

HENGSTLER



Emulation Command Set Reference Manual

Thermal Printer Family
eXtendo[®]

Types: X-56[™] and X-80[™]

Firmware: V1.02 (USB and RS-232)

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HENGSTLER GmbH

Uhlandstrasse 49

78554 Aldingen / Germany

Tel. +49 (0) 7424-89 0

Fax +49 (0) 7424-89 500

eMail: info@hengstler.com

www.hengstler.com



Document History

Revision	Date	Init	Status	Description
1.00	2007 Oct 5	CBL	Closed	Initial version
1.01	2007 Nov 7	CBL	Closed	“lsb”, “msb”, “lsn”, “msn” all capitalized. Add “Printer Status Summary”, bit 15: “Printer not ready to print”. “End of Page” definition of parameter [n] revised. Add “Start Block Rotation” and “End Block Rotation” commands.
1.02	2007 Nov 13	CBL	Closed	Admonition to use hardware handshaking added.
1.03	2008 Jan 24	CBL	Closed	Removed beta firmware reference on cover. Added released firmware version 1.00 to Comments section. Modify ITF section of bar code command, adding checksum calculation explanation. Add known bug of ITF not calculating checksum. Add explanation of Advanced Firmware Features and highlight Advanced Firmware commands. Add note that print speed will not exceed 130 mm/s regardless of print speed setting if printer was ordered with lower print speed. Changed parameter [m] in 1D barcodes to be hex.
1.04	2008 June 16	CBL	Closed	Correct error in “Print Stored Image Data”; m and n reversed. Correct error ESC!+n command; double-height and double-width reversed. Advanced Firmware option made standard. Change references to firmware v1.01. Reflect corrected ITF barcode function and remove ITF checksum calculation. Commands Position Stamp Set, Position Stamp Feed, and Position Stamp Retract added.
1.05	2008 June 18	CBL	Closed	Correct error in RS-232 Configuration command.
1.06	2008 June 27	CBL	Closed	Correct Code 128 error. Add known anomaly that manual selection of Code 128 subset C does not function correctly. Add known anomaly that selection of bar code type [48] ¹⁶ causes a reset. Clarify print speed maximum 130 mm/sec with 12V printhead in print speed setting command section.
1.07	2010 April 29	CBL	Closed	Correct Mod. Nr. first digit to “4”. Add @ symbol to eXtendo® name. Correct Function description for Position Stamp Feed and Position Stamp Retract. Extend Status DWORD with EEPROM Missing flags. Add description of firmware patches. Extend Status DWORD with three partial cut monitoring flags. Remove limitation on barcode subtitling when rotating barcode. Add CAN command. Add create bitmap and bitmap body data commands.

Comments

Following anomalies have been found in firmware version 1.01:

Id	Anomaly	Comment
	Manual selection of subset C when using Code 128 bar code does not function.	This will be corrected in the next firmware version. Subset C is automatically selected when no subset is manually specified and only numeric data is encoded.
	Selection of bar code type [48] ¹⁶ will cause a printer reset.	This will be corrected in the next firmware version.

- All eXtendo® firmware versions ending in an extension 'a', 'b', 'c', etc. (e.g. 1.00c) are beta versions that are not fully tested and which have not been released. These firmware versions are to be used for evaluation purposes only. Final, released firmware versions will never have the extension 'a', 'b', etc.
- Currently following eXtendo® firmware versions are released : v1.01, v1.02

Safety Precautions

- Please read and understand these specifications thoroughly before using the eXtendo® printer. We recommend that you save this document in a place where it may be easily consulted when the printer is used.
- Please do not modify or service this printer as this may cause unpredictable faults to occur.
- This product is not intended to be installed as a critical component in devices or applications which require extremely high reliability or which involve risk to human life, such as life-support medical equipment, undersea relays, aerospace applications or nuclear power control. If you are considering such applications, please consult our customer service department.
- As with every product, there is a possibility of component failure. Every effort has been made to insure optimal product quality, but the possibility of such failures cannot be completely eliminated. Please consider such failures when designing this printer into your application.
- Take care to verify that this document is intended for use with the firmware of your specific eXtendo® printer by confirming firmware revision levels between the printer and this document.

This manual is intended to be a supplement to the product operating manual. Any approval or order based solely upon this manual will not be accepted by HENGSTLER. Any approval must be made based upon testing and verification of samples of the product in the customer's application.

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1 Introduction

This eXtendo® Emulation Command Set Reference describes the command set of the Hengstler eXtendo® thermal printers. Please read this reference manual thoroughly before using the eXtendo® and communicating with the printer.

Comments:

- Communication with the host is accomplished either through a USB or RS232 interface.
- eXtendo® printers can print graphic data with or without compression.
- Burn time (“on” time of the thermal printhead) can be adjusted to control the printing intensity.
- Drivers are available for easy operation by PC. The Windows XP driver contains an API for easy integration to the host application.
- Upload of firmware revisions can be accomplished with a tool that accompanies the Windows XP driver.
- Note that when data is sent from the external equipment to the eXtendo® printer, all data must be sent as binary data.
- Note that the eXtendo® series of printers use advanced printing and positioning features, allowing the placement of images, bar codes, text, etc., anywhere on the printout. As a result, the eXtendo® series does not automatically wrap text that exceeds its margins. Proper design of print location on the printout should eliminate the need for text wrapping.
- When using RS232 communications, the question of whether handshaking is required sometimes occurs. eXtendo® printers employ large buffers and, in many cases, will work without any handshaking at all. However, to ensure that there is no data loss and to optimize performance of your eXtendo® printer, we recommend that hardware handshaking always be employed and that the host queries the status of the eXtendo® printer at appropriate times.

2 Printer Command Overview (Emulation)

Each command is explained using the following conventions:

[Name]	Command name
[Function]	Function of command
[Code]	Control code represented in hexadecimal or decimal notation.
	[X] ¹⁶ Hexadecimal notation ('0'..'9', 'A'..'F')
	[X] ¹⁰ Decimal notation ('0'..'9')
	[X] ² Binary notation ('0'..'1')
[Description]	Explanation of command function

2.1 Emulation Command Set

The following commands are used when communicating with the printer controller. All other commands are ignored

2.1.1 HT**Horizontal tab**

[Name]	Horizontal tab
[Function]	This command moves the printing position to the next horizontal tab position.
[Code]	[09] ¹⁶ [09] ¹⁰

[Description]

1. Command "HT" moves the printing position to the next tab position.
2. The horizontal tab positions are set with command "ESC D".
3. If the next horizontal tab position is not set, the HT command is ignored.
4. If the next horizontal tab position is outside the printing area, the printing position is shifted to the next line.

2.1.2 LF**Line feed**

[Name] Line feed

[Function] This command prints the data already contained in the print buffer, then sets the next-data receive position at the left most column on the next line.

[Code] [0A]¹⁶
[10]¹⁰

[Description]

1. The "LF" command prints the data already contained in the print buffer, then sets the next-data receive position at the leftmost column on the next line.
2. In the initial state, the line spacing is set to approx. 1/8 inch.
3. When there is no data in the print buffer, only a line feed operation is executed.
4. When different-height character typefaces are to be printed on the same line, these character typefaces are arranged so that their bottom ends are aligned at the same level.
5. If line spacing during printing/line-feeding is shorter than the character height, a length equal to the character height feeds the paper.

2.1.3 CR**Carriage Return**

[Name] Carriage Return

[Function] This command resets the printing position to the leftmost column on the same line.

[Code] [0D]¹⁶

[14]¹⁰

[Description]

1. The "CR" command resets the printing position to the leftmost column on the same line. Please note that it does not cause the line to print. Use the Line Feed (LF) command to print the current line and advance to the next line.

2.1.4 FF**Form Feed (new page)**

[Name]	Form Feed (new page)
[Function]	This command feeds paper by the specified page length.
[Code]	[0C] ¹⁶ [12] ¹⁰

[Description]

1. The "FF" command prints the data already contained in the print buffer, then sets the next-data receive position at the leftmost column on the next page.
2. Page length defaults to approx. 143 mm (44 lines).

2.1.5 CAN**Cancel (reset print engine)**

[Name]	Cancel
[Function]	This command resets the print engine to the default values and deletes buffered print data.
[Code]	[18] ¹⁶ [24] ¹⁰

[Description]

1. The "CAN" command resets the print engine to the default values and deletes all buffered print data.

2.1.6 ESC %+[n] Character set selection

[Name] Character set selection

[Function] This command selects the primary or secondary character set.

[Code] $[1B]^{16} + [25]^{16} + [n]$
 $[27]^{10} + [37]^{10} + [n]$

[Description]

1. The “ESC %+[n]” command selects the primary or secondary character set. Either character set can be changed by uploading a new character set to the printer using the supplied font upload tool.
2. If parameter [n] is $[0]^{10}$, then the primary character set is selected.
3. If parameter [n] is $[1]^{10}$, then the secondary character set is selected..
4. The type of primary/secondary character set (e.g. 8x16, 12x24, 16x32, 20x40) required is selected with the print mode command (see “ESC ! + ...”).

Printing mode specification (command “ESC ! + ..”, lower 4 bits)	Primary character set	Secondary character set
08 x 16	08 x 16	08 x 16
12 x 24	12 x 24	12 x 24
16 x 32	16 x 32	16 x 32
20 x 40	20 x 40	20 x 40

2.1.7 ESC !+[n] Character size specification

[Name] Character size specification
 [Function] This command specifies character size for text output.
 [Code] $[1B]^{16} + [21]^{16} + [n]$
 $[27]^{10} + [33]^{10} + [n]$

[Description]

1. The “ESC !+[n]” command specifies character size.
2. The following figure shows the relationship between the bits of parameter [n] and character size:

Parameter [n], bit	Value	Printing mode
b0 (LSB) b1	$[00]^2$	08x16-dot character typeface
	$[01]^2$	12x24-dot character typeface
	$[10]^2$	16x32-dot character typeface
	$[11]^2$	20x40-dot character typeface
b2 b3	$[00]^2$	No magnification
	$[01]^2$	2 X magnification
	$[10]^2$	3 X magnification
	$[11]^2$	4 X magnification
b4	0	Double height disabled
	1	Double height enabled
b5	0	Double width disabled
	1	Double width enabled
b6	Reserved for future use; must be set to “0”	
b7 (MSB)		

3. When one line contains different-height character typefaces, the character typefaces are arranged so that their bottom ends are aligned at the same level.

2.1.8 GS B + [n]**Black-on-white reversed printing specification**

[Name]	Black-on-white reversed printing specification
[Function]	This command enables and disables black-on-white reversed printing.
[Code]	[1D] ¹⁶ + [42] ¹⁶ + [n] [29] ¹⁰ + [66] ¹⁰ + [n]

[Description]

1. The "GS B + [n]" command enables or disables black-on-white (reversed) printing.
2. Permissible values of [n] are "0" and "1".
3. If n = 0, black-on-white reversed printing is off. If n = 1, black-on-white reverse printing is on.
4. The default value for [n] is "0".
5. The command can be used in all character modes and all character sets.
6. The line-spacing (line pitch) area does not appear in reverse format.
7. A single text-line can contain both normal printed characters and reverse printed characters.
8. No character spacing (except for character blanks, e.g. tabs, margins), appears reversed.

2.1.9 ESC 2**1/6-inch line pitch setting**

[Name]	1/6-inch line pitch setting
[Function]	This command sets the single line pitch to 1/6 inch.
[Code]	[1B] ¹⁶ + [32] ¹⁶ [27] ¹⁰ + [50] ¹⁰

[Description]

1. The “ESC 2” command sets single line pitch to 1/6 inch.
2. Please note that “line pitch” is defined as the distance from the top of one character line to the top of the next character line.
3. This command invalidates the line pitch previously set with the “ESC 3+..” command.
4. This command invalidates the line spacing previously set with the “ESC A+..” command.

2.1.10 ESC 3+[n] Line pitch setting

[Name] Line pitch setting

[Function] This command sets the single line pitch in dot lines.

[Code] [1B]¹⁶ + [33]¹⁶ + [n]
[27]¹⁰ + [51]¹⁰ + [n]

[Description]

1. The “ESC 3+[n]” command sets the single line pitch to n dot lines.
2. Please note that “line pitch” is defined as the distance from the top of one character line to the top of the next character line.
3. This command invalidates the line pitch previously set with the “ESC 2” command.
4. This command invalidates the line spacing previously set with the “ESC A+[n]” command.
5. Parameter [n] defines the line pitch in dot lines.
6. Parameter [n] must match following conditions:
 $[0]^{10} \leq [n] \leq [255]^{10}$
7. When a line feed is executed and there is printing on that character line, paper is fed by at least the height of the character currently specified. When a line feed is executed without printing on the character line, paper is fed only by the specified line spacing. For example, when line spacing of 10 dot lines is specified for a character whose height is 24 dot lines, paper is fed by 24 dot lines (if there are characters on the line) or 10 dot lines (if there are no characters on the line).

2.1.11 ESC A+[n] Line spacing setting

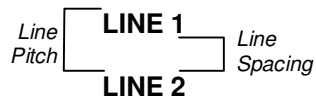
[Name] Line spacing setting

[Function] This command sets the line spacing to a specific amount of dot lines.

