**TOSHIBA**

# Barcode Printing Guide

# PREFACE

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# NOTES, CAUTIONS AND WARNINGS

*NOTE*
*A note provides additional information to supplement the main text.*

## CAUTION!

**A caution provides additional information which, if ignored, may result in equipment malfunction or damage.**

## WARNING!

**A warning provides additional information which, if ignored, may result in a risk of personal injury.**

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# INTRODUCTION

This manual describes your printer's built in barcode printing feature. It is a technical manual for systems integrators with a working knowledge of the PCL5e page description language and of barcode schemes in general.

> *NOTE*
> *The barcode illustrations in this manual are NOT genuine barcodes. They are illustrations only, and cannot be read correctly by standard barcode readers.*

The barcode printing feature uses special PCL5e font selection code sequences to generate scalable, configured barcodes in a range of sizes, with automatic generation of check characters upon request.

Barcodes are generated graphically rather than using special barcode fonts. This provides better support for bar thickness, wide-to-narrow ratios, check digits and a wider range of bar coding schemes than is possible with bar coding fonts.

The barcode printing feature supports the range of one-dimensional barcodes listed in the following table.

| BARCODE | SUPPORT FORMAT DETAIL |
|---|---|
| UPC–A | UPC–A<br>UPC–A +2<br>UPC–A +5 |
| UPC–E | UPC–E (UPC–E0, UPC–E1)<br>UPC–E +2<br>UPC–E +5 |
| EAN/JAN–8 | EAN/JAN–8<br>EAN/JAN–8 +2<br>EAN/JAN–8 +5 |
| EAN/JAN–13 | EAN/JAN–13<br>EAN/JAN–13 +2<br>EAN/JAN–13+5 |
| Interleaved 2of5 | Interleaved 2of5 (ITF)<br>Interleaved 2of5 +CHK |
| Code39 | Code39<br>Code39 +CHK |
| Code128 | Code128 autoswitch<br>Code128 A<br>Code128 B<br>Code128 C |
| EAN/UCC–128 | EAN/UCC–128 |
| CODABAR | CODABAR<br>CODABAR +CHKmod16 |
| ZIP+4 POSTNET | ZIP+4 POSTNET 5<br>ZIP+4 POSTNET 9<br>ZIP+4 POSTNET 11 |

# How to use

Barcode printing is generated by inserting special extended PCL5e commands into the data stream. Once the required escape sequence has been received the printer will interpret the following characters as barcode data until it receives a command that specifies the next primary font for text printing.

After the barcode parameters have been selected, following text data is gathered for processing the barcode image. The end of barcode data will be determined by the barcode type, but in general it is indicated by **CR/LF/FF/<Escape code>**.

When the full sequence of text data to be printed as a barcode has been received, it is analysed to ensure that it conforms to the correct number of characters and range of character values for the specified barcode type. If not, an error code is printed.

## Printing special characters

If you need to print special characters (0x00~0x1F) as barcode data, the Transparent Print Data command must immediately follow the font selection sequence. This command is:

> **<ESC>&p#X**

where the number # specifies the number of following data bytes.

## Data compression

Once the barcode data has been received and verified, it is compressed if necessary. Where the barcode type prints compressed data the barcode printing feature allows the code to be precompressed (6 characters input) or uncompressed (10 or 11 characters input). If uncompressed data is sent but the barcode type requires it to be compressed, then the compression is performed automatically.

## AUTOMATIC CHARACTERS

Generally, check digit, start/stop bars and left/centre/right guard are calculated and added automatically as needed. Characters added automatically are *not* included in the table of valid codes, refer to "Valid character codes" on page 8. However, for CODABAR and CODABAR +CHKmod16, they can be selected from a, b, c and d (0x61~0x64). These must be sent as barcode data and *are* included in the number of character codes.

## CURSOR START POSITION

In barcode printing, the cursor position at the time the barcode data is sent is at the lower left point of the leading bar. Since characters of barcode types UPC-A, UPC-E and EAN/JAN-13 are laid out to the left of the cursor position at start of printing, the cursor position must first be set taking any print margin into account.

