DigiPoints
Volume 1

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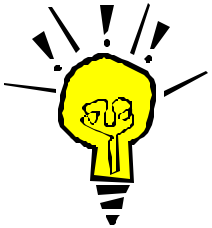
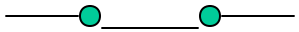
WHAT IS DIGITAL?

1 ON CLOSE

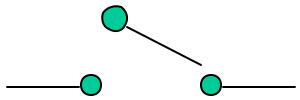
YES





0 OFF OPEN

NO



Your Point Is ???

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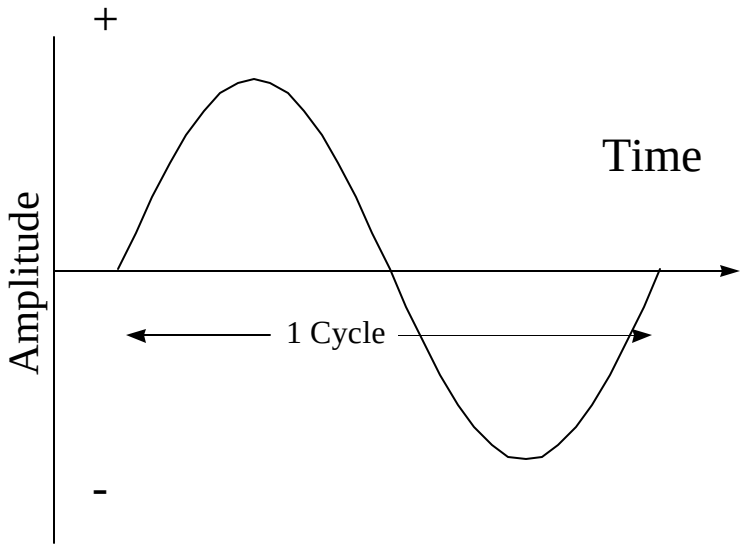
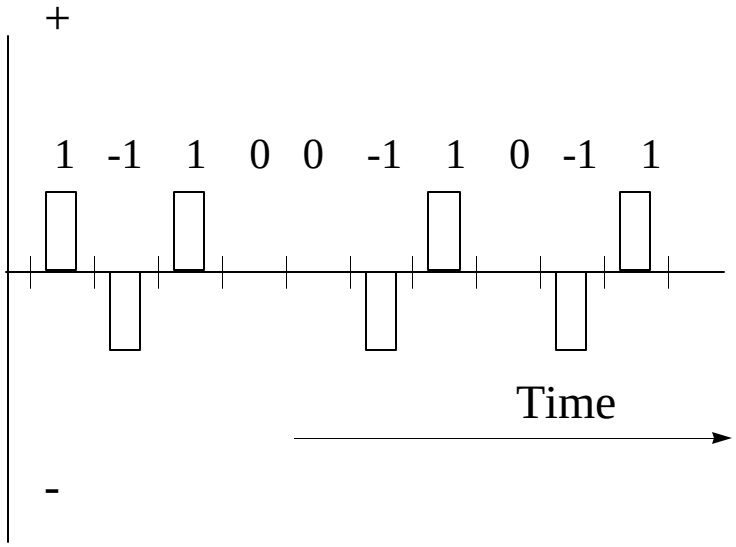


ANALOG

DIGITAL



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Binary System vs. Base 10

Binary System

The Binary System is called a Base 2 system since it consists of only two numbers or states, 0 and 1. The system we use everyday is the Base 10 system (Apparently whomever invented it was already wearing shoes or we would be in a Base 20 system). The numbers correspond as follows:

Base 10	**Base 2**
0	0
1	1
2	10
3	11
4	100
5	101
6	110
7	111
8	1000
9	1001

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Powers of 2 or 2^n

Digit Position	8	7	6	5	4	3	2	1
Powers of 2	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
VALUE	128	64	32	16	8	4	2	1

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EXAMPLES									Base 10 Value
Binary A	1	0	0	1	0	0	1	1	XXX
Value	+128	+0	+0	+16	+0	+0	+2	+1	147
Binary B	0	0	0	1	1	0	1	0	
Binary C	1	1	1	1	1	1	1	1	
Binary D									85
Binary E									97

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QUESTIONS

Powers of 2	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	Base 10 Value
A	1	0	0	0	1	1	0	0	
B	0	0	0	1	1	1	0	1	
C	0	1	1	0	1	0	0	0	
D									25
E									186
F									127