[Code] $[1B]^{16} + [41]^{16} + [n]$
 $[27]^{10} + [65]^{10} + [n]$

[Description]

1. The “ESC A+[n]” command sets the line spacing to [n] dot lines.
2. Condition $[0]^{10} \leq [n] \leq [255]^{10}$ must be satisfied.
3. If this command is set two or more times for the same line, the last set line spacing is valid.
4. When line pitch is set with the “ESC 3” or “ESC 2” command, the line spacing set with this command is invalidated.
5. Please note that “line spacing” is defined as the distance from the bottom of one character line to the top of the next character line. Note the difference between line pitch and line spacing:



2.1.12 GS L+[n]+[m] Left margin specification

[Name]	Left margin specification
[Function]	This command sets the left margin.
[Code]	$[1D]^{16} + [4C]^{16} + [n] + [m]$ $[29]^{10} + [76]^{10} + [n] + [m]$

[Description]

1. The "GS L+[n]+[m]" command specifies the left margin in dots.
2. Both parameters [n] and [m] specify the left margin, whereas this margin is calculated as follows:
"left margin" = $[n] + [m] * [256]^{10}$.
3. The range of parameter [n] is $[0]^{10} \leq [n] \leq [255]^{10}$.
4. The range of parameter [m] is as follows.
X-56 (203 dpi): $[0]^{10} \leq [m] \leq [1]^{10}$
X-80 (203 dpi): $[0]^{10} \leq [m] \leq [2]^{10}$
5. If the result of the calculation $[n] + [m] * [256]^{10}$ is greater than the number of dots in the dot row (448 for the X-56/203 dpi and 640 for the X-80/203 dpi), then this command will be ignored.

2.1.13 ESC SP+[n] Character spacing specification

[Name]	Character spacing specification
[Function]	This command specifies the character spacing in dots.
[Code]	$[1B]^{16} + [20]^{16} + [n]$ $[27]^{10} + [32]^{10} + [n]$

[Description]

1. The “ESC SP+[n]” command specifies the spacing between characters in dots.
2. Parameter [n] specifies the number of blank dots between adjacent characters.
3. Condition $[0]^{10} \leq [n] \leq [32]^{10}$ must be satisfied.
4. Initially the value for [n] is $[0]^{10}$ (no character spacing).

2.1.14 ESC ‘-’+[n] Character underlining

[Name] Character underlining

[Function] This command turns character underlining on and off, and specifies the number of dot rows to be used when underlining a character.

[Code] $[1B]^{16} + [2D]^{16} + [n]$
 $[27]^{10} + [45]^{10} + [n]$

[Description]

1. The “ESC ‘-’+[n]” command controls character underlining and the number of dot rows used for the underline.
2. Parameter [n] specifies the number of dot rows to be used when underlining.
3. Condition $[0]^{10} \leq [n] \leq [3]^{10}$ must be satisfied; I.E., a maximum of three dot rows can be used for underlining.
4. The default value for [n] is $[0]^{10}$ (no underlining).
5. Underlining remains in effect until a subsequent underline command changes the value.
6. It is possible to mix underlining on a single line. For example, part of the line can be underlined with three dot rows, part with two, part with one, and part with none.

2.1.15 ESC 'E'+[n] Bold characters enable/disable

[Name]	Bold characters enable/disable
[Function]	This command enables/disables bold character printing
[Code]	$[1B]^{16} + [45]^{16} + [n]$ $[27]^{10} + [69]^{10} + [n]$

[Description]

1. The "ESC 'E'+[n]" command enables or disables bold character printing.
2. Bold characters are enabled when parameter $[n] = [1]^{10}$, and disabled otherwise.
3. Condition $[0]^{10} \leq [n] \leq [1]^{10}$ must be satisfied.
4. The default value for $[n]$ is $[0]^{10}$ (bold characters disabled).

2.1.16 ESC [F0]+[07]+[01]+[n] Enable wide font printing

[Name] Enable wide font printing

[Function] This command enables/disables wide font printing with standard/ GB2312-Chinese/KS5601-Korean character sets.

[Code] $[1B]^{16} + [F0]^{16} + [07]^{16} + [01]^{16} + [n]$
 $[27]^{10} + [240]^{10} + [07]^{10} + [01]^{10} + [n]$

[Description]

1. The "ESC [F0]+[07]+[01]+[n]" command enables/disables wide font printing, where the wide font is represented by 7000+ characters, each made up of 24X24 or 20X20 dots.
2. If wide font printing is enabled, then each character in this font is represented by a specific 2 byte code, which correlates to a specific wide font character. The selected wide font index specifies how the two byte code is mapped onto an entry in the wide font.
3. Four wide font indexes are available: standard 24X24, GB2312-Chinese 24X24, standard 20X20 and KS5601-Korean 20X20. Wide font printing is automatically enabled if one of these indexes is selected.
4. For both standard indexes, each two consecutive bytes that exceed $[E0]^{16}[00]^{16}$ are regarded as wide font character code references, whereas the corresponding character in the wide font is selected by subtracting $[E0]^{16}[00]^{16}$ (e.g. $[E0]^{16}[00]^{16}$ is the 1st character, $[E0]^{16}[01]^{16}$ is the 2nd character, ..., $[E0]^{16}[FF]^{16}$ is the 256th character, $[E1]^{16}[00]^{16}$ is the 257th character, etc.).
5. For the GB2312-Chinese index, each two consecutive bytes that exceed $[A0]^{16}[00]^{16}$ are regarded as wide font character code references, whereas the corresponding character in the wide font is selected according to the "GB2312" Simplified Chinese character map. The GB2312-Chinese index operates with a special preprocessed GB2312 type font only.
6. For the KS5601-Korean index, each two consecutive bytes that exceed $[A0]^{16}[00]^{16}$ are regarded as wide font character code references, whereas the corresponding character in the wide font is selected according to the "KS5601" Korean character map. The KS5601-Korean index operates with a special preprocessed KS5601 type font only.
7. Bytes that are not regarded as wide font character code references are regarded as normal single byte references in the internal/external character sets. If received, then the corresponding internal/external character is printed.
8. Escape commands that affect the internal/external character set (e.g. print mode) also affect the wide font printing (e.g. double width, 3X magnification, etc.).
9. The default wide font index is stored in flash memory. Its value can be wide font disabled, wide font enabled with standard index or wide font enabled with Chinese index.
10. The valid range for parameter [n] is $[0]^{10} \leq [n] \leq [4]^{10}$ or $[7]^{10}$. All other values are ignored. The meaning of each value of [n] is as follows.

n	Result
0	Wide font printing disabled
1	Wide font printing enabled with standard 24 x 24 index
2	Wide font printing enabled with GB3212 Chinese 24 x 24 index
3	Wide font printing enabled with standard 20 x 20 index
4	Wide font printing enabled with KS5601-Korean 20 x 20 index
7	Wide font printing index is reset to its default value, which is stored in flash memory.

11. The printer status information that is printed after paper insertion also contains information on the selected wide font index, provided that wide font printing is enabled.

2.1.17 ESC [F1]+[01]+[03]+[0A]+[n] Page length setting

[Name] Page length setting

[Function] This command sets the page length to a specific length.

[Code] $[1B]^{16} + [F1]^{16} + [01]^{16} + [03]^{16} + [0A]^{16} + [n]$
 $[27]^{10} + [241]^{10} + [01]^{10} + [03]^{10} + [10]^{10} + [n]$

[Description]

1. The "ESC [F1]+[01]+[03]+[0A]+[n]" command sets the page length to a specific length, in mm.
2. Parameter [n] represents the page length in 1/10 mm. (For example, "1234" = 123.4 mm.)
3. Parameter [n] is a 16-bit, unsigned integer with a valid range up to 65,535. It is therefore possible to represent a length of approx. 6.5 meters of paper (approx. 21 feet). Care should be taken to avoid the paper wasted associated with accidentally setting the page length so long.

2.1.18 ESC [F0]+[06]+[x]+[n]+[m] End of page

[Name]	End of page
[Function]	This command signals the end of page, prints the buffer, initiates cutting (if desired), and allows the transmission of a parameter byte to be echoed back by the printer after printing is completed
[Code]	$[1B]^{16} + [F0]^{16} + [06]^{16} + [x] + [n] + [m]$ $[29]^{10} + [240]^{10} + [06]^{10} + [x] + [n] + [m]$

[Description]

- The "ESC [F0] + [06] + [x] + [n] + [m]" command signals the end of page, prints the buffer, initiates cutting (if desired), and allows the transmission of a parameter byte to be echoes back by the printer after printing is completed.
- Permissible values of [x] are "1" and "2".
 If $x = 1$, then the command is to be used without a parameter byte to be echoed back. In this case, the syntax is $[1B]^{16} + [F0]^{16} + [06]^{16} + [01] + [n]$.
 If $x = 2$, then the command is to be used with a parameter byte. The syntax then is $[1B]^{16} + [F0]^{16} + [06]^{16} + [02] + [n] + [m]$.
- Parameter [n] is broken into a most significant nybble (MSN) and a least significant nybble (LSN). The LSN controls cutting, as follows, and has the permissible values of "0", "1" or "2".
 If $LSN[n] = 0$, no cut will occur after printing.
 If $LSN[n] = 1$, a partial cut will occur after printing (if available).
 If $LSN[n] = 2$, a full cut will occur after printing (if available).
 The MSN of n determines whether the command is interpreted as an "End of Print" or an "End of Form".
 If $MSN [n] = 0$, the command is treated as an "End of Print".
 If $MSN [n] = 1$, the command is treated as an "End of Form".
- "End of Print" acts as follows. (Please note that the "End of Print" command generally causes immediate movement of the paper and execution of the cut, as commanded. Also please note that anytime the "Top of Page" is set, the "Top of Form" is also set to the same location. When the "Top of Form" is set directly, it has no impact on the "Top of Page" location.)
 If End of Print is sent with no cut command, the current location will be set as "Top of Page".
 If End of Print is sent with a partial cut command, this location will be set as "Top of Page", the paper will be advanced to the cut line, and a partial cut will occur. There will be no retracting to the park position because the partially cut paper is still attached to the paper roll.
 If End of Print is sent with a full cut command, this location will be set as "Top of Page", the paper will be advanced to the cut line, and a full cut will occur. The paper will then be retracted to the park position.
- "End of Form" acts as follows. (Please note that the "End of Form" command generally causes no movement of the paper.)
 If End of Form is sent with no cut command, the current location will be set as "Top of Form".
 If End of Form is sent with a partial cut command, this location will be set as "Top of Form" and a partial cut will occur when this location moves under the cut line due to other printing commands (additional data printed, line feeds, etc.).
 If End of Form is sent with a full cut command, this location will be set as "Top of Page", and a full cut will occur when this location moves under the cut line due to other printing commands (additional data printed, line feeds, etc.).
- The default value for [n] is "0".
- Permissible values for [m] are in the range $[0]^{10} \leq [m] \leq [255]^{10}$.

8. The parameter [m] will be echoed back through the Status information. See the Request Printer Status section for the format of the data being returned.
9. The status parameter [m] can also be set via the Set Status Parameter command. See the Set Status Parameter section for a more detailed discussion of how this parameter is used.

2.1.19 ESC D+[d1]..[dn]+NUL Horizontal tab positions

[Name] Sets Horizontal tab positions

[Function] This command sets one or more horizontal tab positions or deletes all tab positions.

[Code] $[1B]^{16} + [44]^{16} + [d1]$ to $[dn]$ + $[00]^{16}$
 $[27]^{10} + [68]^{10} + [d1]$ to $[dn]$ + $[0]^{10}$

[Description]

1. Command "ESC D+[d1]..[dn]+NUL" sets one or more tab positions, which are used by the horizontal tab command "HT".
2. The following conditions must be satisfied for the values of d1, d2, etc. (tab position).
 X-56 / 203 dpi Printer: $[1]^{10} \leq [d] \leq [56]^{10}$
 X-80 / 203 dpi Printer: $[1]^{10} \leq [d] \leq [80]^{10}$
3. The maximum number of tabs that can be set is 32. Therefore, the condition $[1]^{10} \leq [n] \leq [32]^{10}$ must be satisfied. Any data sent after the 32nd horizontal tab position will be treated as ordinary data.
4. The horizontal tab position is set to $[d] \times 8$ dots distant from the head of the line in the printing area.
5. When the horizontal tab is set with this command, all horizontal tab positions previously set are deleted. Therefore, to add a tab, it is necessary to resend all the previous tab locations along with the new tab location.
6. The $[d]$ values must be entered in ascending order, and the data string must end with NUL ($[0]^{10}$).
7. All horizontal tab positions can be deleted with the "ESC D+NUL" command.
8. When the power to the printer is cycled or the printer is reset, the horizontal tab positions are set to intervals of 8 default characters as selected during initialization.

2.1.20 ESC J+[n] Forward paper feed

[Name] Forward paper feed

[Function] This command feeds paper in the forward direction.

[Code] [1B]¹⁶ + [4A]¹⁶ + [n]
[27]¹⁰ + [74]¹⁰ + [n]

[Description]

1. The "ESC J+[n]" command feeds paper in the forward direction by [n] dot lines.
2. Condition $[0]^{10} \leq [n] \leq [255]^{10}$ must be satisfied.
3. When there is data in the print buffer, this data will be printed first, and then the paper will be fed in the forward direction as specified by [n].
4. If parameter [n] equals $[0]^{10}$, the data contained in the buffer is printed but paper is not fed.

