clarity.
- Refresh Rate: how often the image is “re-drawn” on the monitor. Most monitors have a refresh rate of 75 Hz or better (image refreshes 75 times every second). The faster the rate, the better the image
- Size or Viewable Size: the diagonal length of the monitor’s viewing area. Smaller monitors have better image quality, but it’s also smaller to view

3.Describe CRTs, flat-panel, and specialty monitors.

- Distributed processing separates the data processing onto different servers rather than on one dedicated host computer

a)Cathode-Ray Tube

- Most common type of desktop monitor.
- Uses similar technology as standard TV screens
- Advantage is they are relatively inexpensive and have a high quality image display.
- Disadvantage is they take up a lot of room

b)Flat-Panel Monitor

- The advantage is they take up less room, and are frequently used on laptop computers. Now becoming popular for desktops as well since they have dropped in price

Computing Essentials 2004

Chapter 5 Input and Output

- Two basic types are:
- Passive matrix (dual scan monitors): lower power, but poorer clarity
- Active matrix (TFT: Thin Film Transistor): costs more, uses more power, but produces a much better image.

c)Other (Specialty) Monitors

- E-books (aka e-book readers) are PDA sized devices that display text and graphics. These have not had a lot of commercial success, yet it is possible to download e-books onto computers.
- Data projectors: capable of projecting the output onto a screen for a large audience
- High Definition TeleVision (HDTV): a merger of microcomputers and television (PC/TV) offers much clearer and more detailed wide screen pictures than a standard TV (but currently at more cost). Since images are digital, they can be stored and edited.

G.Ch 7 page 195

1.Discuss the printer features: resolution, color capability, speed, and memory

- Resolution: measured in Dots Per Inch (DPI), typically 300, 600, or 1,200 in modern printers. The more dots, the better the image, but the more ink that is used. Photo printing uses even higher dpi printers (2,400 & 4,800 dpi)
- Color capability: Black & White or color
- Speed: typically measured in Pages Per Minute (ppm). Personal printers typically print 17-19 ppm for a single color (black) and 13-15 color
- Memory: most printers have on-board RAM to buffer the print so the computer is free to do other tasks

2.Discuss three types of commonly used printers

a)Ink-Jet Printer

- Widely used technology that sprays ink onto paper.
- They are relatively inexpensive, quiet, and reliable.

b)Laser Printer

- Use technology similar to a photocopier
- Cheaper printers don't support color
- Office printers may print color, and print at high speeds

c)Thermal Printer

- Not as common as Ink-Jet and Laser printers

Computing Essentials 2004
Chapter 5 Input and Output

- Used for high end artwork and image reproduction

3. Discuss dot-matrix, plotter, and photo printers

- Dot matrix printers: older technology, but good for multipart forms
- Plotters: special purpose for making maps, images, drawings
- Photo printers: special purpose for higher quality images on photo stock

H.Ch 7 page 198

1. What are the two most widely used audio output devices?

- Most widely used devices are speakers and headphones
- Many systems support 5.1 digital sound

2. Describe the three most popular Internet telephony approaches.

- Computer to computer
- Computer to traditional telephone
- Traditional telephone to traditional telephone (through Internet phone service)
- The quality of all of these typically is not as good as traditional telephone service, but it is improving. The big advantage is cost – IP phone service is typically free or low cost.

3. Describe the following combination devices: fax machine, MFD, Internet telephone, and terminal.

a) Fax machines

- Also known as Facsimile Transmission Machines, it's an older technology used to transmit a "picture" of a document.

b) Multifunction Devices (MFD)

- These devices combine the functions of a printer, scanner, copier, and fax into one unit.
- The advantage is it can save cost over buying separate units, as well as space.
- The disadvantage is the functionality may not be as good as separate machines, and if one goes bad, you may need to replace the whole device.

c) Internet Telephone

- Also known as Telephony, Internet telephony, IP telephony and Voice Over IP (VoIP) – Note: IP = Internet Protocol

Computing Essentials 2004

Chapter 5 Input and Output

- Convert analog voice into digital, and utilizes the Internet Protocol to send the digital signals.
- This technology is proving to be a popular, cost saving tool for both businesses and home users.

d)Terminals

- Older technology often used to connect to a mainframe or host/server computer.
- Dumb terminals: only provide input and output to the host
- Intelligent terminals (Smart terminals) can do some processing at the terminal – an example would be a PC hooked up to act as a terminal as well.
- Network terminal (aka thin client or network computer) is a low cost alternative to an intelligent terminal. Most don't have storage capabilities, but are able to do some local processing. Sun Microsystems has tried to push this model of computing for years.
- Internet terminal (aka web terminal or web appliance) is designed to provide inexpensive, easy access to the Internet.
- Common network strategies are terminal, client server, and peer-to-peer systems

III.List of Figures at a glance

- Ch 7 page 180 figure 7-1 Flexible keyboard
 - Photo of a flexible keyboard, somewhat “untraditional” but may be useful for its portability
- Ch 7 page 180 figure 7-2 Ergonomic keyboard
 - Photo of a curved, ergonomic keyboard designed to alleviate wrist strain associated with the repetitive movements of typing
- Ch 7 page 181 On the Web Explorations
 - Encourage students to learn more about the manufacturers of ergonomic keyboards by visiting the text's Web site
- Ch 7 page 181 figure 7-3 PDA with keyboard
 - Photo of a Palm PDA with a small keyboard built into the device for simple data input
- Ch 7 page 181 figure 7-4 Traditional keyboard
 - Image of a traditional 101-key keyboard with some of the special keys highlighted including:
 - The Escape key
 - Function keys
 - Numeric keypad
 - Windows key
 - Spacebar
 - Navigation (arrow) keys