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ANSWERS

Powers of 2	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	Base 10 Value
A	1	0	0	0	1	1	0	0	**140**
B	0	0	0	1	1	1	0	1	**29**
C	0	1	1	0	1	0	0	0	**104**
D	**0**	**0**	**0**	**1**	**1**	**0**	**0**	**1**	25
E	**1**	**0**	**1**	**1**	**1**	**0**	**1**	**0**	186
F	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	127

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Practice

Convert the following Base 10 Numbers to Base 2:

257 9 199 150 227 82

Convert the following Base 2 Numbers to Base 10:

1001 11001 11001100 1010101 0111110000 1111

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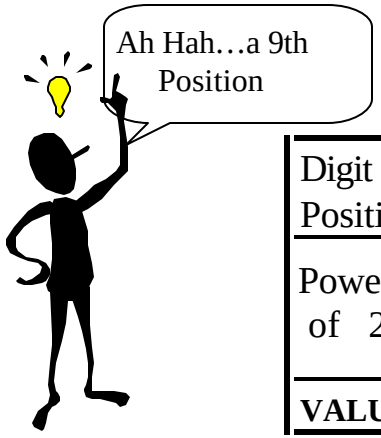
Practice ANSWERS



Digit Position	**9**	8	7	6	5	4	3	2	1
Powers of 2	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}
VALUE	256	128	64	32	16	8	4	2	1

Convert the following Base 10 Numbers to Base 2:

257	*9*	199	**150**	*227*	82
1 0000 0001	*1001*	1100 0111	**1001 0110**	*1110 0011*	101 0010

Convert the following Base 2 Numbers to Base 10:

1011	*1 1001*	1100 1100	**101 0101**	*01 1111 0000*	1111
11	*25*	204	**85**	*496*	15

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Hexadecimal "Heartache"

		Hexadecimal Columns			
Column 3		Column 2		Column 1	
HEX =	DECimal	HEX =	DEC	HEX =	DEC
0	0	0	0	0	0
1	256	1	16	1	1
2	512	2	32	2	2
3	768	3	48	3	3
4	1,024	4	64	4	4
5	1,280	5	80	5	5
6	1,535	6	96	6	6
7	1,792	7	112	7	7
8	2,048	8	128	8	8
9	2,304	9	144	9	9
A	2,560	A	160	A	10
B	2,816	B	176	B	11
C	3,072	C	192	C	12
D	3,328	D	208	D	13
E	3,584	E	224	E	14
F	3,840	F	240	F	15

POWERS OF 16	Exponent	Powers of 10	& 2
16^N	N	10^N	2^N
1	0	1	1
16	1	10	2
256	2	100	4
4,096	3	1,000	8
65,536	4	10,000	16
1,048,576	5	100,000	32
16,777,216	6	1,000,000	64

These tables are extracted in part from the **Reference Manual for Telecommunications Engineering: Second Edition**, by Roger L Freeman,
A Wiley-Interscience Publication,
John Wiley & Sons, Inc., New York,
ISBN 0-471-57960-2

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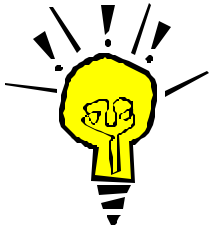
Page 1453, Table 17-20 Hexadecimal and Decimal Conversion