2.1.21 ESC d+[n] Forward n-line feed

[Name] Forward n-line feed

[Function] This command prints the data and feeds a line, then feeds the paper by [n] character lines.

[Code] $[1B]^{16} + [64]^{16} + [n]$
 $[27]^{10} + [100]^{10} + [n]$

[Description]

1. The "ESC d+[n]" command feeds paper by a character line count specified with parameter [n].
2. Condition $[0]^{10} \leq [n] \leq [255]^{10}$ must be satisfied.
3. After [n] lines are fed, the next print position is located at the left edge on the line.
4. When there is data in the print buffer, the data contained in the buffer is printed upon receipt of this command, after which paper is fed by [n] character lines.
5. Pitch or spacing is also taken into account by this command.

2.1.22 ESC [F2] [04] [00] Position Stamp Set

[Name] Position Stamp Set

[Function] This command sets a position stamp for the current position.

[Code] $[1B]^{16} + [F2]^{16} + [04]^{16} + [00]^{16}$
 $[27]^{10} + [242]^{10} + [4]^{10} + [0]^{10}$

[Description]

1. The command "ESC [F2] [04] [00]" sets a position stamp of the current position. This position stamp is used as a reference position for subsequent commands, such as Position Stamp Feed or Position Stamp Retract.
2. Buffered print data will be printed before the printer processes this command.
3. The Position Stamp Set command must be placed at the start of the printout. The command will interrupt fluent printout if placed elsewhere.

2.1.23 ESC [F2] [05] [02] [n1] [n2] Position Stamp Feed

[Name] Position Stamp Feed

[Function] This command feeds paper in the forward direction to an offset relative to the last Position Stamp Set position.

[Code]

$$[1B]^{16} + [F2]^{16} + [05]^{16} + [02]^{16} + [n1] + [n2]$$
$$[27]^{10} + [242]^{10} + [5]^{10} + [2]^{10} + [n1] + [n2]$$

[Description]

1. The command “ESC [F2] [05] [02] [n1] [n2]” feeds paper in the forward direction to an offset relative to the last Position Stamp Set position.
2. Parameters [n1] and [n2] specify a target position in millimeters from the last Position Stamp Set location. Together they form a 16-bit, unsigned integer with a valid range up to 65,535. Parameter [n1] is the MSB and parameter [n2] is the LSB of this number.
3. The conditions $[0]^{10} \leq [n1] \leq [255]^{10}$ and $[0]^{10} \leq [n2] \leq [255]^{10}$ must be satisfied.
4. Buffered print data will be printed before the printer processes this command.
5. The Position Stamp Feed command will have no effect when the requested position has already been passed.
6. By using the “Position Stamp Set” command at the start of a printout and the “Position Stamp Feed” command at the end of the printout, an application is able to insure a minimum printout length.

2.1.24 ESC [F2] [06] [02] [n1] [n2] Position Stamp Retract

[Name] Position Stamp Retract

[Function] This command feeds paper backwards to an offset relative to the last Position Stamp Set position.

[Code]

$$[1B]^{16} + [F2]^{16} + [06]^{16} + [02]^{16} + [n1] + [n2]$$
$$[27]^{10} + [242]^{10} + [6]^{10} + [2]^{10} + [n1] + [n2]$$

[Description]

1. The command “ESC [F2] [06] [02] [n1] [n2]” feeds paper backwards to an offset relative to the last Position Stamp Set position.
2. Parameters [n1] and [n2] specify a target position in millimeters from the last Position Stamp Set location. Together they form a 16-bit, unsigned integer with a valid range up to 65,535. Parameter [n1] is the MSB and parameter [n2] is the LSB of this number.
3. The conditions $[0]^{10} \leq [n1] \leq [255]^{10}$ and $[0]^{10} \leq [n2] \leq [255]^{10}$ must be satisfied.
4. Buffered print data will be printed before the printer processes this command.
5. By using the “Position Stamp Set” command at the start of a printout and the “Position Stamp Retract” command at the end of the printout, an application is able to retract the paper to the start of the printout and invalidate it afterwards by overprinting it (E.G., by printing “VOID” on the printout).

2.1.25 ESC \$ + [n1] + [n2] + [m1] + [m2] Set position

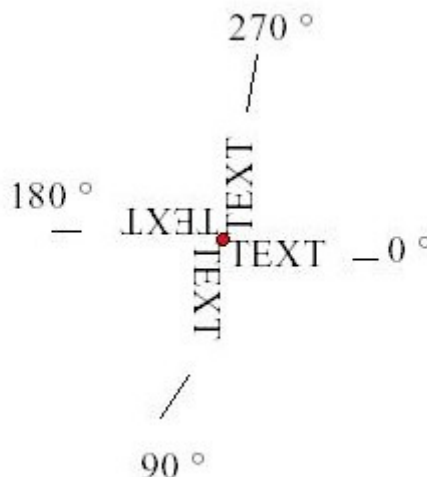
[Name] Set position
 [Function] This command specifies the position at which predefined objects such as graphics, text, bar codes, etc. will print.
 [Code] $[1B]^{16} + [24]^{16} + [n1] + [n2] + [m1] + [m2]$
 $[27]^{10} + [36]^{10} + [n1] + [n2] + [m1] + [m2]$

[Description]

1. The “ESC \$+[n1]+[n2]+[m1]+[m2]” command specifies the position at which a predefined object, such as graphics, text, bar codes, etc., will be printed.
2. Parameters n1 and n2 define the X coordinate of the upper, left-hand corner of where the object will print, defined in tenths of a mm (0.1 mm). n1 is the MSB, while n2 is the LSB. The X coordinate is therefore defined as $n1 * [256]^{10} + n2$, in tenths of a mm.
3. Parameters m1 and m2 define the Y coordinate of the upper, left-hand corner of where the object will print, defined in tenths of a mm (0.1 mm). m1 is the MSB, while m2 is the LSB. The Y coordinate is therefore defined as $m1 * [256]^{10} + m2$, in tenths of a mm.
4. The ranges of the four parameters are as follows. Also please note that if the value of $n1 * 256 + n2$ exceeds **560** for an X-56 / 203 dpi or **800** for an X-80 / 203 dpi, the upper left corner of the printing start position will be off the paper.
5. Similarly, please note that the value of $m1 * 256 + m2$ can become quite large, positioning the upper left corner of the print start position over one meters down the paper. Care should be taken to avoid this situation accidentally.

Parameter	Valid Ranges
n1	$[0]^{10} \leq [n1] \leq [255]^{10}$
n2	$[0]^{10} \leq [n2] \leq [255]^{10}$
m1	$[0]^{10} \leq [m1] \leq [40]^{10}$
m2	$[0]^{10} \leq [m2] \leq [255]^{10}$

6. Note the red dot in the image below. This represents the position as defined by this command and shows where the text, image, bar code, etc. will be oriented with regard to that position with different degrees of rotation.



2.1.26 ESC V+[n]+[m] Text, image, bar code and character rotation

[Name]	Text, image, bar code and character rotation
[Function]	This command specifies the rotation angle for text, images, bar codes and characters.
[Code]	[1B] ¹⁶ + [56] ¹⁶ + [n] + [m] [27] ¹⁰ + [86] ¹⁰ + [n] + [m]
[Description]	

- The “ESC V+[n]+[m]” command specifies the rotation angle for:
 - text rotation: 0°, 90°, 180° and 270°
 - image rotation: 0°, 90°, 180° and 270°
 - bar code rotation: 0°, 90°, 180° and 270°
 - character rotation: 0°, 90°, 180° and 270°
- Parameter [n] defines what is affected by the rotation:

Parameter [n]	Rotation
[00] ¹⁰	Text
[01] ¹⁰	Images
[02] ¹⁰	Bar Codes
[03] ¹⁰	Characters

- Parameter [m] defines the angle of rotation:

Parameter [m]	Angle of rotation
[00] ¹⁰	0°
[01] ¹⁰	90°
[02] ¹⁰	180°
[03] ¹⁰	270°

- All objects can be rotated in all available directions, whereas the left upper position is defined by the “Set position” command “ESC \$+[n1]+[n2]+[m1]+[m2]”.
- Text rotation causes the entire text to be rotated as a unit.
- Character rotation causes only the individual characters to be rotated, not the entire text.
- All bar code settings (height, width, magnification) are effective when printing bar codes.

2.1.27 ESC [F0]+[0B]+[01]+[n] Start block rotation

[Name] Start block rotation
 [Function] This command signifies that all commands sent after it are to be treated as a single block and rotated intact as specified below.
 [Code] $[1B]^{16} + [F0]^{16} + [0B]^{16} + [01]^{16} + [n]$
 $[27]^{10} + [240]^{10} + [11]^{10} + [01]^{10} + [n]$
 [Description]

1. The “ESC [F0]+[0B]+[01]+[n]” command signifies that all commands and data sent after it, until receipt of the End Block Rotation command, are to be treated as a single block and rotated intact as specified below.
2. Parameter [n] defines the angle of rotation for the entire block:

Parameter [n]	Angle of rotation
$[FF]^{16}$	Disabled
$[00]^{16}$	0°
$[01]^{16}$	90°
$[02]^{16}$	180°
$[03]^{16}$	270°

3. The upper left corner of the block is the key when rotating, and the block will start as far to the upper left as defined by the rotation of the objects sent.

The “T” in “The” is the upper left hand corner before rotation.

The “T” in “The” is the upper left hand corner after rotation.

4. Please note that all commands, including Line Feed, are stored and are used only to position and format the data to be printed. Once this command has been sent, there will be no printing until receipt of the End Block Rotation command, which will cause the entire block to be printed.
5. The commands “Print uncompressed graphics” and “Print RLE8 compressed graphics” are ignored by the Start Block Rotation command.

2.1.28 ESC [F0]+[0C]+[00] End block rotation

[Name]	End block rotation
[Function]	This command closes the Start Block Rotation command and immediately causes printing of the data sent after the Start Block Rotation command was received.
[Code]	$[1B]^{16} + [F0]^{16} + [0C]^{16} + [00]^{16}$ $[27]^{10} + [240]^{10} + [12]^{10} + [00]^{10}$
[Description]	

1. The "ESC [F0]+[0C]+[00]" command ends the transmission of data to be printed as a block that was initiated by the Start Block Rotation command and causes it to be printed.

2.1.29 ESC @ Printer reset (software)

[Name] Printer reset (software)
[Function] This command initializes/resets the printer.
[Code] [1B]¹⁶ + [40]¹⁶
[27]¹⁰ + [64]¹⁰

[Description]

1. The "ESC @" command resets the printer settings to their default values.
2. "Default" is defined as the status of the printer after initial power up.
3. The "ESC @" command prints the data contained in the print buffer before resetting.

2.1.30 ESC+[F2]+[03]+[00] Printer reset (hardware)

[Name]	Printer reset (hardware)
[Function]	This command performs a hard reset of the printer by resetting the hardware.
[Code]	[1B] ¹⁶ + [F2] ¹⁶ + [03] + [00] [27] ¹⁰ + [142] ¹⁰ + [03] + [00]

[Description]

1. The “ESC+[F2]+[03]+[00]” command performs a hardware reset of the printer.
2. When the “ESC+[F2]+[03]+[00]” command is executed, the printer does not print the buffer before resetting. All data in the buffer is lost. All conditions are returned to those that would exist if the power were removed and then restored.

2.1.31 GS '+[m]+[n] Print stored image data

[Name] Print stored image data
 [Function] This command causes stored image data to be printed.
 [Code] $[1D]^{16} + [27]^{16} + [m] + [n]$
 $[29]^{10} + [39]^{10} + [m] + [n]$

[Description]

1. The "GS '+[m]+[n]" command causes image data, stored in flash memory, to be printed.
2. Parameter [m] specifies the identification number of the stored image. (The first stored image is identification no. 1, the second ID no. 2, etc.)
3. The range of parameter [m], the identification number, is $[1]^{10} \leq [m] \leq [255]^{10}$.
4. If there is no registered image stored for a transmitted identification number, then the command is ignored.
5. Parameter [n] specifies the print mode, as follows:

Parameter [n]	Print mode	Caption
$[00]^{10}$	Normal	The stored image data is printed in the original stored size.
$[01]^{10}$	Double width	The stored image data is printed in double width.
$[02]^{10}$	Double height	The stored image data is printed in double height.
$[03]^{10}$	Double width and height	The stored image data is printed in double width and height.

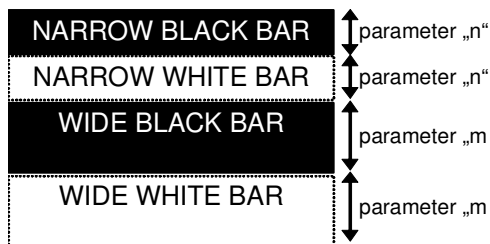
6. Use of values for Parameters [m] and [n] other than as described above will cause the command to be ignored.
7. Images can be created and stored in the eXtendo® printer by using the tools that come with the eXtendo® print driver.

2.1.32 GS e+[n]+[m] Bar code bar width setting

[Name]	Bar code bar width setting
[Function]	This command sets the width of the bar code narrow and wide bars.
[Code]	$[1D]^{16} + [65]^{16} + [n] + [m]$ $[29]^{10} + [101]^{10} + [n] + [m]$

[Description]

1. Command "GS e+[n]+[m]" defines the width of the bar code bars.
2. The bars in a one-dimensional bar code can be wide or narrow and black or white.



