Code 128 Bar Code QwikTip™ (AFP).

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 b 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.

Code128 Character Table

Code Value	EBCDIC Hex Position	SubSet A	SubSet B	SubSet C
0	64	space	space	zero-zero
1	65	exclamation	exclamation	zero-1
2	66	db. Quote	db. Quote	zero-2
3	67	number	number	zero-3
4	68	dollar	dollar	zero-4
5	69	percent	percent	zero-5
6	6A	ampersand	ampersand	zero-6
7	6B	single quote	single quote	zero-7
8	6C	left paren	left paren	zero-8
9	6D	right paren	right paren	zero-9
10	6E	astrisk	astrisk	10
11	6F	plus	plus	11
12	70	comma	comma	12
13	71	minus	minus	13
14	72	period	period	14
15	73	forward slash	forward slash	15
16	74	0	0	16
17	75	1	1	17
18	76	2	2	18
19	77	3	3	19
20	78	4	4	20
21	79	5	5	21
22	7A	6	6	22
23	7B	7	7	23
24	7C	8	8	24
25	7D	9	9	25
26	7E	colon	colon	26
27	7F	semi-colon	semi-colon	27
28	80	less than	less than	28
29	81	equal	equal	29
30	82	greater than	greater than	30
31	83	question	question	31
32	84	at	at	32
33	85	A	A	33
34	86	B	B	34
35	87	C	C	35

36	88	D	D	36
37	89	E	E	37
38	8A	F	F	38
39	8B	G	G	39
40	8C	H	H	40
41	8D	I	I	41
42	8E	J	J	42
43	8F	K	K	43
44	90	L	L	44
45	91	M	M	45
46	92	N	N	46
47	93	O	O	47
48	94	P	P	48
49	95	Q	Q	49
50	96	R	R	50
51	97	S	S	51
52	98	T	T	52
53	99	U	U	53
54	9A	V	V	54
55	9B	W	W	55
56	9C	X	X	56
57	9D	Y	Y	57
58	9E	Z	Z	58
59	9F	left bracket	left bracket	59
60	A0	back slash	back slash	60
61	A1	right bracket	right bracket	61
62	A2	carot	carot	62
63	A3	underscore	underscore	63
64	A4	NUL	apostrophy	64
65	A5	SOH	a	65
66	A6	STX	b	66
67	A7	ETX	c	67
68	A8	EOT	d	68
69	A9	ENQ	e	69
70	AA	ACK	f	70
71	AB	BEL	g	71
72	AC	BS	h	72
73	AD	HT	i	73
74	AE	LF	j	74
75	AF	VT	k	75
76	B0	FF	l	76
77	B1	CR	m	77
78	B2	SO	n	78
79	B3	SI	o	79
80	B4	DLE	p	80
81	B5	DC1	q	81
82	B6	DC2	r	82
83	B7	DC3	s	83
84	B8	DC4	t	84
85	B9	NAK	u	85

86	BA	SYN	v	86
87	BB	ETB	w	87
88	BC	CAN	x	88
89	BD	EM	y	89
90	BE	SUB	z	90
91	BF	ESC	{	91
92	C0	FS	|	92
93	C1	GS	}	93
94	C2	RS	~	94
95	C3	US	DEL	95
96	C4	FNC3	FNC3	96
97	C5	FNC2	FNC2	97
98	C6	SHIFT	SHIFT	98
99	C7	CODE C	CODE C	99
100	C8	CODE B	FNC 4	CODE B
101	C9	FNC 4	CODE A	CODE A
102	CA	FNC 1	FNC 1	FNC 1
103	E6	START		
104	E7		START	
105	E8			START
	E9	STOP	STOP	STOP

If you are not successful at encoding the Code 28 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 it back to us.

Code 128 – Subset A

The start character for Subset A is located in Hex E6. 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 Hex E9. 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 "12345678". We already know the start character is Hex E6, 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 multiple the Code Value times the position number (see example 1).

Test String: "12345678"

Character	1	2	3	4	5	6	7	8
Data Position	1	2	3	4	5	6	7	8
Code Value	17	18	19	20	21	22	23	24
CV x DP	**17**	**36**	**57**	**80**	**105**	**132**	**161**	**192**

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 position (see example for Step 2).

- 103 + 17 + 36 + 57 + 80 + 105 + 132 + 161 + 192 = 883
- 883 / 103 = 8.5728…
- 8 x 103 (MOD 103 is constant) = 824
- 883 – 824 = Code Value 59
- Code Value 59 = Hex 9F.

Step 3

The example for Step 3 shows what the complete symbol looks like.

Your Data: "12345678"										**Check Digit**	
Character	Start	1	2	3	4	5	6	7	8	**[**	Stop
Hex Position	E6	75	76	77	78	79	7A	7B	7C	**9F**	E9

Code 128 – Subset B

The start character for Subset B is located in Hex E7. 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 Hex E9. 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 "12345678". We already know the start character is Hex E7, 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 multiple the Code Value times the position number (see example below).

Test String: "12345678"

Character	1	2	3	4	5	6	7	8
Data Position	1	2	3	4	5	6	7	8
Code Value	17	18	19	20	21	22	23	24
CV x DP	**17**	**36**	**57**	**80**	**105**	**132**	**161**	**192**

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 EBCDIC Hex position (see example for Step 2).

- 104 + 17 + 36 + 57 + 80 + 105 + 132 + 161 + 192 = 884
- 884 / 103 = 8.5825…
- 8 x 103 (MOD 103 is constant) = 824
- 884 – 824 = Code Value 60
- Code Value 60 = Hex A0.

Step 3

The example below shows what the complete symbol looks like.

Your Data: "12345678"										**Check Digit**	
Character	Start	1	2	3	4	5	6	7	8	\	Stop
Decimal Position	E7	75	76	77	78	79	7A	7B	7C	**A0**	E9

Code 128 – Subset C

The start character for Subset C is located in Hex E8. 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 Hex E9. 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 Hex E8, 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) - multiple the Code Value times the position number (see example below).

Character	1	23	45	67	89
Data Position	1	2	3	4	5
Code Value	1	23	45	67	89
CV x DP	**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 x 103 (MOD 103 is constant) = 927
- 1000 – 927 = Code Value 73
- Code Value 73 = Hex AD.

Step 4
The example below shows what the complete symbol looks like.

Your Data: "0123456789"							**Check Digit**	
Character	Start	!	7	M	c	y	**i**	Stop
Hex Position	E8	65	7B	91	A7	BD	**AD**	E9

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 a 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 Hex Value is 7C.

The data string should look like this:

Data	Start	FNC1	12	34	**Check Digit**	Stop
Decimal Position	E8	CA	70	86	**7C**	E9

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).

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 x 103 (103 is constant) = 3811
3850 – 3811 = Code Value 39

The Code Value 39 is Hex 8B. The final string looks like this:

Data	**Start**	**12**	**34**	**56**	**78**	**90**	**12**	**34**	**56**	**78**	**shift**	**9**	**check**	**stop**
Hex	E8	70	86	9C	B2	BE	70	86	9C	B2	C8	7D	8B	E9