## ACTIVATING BARCODE PRINT MODE

To activate barcode printing mode an escape <ESC> sequence is sent in the following form:

**<ESC> ( s # p # h # v # b # s # T**

*NOTE*
*In this manual the term <ESC> refers to the escape character (0x1B).*

Six font selection parameters are used: p, h, v, b, s, T. All parameters are sent as indicated above in a single escape sequence command. Parameters with default values may be omitted if desired, but the T parameter must always be present to select the barcode type. Refer to "Default parameter values" on page 12.

The following table summarises the use of each parameter.

| PARAMETER | FUNCTION |
|-----------|----------|
| p | Determines if and how text is printed with the barcode. (See "P-parameter" on page 10.) |
| h | Specifies the font used for human readable text if printed. (See "H-parameter" on page 11.) |
| v | Specifies the height of the barcode in points. (1pt = 1/72 inch.) (See "V-parameter" on page 11.) |
| b | Specifies the width of black bars. Up to four values can be given. (See "B-parameter" on page 11.) |
| s | Specifies the width of white bars. Up to four values can be given. (See "S-parameter" on page 12.) |
| T | Specifies the barcode type. (See "T-parameter" on page 9.) |

# VALID CHARACTER CODES

Valid character codes for each barcode type are listed in the following table.

| BARCODE | CHARACTER CODE VALID RANGE | NO. OF CHARACTER CODES |
|---------|---------------------------|------------------------|
| UPC–A / +2 / +5 | 0x30~0x39 | 11 /13 / 16 characters input. |
| UPC–E (UPC–E0, UPC–E1) | 0x30~0x39 | Compression format: 6 characters input. Added character "0" (0x30) at the start not included. Non-compression format (number system omitted form): 10 characters input. Added character "0" (0x30) not included. Non-compression format: 11 characters input. Added character at the start included. |
| UPC–E / +2 / +5 | 0x30~0x39 | Fixed to "number of UPC–E items" +2 / +5 characters. |
| EAN/JAN–8 / +2 / +5 | 0x30~0x39 | 7 / 9 / 12 characters input. |
| EAN/JAN–13 / +2 / +5 | 0x30~0x39 | 12 /14 /17 characters input. |
| Interleaved 2of5 (ITF) | 0x30~0x39 | Variable (even number), max. 150. |
| Interleaved 2of5 +CHK | 0x30~0x39 | Variable (odd number), max. 149. |
| Code39 / +CHK | 0x20, 0x24, 0x25, 0x2B, 0x2D~0x2F, 0x30~0x39, 0x41~0x5A, 0x61~0x7A | Variable, max. 150. |
| Code128 autoswitch | 0x00~0x7F, (0x80~0x87) | Variable, max. 150. |
| Code 128 A | 0x00~0x5F, (0x80~0x84, 0x86, 0x87) | Variable, max. 150. |
| Code 128 B | 0x20~0x7F, (0x80~0x85, 0x87) | Variable, max. 150. |
| Code 128 C | 0x30~0x39, (0x81, 0x85, 0x86) | Variable (even number), max. 300. |
| EAN/UCC–128 | 0x00~0x7F, (0x80~0x87) | Variable, max. 150. |
| CODABAR / +CHKmod16 | 0x24, 0x2B, 0x2D~0x2F, 0x30~0x3A, 0x61~0x64 | Variable, max. 150. Lower case alphabetic (0x61~0x64) for Start/ Stop included. |
| ZIP+4 POSTNET 5 / 9 / 11 | 0x2D, 0x30~0x3A, 0x41~0x4A | 5 / 9/ 11 characters. |

# PARAMETER DETAIL

As stated earlier, barcode printing is activated with the following escape sequence:

> **<ESC> ( s # p # h # v # b # s # T**

This section describes the use of each of the six parameters of this command.