3. Parameter [n] specifies the width of a narrow white/black bar in dots.
4. Parameter [m] specifies the width of a wide white/black bar in dots.
5. When the bar code selected does not consist of wide bars and/or narrow bars, the value of parameter [n] is set as the minimum width.
6. The initial value of parameter [n] is $[2]^{10}$.
7. The initial value of Parameter [m] is $[6]^{10}$.
8. The following conditions must be satisfied:
 $[1]^{10} \leq [n] \leq [255]^{10}$ and $[1]^{10} \leq [m] \leq [255]^{10}$

2.1.33 GS h+[n] Bar code height setting

[Name]	Bar code height setting
[Function]	This command sets the height of a bar code in dots.
[Code]	$[1D]^{16} + [68]^{16} + [n]$ $[29]^{10} + [104]^{10} + [n]$

[Description]

1. Command "GS h+[n]" defines the height of a bar code.
2. Parameter [n] specifies the height of the bar code in dots.
3. The following conditions must be satisfied:
 $[1]^{10} \leq [n] \leq [255]^{10}$.
4. The default value of parameter [n] is $[60]^{10}$.

2.1.34 GS w+[n] Bar code width magnification setting

[Name] Bar code width magnification setting

[Function] This command sets the width magnification for a bar code.

[Code] [1D]¹⁶ + [77]¹⁶ + [n]
[29]¹⁰ + [109]¹⁰ + [n]

[Description]

1. Command "GS w+[n]" specifies the width magnification of a one-dimensional bar code by multiplying the dot width of the narrow and wide bars by a specified integer value.
2. Parameter [n] specifies the horizontal magnification of a bar code.
3. The following conditions must be satisfied:
 $[1]^{10} \leq [n] \leq [4]^{10}$.
4. The default value of parameter [n] is [1]¹⁰.
5. The widths of the narrow and wide bars (black and white) are multiplied by [n].
6. This command is ignored two-dimensional bar codes.

2.1.35 GS k+[m]+[n]+[d1]..[dn] Bar code printing

[Name] Bar code printing

[Function] This command selects a one dimensional bar code type and prints a one dimensional bar code.

[Code] [1D]¹⁶ + [6B]¹⁶ + [m] + [n] + [d1]..[dn]
 [29]¹⁰ + [107]¹⁰ + [m] + [n] + [d1]..[dn]

[Description]

1. Command "GS k+[m]+[n]+[d1]..[dn]" selects a bar code type, supplies the data to be encoded and prints a bar code. The eXtendo® printer will determine and print the bar code based on the data sent to it for encoding. The eXtendo® is also capable of printing any bar code of appropriate resolution sent to it as a graphics file. For printing of two dimensional bar codes, see "2D Bar code configuration" and "2D Bar code printing".
2. Parameter [m] specifies the type of bar codes to be printed, which can be UPCA, UPCE, EAN13, EAN8, Code39, ITF (also called "Interleaved Two of Five"), Codabar, Code 128.
3. The command configuration, code, definition area, and certain other conditions depend on parameter [m].
4. Parameter [n] specifies the number of characters to be encoded by the bar code, which depends on the type of bar code.
5. If the print data generates a bar code wider than will fit on one line, the excess portion of the bar code will print on the next line.
6. Bar code height will be determined by the bar code height setting GS h+[n], regardless of the line spacing set with the ESC 2 or ESC 3 commands.
7. When one line contains both a bar code and characters to be printed, the bottom of these characters and the bottom of the bar code are aligned.
8. Two or more bar codes cannot be contained on the same line. If this GS command is received when there is a bar code in the print buffer, the data contained in the print buffer is automatically printed, after which the new command is accepted.

Parameter [m]	Type of Bar code	Number of bar code characters	Value of parameter "d"
[41] ¹⁶	UPCA	[11] ¹⁰ <=n<= [12] ¹⁰	[48] ¹⁰ <=d<=[57] ¹⁰
[42] ¹⁶	UPCE	[11] ¹⁰ <=n<= [12] ¹⁰	[48] ¹⁰ <=d<=[57] ¹⁰
[43] ¹⁶	EAN13	[12] ¹⁰ <=n<= [13] ¹⁰	[48] ¹⁰ <=d<=[57] ¹⁰
[44] ¹⁶	EAN8	[7] ¹⁰ <=n<= [8] ¹⁰	[48] ¹⁰ <=d<=[57] ¹⁰
[45] ¹⁶	Code39	Variable	Space , \$, % , + , - , . , / , 0-9 , A-Z
[46] ¹⁶	ITF	Variable but must be an even number	Even number, ASCII digits 0-9 only, last digit must be a checksum
[47] ¹⁶	Codabar	Variable	'0' ~ '9', ',', '\$', ':', '/', '.', '+', 'A' ~ 'D' ('A' or 'D' are end characters)
[49] ¹⁶	Code128	Variable	0 to 105

9. Restrictions and notes regarding UPCA:
 - if n is [11]¹⁰, then the eXtendo® printer will calculate the checksum.
10. Restrictions and notes regarding EAN8:
 - if n is [7]¹⁰, then the eXtendo® printer will calculate the checksum.

11. Restrictions and notes regarding EAN13:
 - if n is $[12]^{10}$, then the eXtendo® printer will calculate the checksum.
12. Restrictions and notes regarding Code 39:
 - The first and last characters must be '*' (required by code 39 syntax).
13. Restrictions and notes regarding ITF:
 - Only the digits 0 – 9 can be encoded by ITF, and they are sent as ASCII characters
 - ITF bar code must have an even number of digits, including the checksum
 - The last digit in the ITF bar code is the checksum.
14. Restrictions and notes regarding Code 128.
 - There are three subsets of Code128 (Code128A, Code128B and Code128C).
 - The first data character (d1) specifies which character set is to be used.
 - The d1 character must be either $[103]^{10}$ (subset A), $[104]^{10}$ (subset B), or $[105]^{10}$ (subset C) in order to manually select a subset. If d1 is any other value than $[103]^{10}$, $[104]^{10}$ or $[105]^{10}$, then d1 will be treated as data to be encoded.
 - If a subset is not specified, the eXtendo® printer will automatically select the appropriate subset depending upon what data is to be encoded in d1...dn.
 - Note that the value of n must include d1, regardless of whether it's data or a subset code.
 - Please note that subset C is intended for the creation of more compact Code 128 bar codes when only numeric data is being encoded.

The following table shows the value encoded for data (d) depending upon which subset is selected.

Code128 bar code table

data 'd'	subset A	subset B	subset C	data 'd'	subset A	subset B	subset C
$[0]^{10}$	Space	Space	0	$[52]^{10}$	T	T	52
$[1]^{10}$	!	!	1	$[53]^{10}$	U	U	53
$[2]^{10}$	"	"	2	$[54]^{10}$	V	V	54
$[3]^{10}$	#	#	3	$[55]^{10}$	W	W	55
$[4]^{10}$	\$	\$	4	$[56]^{10}$	X	X	56
$[5]^{10}$	%	%	5	$[57]^{10}$	Y	Y	57
$[6]^{10}$	&	&	6	$[58]^{10}$	Z	Z	58
$[7]^{10}$	'	'	7	$[59]^{10}$	[	[	59
$[8]^{10}$	(	(	8	$[60]^{10}$	\	\	60
$[9]^{10}$	)	)	9	$[61]^{10}$	]	]	61
$[10]^{10}$	*	*	10	$[62]^{10}$	^	^	62
$[11]^{10}$	+	+	11	$[63]^{10}$	_	_	63
$[12]^{10}$	,	,	12	$[64]^{10}$	NUL	`	64
$[13]^{10}$	-	-	13	$[65]^{10}$	SOH	a	65
$[14]^{10}$	.	.	14	$[66]^{10}$	STX	b	66
$[15]^{10}$	/	/	15	$[67]^{10}$	ETX	c	67
$[16]^{10}$	0	0	16	$[68]^{10}$	EOT	d	68
$[17]^{10}$	1	1	17	$[69]^{10}$	ENQ	e	69
$[18]^{10}$	2	2	18	$[70]^{10}$	ACK	f	70
$[19]^{10}$	3	3	19	$[71]^{10}$	BEL	g	71
$[20]^{10}$	4	4	20	$[72]^{10}$	BS	h	72
$[21]^{10}$	5	5	21	$[73]^{10}$	HT	i	73

[22] ¹⁰	6	6	22	[74] ¹⁰	LF	j	74
[23] ¹⁰	7	7	23	[75] ¹⁰	VT	k	75
[24] ¹⁰	8	8	24	[76] ¹⁰	FF	l	76
[25] ¹⁰	9	9	25	[77] ¹⁰	CR	m	77
[26] ¹⁰	:	:	26	[78] ¹⁰	SO	n	78
[27] ¹⁰	;	;	27	[79] ¹⁰	SI	o	79
[28] ¹⁰	<	<	28	[80] ¹⁰	DLE	p	80
[29] ¹⁰	=	=	29	[81] ¹⁰	DC1	q	81
[30] ¹⁰	>	>	30	[82] ¹⁰	DC2	r	82
[31] ¹⁰	?	?	31	[83] ¹⁰	DC3	s	83
[32] ¹⁰	@	@	32	[84] ¹⁰	DC4	t	84
[33] ¹⁰	A	A	33	[85] ¹⁰	NAK	u	85
[34] ¹⁰	B	B	34	[86] ¹⁰	SYN	v	86
[35] ¹⁰	C	C	35	[87] ¹⁰	ETB	w	87
[36] ¹⁰	D	D	36	[88] ¹⁰	CAN	x	88
[37] ¹⁰	E	E	37	[89] ¹⁰	EM	y	89
[38] ¹⁰	F	F	38	[90] ¹⁰	SUB	z	90
[39] ¹⁰	G	G	39	[91] ¹⁰	ESC	{	91
[40] ¹⁰	H	H	40	[92] ¹⁰	FS	|	92
[41] ¹⁰	I	I	41	[93] ¹⁰	GS	}	93
[42] ¹⁰	J	J	42	[94] ¹⁰	RS	~	94
[43] ¹⁰	K	K	43	[95] ¹⁰	US	DEL	95
[44] ¹⁰	L	L	44	[96] ¹⁰	FNC3	FNC3	96
[45] ¹⁰	M	M	45	[97] ¹⁰	FNC2	FNC2	97
[46] ¹⁰	N	N	46	[98] ¹⁰	SHIFT	SHIFT	98
[47] ¹⁰	O	O	47	[99] ¹⁰	Code C	Code C	99
[48] ¹⁰	P	P	48	[100] ¹⁰	Code B	FNC 4	Code B
[49] ¹⁰	Q	Q	49	[101] ¹⁰	FNC 4	Code A	Code A
[50] ¹⁰	R	R	50	[102] ¹⁰	FNC 1	FNC 1	FNC1
[51] ¹⁰	S	S	51				

2.1.36 ESC [F0]+[08]+[01]+[n] Bar code text subtitle setting

[Name] Bar code text subtitle setting

[Function] This command allows enabling or disabling of the bar code text subtitle

[Code] $[1B]^{16} + [F0]^{16} + [08]^{16} + [01]^{16} + [n]$
 $[27]^{10} + [240]^{10} + [08]^{10} + [01]^{10} + [n]$

[Description]

1. The "ESC [F0]+[08]+[01]+[n]" command enables/disables bar code text subtitling and specifies it's appearance.
2. Parameter [n] specifies bar code text subtitling enabled/disabled, font size 8x16/12x24 and font source primary/secondary character set.

Subtitle Fonts		
Size	Primary Font	Secondary Font
8x16	$[01]^{16}$	$[09]^{16}$
12x24	$[03]^{16}$	$[0B]^{16}$
16x32	$[05]^{16}$	$[0D]^{16}$
20x40	$[07]^{16}$	$[0F]^{16}$

3. Parameter [n] has following bit map:

Bit	Status	Caption	
0	Bar Code Plain Text Subtitle	0: Disabled	1: Enabled
1-2	Font size	00: 08x16, 01: 12x24, 10: 16x32, 11: 20x40	
3	Font source	0: Primary	1: Secondary
4-7	Reserved	0 (these values should always be set to "0")	

4. Bar code text subtitling is disabled by default.
5. The bar code text subtitling may be unreadable or incorrect if the bar code dimension exceeds the paper width.
6. Since the internal primary or secondary font is used for bar code text subtitling, a replacement of the default fonts might result in an incorrect subtitling.

2.1.37 ESC [F0]+[09]+[07]+[n1]..[n7] 2D Bar code configuration

[Name] 2D Bar code configuration

[Function] This command selects a 2D bar code and sets the conditions for printing it.

