

^BC – Code 128 Bar Code (Subsets A, B, and C)

Description The ^BC command creates the Code 128 bar code, a high-density, variable length, continuous, alphanumeric symbology. It was designed for complexly encoded product identification.

Code 128 has three subsets of characters. There are 106 encoded printing characters in each set, and each character can have up to three different meanings, depending on the character subset being used. Each Code 128 character consists of six elements: three bars and three spaces.

- ^BC supports a fixed print ratio.
- Field data (^FD) is limited to the width (or length, if rotated) of the label.

Format ^BCo,h,f,g,e,m




Important • If additional information about the Code 128 bar code is required, go to www.aimglobal.org.

Parameters	Details
o = orientation	<p><i>Accepted Values:</i></p> <ul style="list-style-type: none"> N = normal R = rotated 90 degrees (clockwise) I = inverted 180 degrees B = read from bottom up, 270 degrees <p><i>Default Value:</i> current ^FW value</p>
h = bar code height (in dots)	<p><i>Accepted Values:</i> 1 to 32000</p> <p><i>Default Value:</i> value set by ^BY</p>
f = print interpretation line	<p><i>Accepted Values:</i> Y (yes) or N (no)</p> <p><i>Default Value:</i> Y</p> <p>The interpretation line can be printed in any font by placing the font command before the bar code command.</p>
g = print interpretation line above code	<p><i>Accepted Values:</i> Y (yes) or N (no)</p> <p><i>Default Value:</i> N</p>
e = UCC check digit	<p><i>Accepted Values:</i> Y (turns on) or N (turns off)</p> <p>Mod 103 check digit is always there. It cannot be turned on or off. Mod 10 and 103 appear together with e turned on.</p> <p><i>Default Value:</i> N</p>

Parameters	Details
<p>m = mode</p>	<p><i>Accepted Values:</i></p> <p>N = no selected mode</p> <p>U = UCC Case Mode</p> <ul style="list-style-type: none"> • More than 19 digits in ^FD or ^SN are eliminated. • Fewer than 19 digits in ^FD or ^SN add zeros to the right to bring the count to 19. This produces an invalid interpretation line. <p>A = Automatic Mode</p> <p>This analyzes the data sent and automatically determines the best packing method. The full ASCII character set can be used in the ^FD statement — the printer determines when to shift subsets. A string of four or more numeric digits causes an automatic shift to Subset C.</p> <p>D = UCC/EAN Mode (x.11.x and newer firmware)</p> <p>This allows dealing with UCC/EAN with and without chained application identifiers. The code starts in the appropriate subset followed by FNC1 to indicate a UCC/EAN 128 bar code. The printer automatically strips out parentheses and spaces for encoding, but prints them in the human-readable section. The printer automatically determines if a check digit is required, calculate it, and print it. Automatically sizes the human readable.</p> <p><i>Default Value:</i> N</p>



Example 1 • This is an example of a Code 128 bar code:

ZPL II CODE	CODE 128 BAR CODE
<pre> ^XA ^FO100,100^BY3 ^BCN,100,Y,N,N ^FD123456^FS ^XZ </pre>	

Code 128 Subsets

The Code 128 character subsets are referred to as Subset A, Subset B, and Subset C. A subset can be selected in these ways:

- A special Invocation Code can be included in the field data (^FD) string associated with that bar code.
- The desired Start Code can be placed at the beginning of the field data. If no Start Code is entered, Subset B are used.

To change subsets within a bar code, place the Invocation Code at the appropriate points within the field data (^FD) string. The new subset stays in effect until changed with the Invocation Code. For example, in Subset C, >7 in the field data changes the Subset to A.

Table 6 shows the Code 128 Invocation Codes and Start Characters for the three subsets.

Table 6 • Code 128 Invocation Characters

Invocation Code	Decimal Value	Subset A Character	Subset B Character	Subset C Character
<<	62			
>0	30	>	>	
>=	94		~	
>1	95	USQ	DEL	
>2	96	FNC 3	FNC 3	
>3	97	FNC 2	FNC 2	
>4	98	SHIFT	SHIFT	
>5	99	CODE C	CODE C	
>6	100	CODE B	FNC 4	CODE B
>7	101	FNC 4	CODE A	CODE A
>8	102	FNC 1	FNC 1	FNC 1
Start Characters				
>9	103	Start Code A	(Numeric Pairs give Alpha/Numerics)	
>:	104	Start Code B	(Normal Alpha/Numeric)	
>;	105	Start Code C	(All numeric (00 - 99))	

