



Computer Fundamentals

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Lecture 4



Outline

- Printers
- How Computers Represent Data



Printers

- Impact printers
 - ❑ Generate output by striking the paper
 - ❑ Uses an inked ribbon or hammer embossed with different alphabets
- Non-impact printers
 - ❑ Use methods other than force
 - ❑ Tend to be quiet and fast



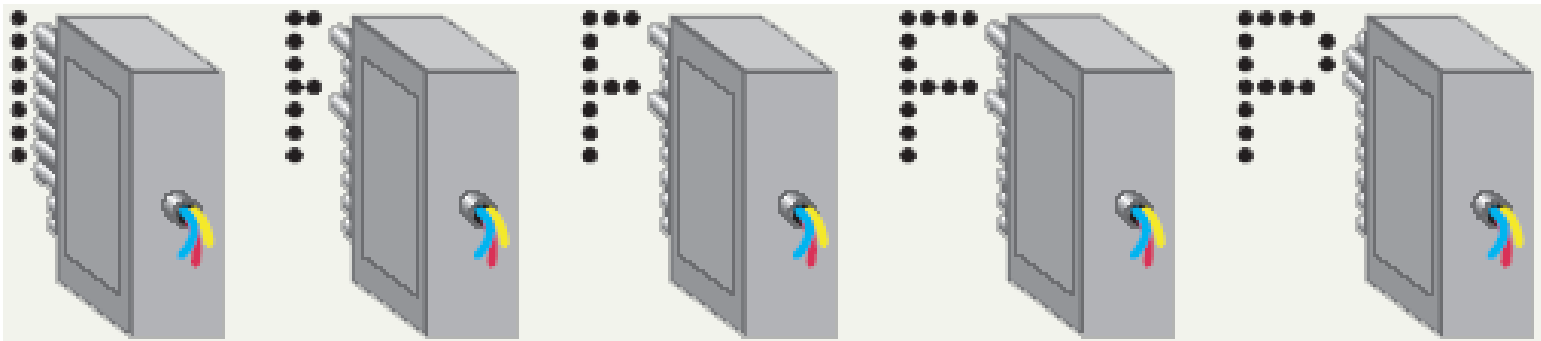
Source: <http://www.thehaystackneedleonline.com/2009/10/typewriter-collection.html>



Printers (cont.)

➤ Dot matrix printers

- ❑ Impact printer
- ❑ Print head strikes inked ribbon
- ❑ Speed measured in characters per second
 - Range from 50 to 500 cps
- ❑ Types
 - Line printers for printing line
 - Band printers with rotating band embossed with characters



