

Elfring Fonts, Inc.

PCL Bar Code 128

This package contains eight LaserJet, or PCL, bar code 128 fonts. These fonts come in portrait mode only, since no modern printer uses landscape version fonts. You get bar code 128 fonts at .25, .5, .75, and 1 inch heights, all in both 6.8 and 9.09 pitch. To use these bar code fonts you must be able to add the correct Start and Stop codes to your bar code and to calculate a checksum for each individual bar code you make.

Bar code 128 was introduced in 1981 for high-density alphanumeric work. Bar code 128 produces variable length codes and includes three different symbol sets: two that represent the ASCII character set, and a third set of paired digits, which increase the print density of numeric data by a factor of two. These separate symbol sets are referred to as "A", "B", and "C".

Symbol set A is used to print most ASCII characters and the standard ASCII control characters. Symbol set B is used to print the complete ASCII character set. Symbol set C prints pairs of numbers, 00 through 99. See the character encoding chart (Table 1) in this documentation for a complete description.

All bar codes must start with a specific Start character corresponding to the bar code character set (Start A, Start B, or Start C), and must end with a Stop code. You may switch between bar code subsets in the middle of a bar code. Bar Code 128 also requires a checksum character, placed before the Stop character. Bar code 128 is essentially a fixed width bar code, with the exception of the Stop character.

How To Use These Fonts

We supply these bar code fonts in binary PCL font format. The fonts are simple binary data that resides on your computer's hard disk. To use a font to print a bar code, you first send the font to your printer (this process is called downloading). When your application needs to print a bar code it sends a special command to the printer to switch from the normal font to the bar code font. You then send your bar code data (with start, stop, checksums, etc added). Finally, you send a special printer command to tell the printer to return back to the normal font.

Printer commands always start with the Escape character (1B in hex, or 27 in decimal). The rest of the printer command is straight ASCII.

To return back to the default font your printer sets when it is turned on, use the following PCL command:

```
<Esc>(3@
```

Font Naming and Selection

All Bar Code 128 font files are named as follows: BC128-X-##.SF?. The first 5 places simply indicate that this is a Bar Code 128 font. The "X" is either an **R** for fonts that print at 44/300 of an inch per character (*6.818 pitch*), or an **N** for fonts that print at 33/300 of an inch per character (*9.09 pitch*). The two digit number that follows in the file name is the point size of the font, (*72 points to the inch*). Finally, all portrait fonts end with the file name extension ".SFP", and all landscape fonts end with ".SFL". Note that in the font calling sequences the characters: <Esc> stand for the single Escape character (1B hex or 27 decimal).

This package includes the following versions of Bar Code 128:

BC128R72.SFP	Bar Code 128, 1" tall (72 points), portrait Font Calling Sequence: <Esc>(10U<Esc>(s1p72.0v0s0b171T
BC128R54.SFP	Bar Code 128, .75" tall (54 points), portrait Font Calling Sequence: <Esc>(10U<Esc>(s1p54.0v0s0b171T
BC128R36.SFP	Bar Code 128, .5" tall (36 points), portrait Font Calling Sequence: <Esc>(10U<Esc>(s1p36.0v0s0b171T
BC128R18.SFP	Bar Code 128, .25" tall (18 points), portrait Font Calling Sequence: <Esc>(10U<Esc>(s1p18.0v0s0b171T
BC128N72.SFP	Bar Code 128, 1" tall (72 points), portrait Font Calling Sequence: <Esc>(10U<Esc>(s1p72.0v0s0b172T
BC128N54.SFP	Bar Code 128, .75" tall (54 points), portrait Font Calling Sequence: <Esc>(10U<Esc>(s1p54.0v0s0b172T
BC128N36.SFP	Bar Code 128, .5" tall (36 points), portrait Font Calling Sequence: <Esc>(10U<Esc>(s1p36.0v0s0b172T
BC128N18.SFP	Bar Code 128, .25" tall (18 points), portrait Font Calling Sequence: <Esc>(10U<Esc>(s1p18.0v0s0b172T

Downloading Fonts to Your Printer

Windows:

The Windows utility program Downloadwin.exe will send a font to any Windows printer. To use this utility, first enter in the name and path of the font you want to download, or use the *Browse* button to locate a font. Your default printer is automatically selected. If this is not the printer you want to send the font to, click on *Select Printer* to pick a different printer. You can enter an ID number for the font or default to the number shown on the screen. To download the font click on *Download Font* button. The program will tell you when the font download is complete.

DOS:

The DOS utility program Download.exe will send a font from the command line or from a batch file to any parallel or serial printer. It will not work with networked printers or printers with USB connections. See the documentation file, download.txt for details on how to use this utility.