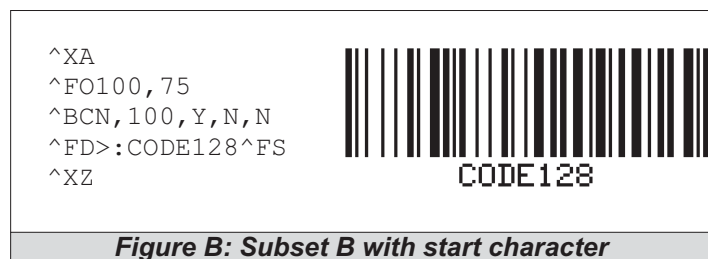
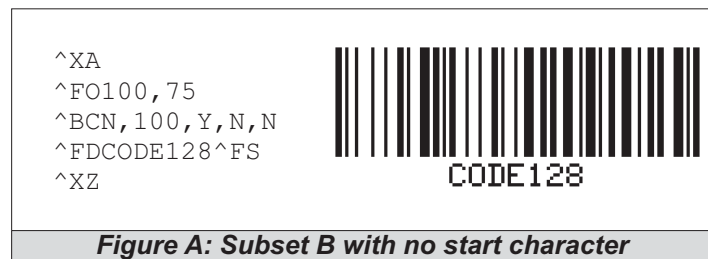
Table 7 shows the character sets for Code 128:

Table 7 •

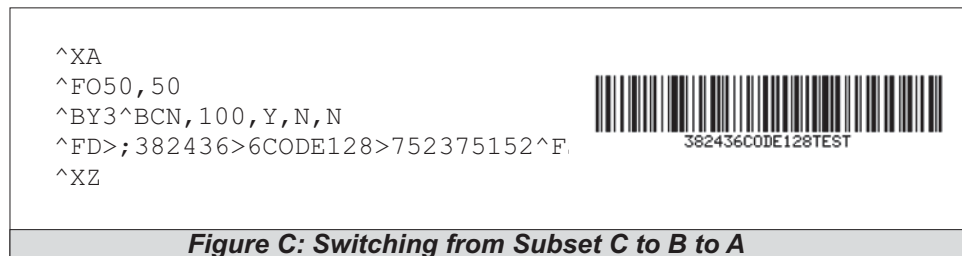
Value	Code A	Code B	Code C	Value	Code A	Code B	Code C
0	SP	SP	00	53	U	U	53
1	!	!	01	54	V	V	54
2	"	"	02	55	W	W	55
3	#	#	03	56	X	X	56
4	\$	\$	04	57	Y	Y	57
5	%	%	05	58	Z	Z	58
6	&	&	06	59	[[59
7	'	'	07	60	\	\	60
8	((08	61]]	61
9))	09	62	^	^	62
10	*	*	10	63			63
11	+	+	11	64	NUL	.	64
12	,	,	12	65	SOH	a	65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



Example 2 • Figures A and B are examples of identical bar codes, and Figure C is an example of switching from Subset C to B to A, as follows:



Because Code 128 Subset B is the most commonly used subset, ZPL II defaults to Subset B if no start character is specified in the data string.



How ^BC Works Within a ZPL II Script

^XA – the first command starts the label format.

^FO100,75 – the second command sets the field origin at 100 dots across the x-axis and 75 dots down the y-axis from the upper-left corner.

^BCN,100,Y,N,N – the third command calls for a Code 128 bar code to be printed with no rotation (N) and a height of 100 dots. An interpretation line is printed (Y) below the bar code (N). No UCC check digit is used (N).

^FDCODE128^FS (Figure A) **^FD>:CODE128^FS** (Figure B) – the field data command specifies the content of the bar code.

^XZ – the last command ends the field data and indicates the end of the label.

The interpretation line prints below the code with the UCC check digit turned off.

The ^FD command for Figure A does not specify any subset, so Subset B is used. In Figure B, the ^FD command specifically calls Subset B with the >: Start Code. Although ZPL II defaults to Code B, it is good practice to include the Invocation Codes in the command.