[Code] $[1B]^{16} + [F0]^{16} + [09] + [07] + [n1]..[n7]$
 $[27]^{10} + [240]^{10} + [09] + [07] + [n1]..[n7]$

[Description]

1. Command "ESC [F0]+[09]+[07]+[n1]..[n7]" selects a two-dimensional (2D) bar code type and sets the conditions to be used for printing it. This command does not initiate the printing of 2D bar code itself. See "2D Bar code printing" for the details on printing the bar code itself. The eXtendo® printer will determine and print the bar code based on the settings from this command and the data sent to it for encoding from the "2D Bar code printing" command. The eXtendo® is also capable of printing any bar code of appropriate resolution sent to it as a graphics file.
2. Parameter [n1] specifies the type of 2D bar code to be printed. At present, the only valid selection is "0", which specifies a PDF417 bar code. Other 2D bar codes may be added in the future.
3. Parameter [n2] specifies the 2D bar code style.

n2	Style
0	Normal style
1	Truncated style; no stop pattern or right row indicator

4. Parameter [n3] specifies the ECC-error correction level. The valid range is $[0]^{10} \leq [n3] \leq [8]^{10}$, where 0 = least error correction and 8 = most error correction. ECC-error correction is intended to allow the bar code to be read even when there is damage to it, such as a line being drawn across it or part of it being torn or destroyed. The more error correction that is used, the more redundancy exists in the data and the larger the bar code is. Therefore, selection of this parameter is a tradeoff between greater readability when damaged and smaller size.
5. Parameter [n4] specifies the magnification range of the bar code. The valid range is $[1]^{10} \leq [n4] \leq [4]^{10}$. The default value is "1".
6. Parameter [n5] specifies the height to be used when setting the bar code's aspect ration. The valid range is $[1]^{10} \leq [n5] \leq [255]^{10}$.
7. Parameter [n6] specifies the width to be used when setting the bar code's aspect ration. The valid range is $[1]^{10} \leq [n5] \leq [255]^{10}$.
8. Additionally, the ratio of [n5]/[n6] must fall in the range of 0.1 to 10.0. The default aspect ratio is 1:2.
9. Parameter [n7] specifies the height of the smallest module (mark) in the 2D bar code.
10. Once the above data has been transmitted, use the command "ESC [F0]+[0A]+[n]+[d1]..[dn-1]" from the "2D Bar code printing" section to print 2D bar codes.

2.1.38 ESC [F0]+[0A]+[n]+[d1]..[dn-1] 2D Bar code printing

[Name] 2D Bar code printing

[Function] This command encodes and prints a 2D bar code whose configuration has already been determined.

[Code] $[1B]^{16} + [F0]^{16} + [0A] + [n] + [d1]..[dn-1]$
 $[27]^{10} + [240]^{10} + [0A] + [n] + [d1]..[dn-1]$

[Description]

1. Command "ESC [F0]+[0A]+[n]+[d1]..[dn-1]" encodes and prints a 2D bar code whose configuration has already been determined. This command does not configure the 2D bar code itself. See "2D Bar code configuration" for the details on configuring the 2D bar code. The eXtendo® printer will determine and print the bar code based on the settings from the "2D Bar code configuration" command and the data sent to it for encoding by this command. The eXtendo® is also capable of printing any bar code of appropriate resolution sent to it as a graphics file.
2. Parameter [n] specifies the number of bytes to be encoded, plus itself. For example, if there are 8 bytes of actual data to be encoded, $n = 9$. [d1]...[dn-1] is the actual data to be encoded in the 2D bar code. If there are fewer than 255 bytes of data to be encoded, the bar code will print after receipt of the last data byte.
3. If parameter $[n] = [256]^{10}$, then there are 255 bytes of data to be encoded. In order to allow for larger bar codes than 255 bytes, the bar code will not print if $[n] = [256]^{10}$. The eXtendo® printer will wait for an additional "ESC [F0]+[0A]+[n]+[d1]..[dn-1]" command, and will print when the last "ESC [F0]+[0A]+[n]+[d1]..[dn-1]" command has a value of $[n] < 256$. If the amount of data to be encoded is exactly 255 bytes, then a second "ESC [F0]+[0A]+[n]+[d1]..[dn-1]" command must be sent with $[n] = 1$ and no data following it.

2.1.39 GS a+[n] Request printer status

[Name] Request printer status
 [Function] This command requests that the printer report its status.
 [Code] [1D]¹⁶ + [61]¹⁶ + [n]
 [29]¹⁰ + [97]¹⁰ + [n]

[Description]

1. The "GS a+[n]" requests the that the printer transmit one of several status packets back to the host.
2. The parameter [n] determines which status packet is sent from the printer, based on the following chart. The exact content of these packets is documented below.

[n]	Status Packets
01	Printer Status Packet
02	Printer Info Packet
04	Printer Sensor Packet
08	Reserved – Internal

3. All Status Packets will send their results in the sequence shown in their respective charts.

PRINTER STATUS PACKET

Description	# Bytes	Definition																								
Header	4	[1B]+[FF]+[02]+[m], where [m] is the number of bytes of status data following the [m]. Note that the first two header bytes are the same for all Status Packets, while byte 3 defines the type of packet. Here, the [02] indicates a Printer Status Packet.																								
Printer Status Summary	4	Each of the 32 bits of the Printer Status Summary is available as a flag for the following purposes. Note that this is a 32-bit unsigned integer. <table border="1" style="width: 100%; margin-top: 5px;"> <thead> <tr> <th>Bit No.</th> <th>Definition</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Printer error; 1 = printer error, 0 = no printer error</td> </tr> <tr> <td>1</td> <td>Printhead over temperature alert; 1 = over temperature, 0 = not over temperature</td> </tr> <tr> <td>2</td> <td>Flash checksum error; 1 = error, 0 = no error</td> </tr> <tr> <td>3</td> <td>Printer stalled; 1 = printer stalled, 0 = printer not stalled</td> </tr> <tr> <td>4</td> <td>Paper out detected; 1 = paper out, 0 = paper not out</td> </tr> <tr> <td>5</td> <td>Paper low detected; 1 = paper low, 0 = paper not low</td> </tr> <tr> <td>6</td> <td>Paper mark detected; 1 = mark detected, 0 = mark not detected</td> </tr> <tr> <td>7</td> <td>Paper in chute detected; 1 = paper in chute, 0 = paper not in chute</td> </tr> <tr> <td>8</td> <td>Printhead raised detected; 1 = printhead raised, 0 = printhead not raised</td> </tr> <tr> <td>9</td> <td>Last printout lost; 1 = last printout lost, 0 = last printout not lost</td> </tr> <tr> <td>10</td> <td>Auxiliary sensor active;</td> </tr> </tbody> </table>	Bit No.	Definition	0	Printer error; 1 = printer error, 0 = no printer error	1	Printhead over temperature alert; 1 = over temperature, 0 = not over temperature	2	Flash checksum error; 1 = error, 0 = no error	3	Printer stalled; 1 = printer stalled, 0 = printer not stalled	4	Paper out detected; 1 = paper out, 0 = paper not out	5	Paper low detected; 1 = paper low, 0 = paper not low	6	Paper mark detected; 1 = mark detected, 0 = mark not detected	7	Paper in chute detected; 1 = paper in chute, 0 = paper not in chute	8	Printhead raised detected; 1 = printhead raised, 0 = printhead not raised	9	Last printout lost; 1 = last printout lost, 0 = last printout not lost	10	Auxiliary sensor active;
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10	Auxiliary sensor active;																									

		1 = aux. sensor active, 0 = aux. sensor not active
	11	System failure; 1 = system failure, 0 = no system failure
	12	Power failure; 1 = power failure, 0 = no power failure
	13	Customer flag #1; 1 = flag #1 set, 0 = flag #1 not set
	14	Customer flag #2; 1 = flag #2 set, 0 = flag #2 not set
	15	Printer not ready to print: 1 = printer not ready, 0 = printer ready (Note: any data transmitted while this bit is high will be ignored.)
	16	EEPROM missing: 1 = data cannot be written to EEPROM (early sample printers) 0 = data can be written to EEPROM (normal operation) This bit should normally be "0".
	17-19	Reserved for future use-will always report "0"
	20-21	Partial cut monitoring (clear at beginning of new printout): 01 = partial cut printout has been taken by the user 02 = partial cut timeout has expired and full-cut has been made automatically 03 = partial cut printout is still in the chute If the printer is equipped with only a full-cut cutter, or a full-cut has been made, these bits will be "0" and should be ignored.
	22-31	Reserved for future use-will always report "0"
Status Parameter	1	If a print job completed correctly, this will be the character previously sent to the printer using the FS r [n] command. Note that this is an 8-bit, unsigned character.
Printhead Temperature	2	Printhead temperature in degrees Celsius. Note that this is a 16-bit signed integer, allowing for both positive and negative numbers. The bytes are sent LSB, MSB.
Control Board Voltage	2	Control board supply voltage in tenths of a volt. Note that this is a 16-bit unsigned integer. The bytes are sent LSB, MSB.
Paper Control Status	1	Note that this is an 8-bit, unsigned character.
Paper Control Error	2	Note that this is a 16-bit, unsigned integer.
Reserved	2	Reserved; will read out as "0". Note that these are two 8-bit, unsigned characters.

PRINTER INFO PACKET

Description	# Bytes	Definition
Header	4	[1B]+[FF]+[03]+[m], where [m] is the number of bytes of status data following the [m]. Note that the first two header bytes are the same for all Status Packets, while byte 3 defines the type of packet. Here, the [03] indicates a Printer Info Packet.
Communication Protocol Revision No.	1	This byte contains the communication protocol revision number, and is an 8-bit unsigned character.

Printer Part Number	17	The first 16 bytes of this string contain the printer part number in ASCII format. The last byte is a NUL character, which acts as a string terminator. Note that these are all 8-bit, unsigned characters.														
Printer Serial Number	17	The first 16 bytes of this string contain the printer serial number in ASCII format. The last byte is a NUL character, which acts as a string terminator. Note that these are all 8-bit, unsigned characters.														
Date of Manufacture	17	The first 16 bytes of this string contain the printer's date of manufacture in ASCII format. The last byte is a NUL character, which acts as a string terminator. Note that these are all 8-bit, unsigned characters.														
System Configuration	4	<p>Each of the 8 nybbles of the System Configuration is available as an indicator for the following purposes. Note that this is a 32-bit unsigned integer.</p> <table border="1"> <thead> <tr> <th>Nybble No.</th> <th>Definition</th> </tr> </thead> <tbody> <tr> <td>2 - 0 (0=LSN)</td> <td>Model Type 000 = X-56 3E8 = X-80 FFF = Custom</td> </tr> <tr> <td>3</td> <td>Reserved: F = default</td> </tr> <tr> <td>4</td> <td>Cutter type: 0 = none or manual 1 = Twincut, full and partial cut 2 = Twincut, full cut only 3 = Rotary 4 = Pizza</td> </tr> <tr> <td>5</td> <td>Communications interface: 0 = unknown 1 = RS-232 2 = USB</td> </tr> <tr> <td>6</td> <td>Operating voltage: 0 = unknown 1 = 8 VDC 2 = 12 VDC 3 = 24 VDC</td> </tr> <tr> <td>7</td> <td>Printhead type; 0 = unknown 1 = 56 mm 448 dots 2 = 80 mm 640 dots</td> </tr> </tbody> </table>	Nybble No.	Definition	2 - 0 (0=LSN)	Model Type 000 = X-56 3E8 = X-80 FFF = Custom	3	Reserved: F = default	4	Cutter type: 0 = none or manual 1 = Twincut, full and partial cut 2 = Twincut, full cut only 3 = Rotary 4 = Pizza	5	Communications interface: 0 = unknown 1 = RS-232 2 = USB	6	Operating voltage: 0 = unknown 1 = 8 VDC 2 = 12 VDC 3 = 24 VDC	7	Printhead type; 0 = unknown 1 = 56 mm 448 dots 2 = 80 mm 640 dots
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System Sensors	4	<p>Each of the 8 nybbles of the System Sensors is available as an indicator for the following purposes. Note that this is a 32-bit unsigned integer.</p> <table border="1"> <thead> <tr> <th>Nybble No.</th> <th>Definition</th> </tr> </thead> <tbody> <tr> <td>3 - 0 (0=LSN)</td> <td>Reserved; FFFF = Default</td> </tr> <tr> <td>4</td> <td>Paper exit (output) sensor (TOF); 0 = none 1 = Reflex sensor 2 = Through-beam/through-light sensor</td> </tr> <tr> <td>5</td> <td>Printhead up sensor: 0 = none 1 = Switch</td> </tr> <tr> <td>6</td> <td>Paper entry sensor (#2):</td> </tr> </tbody> </table>	Nybble No.	Definition	3 - 0 (0=LSN)	Reserved; FFFF = Default	4	Paper exit (output) sensor (TOF); 0 = none 1 = Reflex sensor 2 = Through-beam/through-light sensor	5	Printhead up sensor: 0 = none 1 = Switch	6	Paper entry sensor (#2):				
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			0 = none 1 = Reflex sensor 2 = Through-beam/through-light sensor
		7	Paper entry sensor (#1); 0 = none 1 = Reflex sensor 2 = Through-beam/through-light sensor
System Features	4	Each of the 8 nybbles of the System Features is available as an indicator for the following purposes. Note that this is a 32-bit unsigned integer.	
		Nybble No.	Definition
		2 - 0 (0=LSN)	Reserved; FFF = Default
		3	Firmware features: 0 = Advanced configuration 1 = Basic configuration
		4	Temperature/humidity ratings: 0 = Maximum temp/humidity range 1 = Limited temp/humidity range
		5	Maximum print speed: 0 = 250 mm/sec 1 = 130 mm/sec
		7-6	Warranty period: 00 = undefined 01 = 0.5 years 02 = 1 year 03 = 1.5 years 04 = 2.0 years 05 = 2.5 years 06 = 3.0 years
Firmware Part Number	17	The first 16 bytes of this string contain the firmware part number in ASCII format. The last byte is a NUL character, which acts as a string terminator. Note that these are all 8-bit, unsigned characters.	
Firmware Version Number	11	The first 10 bytes of this string contain the firmware version number in ASCII format in the form "Rx-Vy.zzb". The last byte is a NUL character, which acts as a string terminator. Note that these are all 8-bit, unsigned characters.	
Firmware Date	13	The first 12 bytes of this string contain the firmware date in ASCII format in the form "mmm dd yyyy". The last byte is a NUL character, which acts as a string terminator. Note that these are all 8-bit, unsigned characters.	
Firmware Patch Code	4	Bit No.	Definition
		0	Firmware patch for controller 2684078 ver. A 1 = patch installed, 0 = patch not installed
		1	Firmware patch for inverse printhead switch: 1 = patch installed, 0 = patch not installed
		2-31	Reserved; will read out as "0".

