#### OUTLINE

- (1) Brief overview on character data type.
- (2) Size of characters.
- (3) Range of characters.
- Difference between signed and unsigned characters.





# **ASCII TABLE**

Decimal Hex Char		Decimal	Hex	Char	Decima	al Hex C	har	Decima	l Hex C	har	
0	0	[NULL]	32	20	[SPACE]	64	40	@	96	60	,
1	1	[START OF HEADING]	33	21	!	65	41	A	97	61	a
2	2	[START OF TEXT]	34	22	"	66	42	В	98	62	b
3	3	[END OF TEXT]	35	23	#	67	43	C	99	63	C
4	4	[END OF TRANSMISSION]	36	24	\$	68	44	D	100	64	d
5	5	[ENQUIRY]	37	25	%	69	45	E	101	65	е
6	6	[ACKNOWLEDGE]	38	26	&	70	46	F	102	66	f
7	7	[BELL]	39	27		71	47	G	103	67	g
8	8	[BACKSPACE]	40	28	(	72	48	н	104	68	h
9	9	[HORIZONTAL TAB]	41	29	)	73	49	1	105	69	i
10	A	[LINE FEED]	42	2A	*	74	4A	J	106	6A	j
11	В	[VERTICAL TAB]	43	2B	+	75	4B	K	107	6B	k
12	C	[FORM FEED]	44	2C	,	76	4C	L	108	6C	1
13	D	[CARRIAGE RETURN]	45	2D	-	77	4D	M	109	6D	m
14	E	[SHIFT OUT]	46	2E		78	4E	N	110	6E	n
15	F	[SHIFT IN]	47	2F	1	79	4F	0	111	6F	0
16	10	[DATA LINK ESCAPE]	48	30	0	80	50	P	112	70	р
17	11	[DEVICE CONTROL 1]	49	31	1	81	51	Q	113	71	q
18	12	[DEVICE CONTROL 2]	50	32	2	82	52	R	114	72	r
19	13	[DEVICE CONTROL 3]	51	33	3	83	53	S	115	73	S
20	14	[DEVICE CONTROL 4]	52	34	4	84	54	Т	116	74	t
21	15	[NEGATIVE ACKNOWLEDGE]	53	35	5	85	55	U	117	75	u
22	16	[SYNCHRONOUS IDLE]	54	36	6	86	56	V	118	76	v
23	17	[ENG OF TRANS. BLOCK]	55	37	7	87	57	W	119	77	w
24	18	[CANCEL]	56	38	8	88	58	X	120	78	x
25	19	[END OF MEDIUM]	57	39	9	89	59	Y	121	79	У
26	1A	[SUBSTITUTE]	58	3A	:	90	5A	Z	122	7A	Z
27	1B	[ESCAPE]	59	3B	;	91	5B		123	7B	{
28	1C	[FILE SEPARATOR]	60	3C	<	92	5C	1	124	7C	
29	1D	[GROUP SEPARATOR]	61	3D	=	93	5D	]	125	7D	}
30	1E	[RECORD SEPARATOR]	62	3E	>	94	5E	^	126	7E	~
31	1F	[UNIT SEPARATOR]	63	3F	?	95	5F	_	127	7F	[DEL]

## OVERVIEW

char some\_variable\_name = 'N';

char some\_variable\_name = 65;

## SIZE AND RANGE OF CHARACTER

Size:

1byte = 8 bits

Range:

