Basic Purpose Printer
LB20

digital

Programmer's Reference Guide

Part Number: EK-LB20A-RG

ACKNOWLEDGMENT

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1 PREFACE

The Programmer's Reference Guide gives information for application programmers who wish to interface the LB20 Basic Purpose Printer with a Host Computer.

A thorough knowledge of mechanical and electronic functions of the LB20 is desirable.

1.1 Scope

This Programmer's Reference Guide contains the following chapters:

- Introduction
- IBM Mode
- Glossary
- Index

1.2 Related Documentation

- User's Guide (EK-LB20A-UG)
- Field Support Manual (EK-LB20A-SM)
- Spare Part Guide (EK-LB20A-PG)

1.3 Order Process

Documentation, Accessories and Spare Parts can be ordered from:

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2 Introduction

The Product Engine is a serial or parallel device capable of printing in or on documents such as passbooks, envelopes and forms in the IBM Proprinter emulation.

2.1 Documents

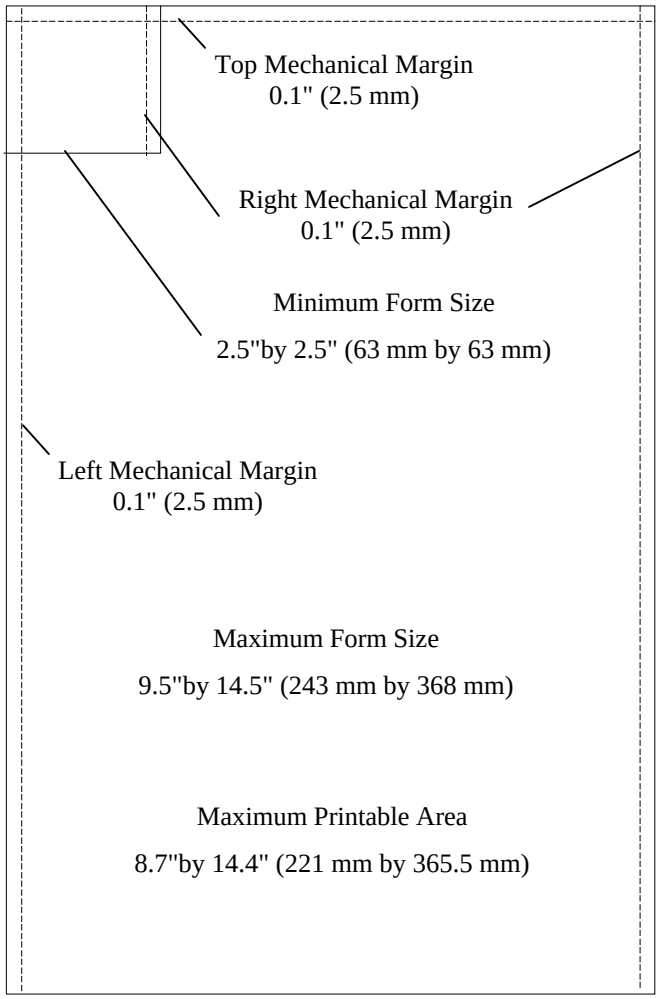
These may be of different size, shape and thickness.

The two types are:

- Forms - single-sheet or a ‘set of forms’ (an envelope is treated as a form)
- Passbooks - vertical or horizontal seam.

2.1.1 Forms

The printable area is defined to be between the left, right, top and bottom mechanical margins, as shown below:



Single-Sheet and ‘Set of Forms’

The printer can handle a ‘set of forms’ consisting of one top sheet and up to three copies.

Form Size and Minimum Margins are:

	≤ 8.7" (221 mm)	≤ 9.5" (241 mm)
Width	2.5" (63 mm) to 8.7" (221 mm)	2.5" (63 mm) to 9.5" (241 mm)
Length	2.5" (63 mm) to 14.5" (368 mm)	2.5" (63 mm) to 14.5" (368 mm)
Ratio,Length /Width	Up to 2.5	Up to 2.5
Left Margin	Single-ply 0.10" (2.5 mm) Multi-ply 0.22" (5.5 mm)	Single-ply 0.10" (2.5 mm) Multi-ply0.22" (5.5 mm)
Right Margin	Single-ply 0.10" (2.5 mm)	Single-ply* 0.10" (2.5 mm) to 0.7" (18 mm)
	Multi-ply 0.22" (5.5 mm)	Multi-ply* 0.10" (2.5 mm) to 0.7" (18 mm)