## T-PARAMETER

This parameter selects the barcode type to use. It must always be present. If not, or the parameter value does not match one of the values in the following table, it is treated as the primary font's font specification.

| VALUE | BARCODE | VALUE | BARCODE |
|-------|---------|-------|---------|
| 24600 | UPC–A | 24641 | Interleaved 2of5 +CHK |
| 24601 | UPC–A +2 | 24670 | Code39 |
| 24602 | UPC–A +5 | 24671 | Code39 +CHK |
| 24610 | UPC–E (E0, E1) | 24700 | Code128 autoswitch |
| 24611 | UPC–E +2 | 24701 | Code128 A |
| 24612 | UPC–E +5 | 24702 | Code128 B |
| 24620 | EAN/JAN–8 | 24704 | Code128 C |
| 24621 | EAN/JAN–8 +2 | 24720 | EAN/UCC–128 |
| 24622 | EAN/JAN–8 +5 | 24750 | CODABAR |
| 24630 | EAN/JAN–13 | 24751 | CODABAR +CHKmod16 |
| 24631 | EAN/JAN–13 +2 | 24770 | ZIP+4 POSTNET 5 |
| 24632 | EAN/JAN–13 +5 | 24771 | ZIP+4 POSTNET 9 |
| 24640 | Interleaved 2of5 (ITF) | 24772 | ZIP+4 POSTNET 11 |

# P-PARAMETER

Specifies if and how to print human readable (text) characters. If this parameter is omitted or invalid, its default value is assumed. Refer to "Default parameter values" on page 12.

| VALUE | PRINT IMAGE | PRINT METHOD |
|---|---|---|
| 0 | | Use default setting. See "Default parameter values" on page 12. |
| 1 | | Text not printed. |
| 2 | | Text embedded in bottom of barcode. |
| 3 | | Text half embedded in barcode. |
| 4 | | Text below barcode. |
| 5 | | Text above barcode. |

For barcodes that do not have human readable characters this parameter is ignored.
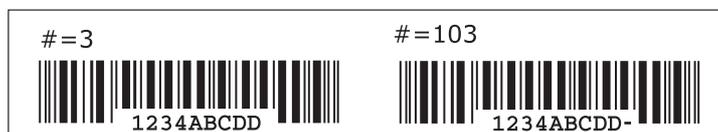
For Code39 / +CHK, if 10 is added (# = 10~15), Start/Stop bar characters (*) are printed as human readable characters.

Code39 / Code39 +CHK

#=3        1234ABCDD        #=13        *1234ABCDD*

For UPC–A / +2 / +5 and UPC–E / +2 / +5, if 100 is added (# = 100~105), the added character and check character are printed in 4/7 size of the other human readable characters.

#=3        12        0 012345 7        #=103        12        0 012345 7

For Interleaved 2of5 +CHK, Code39 +CHK, Code128, EAN/UCC–128 and CODAR +CHKmod16, if 100 is added (# = 100@105), the check digit is printed as a human readable character.

#=3        1234ABCDD        #=103        1234ABCDD-

# H-PARAMETER

Specifies a font for human readable characters. If this parameter is omitted or invalid, the printer functions with its default value. Refer to "Default parameter values" on page 12.

| VALUE | FONT USED |
|---|---|
| 0 | Courier Bold (default) |
| 1 | Letter Gothic Bold |
| 2 | Univers Bold |
| 3 | Univers Condensed Bold |
| 4 | CG-Times Bold |
| 100~104 | Medium weight versions of 0~4. |
| 105 | OCR–B |
| 200~204 | Italic versions of 0~4. |
| 300~304 | Same fonts as 0~4. |
| 400~404 | Bold Italic versions of 0~4. |

If the selected font is not available, the default is used.

# V-PARAMETER

Specifies the height of a bar in points. (1pt = 1/72 inch.) If the parameter is omitted or invalid, the default value is assumed. Refer to "Default parameter values" on page 12.

| VALUE | BAR HEIGHT (POINTS) |
|---|---|
| <3 | Default value is used. |
| 3~1000 | 3~1000pt |
| >1000 | 1000pt |

The sign and decimal part of the value supplied are ignored.

# B-PARAMETER

Specifies the width of (black) bars in units of 1/600 inch. Up to four values may be specified, separated by commas. In barcodes having only two bar widths the third and fourth values are ignored. If the parameter is omitted, the default value is assumed. Refer to "Default parameter values" on page 12.

| PARAMETER | FUNCTION |
|---|---|
| #1 | Width of thinnest bar. |
| #2 | Width of second thinnest bar. |
| #3 | Width of third thinnest bar. |
| #4 | Width of widest bar. |

If values are invalid or 0, the default value is assumed. Sign and decimal parts are ignored. In barcodes that have only two bar widths, the specifications of #3 and #4 are ignored.