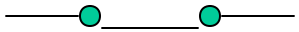
Mark & Space

1 ON CLOSE

MARK **± 3**

YES

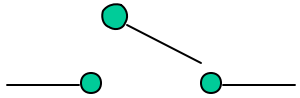




0 OFF OPEN

SPACE **0**

NO



da BIT’s family

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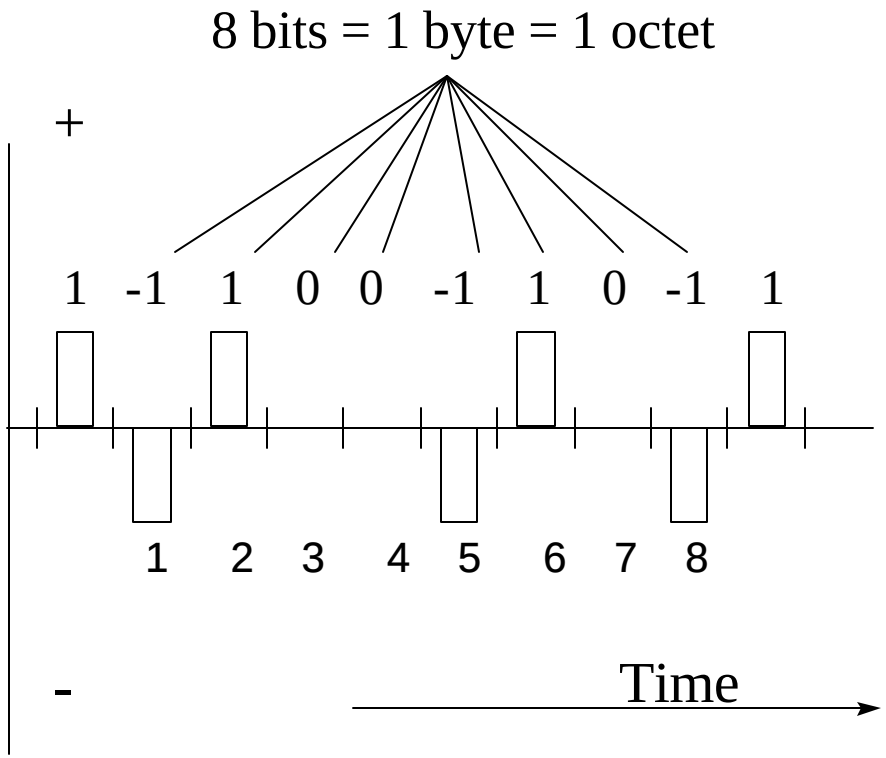
Bit, Byte, and Baud



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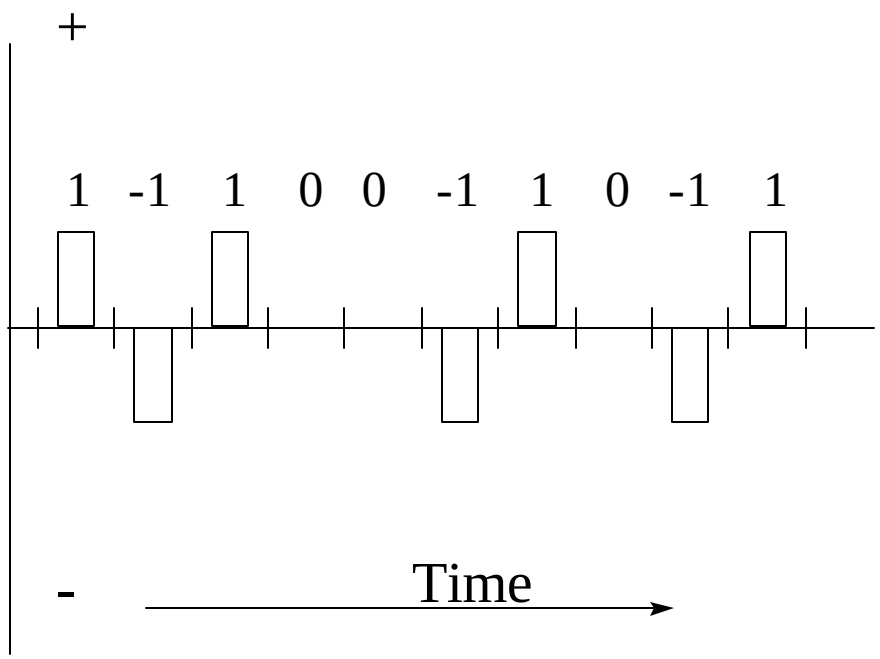
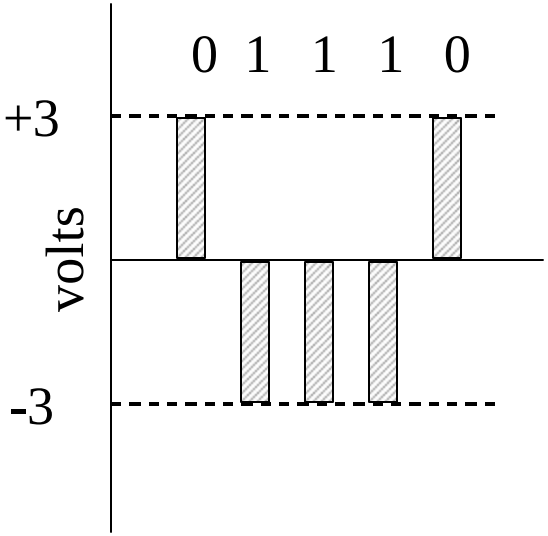
BIT RATES