* Depending on document position

The Paper used for a Form should be:

	Single-Ply	Two-Ply	Multi-Ply
Total Thickness	0.004" to 0.02" (0.1 to 0.45 mm)	0.004" to 0.02" (0.1 to 0.45 mm)	0.004" to 0.02" (0.1 to 0.45 mm)
Max. No. of Copies	1	1 + 1	1 + 3 *
Top Sheet Weight	16 to 32 lbs (60 to 120 /m²)**	14 to 26 lbs (50 to 100 g/m²)	11 to 24 lbs (40 to 90 g/m²)
Bottom Sheet Weight		14 to 26 lbs (50 to 100 g/m²)	22 to 32 lbs (80 to 120 g/m²)
Inner sheet weight			11 to 22 lbs (40 to 80 g/m²)
Total weight	16 to 32 lbs (60 to 120 g/m²)	26 to 52 lbs (100 to 200 g/m²)	16 to 77 lbs (60 to 280 g/m²)

* To handle this number of copies you must use the minimum allowed weight for each sheet

** To allow for varying paper quality, the recommended minimum weight is 65g/m2

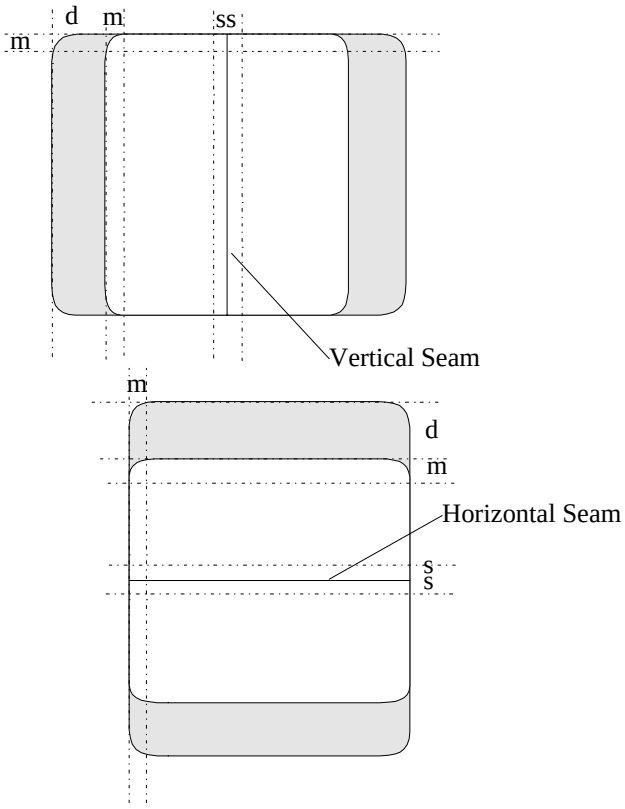
2.1.2 Passbooks

Dimensions are shown below:

	Vertical Seam Passbooks	Horizontal Seam Passbooks
Minimum Width	4.0" (101 mm)	4.0" (101 mm)
Maximum Width	7.6" (193 mm)	7.6" (193 mm)
Minimum Length	4.0" (101 mm)	4.0" (101 mm)
Maximum Length	7.6" (193 mm)	7.0" (177 mm)
Minimum Thickness	0.02" (0.5 mm)	0.02" (0.5 mm)
Maximum Thickness	0.08" (2 mm)	0.08" (2 mm)
Top & Bottom, Left & Right Minimum Margin	0.25" (6.35 mm)	0.25" (6.35 mm)
Minimum Seam Margins	2 x 0.31" (8 mm)*	2 x 0.39" (10 mm)*

Parameters

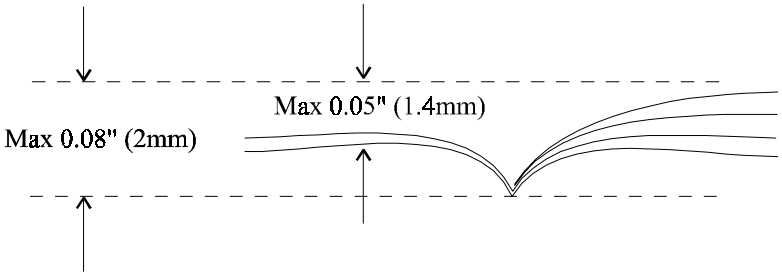
These are; d = Cover Offset, m = Mechanical Margin and s = Seam Margin as shown below:



Note: For more information on Passbook Parameters please refer to the DOC Menu in the User's Guide.