For barcodes with fixed bar width this parameter is ignored.

When changing the bar width with this command, the bar width ratios should be the same or close to the default width ratio.

For an illustration of how to insert these parameters see "Data for UPC–A barcode printing (example 2)" on page 14.

## S-PARAMETER

Specifies the width of spaces (white bars) in units of 1/600 inch. Usage is exactly the same as for the B-parameter. Refer to "B-parameter" on page 11.

## DEFAULT PARAMETER VALUES

If parameters are omitted or invalid their default values are assumed. These vary depending on the barcode type selected with the T-parameter. Default values for each barcode type are listed in the following table.

| BARCODE | P | V | B/S | | | |
|---|---|---|---|---|---|---|
| | | | #1 | #2 | #3 | #4 |
| UPC–A | 3 | 74 | 8 | 16 | 24 | 32 |
| UPC–E | 3 | 29 | 8 | 16 | 24 | 32 |
| EAN/JAN–8 | 3 | 50 | 8 | 16 | 34 | 32 |
| EAN/JAN–13 | 3 | 74 | 8 | 16 | 24 | 32 |
| Interleaved 2of5 | 1 | 29 | 6 | 18 | – | – |
| Code39 | 1 | 29 | 6 | 18 | – | – |
| Code128 | 1 | 29 | 6 | 12 | 18 | 24 |
| EAN/UCC–128 | 1 | 29 | 6 | 12 | 18 | 24 |
| CODABAR | 1 | 29 | 6 | 18 | – | – |
| ZIP+4 POSTNET | * | * | * | – | – | – |

\* For ZIP+4 POSTNET no human readable text is printed, and bar width and height are fixed. These items do not therefore require parameters. If supplied, they are ignored.

# COMMAND SEQUENCE

The command sequence for barcode printing is the same as for printing text after specifying the font.

When printing text, commands are arranged in the following order:

**1.** Specify font; specify print position; draw text;

**2.** Specify font; specify print position; draw text;

**3.** Specify font; specify print position; draw text.

When printing a barcode, the font specification is simply replaced by a barcode specification:

**1.** Specify font; specify print position; draw text;

**2.** Specify barcode; specify print position; draw barcode;

**3.** Specify font; specify print position; draw text.

## COMMAND EXAMPLES

### DATA FOR TEXT PRINTING

The sequence is:

> **\<ESC\>(**10**U\<ESC\>(s**0**p**10**h**12**v**0**s**0**b**4099**T**
> **\<ESC\>\*p#x#Y**abcdefghij

Construction is as follows:

| COMMAND | COMMAND DETAIL |
|---|---|
| Primary font | **\<ESC\>(**10**U\<ESC\>(s**0**p**10**h**12**v**0**s**0**b**4099**T** |
| Print position | **\<ESC\>\*p#x#Y** |
| Text | abcdefghij |

### DATA FOR UPC–A BARCODE PRINTING (EXAMPLE 1)

In this example only the T-parameter is used. All others have been omitted and therefore print with their default values. Since the chosen barcode is UPC–A, it is an 11-digit number beginning with the added character "o".

The sequence is:

> **\<ESC\>(s**24600**T\<ESC\>\*p#x#Y**01234567890

Construction is as follows:

| COMMAND | COMMAND DETAIL |
|---|---|
| UPC–A barcode | **\<ESC\>(s**24600**T** |
| Print position | **\<ESC\>\*p#x#Y** |
| Barcode data | 01234567890 |

## DATA FOR UPC–A BARCODE PRINTING (EXAMPLE 2)

In this example all parameters have been supplied, although for simplicity their default values are specified here.

The sequence is:

> **&lt;ESC&gt;(s**3**p**0**h**74**v**8,16,24,32**b**8,16,24,32**s**24600**T**
> **&lt;ESC&gt;\*p#x#Y**01234567890

Construction is as follows:

| COMMAND | COMMAND DETAIL |
|---|---|
| UPC–A barcode | **&lt;ESC&gt;(s**3**p**0**h**74**v**8,16,24,32**b**8,16,24,32**s**24600**T** |
| Print position | **&lt;ESC&gt;\*p#x#Y** |
| Barcode data | 01234567890 |

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