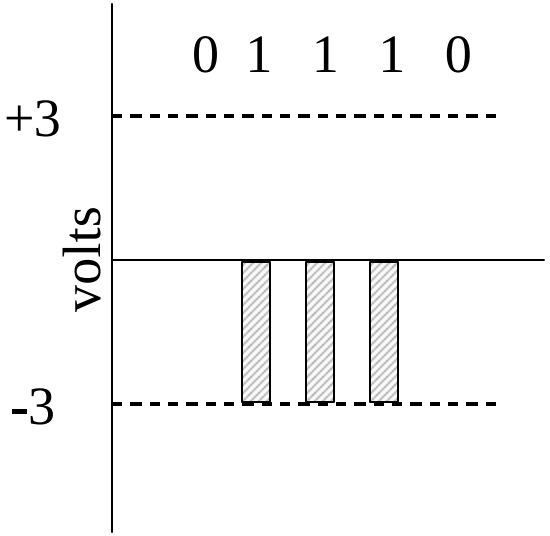


How many bits per second are being transmitted if what you are looking at is 1 second of time?

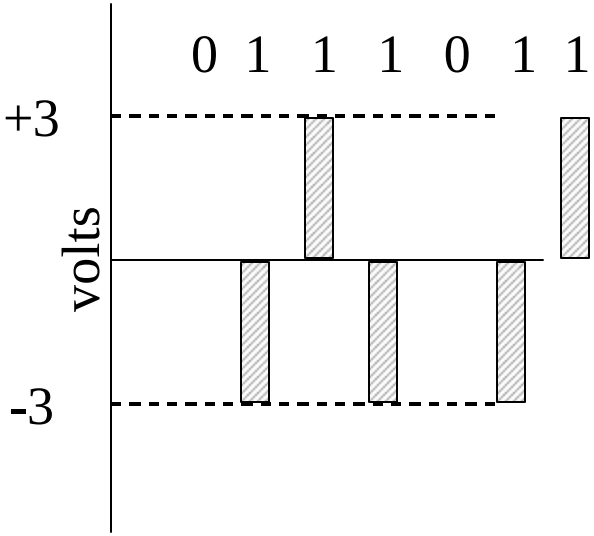
Communication Voltages



CCITT & EIA
Recommend
Standard



Voltage levels that
are used today
in computers



Voltage levels that
are used today
in digital telephony
systems