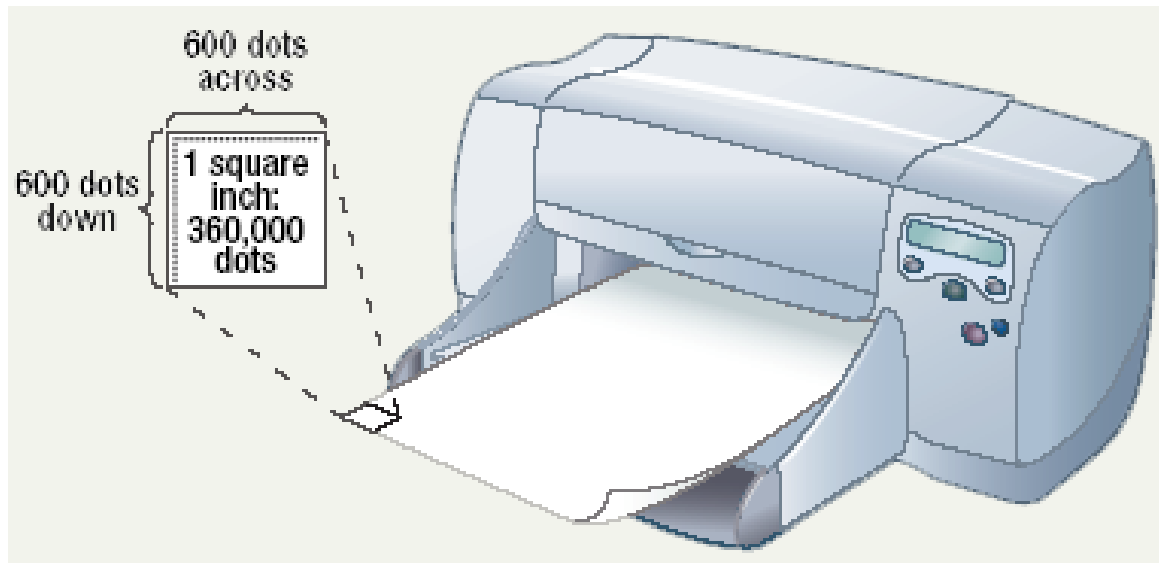
Dot Matrix Print Head



Printers (cont.)

➤ Ink-jet printers

- ❑ Non-impact printer
- ❑ Inexpensive home printer
- ❑ Color output common using *CMYK*
 - Cyan (like blue), magenta (like red), yellow, key (black)
- ❑ Sprays ink onto paper
- ❑ Speed measured in pages per minute
- ❑ Quality expressed as dots per inch

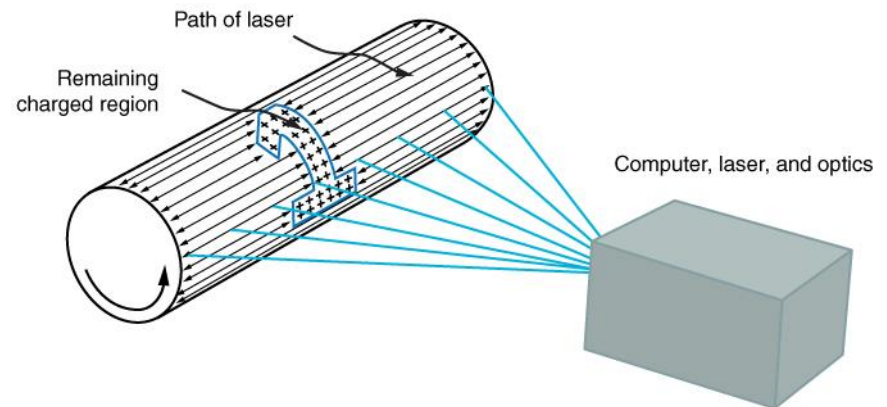




Printers (cont.)

➤ Laser printer

- ❑ Non-impact printer
- ❑ Produces high quality documents
- ❑ Color or black & white
- ❑ Print process
 - Laser draws text on drum
 - Toner sticks to text on drum to page
 - Toner melted to page
- ❑ Speed measured in pages per minute
- ❑ Quality expressed as dots per inch



Source: <http://devarchive.cnx.org/contents/b76ece9b-3fb0-4701-bb7a-b92b7941e4c5@1/18-9-applications-of-electrostatics>



Printers (cont.)

- All-in-one peripherals
 - ❑ Scanner, copier, printer and fax
 - ❑ Popular in home and offices
 - ❑ Prices are very reasonable



Source: <https://www.amazon.com/HP-LaserJet-Printer-Q6500A-ABA/dp/B000E6Z4E2>



Printer Comparison

- Determine what you need
- Determine what you can spend
- Initial cost
- Cost of operating
- Image quality
- Speed



High Quality Printers

- Special purpose printers
 - ❑ Used by a print shop
 - ❑ Output is professional grade
 - ❑ Prints to a variety of surfaces



High Quality Printers (cont.)