Code 128 – Subset B is programmed directly as ASCII text, except for values greater than 94 decimal and a few special characters that must be programmed using the invocation codes. Those characters are:

^ > ~

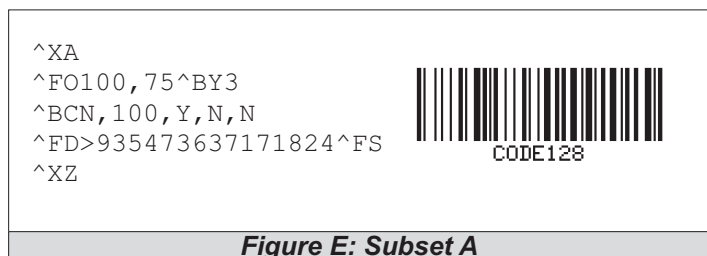
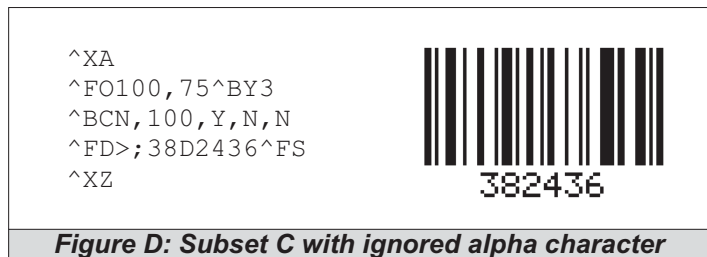
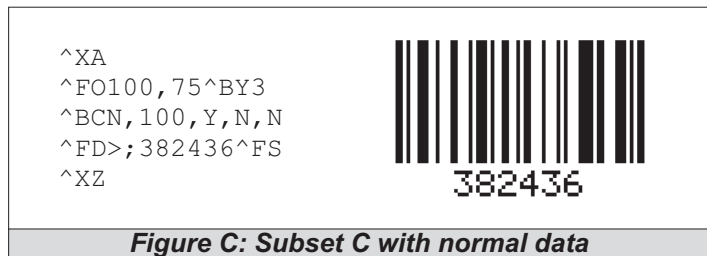
➔ **Example 3 • Code 128 – Subsets A and C**

Code 128, Subsets A and C are programmed in pairs of digits, 00 to 99, in the field data string. For details, see [Table 6 on page 95](#).

In Subset A, each pair of digits results in a single character being encoded in the bar code; in Subset C, characters are printed as entered. Figure E below is an example of Subset A (>9 is the Start Code for Subset A).

Nonintegers programmed as the first character of a digit pair (D2) are ignored. However, nonintegers programmed as the second character of a digit pair (2D) invalidate the entire digit pair, and the pair is ignored. An extra unpaired digit in the field data string just before a code shift is also ignored.

Figure C and Figure D below are examples of Subset C. Notice that the bar codes are identical. In the program code for Figure D, the D is ignored and the 2 is paired with the 4.



The UCC/EAN-128 Symbology

The symbology specified for the representation of Application Identifier data is UCC/EAN-128, a variant of Code 128, exclusively reserved to EAN International and the Uniform Code Council (UCC).



Note • It is not intended to be used for data to be scanned at the point of sales in retail outlets.

UCC/EAN-128 offers several advantages. It is one of the most complete, alphanumeric, one-dimensional symbologies available today. The use of three different character sets (A, B and C), facilitates the encoding of the full 128 ASCII character set. Code 128 is one of the most compact linear bar code symbologies. Character set C enables numeric data to be represented in a double density mode. In this mode, two digits are represented by only one symbol character saving valuable space. The code is concatenated. That means that multiple AIs and their fields may be combined into a single bar code. The code is also very reliable. Code 128 symbols use two independent self-checking features which improves printing and scanning reliability.

UCC/EAN-128 bar codes always contain a special non-data character known as function 1 (FNC 1), which follows the start character of the bar code. It enables scanners and processing software to auto-discriminate between UCC/EAN-128 and other bar code symbologies, and subsequently only process relevant data.

The UCC/EAN-128 bar code is made up of a leading quiet zone, a Code 128 start character A, B, or C, a FNC 1 character, Data (Application Identifier plus data field), a symbol check character, a stop character, and a trailing quiet zone.

UCC/EAN, UCC/128 are a couple of ways you'll hear someone refer to the code. This just indicates that the code is structured as dictated by the application identifiers that are used.

SSCC (Serial Shipping Container Code) formatted following the data structure layout for Application Identifier 00. See [Table 8, UCC/EAN Application Identifier on page 102](#). It could be 00 which is the SSCC code. The customer needs to let us know what application identifiers are used for their bar code so we can help them.

