

THE BASE64 AND BASE32 ALPHABETS

(From [RFC 3548](#))

The BASE64 Alphabet										
Char.	Dec.	Hex.		Char.	Dec.	Hex.		Char.	Dec.	Hex.
A	0	00		W	22	16		s	44	2C
B	1	01		X	23	17		t	45	2D
C	2	02		Y	24	18		u	46	2E
D	3	03		Z	25	19		v	47	2F
E	4	04		a	26	1A		w	48	30
F	5	05		b	27	1B		x	49	31
G	6	06		c	28	1C		y	50	32
H	7	07		d	29	1D		z	51	33
I	8	08		e	30	1E		0	52	34
J	9	09		f	31	1F		1	53	35
K	10	0A		g	32	20		2	54	36
L	11	0B		h	33	21		3	55	37
M	12	0C		i	34	22		4	56	38
N	13	0D		j	35	23		5	57	39
O	14	0E		k	36	24		6	58	3A
P	15	0F		l	37	25		7	59	3B
Q	16	10		m	38	26		8	60	3C
R	17	11		n	39	27		9	61	3D
S	18	12		o	40	28		+	62	3E

T	19	13		p	41	29		/	63	3F
U	20	14		q	42	2A				
V	21	15		r	43	2B		=	(pad)	(pad)

BASE64 characters are 6 bits in length. They are formed by taking a block of three octets to form a 24-bit string, which is converted into four BASE64 characters.

NOTE: The pad character (=) does not have a binary representation in BASE64; it is inserted into the BASE64 text as a placeholder to maintain 24-bit alignment.

NOTE: In the *URL and Filename safe* variant, character 62 (0x3E) is replaced with a "-" (minus sign) and character 63 (0x3F) is replaced with a "_" (underscore).

When converting to binary, remember to use only 6 bits (e.g., 0x19 = binary 01 1001).

You can download a BASE64 conversion program [here](#).

The BASE32 Alphabet

Char.	Dec.	Hex.		Char.	Dec.	Hex.		Char.	Dec.	Hex.
A	0	00		M	12	0C		Y	24	18
B	1	01		N	13	0D		Z	25	19
C	2	02		O	14	0E		2	26	1A
D	3	03		P	15	0F		3	27	1B
E	4	04		Q	16	10		4	28	1C
F	5	05		R	17	11		5	29	1D
G	6	06		S	18	12		6	30	1E
H	7	07		T	19	13		7	31	1F
I	8	08		U	20	14				
J	9	09		V	21	15		=	(pad)	(pad)

K	10	0A		W	22	16				
L	11	0B		X	23	17				

BASE32 characters are 5 bits in length. They are formed by taking a block of five octets to form a 40-bit string, which is converted into eight BASE32 characters.

NOTE: The pad character (=) does not have a binary representation in BASE32; it is inserted into the BASE32 text as a placeholder to maintain 40-bit alignment.

When converting to binary, remember to use only 5 bits (e.g., 0x19 = binary 1 1001).

Examples

BASE64

Convert the following 24-bit string to BASE64:

- Original binary string: 01001101 01011010 10010000
- Regroup into 6-bit quantities: 010011 010101 101010 010000
- Convert to BASE64 characters: TVqQ

Convert the following 16-bit string to BASE64 (this could occur only at the end of a file):

- Original binary string: 10110110 11000101
- Regroup into 6-bit quantities and zero-pad as necessary: 101101 101100
010100 *null*
- Convert to BASE64 characters: tSU=

BASE32

Convert the following 40-bit string to BASE32:

- Original binary string: 11001001 01101110 10010110 00010111
10101101

- Regroup into 5-bit quantities: 11001 00101 10111 01001 01100 00101
11101 01101
- Convert to BASE32 characters: ZFXJMF5N

Convert the following 24-bit string to BASE32:

- Original binary string: 01001101 01011010 10010000
- Regroup into 5-bit quantities and zero-pad as necessary: 01001 10101 01101
01001 00000 *null null null*
- Convert to BASE32 characters: JVNJA===