

TABLE 2.6 ASCII and EBCDIC Codes in Hex.

Character	ASCII	EBCDIC	Character	ASCII	EBCDIC	Character	ASCII	EBCDIC	Character	ASCII	EBCDIC
@	40			60		blank	20	40	NUL	00	
A	41	C1	a	61	81	!	21	5A	SOH	01	
B	42	C2	b	62	82	"	22	7F	STX	02	
C	43	C3	c	63	83	#	23	7B	ETX	03	
D	44	C4	d	64	84	\$	24	5B	EOT	04	37
E	45	C5	e	65	85	%	25	6C	ENQ	05	
F	46	C6	f	66	86	&	26	50	ACK	06	
G	47	C7	g	67	87	'	27	7D	BEL	07	
H	48	C8	h	68	88	(	28	4D	BS	08	16
I	49	C9	i	69	89	)	29	5D	HT	09	05
J	4A	D1	j	6A	91	*	2A	5C	LF	0A	25
K	4B	D2	k	6B	92	+	2B	4E	VT	0B	
L	4C	D3	l	6C	93	,	2C	6B	FF	0C	
M	4D	D4	m	6D	94	-	2D	60	CR	0D	15
N	4E	D5	n	6E	95	.	2E	4B	SO	0E	
O	4F	D6	o	6F	96	/	2F	61	SI	0F	
P	50	D7	p	70	97	0	30	F0	DLE	10	
Q	51	D8	q	71	98	1	31	F1	DC1	11	
R	52	D9	r	72	99	2	32	F2	DC2	12	
S	53	E2	s	73	A2	3	33	F3	DC3	13	
T	54	E3	t	74	A3	4	34	F4	DC4	14	
U	55	E4	u	75	A4	5	35	F5	NAK	15	
V	56	E5	v	76	A5	6	36	F6	SYN	16	
W	57	E6	w	77	A6	7	37	F7	ETB	17	
X	58	E7	x	78	A7	8	38	F8	CAN	18	
Y	59	E8	y	79	A8	9	39	F9	EM	19	
Z	5A	E9	z	7A	A9	:	3A		SUB	1A	
[	5B		{	7B		;	3B	5E	ESC	1B	
\	5C		|	7C	4F	<	3C	4C	FS	1C	
]	5D		}	7D		=	3D	7E	GS	1D	
^	5E		~	7E		>	3E	6E	RS	1E	
_	5F	6D	DEL	7F	07	?	3F	6F	US	1F	

in the computer's memory. To print the digit 5 on the EBCDIC printer, a program must be written that will convert the ASCII code 35_{16} for 5 to its EBCDIC code $F5_{16}$. The output of this program is $F5_{16}$. This will be input to the EBCDIC printer. Because the printer only understands EBCDIC codes, it inputs the EBCDIC code $F5_{16}$ and prints the digit 5.

Let us now discuss packed and unpacked BCD codes in more detail. For example, in order to enter 24 in decimal into a computer, the two keys (2 and 4) will be pushed on the ASCII keyboard. This will generate 32 and 34 (32 and 34 are ASCII codes in hexadecimal for 2 and 4 respectively) inside the computer. A program can be written to convert these ASCII codes into unpacked BCD 02 and 04, and then convert to packed BCD 24 or to binary inside the computer to perform the desired operation.

2.3.3 Excess-3 Code

The excess-3 representation of a decimal digit d can be obtained by adding 3 to its value. All decimal digits and their excess-3 representations are listed in Table 2.7.

The excess-3 code is an unweighted code because its value is obtained by adding three to the corresponding binary value. The excess-3 code is self-complementing. For example, decimal digit 0 in excess-3 (0011) is ones complement of 9 in excess three (1100). Similarly, decimal digit 1 is ones complement of 8, and so on. This is why some older computers used