There are several ways of writing the code to print the code to Application Identifier '00' structure.

Using N for the mode (m) parameter

➔ **Example 1** • This example shows with application identifier 00 structure:

ZPL II CODE	N FOR THE M PARAMETER
<pre> ^XA ^FO90,200^BY4 ^BCN,256,Y,N,Y,N ^FD>;>80012345123451234512^FS ^XZ </pre>	 <p>00123451234512345120</p>

- '>;>8' sets it to subset C, function 1
- '00' is the application identifier followed by '17 characters', the check digit is selected using the 'Y' for the (e) parameter to automatically print the 20th character.
- you are not limited to 19 characters with mode set to N

Using U for the mode (m) parameter

➔ **Example 1** • The example shows the application identifier 00 format:

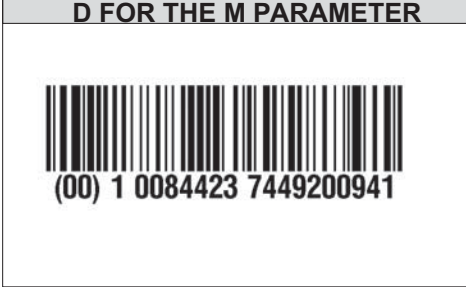
ZPL II CODE	U FOR THE M PARAMETER
<pre> ^XA ^FO90,200 ^BY4^BC,256,Y,N,,U ^FD0012345123451234512^FS ^XZ </pre>	 <p>00123451234512345120</p>

UCC Case Mode

- Choosing **U** selects UCC Case mode. You will have exactly 19 characters available in ^FD.
- Subset C using FNC1 values are automatically selected.
- Check digit is automatically inserted.

Using D for the mode (m) parameter

➔ **Example 1** • This example shows application identifier 00 format ((x.11.x or later):


ZPL II CODE	D FOR THE M PARAMETER
<pre> ^XA ^FO50,200^BCN,150,Y,N,,D ^FD(00)10084423 7449200940^FS ^XZ </pre>	 <p>(00) 1 0084423 7449200941</p>

(0 at end of field data is a bogus character that is inserted as a place holder for the check digit the printer will automatically insert.

- Subset C using FNC1 values are automatically selected.
- Parentheses and spaces can be in the field data. '00' application identifier, followed by 17 characters, followed by bogus check digit place holder.
- Check digit is automatically inserted. The printer will automatically calculate the check digit and put it into the bar code and interpretation line.
- The interpretation line will also show the parentheses and spaces but will strip them out from the actual bar code.

Printing the Interpretation Line

➔ **Example 1** • This example shows printing the interpretation in a different font with firmware x.11.x or later:

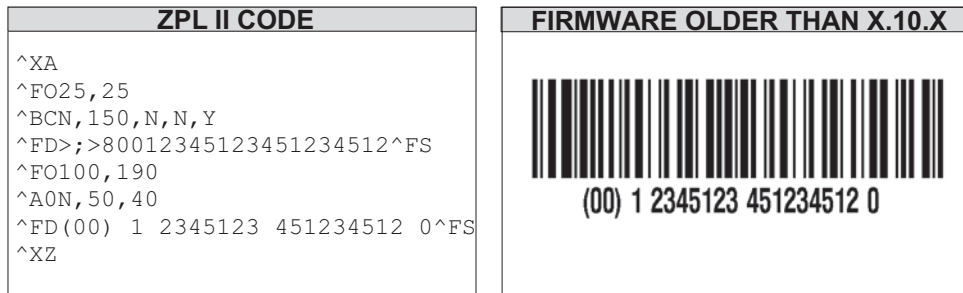
ZPL II CODE	INTERPRETATION LINE
<pre> ^XA ^FO50,200 ^A0N,40,30^BCN,150,Y,N,Y ^FD>;>80012345123451234512^FS ^XZ </pre>	 <p>00123451234512345120</p>

The font command (^A0N,40,30) can be added and changed to alter the font and size of the interpretation line.

With firmware version later than x.10.x

- A separate text field needs to be written.
- The interpretation line needs to be turned off.
- ^A0N,50,40 is the font and size selection for the separate text field.
- You have to make sure you enter the correct check digit in the text field.

- Creating a separate text field allows you to format the interpretation line with parentheses and spaces.



