Chap. 1
Computers and Information

EE2030h
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Slide Set 1

http://www.ece.gatech.edu/academic/courses/ece2030/

http://www.csc.gatech.edu/~copeland/2030/

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Signals

Physical Types
- Voltage
- Current
- Photons

Fixed Number of Discrete Levels (digital, not analog)
- 2 levels - binary (simpler circuits for computers)
  - Called (true, false), (high,low) or (0,1)
- multi-level - good for communications (EE4604)

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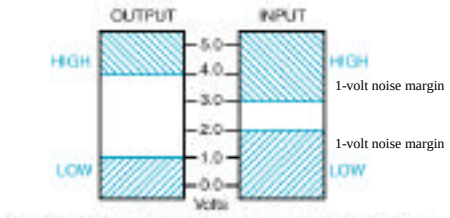


Fig. 1-1 An Example of Voltage Ranges for Binary Signals

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A binary number is called a “Bit”.

Eight bits as a unit are called a “Byte”

Bits may reside:
- on different memory elements in a semiconductor memory chip (C charged or not),
- on different spots on a magnetic disk (M + or -)
- on different spots on a CD (pit or no pit),
- on the input and outputs of “logic gates”
- in a computer “register” or “on a bus”

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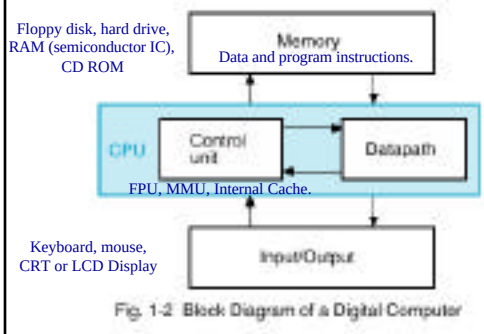


Fig. 1-2 Block Diagram of a Digital Computer

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TABLE 1-2
Numbers with Different Bases

Decimal (base 10)	Binary (base 2)	Octal (base 8)	Hexadecimal (base 16)
00	0000	00	0
01	0001	01	1
02	0010	02	2
03	0011	03	3
04	0100	04	4
05	0101	05	5
06	0110	06	6
07	0111	07	7
08	1000	10	8
09	1001	11	9
10	1010	12	A
11	1011	13	B
12	1100	14	C
13	1101	15	D
14	1110	16	E
15	1111	17	F

If base > 10 new symbols must be defined for 11, 12, ...

1x8 + 3 =13 base10

1x8 +0x4+1x3 +1 = 11 base10

Table 1-2 Numbers with Different Bases

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TABLE 1-3
Binary-Coded Decimal (BCD)

Decimal Symbol	BCD Digit
0	0000
1	0001
2	0010
3	0011
4	0100
5	0101
6	0110
7	0111
8	1000
9	1001

Table 1-3 Binary-Coded Decimal (BCD)

Used in pocket calculators, reduces binary to decimal conversions.

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Alphanumeric characters assigned a 7-bit pattern or binary number.

$B_7B_6B_5B_4B_3B_2B_1$ e.g., "A"= 1000001

TABLE 1-4
American Standard Code for Information Interchange (ASCII)

B.B.B.B.	000	001	010	011	100	101	110	111
0000	NULL	DLE	SP	0	@	P	`	p
0001	SOH	DC1	!	1	A	Q	a	q
0010	STX	DC2	"	2	B	R	b	r
0011	ETX	DC3	#	3	C	S	c	s
0100	EOT	DC4	$	4	D	T	d	t
0101	ENQ	NAK	%	5	E	U	e	u
0110	ACK	SYN	&	6	F	V	f	v
0111	BEL	ETB	'	7	G	W	g	w
1000	BS	CAN	(	8	H	X	h	x
1001	HT	EM	)	9	I	Y	i	y
1010	LF	SUB	*	:	J	Z	j	z
1011	VT	ESC	+	;	K	[	k	{
1100	FF	FS	,	<	L	\	l	|
1101	CR	GS	-	=	M	]	m	}
1110	SO	RS	.	>	N	^	n	~
1111	SI	US	/	?	O	_	o	DEL

Normally "Bytes" are expressed as $B_7B_6B_5B_4B_3B_2B_1B_0$. The bits shown above would be 6-0, and B_7 is the "parity" or "high order" bit.

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Codes 0000000 (0) to 0011111 (31)

Control Characters

NULL	NULL	
SOH	Start of Heading	
STX	Start of text	
ETX	End of text	
EOT	End of transmission	
ENQ	Enquiry	
ACK	Acknowledge	
BEL	Bell	
BS	Backspace	
HT	Horizontal tab	Tab, ^I
LF	Line feed	LF, ^J
VT	Vertical tab	
FF	Form feed	
CR	Carriage return	CR, ^M
SO	Shift out	
SI	Shift in	
SP	Space	
DLE	Data link escape	
DC1	Device control 1	
DC2	Device control 2	
DC3	Device control 3	
DC4	Device control 4	
NAK	Negative acknowledge	
SYN	Synchronous idle	
ETB	End of transmission block	
CAN	Cancel	
EM	End of medium	
SUB	Substitute	
ESC	Escape	
FS	File separator	
GS	Group separator	
RS	Record separator	
US	Unit separator	
DEL	Delete	

End of Line: Teletype and DOS = LF+CR, UNIX = LF, Macintosh = CR

LF ↓ ← CR

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