Other:

Each of these fonts must be sent to your printer (downloaded) before they can be selected and printed. If you are on a PC, you may be able to use our Download utility (see the documentation file download.txt for more information on this program) to send the fonts to your printer. If you are on a computer other than a PC, how you download a font to your printer depends on the particular computer and operating system. Basically you need to:

- 1) Assign the font an ID number by sending the following PCL command:
<Esc>*c###D where <Esc> stands for the escape character (1B in Hex) and ### is the font ID number in ASCII, say 10 for ID 10.
- 2) Copy the font file to the printer
- 3) Repeat step 1 above
- 4) Send the following PCL command to make the font permanent (otherwise it gets erased when you reset the printer.) Note that "permanent" fonts are lost when the power to the printer is turned off.
<Esc>*c5F

To download a font to your printer and assign ID number 23, send:

```
<Esc>*c23D
copy the font file to the printer
<Esc>*c23D
<Esc>*c5F
```

Note that you can also select a font by the ID number you assigned when you downloaded the font. To select a font by its ID number use:

```
<Esc>(###X
where <Esc> is the escape character (1B hex) and ### is the ID number you assigned to the font when it was downloaded.
```

To select the font in the download example above with ID 23 send: <Esc>(23X

Bar Code Basics

A bar code is made up of a series of parallel vertical bars and spaces. Bar codes are designed to convey information in a machine-readable format. In addition, some bar codes include a human readable portion so that a human can easily understand the bar code. Bar codes always start with a special character, or symbol, that tells the machine scanning that bar code to start the reading process. (*This Start character will also tell the reader what bar code symbology is being used.*) A bar code always ends with a special character, or symbol, that tells the reader that this is the end of the bar code, (*the Stop character.*)

The bar codes in this package are implemented as TrueType fonts. Each character in the font corresponds to its matching bar code pattern. To use a bar code font, you switch to the bar code font, enter the bar code Start character, the data that you want to encode, and the Stop character. Windows will display this data as a bar code on screen and will print a bar code on virtually any printer connected to Windows. For examples of how to do this, run the Bar128 program.

TrueType fonts are scaled by changing their height. The character's width is altered proportionate to the change in height. You can pick virtually any font height by changing the point size. (*There are 72 points to the inch.*) Unfortunately, when printing bar codes you frequently want to control both the bar height and its width, independent of each other. (*Printers and scanners can only handle a fixed range of print densities.*)

Code 128 Basics

Bar code 128 has more characters (106) than are available in a standard ASCII font. Since we are using a font to produce bar code 128, there must be some method of making the additional characters available. We use the high ASCII characters (*keyboard mapping*) to let you access these additional characters.

The character mapping table, shown in Table 1, must be used to work with bar code 128. Character mapping has been chosen to make using these bar codes as simple as is possible, however some compromises have been made. Each table entry shows the ASCII character you must use to generate a particular bar pattern, and the bar code 128 value assigned to this pattern. Bar code 128 values are especially important since they are used in calculating the checksum.

Checksums


All bar codes printed in 128 format require a checksum. The checksum is printed after your data, and before the stop code. The checksum is based on a weighted modulo 103 calculation. While this may seem complicated, it is easy to do on a computer. Note that Table 1 shows a value from 0 to 105 to each possible bar code 128 character. The checksum is calculated as follows:

- 1) Initialize your checksum variable to the value of your start code (Start A = 103, Start B = 104, and Start C = 105).
- 2) Initialize a Weighting value to 1.
- 3) Starting with the first character in your bar code after the start code (working from left to right), look up the value associated with that character and multiply that value by the Weighting value.


- 4) Increment the Weighting value by 1, and add the result of the calculation above to your checksum variable.
- 5) Repeat this until there is no more data, then divide the checksum variable by 103. The remainder from this calculation is the checksum. Convert the value to a character via the tables below.
- 6) Put the checksum character after your data and then end the bar code with the Stop code character (~).

The following examples show checksum calculations for both an A and a C 128 bar code.