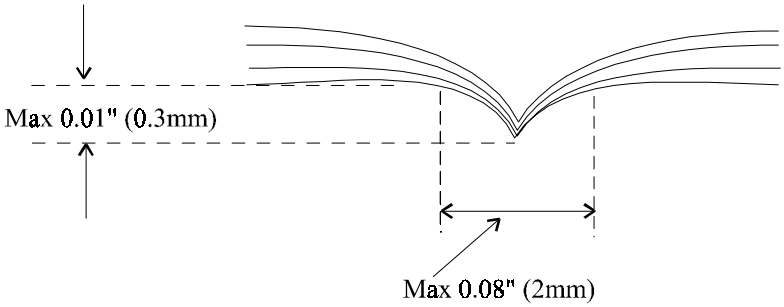
2.1.3 Passbook Thickness

The maximum thickness of a passbook shall not exceed 0.08" (2.0 mm) when opened. The difference between the maximum and minimum at the centerfold shall not exceed 0.05" (1.4 mm) except for an end sheet (vertical seam passbook only).



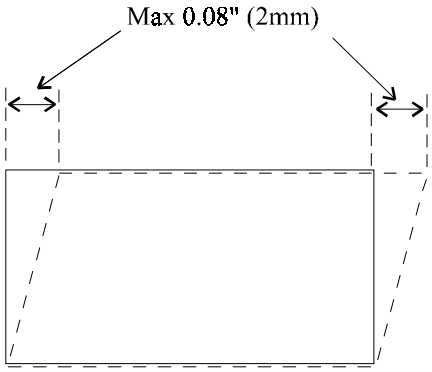
Center Outfold Bulge

The height of the bulge at the center outfold shall not exceed 0.01" (0.3 mm).



2.1.4 Passbook Squareness

When the passbook is closed, the edge of the shorter side must be at a 90° angle to the longer side.



The Paper used for a Passbook should be:

Maximum Total Thickness	0.08" (2 mm)
Cover Thickness	0.008" to 0.02" (0.2 mm to 0.5 mm)
Inner Sheet Weight	90 to 120g/m^2

2.1.5 Rules for Forms

and Passbooks

All documents must be accurately measured before the printer is used

Transparent documents or documents containing transparent areas cannot be used. Reflective ink surfaces (i.e. silver, gold) do not cause problems with the edge detection system.

Dark areas at the top of a form, close to the Left and Right Margins, i.e. Logo's and Letterhead's will cause problems unless the TOP OFFSET in SETUP is correctly set.

Documents with staples, paper clips, holes or perforations are not permitted.

Multi-ply forms of different lengths can be handled only if they are aligned at the top. The shortest form must have a minimum length of 7.3" (185 mm) and the application software must eject the form at the rear of the printer.

Multi-ply forms can consist of up to 3 copies plus the original. **Note:** carbon sheets are not supported.

Single sheets and the top sheet of a multi-ply form should be either white or a light color for maximum print contrast.

When preprinted lines are required, the preprint must be as thin and fine as possible to produce legible results.

2.2 Characters

The printer can print letter, graphic symbols and special characters with a 9-dot vertical resolution in a single pass.

2.2.1 Character Pitch

The selected character pitch defines the width of the character when it is printed. For example, the character width in 12 characters per inch (cpi) is 0.0833" (2.115mm). Character width in enlarged is double the normal character width. Normal maximum character height is 0.12" (3 mm). Double height printing is possible.