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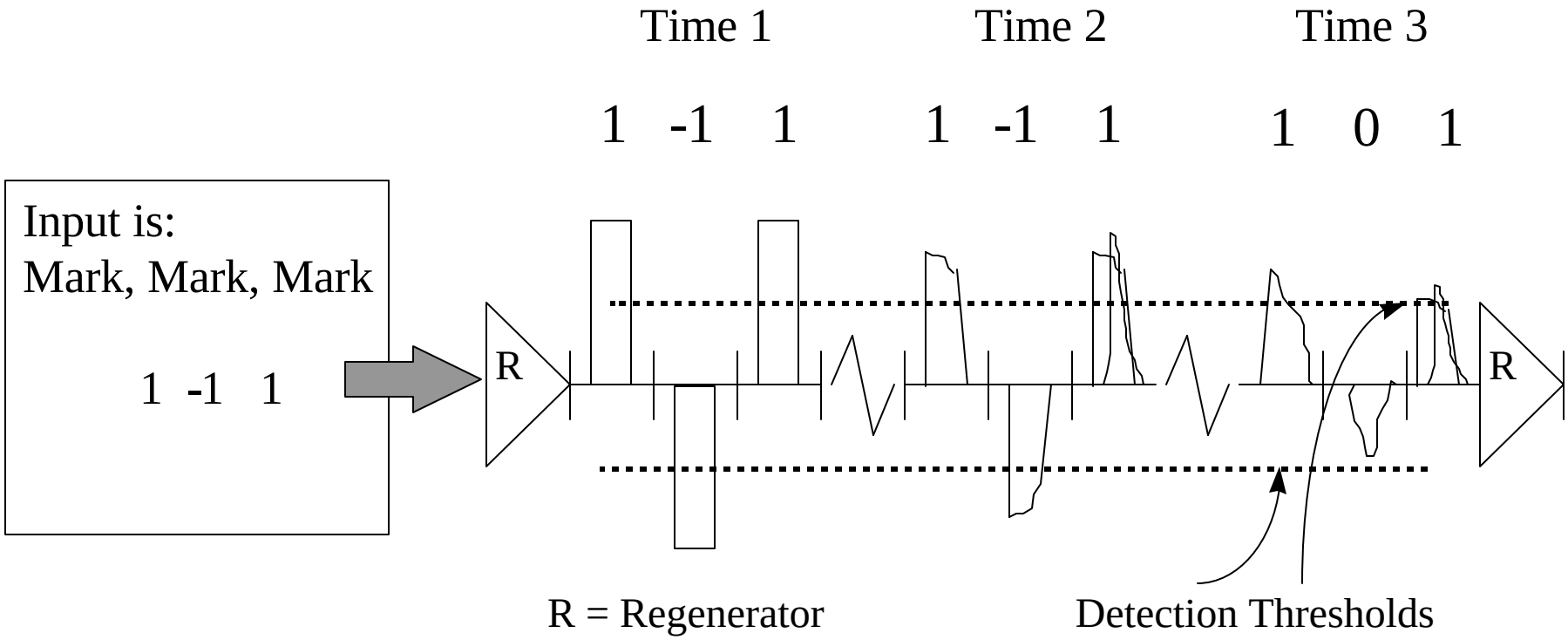
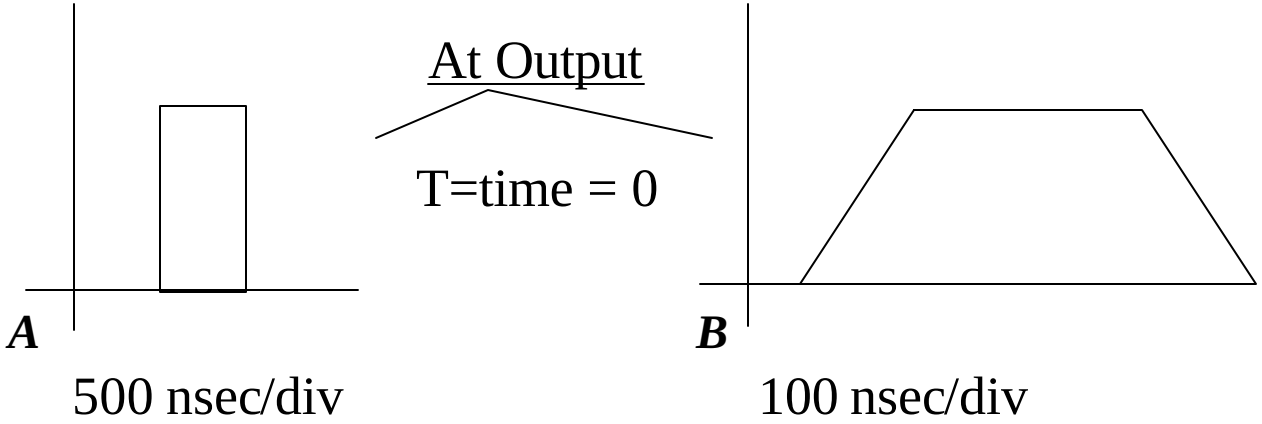
Attenuation of a Digital Signal

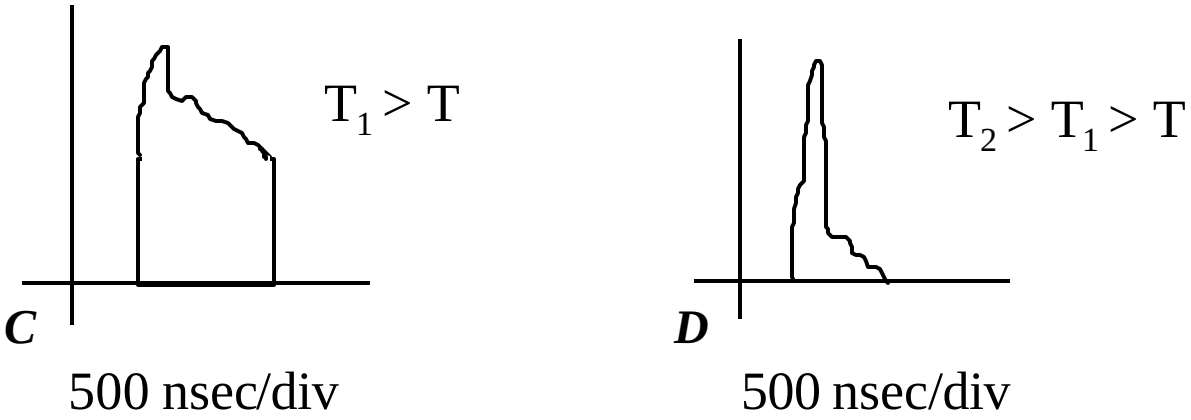


What "DATA" Looks Like

250 nsec
+3 V pulse



Same pulse being looked at "downstream



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Time Domain Picture of 16-VSB Signal