PRINTER SENSOR PACKET

Description	# Bytes	Definition
Header	4	[1B]+[FF]+[04]+[m], where [m] is the number of bytes of status data following the [m]. Note that the first two header bytes are the same for all Status Packets, while byte 3 defines the type of packet. Here, the [04] indicates a Printer Sensor Packet.

Communication Protocol Revision No.	1	This byte contains the revision number of the communications protocol. Please note that this is an 8-bit, unsigned character.																																												
Analog Sensor Values	16	These 16 8-bit, unsigned characters contain the analog value of their corresponding sensors. A value of 0 = 0 volts, while a value of 255 = 5 volts. They are transmitted in the sequence analog sensor ADC #00 to ADC #15. Some of these are likely to be unused in any given eXtendo® printer.																																												
Digital Sensor Values	2	This 16-bit, unsigned integer contains the status of digital sensors DIN #00 to DIN #15 as bits, with DIN #00 being the LSB.																																												
Printhead Temperature	2	Printhead temperature in degrees Celsius. Note that this is a 16-bit signed integer, allowing for both positive and negative numbers. The bytes are sent LSB, MSB.																																												
Control Board Voltage	2	Control board supply voltage in tenths of a volt. Note that this is a 16-bit unsigned integer. The bytes are sent LSB, MSB.																																												
Sensor Type and State	8	<p>These 8-bit unsigned characters are used to relate the sensor type and status. The sensors involved are as follows.</p> <table border="1"> <thead> <tr> <th>Byte</th> <th>Sensor</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Paper low (paper pre-end) sensor</td> </tr> <tr> <td>2</td> <td>Paper entry sensor #1</td> </tr> <tr> <td>3</td> <td>Paper entry sensor #2</td> </tr> <tr> <td>4</td> <td>Printhead position sensor</td> </tr> <tr> <td>5</td> <td>Cutter sensor #1</td> </tr> <tr> <td>6</td> <td>Cutter sensor #2</td> </tr> <tr> <td>7</td> <td>Chute / Paper exit sensor</td> </tr> <tr> <td>8</td> <td>Auxiliary sensor</td> </tr> </tbody> </table> <p>The meaning of the data in the bytes is as shown below. The most significant nybble (MSN) defines the type of sensor, as follows.</p> <table border="1"> <thead> <tr> <th>MSN</th> <th>Definition</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>No sensor</td> </tr> <tr> <td>1</td> <td>Reflex sensor</td> </tr> <tr> <td>2</td> <td>Through-beam (through-light) sensor</td> </tr> <tr> <td>3</td> <td>Switch</td> </tr> </tbody> </table> <p>The least significant nybble (LSN) defines the status of the sensor.</p> <table border="1"> <thead> <tr> <th>LSN</th> <th>Definition</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>none</td> </tr> <tr> <td>1</td> <td>No paper</td> </tr> <tr> <td>2</td> <td>Paper present</td> </tr> <tr> <td>3</td> <td>Paper parked</td> </tr> <tr> <td>4</td> <td>Cutting</td> </tr> <tr> <td>5</td> <td>Printhead in "print" position (down)</td> </tr> <tr> <td>6</td> <td>Printhead in "transport" position (up)</td> </tr> </tbody> </table>	Byte	Sensor	1	Paper low (paper pre-end) sensor	2	Paper entry sensor #1	3	Paper entry sensor #2	4	Printhead position sensor	5	Cutter sensor #1	6	Cutter sensor #2	7	Chute / Paper exit sensor	8	Auxiliary sensor	MSN	Definition	0	No sensor	1	Reflex sensor	2	Through-beam (through-light) sensor	3	Switch	LSN	Definition	0	none	1	No paper	2	Paper present	3	Paper parked	4	Cutting	5	Printhead in "print" position (down)	6	Printhead in "transport" position (up)
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4	Cutting																																													
5	Printhead in "print" position (down)																																													
6	Printhead in "transport" position (up)																																													

		7	Sensor active
		8	Sensor inactive
Reserved	4	Reserved; will read out as "0". Note that these are four 8-bit, unsigned characters.	

4. There may be a delay between reception of the GS a+[n] command and the transmission of the status information.
5. A temperature alert will occur when print head temperature exceeds 70 °C. In this case no printing should be done until the printhead temperature drops below 70 °C. If a printout is initiated when the printhead temperature is above 70 °C, there could be serious damage to the printer.
6. Customer flags are specified with the customer flags setting command.

2.1.40 FS r+[n] Set status parameter

[Name] Set status parameter

[Function] This command specifies a character which will be sent back to the host as part of the status information.

[Code] $[1C]_{16} + [72]_{16} + [n]$
 $[28]_{10} + [114]_{10} + [n]$

[Description]

1. The "FS r+[n]" command is used to transmit a status parameter to the printer, which is sent back as part of the response to a "Request printer status" command ("GS a+[01]¹⁶").
2. This status parameter is specified by parameter [n].
3. The initial value for parameter [n] is $[0]^{10}$.
4. The range of values for parameter [n] is $[0]^{10} \leq [n] \leq [255]^{10}$.
5. As soon as the status parameter is transmitted back to the host in response to the "Request printer status" command ("GS a+[01]¹⁶"), the value of the status parameter is reset to $[0]^{10}$.
6. This parameter can also be transmitted using the End of Page command.
7. Typically, this command is used at the end of a print job to verify that the printout has been completed successfully. First, FS r+[n] is sent to set the status parameter, then GS a+[01]¹⁶ is used to generate a printer status packet response. If the value of the returned status parameter matches [n], then the print job has been successfully completed. If not, then the print job has been lost.
8. It is also common to increment the value of [n] with each print job so that the host can identify which print job was lost.

2.1.41 ESC [F0]+[02]+[n]+[d1]..[dn] Print uncompressed graphics

[Name] Print uncompressed graphics

[Function] This command generates a printout of a single dot line as uncompressed graphics.

[Code] $[1B]^{16} + [F0]^{16} + [02]^{16} + [n]^{16} + [d1]..[dn]$
 $[27]^{10} + [240]^{10} + [02]^{10} + [n]^{10} + [d1]..[dn]$

[Description]

1. The “ESC [F0]+[02]+[n]+[d1]..[dn]” command defines and causes the printing of a single graphic dot line the full width of the printhead.
2. Parameter “n” specifies the number of bytes needed to fully define the graphic dot line. In the data that follows ([d1]...[dn]), dn is therefore the last data byte of the encoded data. The values for “n” are as follows.

Printer Type	n ¹⁰	n ¹⁶
X-56, 203 dpi	56	38
X-80, 203 dpi	80	50

3. Each bit of the data bytes [d1] to [dn] represents a dot on the thermal printhead. A dot is on if its corresponding bit is a “1” and off if it is a “0”.
4. The leftmost dot in a dot line is represented by the MSB of byte d1 (first data byte).
5. The rightmost dot in a dot line is represented by the LSB of byte dn (last data byte).
6. Any other print format settings (E.G., inverse, double width, etc.) have no effect on this command.

2.1.42 ESC [F0]+[03]+[n]+[d1]..[dn] Print RLE8 compressed graphics

[Name] Print RLE8 compressed graphics
 [Function] This command allows printout of a single graphic dot line that is RLE8 compressed.
 [Code] $[1B]^{16} + [F0]^{16} + [03]^{16} + [n]^{16} + [d1]..[dn]$
 $[27]^{10} + [240]^{10} + [03]^{10} + [n]^{10} + [d1]..[dn]$

[Description]

1. The "ESC [F0]+[03]+[n]+[d1]..[dn]" command specifies a single RLE8 compressed dot line of 448 dots (for an X-56, 203 dpi printer) or 640 dots (for an X-80, 203 dpi printer).
2. RLE8 is an 8-bit, run length encoded compression method, where the dot lines are compressed into a repeated sequence of one header byte and one or more data bytes. The most significant bit of the header byte indicates if the data byte(s) represent a run - multiple occurrence of the same character - (bit raised), or a repeated sequence of characters (bit lowered). The lower 7 bits of the header byte represents the number of characters in the run or sequence. "n" represents the total number of bytes needed to encode the entire 56 or 80 byte dot line, including the header byte(s). It is possible to have more than one header byte in a single command; if the first header byte and the number of data bytes defined by it are fewer in total than "n", then the next byte will be interpreted as a header byte.

Header Byte	Bit 7 = 0	Bit 7 = 1
Bit 7 (MSB)	Data is a "sequence"; the following series of data characters are printed once	Data is a "run"; the same character repeated "Y" times
Bits 6 – 0	The number of characters that make up the sequence	The number of times the character will be repeated; "Y"

Examples:

- Header $[83]^{16}$, followed by a single data byte $[44]^{16}$, indicates that the data byte is to interpreted as run of 3 of the same bytes. ($[83]^{16}$ has the MSB high, indicating a multiple occurrence of the same character, and the lower seven bits equal "3".) The data byte $[44]^{16}$ will print the dot pattern associated with it three times in a row.

- Header $[03]^{16}$, followed by three data bytes $[44]^{16} [45]^{16} [46]^{16}$, indicates that the following data bytes are a 3 byte sequence. ($[03]^{16}$ has the MSB low, indicating a sequence of characters, and the lower seven bits equal "3".) The data bytes $[44]^{16} [45]^{16} [46]^{16}$ will print the dot pattern associated with each once.

3. The uncompressed dot line contains 56 or 80 bytes (X-56 or X-80, respectively), whereas the leftmost dot is represented by the most significant bit of the first byte. The rightmost dot in a dot line is represented by the least significant bit of the last byte.
4. [n] represents the number of bytes that are required to RLE8 compress the 56 or 80 bytes dot line, including header byte(s). If, for example, an RLE8 compressed dot line results in 10 bytes, then the RLE8 compression command becomes: $[1B]^{16} + [F0]^{16} + [03]^{16} + [0A]^{16} + [d1]..[d10]$.
5. If the number of bytes required for RLE8 compression exceeds 56 or 80 (X-56 or X-80, respectively), then it is faster to use the "Print uncompressed graphics" command "ESC [F0]+[02]+[n]+[d1]..[dn]" instead.
6. A dot is considered to be on (black) if its corresponding bit is 1 and off if the bit is 0.
7. Any character settings like inverse, double width, etc. have no effect on this command.

2.1.43 ESC [F0]+[04]+[01]+[n] Repeat graphics line

[Name] Repeat graphics line

[Function] This command automatically reprints the previously printed graphic dot line a specified number of times.

[Code] $[1B]^{16} + [F0]^{16} + [04]^{16} + [01]^{16} + [n]$
 $[27]^{10} + [240]^{10} + [04]^{10} + [01]^{10} + [n]$

[Description]

1. The “ESC [F0]+[04]+[01]+[n]” command automatically reprints the previously printed graphic dot line a specified number of times.
2. The parameter [n] specifies the number of times that the previous dot line will be reprinted. The valid range for [n] is $[0]^{10} \leq [n] \leq [255]^{10}$.
3. If $n = 0$, the previous dot line will not be reprinted.

2.1.44 ESC [F0]+[20]+[05]+[w1]+ [w2] +[h1] +[h1] +[a] Create bitmap

[Name] Create bitmap

[Function] This command is used to initiate the printing of a bitmap and to define its size.

[Code] $[1B]^{16} + [F0]^{16} + [20]^{16} + [05]^{16} + [w1] + [w2] + [h1] + [h2] + [a]$
 $[27]^{10} + [240]^{10} + [32]^{10} + [05]^{10} + [w1] + [w2] + [h1] + [h2] + [a]$

[Description]

1. Command "ESC [F0]+[20]+[05]+[w1]+[w2]+[h1]+[h2]+[a]" is used to initiate bitmap printing and will create a white bitmap with the specified width and height.
2. The bitmap content is defined by one or more consecutive "bitmap body data" commands.
3. Parameters [w1], [w2] define the width of the bitmap in pixels as follows:
"bitmap width" = $[w1] * [256]^{10} + [w2]$
4. Parameters [h1], [h2] define the height of the bitmap in pixels as follows:
"bitmap height" = $[h1] * [256]^{10} + [h2]$
5. Parameter [a] defines the attributes for printing the bitmap. The following figure shows the possible values of parameter [a]:

Parameter [a], bit	Value	Printing mode
(LSB) b1 – b0	[00] ²	No magnification
	[01] ²	Double width
	[10] ²	Double height
	[11] ²	Double width and double height
b7 – b2 (MSB)	Reserved for future use; must be set to "0"	

2.1.45 ESC [F0]+[30]+[n]+[d1]...[dn] Bitmap body data

[Name]	Bitmap body data
[Function]	This command is used to provide the pixel data for a previously created bitmap.
[Code]	$[1B]^{16} + [F0]^{16} + [30]^{16} + [05]^{16} + [d1]...[dn]$ $[27]^{10} + [240]^{10} + [48]^{10} + [05]^{10} + [d1]...[dn]$

[Description]

1. Command „ESC [F0]+[30]+[n]+[d1]..[dn]“ is used to provide the pixel data for a bitmap that was previously created with the “Create bitmap” command.
2. Parameter [n] defines the number of bitmap bytes which are included in the command.
3. Parameters [d1]..[dn] contain up to 256 bitmap bytes maximum.
4. Each bitmap byte specifies 8 monochrome pixels, whereas 0 indicates white and 1 indicates black. The most significant bit in a bitmap byte is the left most pixel.
5. The bitmap is sent to the printer in one or more consecutive bitmap body data commands. The first byte of the first bitmap body data command transmitted is the left upper-row byte of the bitmap. The last byte is the last bitmap body command transmitted and is the right lower-row byte of the bitmap. The bitmap rows are sent on a one-byte boundary (e.g. 1-8 pixel per row is 1 byte, 9-16 pixel is 2 bytes, etc.). All pixels in the last byte of each row, which are outside the defined bitmap width (as defined with the Create bitmap command, must be zero.

