

Code 128 Bar Code QwikTip™ (ASCII)

Within a Code 128 bar code there are 3 separate character sets; Subset A, Subset B, and Subset C. Each subset uses a start character, a stop character, and a check digit.

Start character | Data | Check Digit | Stop

By following the instructions enclosed you will be able to encode a Code 128 bar code successfully. The table below displays the Code Value, Hex / Decimal Value, and Subset A/B/C characters. The Code Value shows the value for each Subset character and the value used for calculating the Check Digit.

If you are not successful at encoding the Code 128 bar code yourself, we offer billable assistance. An Architext Technical Support Agreement was provided to you. If you require our help, simply sign the agreement and fax.

Code128 Character Table

Code Value	Hex	Decimal	SubSet A	SubSet B	SubSet C
0	20	32	space	space	zero-zero
1	21	33	exclamation	exclamation	zero-1
2	22	34	db. Quote	db. Quote	zero-2
3	23	35	number	number	zero-3
4	24	36	dollar	dollar	zero-4
5	25	37	percent	percent	zero-5
6	26	38	ampersand	ampersand	zero-6
7	27	39	single quote	single quote	zero-7
8	28	40	left paren	left paren	zero-8
9	29	41	right paren	right paren	zero-9
10	2A	42	astrisk	astrisk	10
11	2B	43	plus	plus	11
12	2C	44	comma	comma	12
13	2D	45	minus	minus	13
14	2E	46	period	period	14
15	2F	47	forward slash	forward slash	15
16	30	48	0	0	16
17	31	49	1	1	17
18	32	50	2	2	18
19	33	51	3	3	19
20	34	52	4	4	20
21	35	53	5	5	21
22	36	54	6	6	22
23	37	55	7	7	23
24	38	56	8	8	24
25	39	57	9	9	25
26	3A	58	colon	colon	26
27	3B	59	semi-colon	semi-colon	27
28	3C	60	less than	less than	28
29	3D	61	equal	equal	29
30	3E	62	greater than	greater than	30
31	3F	63	question	question	31
32	40	64	at	at	32

33	41	65	A	A	33
34	42	66	B	B	34
35	43	67	C	C	35
36	44	68	D	D	36
37	45	69	E	E	37
38	46	70	F	F	38
39	47	71	G	G	39
40	48	72	H	H	40
41	49	73	I	I	41
42	4A	74	J	J	42
43	4B	75	K	K	43
44	4C	76	L	L	44
45	4D	77	M	M	45
46	4E	78	N	N	46
47	4F	79	O	O	47
48	50	80	P	P	48
49	51	81	Q	Q	49
50	52	82	R	R	50
51	53	83	S	S	51
52	54	84	T	T	52
53	55	85	U	U	53
54	56	86	V	V	54
55	57	87	W	W	55
56	58	88	X	X	56
57	59	89	Y	Y	57
58	5A	90	Z	Z	58
59	5B	91	left bracket	left bracket	59
60	5C	92	back slash	back slash	60
61	5D	93	right bracket	right bracket	61
62	5E	94	carat	carat	62
63	5F	95	underscore	underscore	63
64	60	96	NUL	apostrophy	64
65	61	97	SOH	a	65
66	62	98	STX	b	66
67	63	99	ETX	c	67
68	64	100	EOT	d	68
69	65	101	ENQ	e	69
70	66	102	ACK	f	70
71	67	103	BEL	g	71
72	68	104	BS	h	72
73	69	105	HT	i	73
74	6A	106	LF	j	74
75	6B	107	VT	k	75
76	6C	108	FF	l	76
77	6D	109	CR	m	77
78	6E	110	SO	n	78
79	6F	111	SI	o	79
80	70	112	DLE	p	80
81	71	113	DC1	q	81
82	72	114	DC2	r	82
83	73	115	DC3	s	83

84	74	116	DC4	t	84
85	75	117	NAK	u	85
86	76	118	SYN	v	86
87	77	119	ETB	w	87
88	78	120	CAN	x	88
89	79	121	EM	y	89
90	7A	122	SUB	z	90
91	7B	123	ESC	{	91
92	7C	124	FS		92
93	7D	125	GS	}	93
94	7E	126	RS	~	94
95	80	128	US	DEL	95
96	81	129	FNC3	FNC3	96
97	82	130	FNC2	FNC2	97
98	83	131	SHIFT	SHIFT	98
99	84	132	CODE C	CODE C	99
100	85	133	CODE B	FNC 4	CODE B
101	86	134	FNC 4	CODE A	CODE A
102	87	135	FNC 1	FNC 1	FNC 1
103	88	136	START		
104	89	137		START	
105	8A	138			START
	8B	139	STOP	STOP	STOP

Code 128 – Subset A

The start character for Subset A is located in Decimal 136 (Hex 88). The Code Value of this character is 103 (see far left hand column of Character Table). This value is used to calculate the check character.