Computing Essentials 2004

Chapter 5 Input and Output

- Ch 7 page 182 figure 7-5 Optical mouse
 - Photo of the top and bottom side of an optical mouse which uses light to determine the motion rather than a roller ball touching sensors
- Ch 7 page 182 figure 7-6 Trackball
 - Photo of a trackball pointing device built into a keyboard
- Ch 7 page 182 figure 7-7 Touch surface
 - Photo of a person using a “track pad” as a pointing device
- Ch 7 page 182 figure 7-8 Pointing stick
 - Photo of a pointing stick used to control mouse functions – this is built directly in the middle of the keyboard between the G, H, B, N keys
- Ch 7 page 183 figure 7-9 A cordless joystick used for computer games
 - Photo of a “game” joystick
- Ch 7 page 183 figure 7-10 A touch screen: a consumer application
 - Photo of a woman using a touch screen on an information kiosk
- Ch 7 page 183 figure 7-11 A home application of a light pen
 - Image of a light pen on a digitizing surface for creating and editing a digital image
- Ch 7 page 184 figure 7-12 Stylus
 - Photo of a stylus used to press on the pressure sensitive screen of a PDA device
- Ch 7 page 185 figure 7-13 Two types of scanners
 - A flatbed scanner used to digitize full size paper documents
 - A portable scanner used to digitize a few words at a time
- Ch 7 page 185 figure 7-14 A bar code reader is used to record product codes
 - Photo of a grocery store Universal Product Code (UPC) bar code on a carton of milk being scanned
- Ch 7 page 185 figure 7-15 A wand reader is used to record product codes
 - Photo of a woman using a wand reader to scan in a price code of some clothing
- Ch 7 page 186 figure 7-16 A digital camera
 - Photo of people using a digital camera to take a picture
 - Digital cameras store the image electronically rather than on film
- Ch 7 page 186 figure 7-17 A WebCam
 - Photo of a woman using a WebCam to conduct a video conference via the Internet. The camera will display her image on another computer.
- Ch 7 page 187 TIPS box for improving your digital photos
 - Buttons and Knobs: know the functions of your camera
 - Photography Basics: frame your shots
 - Red-eye Reduction: use this in low light
- Ch 7 page 187 figure 7-18 A portable voice recognition system
 - Photo of an Olympus voice recording device that will digitize a human voice for use on a computer
- Ch 7 page 190 figure 7-19 Voice recognition with Microsoft Word

Computing Essentials 2004

Chapter 5 Input and Output

- Screen shot of the “Language Bar” that appears when you use the voice recognition system with a Microsoft Office application
 - You can switch between Voice Command mode and Dictation mode
- Ch 7 page 190 figure 7-20 Yamaha MIDI Silent Cello
 - Photo of a MIDI instrument used to record sound directly to a computer
- Ch 7 page 191 figure 7-21 Monitor resolution
 - Blow up image showing pixels (picture elements) on a monitor
 - Resolution is affected by
 - Number of pixels
 - Dot pitch (space between pixels)
 - Refresh rate
 - And the viewable size of the monitor
- Ch 7 page 191 figure 7-22 Resolution standards
 - Table of common resolution standards including:
 - SVGA 800 x 600 pixels
 - XGA 1,024 x 768
 - SXGA 1,280 x 1,024
 - UXGA 1,600 x 1,200
- Ch 7 page 192 On the Web Explorations
 - Encourage students to learn more about a leading manufacturer of flat-panel monitors by visiting the text’s Web site
- Ch 7 page 192 figure 7-23 CRT monitor
 - CRT – Cathode Ray Tube is a “traditional monitor” similar to a standard television screen
 - They offer great clarity, and are fairly inexpensive, but bulky
- Ch 7 page 192 figure 7-24 A flat-panel monitor
 - Flat panel monitors offer quality output, but tend to cost more. They also take up much less space
- Ch 7 page 192 figure 7-25 E-book
 - E-books – Electronic books – were marketed to offer a low cost solution for reading electronic copies of books.
- Ch 7 page 193 figure 7-26 HDTV
 - Photo of a High Definition TV monitor demonstrating the high quality of the image.
- Ch 7 page 193 On the Web Explorations
 - Students are encouraged to learn more about HDTV (High Definition TV)
- Ch 7 page 194 figure 7-27 dpi comparison
 - Image demonstrating the difference between a large font letter in 300 vs. 1200 dots per inch
- Ch 7 page 194 figure 7-28 A special application ink-jet printer
 - Image showing a man printing a large high quality poster using a specialized ink-jet printer
- Ch 7 page 194 On the Web Explorations

Computing Essentials 2004

Chapter 5 Input and Output

- Encourage students to learn more about a company that makes laser printers by visiting the text's Web site
- Ch 7 page 194 TIPS box
 - This section offers tips for saving paper when you print from the Web including:
 - Preview
 - Choose Printer Friendly
 - Print Selection
- Ch 7 page 195 figure 7-29 A laser printer
 - Photo of a small laser printer that could be used by a small business for high quality output
- Ch 7 page 195 figure 7-30 Photo printer
 - A specialized printer to print a photograph directly from a digital camera
- Ch 7 page 196 figure 7-31 Headphones
 - Photo of a man listening to headphones attached to his computer
- Ch 7 page 196 On the Web Explorations
 - Encourage students to learn more about MFDs (Multifunctional Devices) by visiting the text's Web site
- Ch 7 page 197 figure 7-32 Dumb terminal
 - Photo showing an airline reservation terminal in use