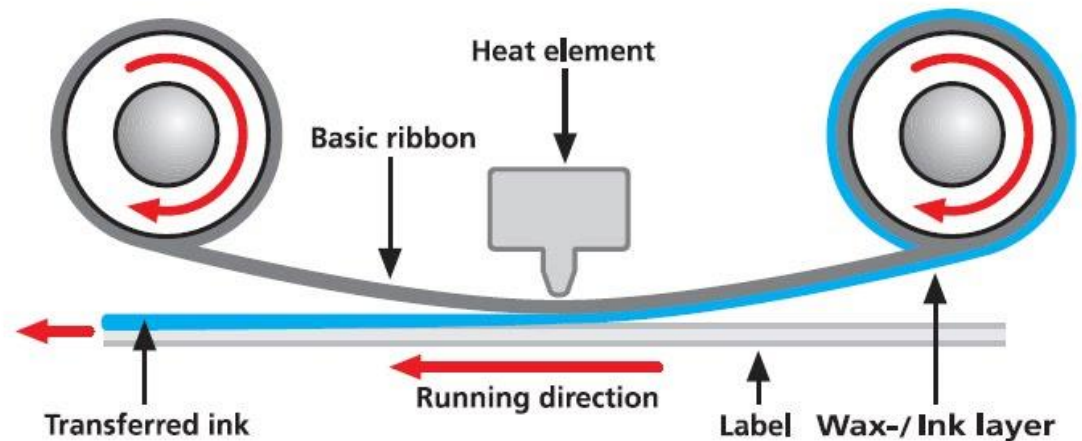
- Photo printers
 - ❑ Produces film quality pictures
 - ❑ Prints a variety of sizes
 - ❑ **Prints very slow**





High Quality Printers (cont.)

- Thermal wax printers
 - ❑ Produces bold color output
 - ❑ Color generated by melting wax
 - Ribbon coated with panels of colored wax
 - Wax melted with focused heat source
 - ❑ Colors do not bleed
 - ❑ Operation costs are low
 - ❑ **Output is slow**



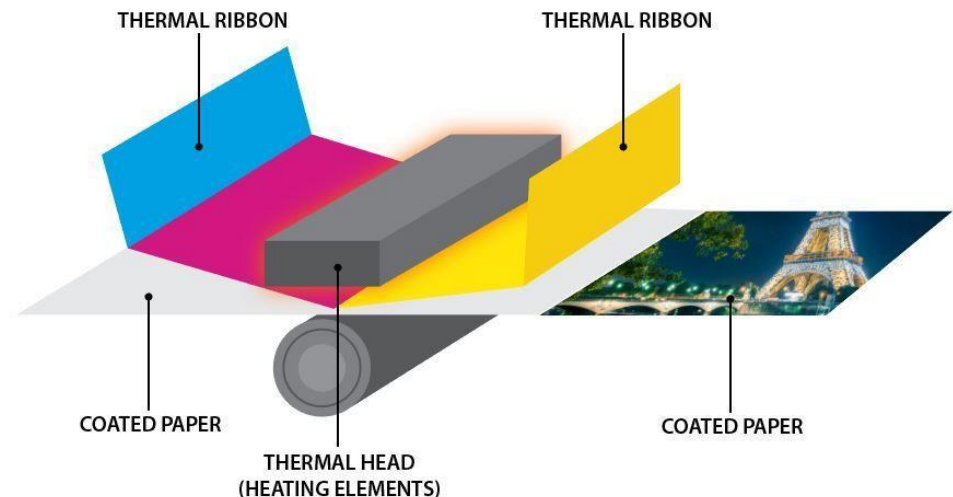
Source: <https://sites.google.com/site/htechnology23/assignments/output-hardware/hardcopy>



High-Quality Printers (cont.)

➤ Dye sublimation printers

- ❑ Color is produced by evaporating ink
 - Ribbon with color panels moved across a focused heat source
 - Evaporated dye diffuse on special coated paper
- ❑ Produces realistic output
- ❑ Used by graphic designers
- ❑ Very high quality
- ❑ Operation costs are high
- ❑ Output is very slow



Source: <https://www.georgiaexpo.com/what-is-dye-sublimation-custom-printed-fabric>



High-Quality Printers (cont.)

➤ Plotters

- ❑ Large high quality images
- ❑ Older models draw with pens
 - Paper is held stationary
- ❑ Operational costs are low
- ❑ **Output is very slow**
- ❑ Advanced plotter are called roller plotters
 - Paper is moved back and fourth along with pen
 - Produce perfect circles and drawings

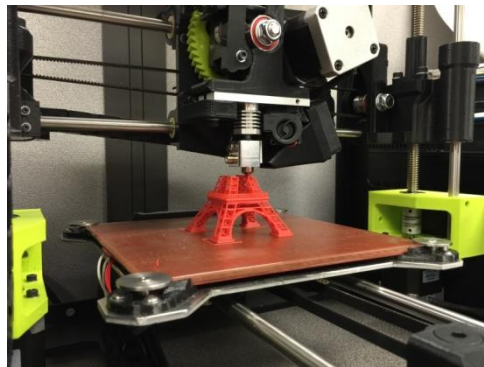




High-Quality Printers (cont.)