The Stop Character is always the same character. It is not used to calculate the check digit. This character is located in Decimal 139 (Hex 8B). This character must be at the end of every symbol. Subset A data characters are printed in the same format as the human readable characters. If the actual numbers to be printed are “1234”, then the input data will look like “1234”.

Step 1

The test string will be “87654321”. We already know the start character is Decimal 136 (Hex 88), and has a Code Value of 103. The next step is to find the Code Value for each character. To find these values, use the Character Table provided (see far left hand column) and multiply the Code Value times the position number.

Test String: 87654321								
String	8	7	6	5	4	3	2	1
Data Position	1	2	3	4	5	6	7	8
Code Value	24	23	22	21	20	19	18	17
DP x CV	24	46	66	84	100	114	126	136

Step 2

After the Data Position and Code Values have been multiplied together, add these values together plus the start character value of 103. Take the sum and divide by 103. Take the whole number of the remainder and multiply by 103. Then take the value and subtract from the sum of all character values. This will give you a Code Value for the Check Digit. Use the Character Table to look up the equivalent Decimal or ASCII Hex position (see example for Step 2).

- $103 + 24 + 46 + 66 + 84 + 100 + 114 + 126 + 136 = 799$
- $799 / 103 = 7.75728...$
- 7×103 (MOD 103 is constant) = 721
- $799 - 721 = \text{Code Value } 78$
- Code Value 78 = Decimal 110 (or Hex 6E).

Step 3

The example for Step 3 shows the completed symbol. Some of the characters maybe out of the normal keyboard range, so you may have to access these positions by their ASCII decimal position (if you are using an IBM PC compatible keyboard, use your ALT key + decimal position).

Test String: 87654321										CD	
Encoding	Start	8	7	6	5	4	3	2	1	n	Stop
Decimal	136	56	55	54	53	52	51	50	49	110	139
Hex	88	38	37	36	35	34	33	32	31	6E	8B

Code 128 – Subset B

The start character for Subset B is located in Decimal 137 (Hex 89). The Code Value of this character is 104 (see far left hand column of Character Table). This value is used to calculate the check character.

The Stop Character is always the same character. It is not used to calculate the check digit. This character is located in Decimal 139 (Hex 8B). This character must be at the end of every symbol. Subset B data characters are printed in the same format as the human readable characters. If the actual numbers to be printed are “1234”, then the input data will look like “1234”.

Step 1

The test string will be “58361413201 30_A”. We already know the start character is Decimal 137 (Hex 89), and has a Code Value of 104. The next step is to find the Code Value for each character. To find these values, use the Character Table provided (see far left hand column) and multiply the Code Value times the position number (see example below).

Test String: 58361413201 30_A																
String	5	8	3	6	1	4	1	3	2	0	1	SP	3	0	_	A
Data Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Code Value	21	24	19	22	17	20	17	19	18	16	17	0	19	16	63	33
DP x CV	21	48	57	88	85	120	119	152	162	160	187	0	247	224	945	528

Step 2

After the Data Position and Code Values have been multiplied together, add these values together plus the start character value of 104. Take the sum and divide by 103. Take the whole number of the remainder and multiply by 103. Then take the value and subtract from the sum of all character values. This will give you a Code Value for the Check Digit. Use the Character Table to look up the equivalent Decimal or ASCII Hex position (see example for Step 2).

- $104 + 21 + 48 + 57 + 88 + 85 + 120 + 119 + 152 + 162 + 160 + 187 + 0 + 247 + 224 + 945 + 528 = 3247$
- $3247 / 103 = 31.524271...$
- $31 \times 103 \text{ (MOD 103 is constant)} = 3193$
- $3247 - 3193 = \text{Code Value 54}$
- Code Value 54 = Decimal 86 (or Hex 56).

Step 3

The example below shows the completed symbol. Some of the characters maybe out of the normal keyboard range, so you may have to access these positions by their ASCII decimal position (if you are using an IBM PC compatible keyboard, use your ALT key + decimal position).

Test String: 58361413201 30_A																		
Encoding	Start	5	8	3	6	1	4	1	3	2	0	1		3	0	_	A	CD
Decimal	137	53	56	51	54	49	52	49	51	50	48	49	32	51	48	95	65	V
Hex	89	35	38	33	36	31	34	31	33	32	30	31	20	33	30	5F	41	Stop
																		8B

Code 128 – Subset C

The start character for Subset C is located in Decimal 138 (Hex 8A). The Code Value of this character is 105 (see far left hand column of Character Table). This value is used to calculate the check character.

The Stop Character is always the same character. It is not used to calculate the check digit. This character is located in Decimal 139 (Hex 8B). This character must be at the end of every symbol. Subset C is used to print condensed symbols (it will handle only numbers, no alpha characters). It does this by pairing each two characters of your data into a single printable character. There are 100 possible pairs in Subset C (00 thru 99). You will need to refer to the Character Table to find the character/pair combinations. Note: you must have an even number of characters in your data. If your data has an odd number of digits, add a zero (0) in front of your data to make your data string an even number.