Sample Checksum Calculations

CODE 128 → {CODE 128t~ →  CODE 1 2 8 t

Data	Value	Multiplier	Sum
{	Start A	n/a	103
C	35	1	103 + 1*35
O	47	2	138 + 2*47
D	36	3	232 + 3*36
E	37	4	340 + 4*37
Space	00	5	488 + 5*0
1	17	6	488 + 6*17
2	18	7	590 + 7*18
8	24	8	716 + 8*24
t	checksum		908 / 103 = 8 remainder 84 (84 = "t")
~	Stop		

12345678 → }-CYoO~ →  1234567847

	Value	Multiplier	Sum
}	Start C	n/a	105
-	12	1	105 + 1*12
C	34	2	117 + 2*34
Y	56	3	185 + 3*56
o	78	4	353 + 4*78
O	checksum		665 / 103 = 6 remainder 47 (47 = "O")
~	Stop		

The Bar Code 128 Character Table

In bar code 128, each specific bar code pattern can be interpreted in 3 different ways by your bar code reader. (*That's what each subset of bar code 128 does.*) For example, in Subset A, the bar code pattern for a lower case "m" is read by your bar code reader as a carriage return. In Subset B, this same bar code pattern is read by your bar code reader as the letter "m". In Subset C, this same bar code pattern is read by your bar code reader as the numeric value 77.

Table 1 shows what each character on your keyboard (*ASCII Position*) will generate in each subset of bar code 128. The table also shows the *value* of each character, which is used in calculating the checksum.

Note that subset B has a standard ASCII mapping. Subset A trades the lower case letters for their control character equivalents. In subset C, all ASCII character positions map to pairs of numbers from 00 – 99.

Finally, since bar code 128 has more bar code patterns than there are characters in the alphabet, some additional (*high-ASCII*) characters must be used. For example, in Subset C when you need a bar code pattern representing the number pair 99, you need to use character position 199. An FNC1 in Subsets A or B is character position 202.

Table 1

ASCII Position	Code A	Code B	Code C	Value	ASCII Position	Code A	Code B	Code C	Value	ASCII Position	Code A	Code B	Code C	Value
Space	Space	Space	00	00	D	D	D	36	36	h	BS	h	72	72
!	!	!	01	01	E	E	E	37	37	i	HT	i	73	73
"	"	"	02	02	F	F	F	38	38	j	LF	j	74	74
#	#	#	03	03	G	G	G	39	39	k	VT	k	75	75
\$	\$	\$	04	04	H	H	H	40	40	l	FF	l	76	76
%	%	%	05	05	I	I	I	41	41	m	CR	m	77	77
&	&	&	06	06	J	J	J	42	42	n	SO	n	78	78
'	'	'	07	07	K	K	K	43	43	o	SI	o	79	79
(	(	(	08	08	L	L	L	44	44	p	DLE	p	80	80
)	)	)	09	09	M	M	M	45	45	q	DC1	q	81	81
*	*	*	10	10	N	N	N	46	46	r	DC2	r	82	82
+	+	+	11	11	O	O	O	47	47	s	DC3	s	83	83
,	,	,	12	12	P	P	P	48	48	t	DC4	t	84	84
-	-	-	13	13	Q	Q	Q	49	49	u	NAK	u	85	85
.	.	.	14	14	R	R	R	50	50	v	SYN	v	86	86
/	/	/	15	15	S	S	S	51	51	w	ETB	w	87	87
0	0	0	16	16	T	T	T	52	52	x	CAN	x	88	88
1	1	1	17	17	U	U	U	53	53	y	EM	y	89	89
2	2	2	18	18	V	V	V	54	54	z	SUB	z	90	90
3	3	3	19	19	W	W	W	55	55	191	ESC	{	91	91
4	4	4	20	20	X	X	X	56	56	192	FS	|	92	92
5	5	5	21	21	Y	Y	Y	57	57	193	GS	}	93	93
6	6	6	22	22	Z	Z	Z	58	58	194	RS	~	94	94
7	7	7	23	23	[	[	[	59	59	195	US	DEL	95	95
8	8	8	24	24	\	\	\	60	60	196	FNC3	FNC3	96	96
9	9	9	25	25	]	]	]	61	61	197	FNC2	FNC2	97	97
:	:	:	26	26	^	^	^	62	62	198	Shift	Shift	98	98
;	;	;	27	27	_	_	_	63	63	199	Code C	Code C	99	99
<	<	<	28	28	`	NUL	`	64	64	200	Code B	FNC4	100	100
=	=	=	29	29	a	SOH	a	65	65	201	FNC4	Code A	101	101
>	>	>	30	30	b	STX	b	66	66	202	FNC1	FNC1	102	102
?	?	?	31	31	c	ETX	c	67	67	{	Start A	Start A	103	103
@	@	@	32	32	d	EQT	d	68	68	|	Start B	Start B	104	104
A	A	A	33	33	e	ENQ	e	69	69	}	Start C	Start C	105	105
B	B	B	34	34	f	ACK	f	70	70	~	STOP	STOP		
C	C	C	35	35	g	BEL	g	71	71					

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