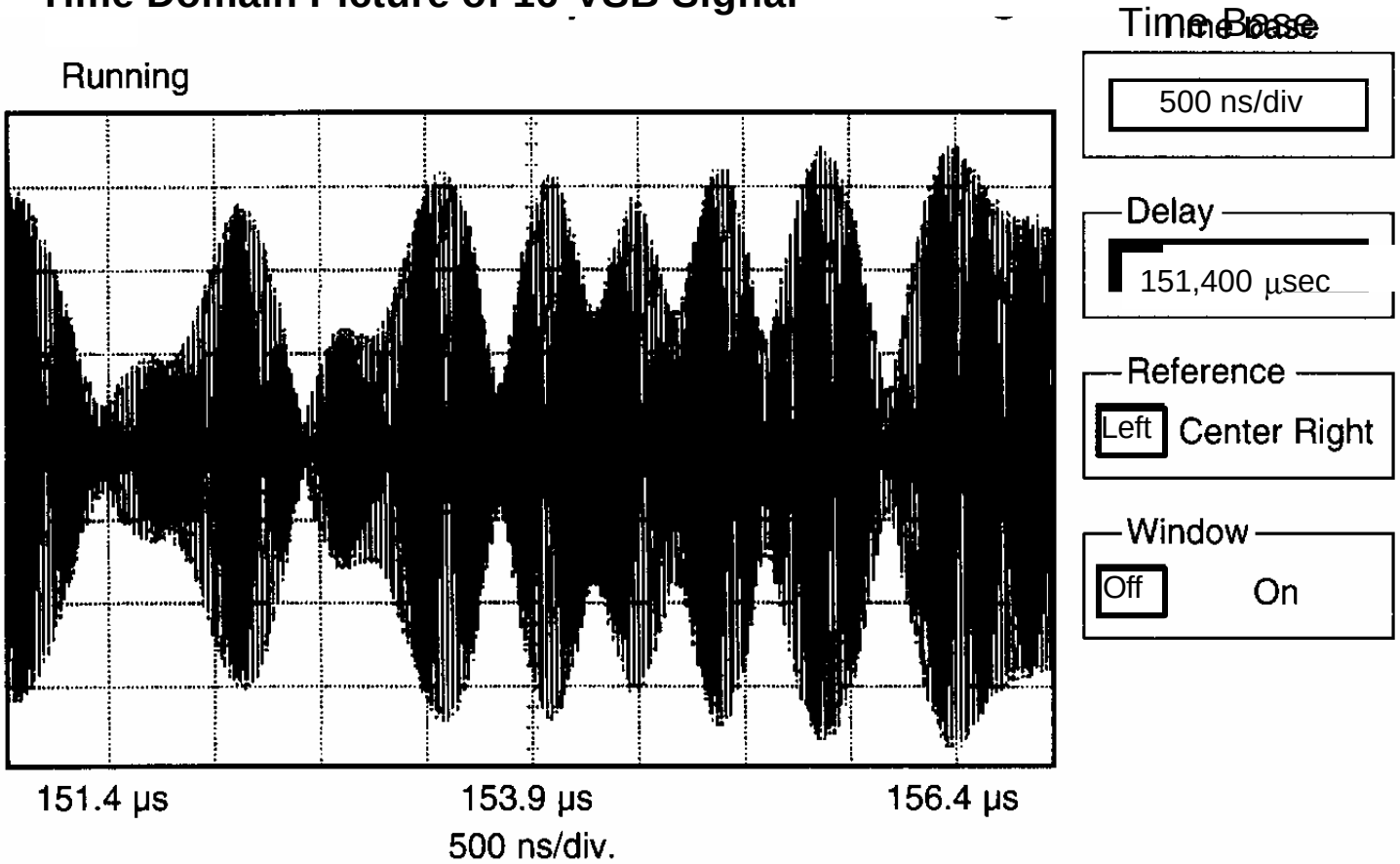

Photo courtesy of
Hewlett Packard

Stop marker: 164.000 ns
Start marker: -34.000 ns
Delta t: 198.000 ns
1/delta t: 5.05051 MHz