Unsigned: 0 to 255

Signed: -128 to +127

ASCII control				ASCII printable							Extended ASCII									
characters				characters								characters								
00	NULL	(Null character)	3	32 spa	ce	64	@	96	•		128	Ç	160	á	192	L	224	Ó		
01	SOH	(Start of Header)	3	33 !		65	Α	97	а		129	ü	161	í	193		225	ß		
02	STX	(Start of Text)	3	34 "		66	В	98	b		130	é	162	ó	194	Т	226	Ô		
03	ETX	(End of Text)	3	35 #		67	C	99	С		131	â	163	ú	195	+	227	Ò		
04	EOT	(End of Trans.)	3	36 \$		68	D	100	d		132	ä	164	ñ	196	_	228	õ		
05	ENQ	(Enquiry)	3	37 %		69	E	101	е		133	à	165	Ñ	197	+	229	Õ		
06	ACK	(Acknowledgement)	3	88 &		70	F	102	f		134	å	166	а	198	ã	230	μ		
07	BEL	(Bell)	3	39 '		71	G	103	g		135	Ç	167	0	199	Ã	231	þ		
08	BS	(Backspace)	4	10 (		72	Н	104	h		136	ê	168	ż	200	L	232	Þ		
09	HT	(Horizontal Tab)	4	11 )		73	- 1	105	i		137	ë	169	R	201	1	233	Ú		
10	LF	(Line feed)	4	12 *		74	J	106	j		138	è	170	7	202	工	234	Û		
11	VT	(Vertical Tab)	4	3 +		75	K	107	k		139	ï	171	1/2	203	TF	235	Ù		
12	FF	(Form feed)	4	14 ,		76	L	108	1		140	î	172	1/4	204	F	236	Ý		
13	CR	(Carriage return)	4	15 -		77	M	109	m		141	ì	173	i	205	=	237	Ý		
14	SO	(Shift Out)	4	16 .		78	N	110	n		142	Ä	174	«	206	#	238	_		
15	SI	(Shift In)	4	7 /		79	0	111	0		143	Å	175	<b>&gt;&gt;</b>	207	¤	239			
16	DLE	(Data link escape)	4	18 0		80	P	112	р		144	É	176		208	ð	240	=		
17	DC1	(Device control 1)	4	19 1		81	Q	113	q		145	æ	177	0.000000 0.000000000000000000000000000	209	Ð	241	±		
18	DC2	(Device control 2)		50 2		82	R	114	r		146	Æ	178		210	Ê	242	_		
19	DC3	(Device control 3)	5	51 3		83	S	115	S		147	ô	179	T	211	Ë	243	3/4		
20	DC4	(Device control 4)		52 4		84	Т	116	t		148	Ö	180	+	212	È	244	9		
21	NAK	(Negative acknowl.)		53 5		85	U	117	u		149	ò	181	Á	213	1	245	§		
22	SYN	(Synchronous idle)		6		86	V	118	V		150	û	182	Â	214	ĺ	246	÷		
23	ETB	(End of trans. block)		55 <b>7</b>		87	W	119	w		151	ù	183	À	215	Î	247			
24	CAN	(Cancel)		66 8		88	X	120	х		152	ÿ	184	©	216	Ï	248	0		
25	EM	(End of medium)	5	57 9		89	Y	121	У		153	Ö	185	4	217	٦	249			
26	SUB	(Substitute)		58 :		90	Z	122	Z		154	Ü	186		218	Г	250			
27	ESC	(Escape)		59 ;		91	[	123	{		155	Ø	187	٦	219		251	1		
28	FS	(File separator)	6	60 <		92	١	124			156	£	188	7	220		252	3		
29	GS	(Group separator)	(	31 =		93	]	125	}		157	Ø	189	¢	221	1	253	2		
30	RS	(Record separator)	6	52 >		94	۸	126	~		158	×	190	¥	222	ì	254			
31	US	(Unit separator)	(	3 ?		95	_				159	f	191	٦	223		255	nbsp		
127	DEL	(Delete)																		

$$-2^{7} 2^{6} 2^{5} 2^{4} 2^{3} 2^{2} 2^{1} 2^{0}$$

$$-128 = 1 0 0 0 0 0 0 0$$

$$2^{7} 2^{6} 2^{5} 2^{4} 2^{3} 2^{2} 2^{1} 2^{0}$$
+128 = 1 0 0 0 0 0 0 0

$$-2^{7} 2^{6} 2^{5} 2^{4} 2^{3} 2^{2} 2^{1} 2^{0}$$

$$-127 = 1 0 0 0 0 0 0 1$$

$$2^7 \ 2^6 \ 2^5 \ 2^4 \ 2^3 \ 2^2 \ 2^1 \ 2^0$$
  
+129 = 1 0 0 0 0 0 0 1

$$-2^{7} 2^{6} 2^{5} 2^{4} 2^{3} 2^{2} 2^{1} 2^{0}$$

$$-126 = 1 0 0 0 0 0 1 0$$

$$2^7 \ 2^6 \ 2^5 \ 2^4 \ 2^3 \ 2^2 \ 2^1 \ 2^0$$
  
+130 = 1 0 0 0 0 0 1 0

$$-2^{7} 2^{6} 2^{5} 2^{4} 2^{3} 2^{2} 2^{1} 2^{0}$$

$$-1 = 1 1 1 1 1 1 1 1 1 1$$

$$2^{7} 2^{6} 2^{5} 2^{4} 2^{3} 2^{2} 2^{1} 2^{0}$$

$$+255 = 1 1 1 1 1 1 1 1 1$$

#### SUMMARY

- 1. Size of character = 1 byte
- 2. Signed character range: -128 to +127
- 3. Unsigned character range: 0 to 255
- 4. Negative values won't buy you any additional powers
- 5. In traditional ASCII table, each character requires 7 bits.
- 6. In extended ASCII table, each character utilize all 8 bits.