2.1.46 ESC [F1]+[01]+[02]+[02]+[n] Dot history factor

[Name] Dot history factor

[Function] This command allows specification and enabling/disabling of the dot history factor.

[Code] $[1B]^{16} + [F1]^{16} + [01]^{16} + [02]^{16} + [02]^{16} + [n]$
 $[27]^{10} + [241]^{10} + [01]^{10} + [02]^{10} + [02] + [n]$

[Description]

1. The "ESC [F1]+[01]+[02]+[02]+[n]" command specifies the dot history factor, which is defined as a percentage of the total burn time.
2. Dot history is useful for preventing the over-heating of large, dark areas that is caused by individual heating elements in the thermal printhead building up residual heat due to repeated, sequential activation, (also called "burns").
3. If dot history is enabled, then each dot line is burned in two phases: a main-burn phase and a post-burn phase. During the main-burn phase all required dots are burned. During the post-burn phase, only those required dots that were not burned in printing the previous dot line are burned. (The term "required dots" refers to the individual dots that must be burned to create the current dot line.)
4. The duration of both the main-burn phase and the post-burn phase are defined by the dot history factor, which specifies the percentage of the total burn time that is used for post-burning.
5. The default dot history post-burn factor is stored in flash memory, and its value can be 0 to 99%. Dot history is enabled if the dot history post-burn factor is not equal to zero, and is disabled if the dot history post-burn factor equals zero.
6. Parameter [n] defines the dot history post-burn factor in percentage of the total burn time. The range of parameter [n] is $[0]^{10} \leq [m] \leq [99]^{10}$, whereas
 $[0]^{10}$ disables dot history
 $[1]^{10}$ to $[99]^{10}$ specifies a current dot history pre-burn factor that is 1 to 99 percent of the total burn time
7. The printer status information that is printed after paper insertion also contains information on the dot history pre-burn factor, providing that dot history is enabled.
8. The print speed must be limited to a maximum of 130 mm/s if dot history is enabled and limited to a maximum of 100 mm/s if multi-strobe burning is also enabled. (Note that the eXtendo® automatically limits the print speed if this feature is enabled).

2.1.47 ESC [F1]+[01]+[0C]+[04]+[m1]..[m11] Burn Time Correction

[Name] Burn Time Correction

[Function] This command is used to adjustments in burn time at different temperature settings.

[Code] $[1B]^{16} + [F1]^{16} + [01]^{16} + [0C]^{16} + [04]^{16} + [m1] \dots [m11]$
 $[27]^{10} + [241]^{10} + [01]^{10} + [12]^{10} + [04]^{10} + [m1] \dots [m11]$

[Description]

1. The “ESC [F1]+[01]+[0C]+[04]+[m1]..[m11]” command specifies corrections to burn time based on ambient temperature.
2. The variables [m1] to [m11] are 8-bit, signed integers that specify the burn time adjustment in μs .
3. The adjustment range of [m1] to [m11] is from -125 to +125 μs .
4. The variables [m1] to [m11] relate to the temperature as follows.

Variable	Temperature
m1	-30°C
m2	-20°C
m3	-10°C
m4	0°C
m5	+10°C
m6	+20°C
m7	+30°C
m8	+40°C
m9	+50°C
m10	+60°C
m11	+70°C

5. The intended purpose of the Burn Time Correction is to adjust the eXtendo® temperature response at various ambient temperatures to match different, Hengstler-approved thermal paper types.
6. Sample wide fonts (standard and KS5601-Korean) are provided in the driver package.

2.1.48 ESC [F1]+[01]+[02]+[03]+[n] Multi-strobe factor

[Name]	Multi-strobe factor
[Function]	This command allows specification of the multi-strobe factor
[Code]	$[1B]^{16} + [F1]^{16} + [01]^{16} + [02]^{16} + [03]^{16} + [n]$ $[27]^{10} + [241]^{10} + [01]^{10} + [02]^{10} + [03]^{10} + [n]$

[Description]

1. The “ESC [F1]+[01]+[02]+[03]+[n]” command specifies the multi-strobe factor.
2. Multi-strobe burning is useful if the peak current in an application must be limited, E.G., in the case of a power supply of restricted capacity. If the multi-strobe factor indicates double burn, then only half the peak power is consumed by the print head.
3. If multi-strobe burning is enabled, then the dot line burning is divided into two sequential burn cycles (i.e., burn the left side of the printhead first, then burn the right side; this is referred to as a “double burn”).
4. The multi-strobe factor is stored in flash memory, where its value can be 0 or 1. Multi-strobe burning is enabled if the multi-strobe factor is equal to 1, and is disabled if the multi-strobe factor equals 0.
5. [n] defines the multi-strobe factor in dot line burn cycles. The range of parameter [n] is $[0]^{10} \leq [n] \leq [1]^{10}$, where
 - $[0]^{10}$ disables multi-strobe burning
 - $[1]^{10}$ sets the multi-strobe factor to double burn (2X)
6. The general information that is printed after paper insertion also contains information on the multi-strobe factor under the “Settings” heading, provided that multi-strobe burning is enabled. If multi-strobe burning is not enabled, it will not appear on this printout at all.
7. The print speed must be limited to a maximum of 130 mm/s if multi-strobe burning is enabled, and limited to a maximum of 100 mm/s if dot history is also enabled. (Note that the eXtendo® automatically limits the print speed if this feature is enabled).

2.1.49 ESC [F1]+[01]+[08]+[00]+[d1]...[d7] RS-232 Communication Parameter Setting

[Name]	RS-232 communication parameter setting
[Function]	This command is used to specify the RS-232 communication parameters such as baud rate, stop bits, data bits, parity and flow control.
[Code]	$[1B]^{16} + [F1]^{16} + [01]^{16} + [08]^{16} + [00]^{16} + [d1] \dots [d7]$ $[27]^{10} + [241]^{10} + [01]^{10} + [08]^{10} + [00]^{10} + [d1] \dots [d7]$

[Description]

- The "ESC [F1]+[01]+[08]+[00]+[d1]...[d7]" command specifies the serial communication parameters for RS-232 versions of the eXtendo® printer.
- The following serial communication parameters are specified in [d1]...[d7] as follows: baud rate in [d1], parity on/off in [d2], parity odd/even in [d3], number of data bits in [d4], number of stop bits in [d5], flow control in [d6] and an additional block host TX (CTS signal low) on paper out flag [d7].
- Parameter [d1] specifies the baud rates as follows:

[00] ¹⁰	=	4800
[01] ¹⁰	=	9600
[02] ¹⁰	=	19200
[03] ¹⁰	=	38400
[04] ¹⁰	=	57600
[05] ¹⁰	=	115200
[06] ¹⁰	=	230400 (unsupported at this time)
[07] ¹⁰	=	460800 (unsupported at this time)

 Choosing an unsupported or undefined value will cause the printer to select 115200 baud.
- Parameter [d2] specifies the parity on/off as follows:

[00] ¹⁰	=	PARITY OFF
[01] ¹⁰	=	PARITY ON

 An unsupported or undefined value will select PARITY OFF.
- Parameter [d3] specifies the parity even/odd as follows:

[00] ¹⁰	=	PARITY ODD
[01] ¹⁰	=	PARITY EVEN

 An unsupported or undefined value will select PARITY ODD.
 Parity even/odd is ignored unless parity is ON.
- Parameter [d4] specifies the data bits as follows:

[00] ¹⁰	=	7 DATA BITS (unsupported at this time)
[01] ¹⁰	=	8 DATA BITS

 Any value for d4 will select 8 DATA BITS.
- Parameter [d5] specifies the stop bits as follows:

[00] ¹⁰	=	1 STOP BIT
[01] ¹⁰	=	2 STOP BITS

 An unsupported or undefined value will select 1 STOP BIT.
- Parameter [d6] specifies the control flow as follows:

[00] ¹⁰	=	NO FLOW CONTROL (unsupported)
[01] ¹⁰	=	HARDWARE FLOW CONTROL – RTS / CTS
[02] ¹⁰	=	SOFTWARE FLOW CONTROL - XON/XOFF (unsupported at this time)

 An unsupported or undefined value will select HARDWARE FLOW CONTROL – RTS / CTS.
 (RTS = Ready To Send, CTS = Clear To Send)

9. Parameter [d7] specifies if the host transmission (TX) must be blocked if the eXtendo® detects out-of-paper.

[00]¹⁰ = HOST TX NOT BLOCKED ON PAPER OUT

[01]¹⁰ = HOST TX BLOCKED ON PAPER OUT

An unsupported or undefined value will select HOST TX NOT BLOCKED ON PAPER OUT. This feature is used in combination with the hardware flow control only. For hardware flow control, the host is blocked by lowering the CTS signal.

Note that it does not explicitly indicate paper-out when the host detects TX blocked (CTS low/XOFF). The eXtendo® also blocks the host TX when its internal buffers are full or when it is processing data.

Also note that most host computers (e.g. MS-Windows, Linux) will stop RS-232 communication if they detect host TX blocked. Note that, if Host TX Block on Paper Out is enabled, these computers are not able to communicate with the eXtendo® (e.g. inquire printer status) in cases of paper out. Therefore it is strongly recommended that the full ramifications of using this feature be evaluated before enabling it. The most common use for this feature is with unsophisticated host equipment that cannot evaluate the data returned after a printer status inquiry.

10. The new RS-232 communication parameters become effective only after performing a hardware reset. This can be accomplished through the interface via the ESC+[F2]+[03]+[00] command, or by removing and then restoring power to the eXtendo®.
11. The eXtendo® serial communications default settings are 115200 baud, parity on, parity even, 8 data bits, 1 stop bit, hardware flow control and host TX not blocked on paper-out.

2.1.50 ESC [F1]+[01]+[11]+[06]+[m1]..[m16] Customer Part Number Specification

[Name]	Customer part number specification
[Function]	This command is used to specify a customer part number up to 16 characters long.
[Code]	[1B] ¹⁶ + [F1] ¹⁶ + [01] ¹⁶ + [11] ¹⁶ + [06] ¹⁶ + [m1] ... [m16] [27] ¹⁰ + [241] ¹⁰ + [01] ¹⁰ + [17] ¹⁰ + [06] ¹⁰ + [m1] ... [m16]

[Description]

1. The “ESC [F1]+[01]+[11]+[06]+[m1]..[m16]” command specifies an alphanumeric customer-specified part number.
2. The customer-specified part number may be up to 16 alphanumeric characters long. The values of [m1] to [m16] should be printable ASCII characters, with the exception of the null character [0]¹⁶. The part number must have a following ASCII null character (e.g. [0]¹⁶) if its length is less than 16 characters. If the first character [m1] is a null character, then the customer-specified part number is treated as undefined.
3. If defined, then the eXtendo® prints the customer-specified part number when paper is inserted into the eXtendo®, and transmits it in the Status Packets (see command “GS a + [n]”, Request Printer Status).
4. The customer-specified part number is stored in flash memory and is printed with the header data every time the header data is printed.

2.1.51 ESC [F1]+[01]+[11]+[05]+[m1]..[m16] Customer Serial Number Specification

[Name]	Customer serial number specification
[Function]	This command is used to specify a 16 character maximum customer serial number.
[Code]	[1B] ¹⁶ + [F1] ¹⁶ + [01] ¹⁶ + [11] ¹⁶ + [05] ¹⁶ + [m1] ... [m16] [27] ¹⁰ + [241] ¹⁰ + [01] ¹⁰ + [17] ¹⁰ + [05] ¹⁰ + [m1] ... [m16]

[Description]

1. The “ESC [F1]+[01]+[11]+[05]+[m1]..[m16]” command specifies an alphanumeric customer-specified serial number.
2. The customer-specified serial number may be up to 16 alphanumeric characters long. The values of [m1] to [m16] should be printable ASCII characters, with the exception of the null character [0]¹⁶. The serial number must have a following ASCII null character (e.g. [0]¹⁶) if its length is less than 16 characters. If the first character [m1] is a null character, then the customer-specified serial number is treated as undefined.
3. If defined, then the eXtendo® prints the customer-specified serial number when paper is inserted into the eXtendo®, and transmits it in the Status Packets (see command “GS a + [n]”, Request Printer Status).
4. The customer-specified serial number is stored in flash memory and is printed with the header data every time the header data is printed.