The printer elementary pitch is 1/120" (0.2115mm). Four pitches are possible when printing in Draft or HQD:

- 10 cpi
- 12 cpi
- 17 cpi
- 20 cpi

For a given cpi an 8.7" (221 mm) line will contain the following number of characters:

cpi	Number of characters
5	42
6	51
7.5	63
8	68
8.5	72
10	85
12	102
15	127
16	136
17	144

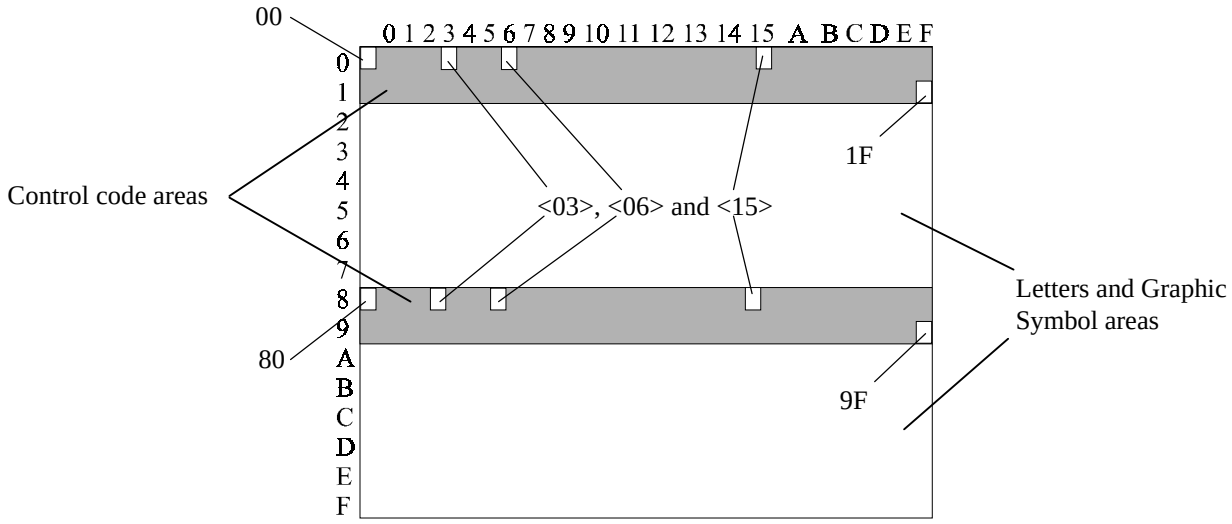
2.2.2 Code Pages

Two variants of the IBM Proprinter characters, called a 'code page', are used. These are:

- Code Page 437 - the variant used in the United States and in most European Countries is also known as PC USA
- Code Page 850 - the variant used in Scandinavia and a few other European Countries, also known as Multi-Latin 1, contains characters required by the languages of these countries, fewer graphic symbols and more accented letters and other special characters.

2.2.3 Character Sets

Characters, consisting of control codes, letter characters and graphic symbols, form a character set which is placed in an area of range:



Three character sets may be configured:

- Character Set 1 - where all characters are printable and control codes are in the range <00> to <1F> or <80> to <9F>

  Note: Code page 437 or 850 is used.

- Character Set 2 - where all characters are printable, with the exception of <03>, <06> and <15>, and control codes are in the range <00:> to <1F>

  Note: Code page 437 or 850 is used.

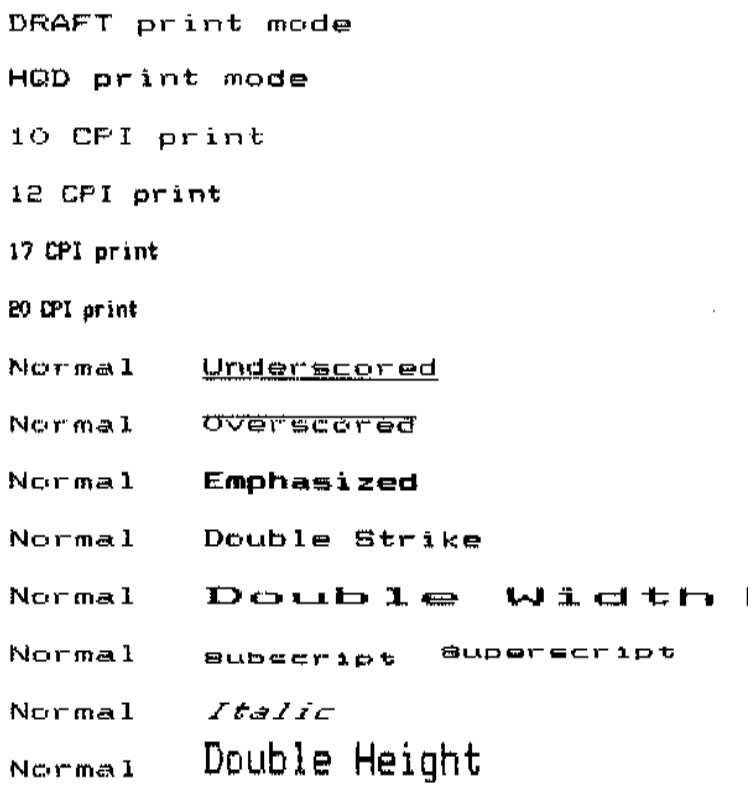
- All Characters Set - this is built from the characters in code pages 437 and/or 850 using the commands *ESC* \ and *ESC* ^.