Application Identifiers — UCC/EAN APPLICATION IDENTIFIER

An Application Identifier is a prefix code used to identify the meaning and the format of the data that follows it (data field).

There are AIs for identification, traceability, dates, quantity, measurements, locations, and many other types of information.

For example, the AI for batch number is 10, and the batch number AI is always followed by an alphanumeric batch code not to exceed 20-characters.

The UCC/EAN Application Identifiers provide an open standard that can be used and understood by all companies in the trading chain, regardless of the company that originally issued the codes.

Table 8 • UCC/EAN Application Identifier

Data Content	AI	Plus The Following Data Structure
Serial Shipping Container Code (SSCC)	00	exactly 18 digits
Shipping Container Code	01	exactly 14 digits
Batch Numbers	10	up to 20 alpha numerics
Production Date (YYMMDD)	11	exactly 6 digits
Packaging Date (YYMMDD)	13	exactly 6 digits
Sell By Date (YYMMDD)	15	exactly 6 digits
Expiration Date (YYMMDD)	17	exactly 6 digits
Product Variant	20	exactly 2 digits
Serial Number	21	up to 20 alpha numerics
HIBCC Quantity, Date, Batch and Link	22	up to 29 alpha numerics
Lot Number	23 ^a	up to 19 alpha numerics
Quantity Each	30	

- a. Plus one digit for length indication.
- b. Plus one digit for decimal point indication.

Table 8 • UCC/EAN Application Identifier

Data Content	AI	Plus The Following Data Structure
Net Weight (Kilograms)	310 ^b	exactly 6 digits
Length, Meters	311 ^b	exactly 6 digits
Width or Diameter (Meters)	312 ^b	exactly 6 digits
Depths (Meters)	313 ^b	exactly 6 digits
Area (Sq. Meters)	314 ^b	exactly 6 digits
Volume (Liters)	315 ^b	exactly 6 digits
Volume (Cubic Meters)	316 ^b	exactly 6 digits
Net Weight (Pounds)	320 ^b	exactly 6 digits
Customer PO Number	400	up to 29 alpha numerics
Ship To (Deliver To) Location Code using EAN 13 or DUNS Number with leading zeros	410	exactly 13 digits
Bill To (Invoice To) Location Code using EAN 13 or DUNS Number with leading zeros	411	exactly 13 digits
Purchase from	412	exactly 13 digits
Ship To (Deliver To) Postal Code within single postal authority	420	up to 9 alpha numerics
Ship To (Deliver To) Postal Code with 3-digit ISO Country Code Prefix	421	3 digits plus up to 9 alpha numerics
Roll Products - width, length, core diameter, direction and splices	8001	exactly 14 digits
Electronic Serial number for cellular mobile phone	8002	up to 20 alpha numerics

- a. Plus one digit for length indication.
b. Plus one digit for decimal point indication.



Note • Table 8 is a partial table showing the application identifiers. For more current and complete information, search the Internet for **UCC Application Identifier**.

For date fields that only need to indicate a year and month, the day field is set to 00.

Chaining several application identifiers (firmware x.11.x or later)

The FNC1, which is invoked by >8, is inserted just before the AI's so that the scanners reading the code sees the FNC1 and knows that an AI follows.

→ **Example 1** • This is an example with the mode parameter set to **A** (automatic):

```

^XA
^BY2,2.5,193
^F033,400
^BCN,,N,N,N,A
^FD>;>80204017773003486100008535>8910001>837252^FS
^FT33,625^AEN,0,0^FD(02)04017773003486(10)0008535(91)0001(
37)252^FS
^XZ

```

→ **Example 2** • This is an example with the mode parameter set to **U**:

```

^XA
^BY3,2.5,193
^F033,200
^BCN,,N,N,N,U
^FD>;>80204017773003486>8100008535>8910001>837252^FS
^FT33,455^A0N,30,30^FD(02)04017773003486(10)0008535(91)000
1(37)252^FS
^XZ

```

→ **Example 3** • This is an example with the mode parameter set to **D***:

```

^XA
^PON
^LH0,0
^BY2,2.5,145
^F0218,343
^BCB,,Y,N,N,D
^FD(91)0005886>8(10)0000410549>8(99)05^FS
^XZ

```

D* — When trying to print the last Application Identifier with an odd number of characters, a problem existed when printing EAN128 bar codes using Mode D. The problem was fixed in firmware version V60.13.0.6.