2.1.52 ESC [F1]+[01]+[02]+[07]+[n] Customer Flag Setting

[Name] Customer flag setting command

[Function] This command sets or resets the customer flags

[Code] $[1B]^{16} + [F1]^{16} + [01]^{16} + [02]^{16} + [07]^{16} + [n]$
 $[27]^{10} + [241]^{10} + [01]^{10} + [02]^{10} + [07]^{10} + [n]$

[Description]

1. The “ESC [F1]+[01]+[02]+[07]+[n]” command is used to specify the state of the two customer flags.
2. The customer flag settings are stored in flash memory, whereas each defined flag can either be 1 or 0.
3. The customer flags are intended to be used to distinguish multiple printers that are connected to a single host. The printer transmits the flags in the Status Packets (see command “GS a + [n]”, Request Printer Status)
4. Customer flags are to be specified in an 8-bit unsigned byte, whereas the least significant bit is status flag #1 and the next bit is status flag #2.
5. Following customer flags are defined:

Bit	Description	Contents	
0	Customer status flag #1 for the eXtendo® status message (see “GS a+[n]”)	0: Disabled	1: Enabled
1	Customer status flag #2 for the eXtendo® status message (see “GS a+[n]”)	0: Disabled	1: Enabled
2-15	Reserved	0 (this value should always be set to "0")	

2.1.53 ESC [F0]+[05]+[01]+[n] Set print density

[Name] Set print density

[Function] This command allows adjustment of the print density by changing the burn time (on time) of the thermal printhead.

[Code] $[1B]^{16} + [F0]^{16} + [05]^{16} + [01]^{16} + [n]$
 $[27]^{10} + [240]^{10} + [05]^{10} + [01]^{10} + [n]$

[Description]

1. The “ESC [F0]+[04]+[01]+[n]” command allows adjustment of the print density by changing the burn time (on time) of the thermal printhead.
2. The parameter [n] specifies the amount of adjustment to the burn time that will be implemented. Please note the following regarding [n].
 - a. The value of [n] is a two's complement number, representing both positive and negative numbers.
 - b. The range of [n] is -100% to +100%. This number represents the **percentage** of the maximum adjustment possible. The maximum adjustment is 250 μ s, so the adjustment range is from -250 μ s to +250 μ s.
 - c. The actual range of [n] is then $[9C]^{16}$ to $[FF]^{16}$ ($[-100]^{10}$ to $[-1]^{10}$) and $[00]^{16}$ to $[64]^{16}$ ($[0]^{10}$ to $[+100]^{10}$).
3. Please note that other factors, (dot history compensation, voltage compensation, etc.), also impact total burn time.
4. Please note that excessively long burn times have a negative impact on thermal printhead life. Therefore, values of [n] should be kept to the minimum possible to achieve the desired print results.

2.1.54 ESC+[F0]+[01]+[01]+[n] Print speed setting

[Name]	Sets target print speed
[Function]	This extended command sets the target printing speed.
[Code]	$[1B]^{16} + [F0]^{16} + [01]^{16} + [01]^{16} + [n]$ $[27]^{10} + [240]^{10} + [01]^{10} + [01]^{10} + [n]$

[Description]

1. The “ESC [F0]+[01]+[01]+[n]” command sets the target printing speed in mm/s.
2. Print speed may be lower depending upon other settings (dot history, multi-strobe, etc.), available voltage, etc.
3. The end-of-page command should precede the printing speed command to assure, that all data in the print buffer is flushed before print speed change becomes effective.
4. When the same printing speed as the current printing speed is specified with this command, no change occurs.
5. Parameter [n] defines the maximum printing speed in mm/s. The range for parameter [n] is $[60]^{10} \text{ mm/s} \leq [n] \leq [250]^{10} \text{ mm/s}$. Printers designed for 24 VDC operation can have a maximum print speed of 250 mm/sec; however, if the printer has been purchased with a maximum print speed of 130 mm/s, values of [n] over 130 mm/s will result in a maximum print speed of 130 mm/s. Printers designed for 12 VDC or 10-36 VDC operation cannot print faster than 130 mm/sec regardless of this setting.
6. The default printing speed is 130 mm/sec.

3 List of character sets

The following character sets are available:

- Internal 8X16 character set
- Internal 12x24 character set
- Internal 16x32 character set
- Internal 20x40 character set
- External 8X16 character set
- External 12x24 character set
- External 16x32 character set
- External 20x40 character set
- Wide 24X24/20X20 character set
- Wide 20X20 character set

Notes:



- The internal character sets are part of the firmware and are loaded into flash memory during firmware upload.
- Although all internal character sets are regarded to be fixed font, a modified set can be integrated in the firmware binary and made effective through upload.
- The external character sets can be uploaded into the flash memory with the appropriate commands.
- The internal character set is also called the “primary font”.
- The external character set is also called the “secondary font”.

3.1.1 Internal 8x16 character set

The internal 8X16 character set has 256 characters, whereas the size of each character is:

- Width: 8 dots
- Height: 16 dots

The top row characters 0 to 31 ([1F]¹⁶) are control characters and are not used.

decimal		hexadecimal
0–31		00–1F
32–63	!"#\$%&'()*+,-./0123456789:;<=>?	20–3F
64–95	@ABCDEFGHIJKLMNPQRSTUVWXYZ[\]^_	40–5F
96–127	`abcdefghijklmnopqrstuvwxyz{|}~	60–7F
128–159		80–9F
160–191	¡¢£¥¦§¨ª«¬®¯°±²³´µ¶·¸¹º»¼½¾¿	A0–BF
192–223	ÀÁÂÃÄÅÆÇÈÉÊËÌÍÎÏÐÑÒÓÔÕÖ×ØÙÚÛÜÝÞß	C0–DF
224–255	àáâãäåæçèéêëìíîïðñóôõö÷øùúûüýþÿ	E0–FF

3.1.8 External 24x40 character set

The external 24x40 character set has 256 characters, whereas the size of each character is:

- Width: 24 dots
- Height: 40 dots

The top row characters 0 to 31 ([1F]¹⁶) are control characters and are not used.

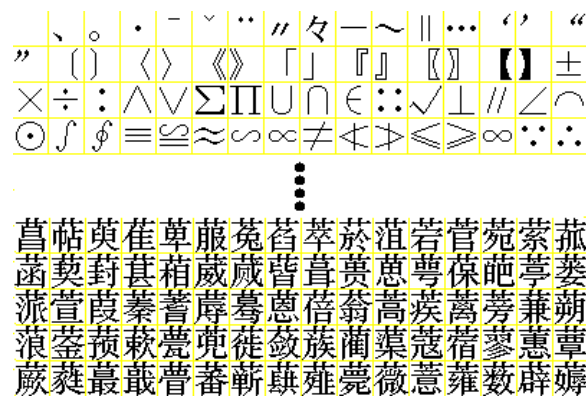
3.1.9 Wide 24X24 and 20X20 character sets

eXtendo® printers can contain a "wide character set" (so called because two bytes are required to index it). Two different wide character sets types are supported: 24x24 and 20x20. The 24x24 wide character set may contain up to 7280 characters, each 24 x 24 dots. The 20x20 wide character set may contain up to 8640 characters, each 20 x 20 dots

The 24X24 wide character set has been implemented to offer a GB2312-Chinese compatible Chinese character set, but can be used for other 24X24 character sets, as well. Currently there are two ways of indexing the 24X24 wide character set: standard (linear) .and GB2312-Chinese.

The 20X20 wide character set has been implemented to offer a KS5601-Korean compatible Korean character set, but can be used for other 20X20 character sets, as well. Currently there are two ways of indexing the 20X20 wide character set: standard (linear) .and KS5601-Korean

See the command "Wide Font Printing" for more information on wide font indexing.



24X24 wide character set
containing 16 * 455 characters

By default, there is no wide character set provided in the eXtendo®. The eXtendo® driver tools allow the upload of a wide character set , where the character set is imported from a standard windows bitmap.

For the 24X24 type wide characters, this bitmap contains exactly 16 x 455 characters that are separated by a line (yellow in the above sample). Each character is 24 x 24 dots, whereas, due to the separator, the X/Y origin starts on a multiple of 25 dots. The total dimension of the wide character set bitmap is 400 pixels horizontally and 11375 pixels vertically.

For the 20X20 type wide characters, this bitmap contains exactly 16 x 540 characters that are separated by a line (yellow in the above sample). Each character is 20 x 20 dots, whereas, due to the separator, the X/Y origin starts on a multiple of 25 dots. The total dimension of the wide character set bitmap is 336 pixels horizontally and 11340 pixels vertically.

All magnification and other settings that affect the appearance of the internal character set will also affect the appearance of the wide character set (e.g. double width, magnification, rotation, etc.).

!	"	#	\$	%	&	'	()	*	+	,	-	.	/		
0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?	
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	
P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_	
`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	
p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	'	
"	"		\	~	'	,	
"	"	.	.	.	<	>	《	》	「	」	『	』	【	】	±	×

⋮

가	각	간	갈	갈	갈	갈	갈	갈	갈	갈	갈	갈	갈	갈	갈	갈
갓	강	강	강	강	강	강	강	강	강	강	강	강	강	강	강	강
갓	강	강	강	강	강	강	강	강	강	강	강	강	강	강	강	강
갓	강	강	강	강	강	강	강	강	강	강	강	강	강	강	강	강
갓	강	강	강	강	강	강	강	강	강	강	강	강	강	강	강	강
갓	강	강	강	강	강	강	강	강	강	강	강	강	강	강	강	강
갓	강	강	강	강	강	강	강	강	강	강	강	강	강	강	강	강
갓	강	강	강	강	강	강	강	강	강	강	강	강	강	강	강	강
갓	강	강	강	강	강	강	강	강	강	강	강	강	강	강	강	강
갓	강	강	강	강	강	강	강	강	강	강	강	강	강	강	강	강

⋮

賄	劃	獲	宐	橫	鑛	哮	嗃	孝	效	數	曉	鳥	溱	淆		
交	着	醇	驍	侯	厚	后	吼	喉	嗅	悞	後	朽	煦	煦	煦	煦
翊	运	助	勳	填	壘	焮	燻	燻	燻	訓	暈	薨	喧	喧	喧	喧
萱	卉	喙	毀	彙	徽	揮	暉	輝	諱	輝	靡	休	携	休	畦	畦
虧	恤	譎	鷓	兇	匈	洵	胸	黑	昕	欣	忻	痕	吃	吃	吃	吃
紇	訖	欠	欽	欽	吸	恰	洽	翕	興	僖	熙	喜	噫	噫	噫	噫
嬉	希	愜	戲	晞	曦	熙	熹	熹	熹	熹	禧	穢	羲	詰	詰	詰

20X20 wide character set containing 16 * 540 characters

4 Additional Information

4.1 Hex/Dec ASCII Table

ASCII		CHAR	ASCII		CHAR	ASCII		CHAR	ASCII		CHAR
HEX	DEC		HEX	DEC		HEX	DEC		HEX	DEC	
00	0	NUL	20	32	SP	40	64	@	60	96	`
01	1	SOH ^A	21	33	!	41	65	A	61	97	a
02	2	STX ^B	22	34	"	42	66	B	62	98	b
03	3	ETX ^C	23	35	#	43	67	C	63	99	c
04	4	EOT ^D	24	36	\$	44	68	D	64	100	d
05	5	ENQ ^E	25	37	%	45	69	E	65	101	e
06	6	ACK ^F	26	38	&	46	70	F	66	102	f
07	7	BEL ^G	27	39	'	47	71	G	67	103	g
08	8	BS ^H	28	40	(	48	72	H	68	104	h
09	9	TAB ^I	29	41	)	49	73	I	69	105	i
0A	10	LF ^J	2A	42	*	4A	74	J	6A	106	j
0B	11	VT ^K	2B	43	+	4B	75	K	6B	107	k
0C	12	FF ^L	2C	44	,	4C	76	L	6C	108	l
0D	13	CR ^M	2D	45	-	4D	77	M	6D	109	m
0E	14	SO ^N	2E	46	.	4E	78	N	6E	110	n
0F	15	SI ^O	2F	47	/	4F	79	O	6F	111	o
10	16	DLE ^P	30	48	0	50	80	P	70	112	p
11	17	DC1 ^Q	31	49	1	51	81	Q	71	113	q
12	18	DC2 ^R	32	50	2	52	82	R	72	114	r
13	19	DC3 ^S	33	51	3	53	83	S	73	115	s
14	20	DC4 ^T	34	52	4	54	84	T	74	116	t
15	21	NAK ^U	35	53	5	55	85	U	75	117	u
16	22	SYN ^V	36	54	6	56	86	V	76	118	v
17	23	ETB ^W	37	55	7	57	87	W	77	119	w
18	24	CAN ^X	38	56	8	58	88	X	78	120	x
19	25	EM ^Y	39	57	9	59	89	Y	79	121	y
1A	26	SUB ^Z	3A	58	:	5A	90	Z	7A	122	z
1B	27	Esc	3B	59	;	5B	91	[	7B	123	{
1C	28	FS	3C	60	<	5C	92	\	7C	124	|
1D	29	GS	3D	61	=	5D	93]	7D	125	}
1E	30	RS	3E	62	>	5E	94	^	7E	126	~
1F	31	US	3F	63	?	5F	95	_	7F	127	DEL

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