Step 1

The test string will be “0123456789”. We already know the start character is Decimal 138 (Hex 8A), and has a Code Value of 105. The next step is to pair the data starting from the left side.

Data	0	1	2	3	4	5	6	7	8	9
Paired Data	01		23		45		67		89	

Step 2

After the data has been paired, we find the Code Value for each pair using the Character Table (see far left hand column) - multiply the Code Value times the position number (see example below).

Paired Data	1	23	45	67	89
Data Position	1	2	3	4	5
Code Value	1	23	45	67	89
DP x CV	1	46	135	268	445

Step 3

Add these values together plus the start character value of 105. Take the sum and divide by 103. Take the whole number of the remainder and multiply by 103. Then take the value and subtract from the sum of all character values. This will give you a *Code Value* for the *Check Digit*.

- $105 + 1 + 46 + 135 + 268 + 445 = 1,000$
- $1000 / 103 = 9.7087...$
- $9 \times 103 \text{ (MOD 103 is constant)} = 927$
- $1000 - 927 = \text{Code Value } 73$
- $\text{Code Value } 73 = \text{Decimal } 105 \text{ (or Hex } 69\text{)}.$

Step 4

The example below shows the completed symbol. Some of the characters maybe out of the normal keyboard range, so you may have to access these positions by their ASCII decimal position (if you are using an IBM PC compatible keyboard, use your ALT key + decimal position).

Test String: 0123456789	CD							
Encoding	Start	!	7	M	c	y	i	Stop
Decimal Position	138	33	55	77	99	121	105	139
Hex Position	8A	21	37	4D	63	79	69	8B

Implementing the Function 1 (FNC1) character

Code 128 bar code has the option of adding Function characters immediately following the start character. The most popular of these Function characters is Function 1 (FNC1). When placed immediately following the start character, the entire symbol now becomes an UCC/EAN-128 bar code. This version of Code 128 is used for shipping purposes. Below is an example of a Code 128 bar code using Subset C, with a FNC1 implemented.

Data Plus the Function 1: FNC1 1 2 3 4

Step #1: Pair the data together: FNC1 12 34

Step #2: Assign a Data Position for each pair: (FNC1) is 1 (12) is 2 (34) is 3

Step #3: Assign a Code Value for the Paired Data: (FNC1= value 102) (12= value 12) (34= value 34)

Step #4: Multiply the Code Value times the Data Position: (1x102=102) (2x12=24) (3x34=102)

Step #5: Add these values together plus the start character of 105:

$$105 + 102 + 24 + 102 = 333$$

Step #6: Divide 333 by 103 = 3.23...

Step #7: Multiply the whole number times 103 (3 x 103 = 309)

Step #8: Subtract 309 from the Sum in step #5 (309 - 333 = 24)

24 is the Code Value – the Decimal Value is 56.

The data string should look like this:

Data	Start	FNC1	12	34	Check Digit	Stop
Decimal	138	135	44	66	56	139

Implementing the Shift character

A shift character is used within a single bar code structure to shift from one subset to another. You could start with subset C, and end up finishing with subset B, or most any other subset. The reason this is done is to compress the overall length of the bar code and make it shorter, as well as add an extra security measure into the bar code. Below is an example of a data string utilizing a shift character from Subset C to B.

Data String: “1234567890123456789”

Step #1: Take the input data and pair up the numerics that will be assigned for Subset C (remember that Subset C requires an even number of character in the string).

1 2 3 4 5 6 7 8 9 1 2 3 4 5 6 7 8 9 (leave out the “9”).

Subset C: 12 34 56 78 90 12 34 56 78

Step #2: Assign a data position and code value for these paired digits:

Paired Digits	12	34	56	78	90	12	34	56	78
Data Position	1	2	3	4	5	6	7	8	9
Code Value	12	34	56	78	90	12	34	56	78
Code Value x Data Position	12	68	168	312	450	72	238	448	702

Step #3: The last character of the data string is the number 9. This character will be encoded using the Subset B. A shift character will need to be added before the number 9. Both will require assigned data position and code values:

Data	Shift B	9
Data Position	10	11
Code Value	100	25
Code Value x Data Position	1000	275

Step #4: Now apply the Mod 103 calculation to these values. Do not forget to add the value to Subset C, which is 105:

$$105 + 12 + 68 + 168 + 312 + 450 + 72 + 238 + 448 + 702 + 1000 + 275 = 3850$$

$$3850 / 103 = 37.3786...$$

$$37 \times 103 \text{ (103 is constant)} = 3811$$

$$3850 - 3811 = \text{Code Value } 39$$

The Code Value 39 is Decimal 71. The final string looks like this:

Data	Start	12	34	56	78	90	12	34	56	78	shift	9	check	stop
Decimal	138	44	66	88	110	122	44	66	88	110	133	57	71	139