2.2.4 Print Attributes

These modify the characteristics of a character. Any of the attributes below, for any one character, Draft and HQD, can be used.

	Draft	HQD	Graphics
Double width	x	x	x
Emphasized	x	x	x
Double strike	x	x	x
Underscore	x	x	-
Overscore	x	x	-
Double height	x	x	x
Sub/superscript	x	x	-
Italic	x	x	-

The above attributes, printed by the LB20, are shown below:



2.3 Line Graphics

These are produced by using a graphic symbol from the character set. Printing is performed in two passes.

Note:

1. Line graphics are designed to be used with 1/6" (0.166", 4mm) line spacing. If other line spacing is used the following will occur:
   - if the line space is less than 1/6", characters will overlap in the vertical direction
   - if the line space is greater than 1/6", white spaces are inserted between vertically adjacent characters.
2. In one line, alphanumeric characters and line graphics can be mixed.

2.4 Line Spacing

5,6 or 8 lines per inch (lpi) are available in the Setup and 1/72" (0.01388" 0.35mm) and 1/216 (0.00463" 0.1174mm). Line graphics are designed for use with 6 lpi. Positioning of text or graphics with smaller space increments than the line pitch use vertical spacing in IBM Mode.

2.5 Bitmap Graphics

The printing mode used is 'All Points Addressable' (APA) graphics giving the following :

- unidirectional printing
- commands that move the print position backwards, horizontally or vertically, are prohibited
- narrow white stripes, less than 0.01" (0.25 mm), may appear between two lines of APA graphics.

Note: Bitmap Graphics should not be used in a passbook.

2.6 Communication Interfaces

The printer will have either an RS232C serial port or a Centronics parallel port.

Data is stored in the input buffer, and then:

- character are printed when a terminator code is received or when the width of the line currently printed is overpassed
- all codes creating an End of Line condition cause that line to be printed before the function is executed
- ignored commands do not stop the printer from printing
- illegal commands are handled according to the current error handling state, and do not stop the printer from printing

2.6.1 Parallel Port

This is unidirectional and is connected to a host computer through a Centronics Interface and cable.

2.6.2 Serial Port

This is RS232C and is connected to a host computer through a Serial Interface and cable.

The settings are as follows:

Parameter	Setting
Baud rate	1200, 2400, 4800, 9600*, 19200
Data Bits	7 or 8 *
Stop Bits	1* or 2
Parity	Odd, Even* or Disabled
Flow Control	RTS/CTS* or XON/XOFF

Factory Default *

2.6.3 Serial Connector and Pin Assignments

A 9 pin male sub-miniature D-shell connector is required at the printer end.

The pin assignments are as follows:

Printer 9-pin Connector		Cable Line	Host 9-pin or 25-pin Connector		
Pin Number	**Signal Name**	**Source**	**Signal Name**	**9-Pin Number**	**25-Pin Number**
1	-				
2	RXD	Host	TXD	3	2
3	TXD	Printer	RXD	2	3
4	DTR	Printer	DSR	6	6
5	GND		GND	5	7
6	DSR	Host	DSR	4	20
7	RTS	Printer	CTS	8	5
8	CTS	Host	RTS	7	4
9	-				

Note: The printer should be switched OFF before the serial line cable is connected or disconnected.

2.6.4 RXD (Receive Data)

This line receives data from the host. The serial interface ignores received data when DSR is low.

2.6.5 TXD (Transmit Data)

This line is for XON/XOFF transmission from the printer to the host only. CTS must be high to enable transmission. The printer does not transmit data when RTS/CTS is selected.