➤ 3D printers

- ❑ Also known as additive manufacturers
- ❑ Process of making three dimensional solid objects from digital file
 - Using additive processes
 - Object created by laying down successive layers of material
 - Process continues until object created
 - Each layers seen as a thinly sliced horizontal cross-section of eventual object
- ❑ Opposite of subtractive manufacturers
 - Subtractive manufacturing is cutting out / hollowing out
- ❑ 3D printing enables to produce complex (functional) shapes
 - Using less material than traditional manufacturing methods



Source: <https://3dprinting.com/what-is-3d-printing>
<https://www.computerworld.com/article/2868817/review-lulzbot-mini-3d-printer-delivers-outstanding-details.html>



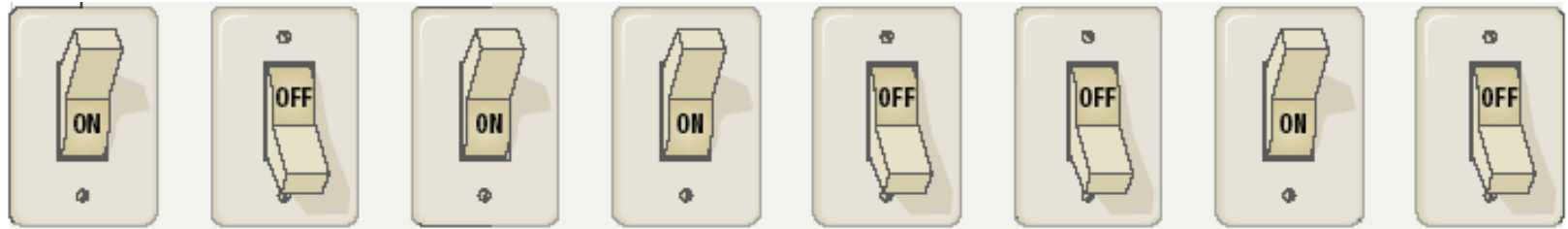
How Computers Represent Data

- Number systems
 - ❑ A manner of counting
 - ❑ Several different number systems exist
- Decimal number system
 - ❑ Used by humans to count
 - ❑ Contains ten distinct digits
 - ❑ Digits combine to make larger numbers
- Binary number system
 - ❑ Used by computers to count
 - ❑ Two distinct digits, 0 and 1
 - ❑ 0 and 1 combine to make numbers



How Computers Represent Data (cont.)

- Bits and bytes
 - ❑ Binary numbers are made of bits
 - ❑ Bit represents a switch
 - ❑ A byte is 8 bits
 - ❑ Byte represents one character





How Computers Represent Data (cont.)

➤ Text codes

- ❑ Converts letters into binary
- ❑ Standard codes necessary for data transfer
- ❑ ASCII
 - American Standard Code for Information Interchange
 - American English symbols
- ❑ Extended ASCII
 - Graphics and other symbols
- ❑ Unicode
 - All languages on the planet



How Computers Represent Data (cont.)

ASCII Code	Decimal Equivalent	Character	ASCII Code	Decimal Equivalent	Character
0010 1011	43	+	0101 0110	86	V
0010 1100	44	,	0101 0111	87	W
0010 1101	45	-	0101 1000	88	X
0010 1110	46	.	0101 1001	89	Y
0010 1111	47	/	0101 1010	90	Z
0011 0000	48	0	0101 1011	91	[
0011 0001	49	1	0101 1100	92	\
0011 0010	50	2	0101 1101	93]
0011 0011	51	3	0101 1110	94	^
0011 0100	52	4	0101 1111	95	_
0011 0101	53	5	0110 0000	96	`
0011 0110	54	6	0110 0001	97	a
0011 0111	55	7	0110 0010	98	b
0011 1000	56	8	0110 0011	99	c
0011 1001	57	9	0110 0100	100	d
0011 1010	58	:	0110 0101	101	e
0011 1011	59	;	0110 0110	102	f
0011 1100	60	<	0110 0111	103	g