2.6.6 DTR (Data Terminal Ready)

This signal is set high and remains high while the printer is ON and the serial interface is operational.

2.6.7 GND (Signal Ground)

This pin connects to logic ground and establishes a common reference for the data and control signals.

2.6.8 DSR (Data Set Ready)

The serial interface ignores received data unless DSR is high.

2.6.9 RTS (Request to Send)

This signal is set high at power-on. The RTS high level tells the host that the printer is ready to receive data. The RTS low level tells the host that the printer is busy and cannot receive data.

2.6.10 CTS (Clear to Send)

The serial interface monitors this signal and must be high for the serial interface to transmit XON and XOFF. Character XON is ASCII code DC1 with hexadecimal value <11>, and character XOFF is ASCII code DC3 with hexadecimal value <13>.

If an illegal command, which will be found under the heading Compatibility on page 3-4, is received the printer keeps printing but unknown single-byte codes are ignored and interpretation of unknown ESC sequences stop after the code following the ESC code.

2.6.11 Flow Control

This is either XON/XOFF or RTS/CTS.

APA graphics printing requires RTS/CTS flow control.

In the IDLE state, the DTR line is active.

2.6.12 XON/XOFF

The printer sends XON to the host when it is able to receive data and XOFF to stop the data flow or to indicate that it is unable to receive data.

The host must send an XOFF to the printer to stop the transmission from the printer when the host buffer is full. When the host buffer is empty, the host must send an XON to reactivate the transmission.

2.6.13 RTS/CTS

When the host wants to send data to the printer, it must wait for the printer RTS line to go ON. If the printer RTS line goes OFF, the host must stop transmission and wait for the printer RTS line to go ON again before sending any data.

2.7 LED Indications

One Station LED and four Status LEDs are used.

2.7.1 Station LED

This LED conveys the following information:

LED State	Information
OFF	no power to the printer
GREEN	ON / Idle / Printing
Blinking GREEN	Waiting for a document
RED	Fatal error
Blinking RED	Non-fatal error

2.7.2 Status LEDs

These inform you of an error condition. Error conditions are checked when the printer is switched on by the Confidence Test Routine (CTR).

2.7.3 Confidence Test Routine

The errors are as follows:

Status LEDs 'x' = ON				Station LED	Error	Corrective Action
				RED	CPU	Call supplier
			x	Blinking RED	NVM	Perform Setup
		x		Blinking RED	Front Cover	Install Correctly
x				RED	Initialization	Call supplier
x			x	RED	Motors	Call supplier
x		x		RED	Edge detector	Call supplier
x		x	x	RED	Motors/edge detector	Call supplier

3 IBM Mode

The Proprinter emulation commands are described under the following headings:

- Character Commands
- Downloading and Quality Commands
- Form Length and Margin Commands
- Print Position Commands
- Printer Control Commands
- Bitmap Graphic Commands

A summary of the commands, in alphabetical function and ascending Hex. Code order are as follows:

3.1 Command Summary - by alphabetical function

Function	Command	Hex. Code	Page
Backspace	BS	<08>	3-14
Cancel	CAN	<18>	3-17
Cancel Perforation Skip	ESC O	<1B><4F>	3-10
Cancel Subscript/Superscript Mode	ESC T	<1B><54>	3-13
Carriage Return	CR	<0D>	3-14
Condensed Printing	SI or ESC SI	<0F> or <1B><0F>	3-7
Downloading Characters	ESC = n..n	<1B><3D>n..n	3-8
Start Double Width Printing	SO or ESC SO	<0E> or <1B><0E>	3-11
End Double Strike Printing	ESC H	<1B><48>	3-12
End Double Width Printing	DC4	<14>	3-11
End Emphasized Printing	ESC F	<1B><46>	3-12
Form Feed	FF	<0C>	3-17
Horizontal Tabulation	HT	<09>	3-14
Line Feed	LF	<0A>	3-14
Print Attributes Definition	ESC [@ s	<1B><5><40> s	3-13
Print Bit Image Graphics at Normal Speed, Dual Density	ESC Y n..n	<1B><59>n..n	3-19
Print Bit Image Graphics in High Density	ESC Z n..n	<1B><5A>n..n	3-20
Print Bit Image Graphics in Normal Density	ESC K n..n	<1B><4B>n..n	3-19
Print Bit Image Graphics at Half Speed, Dual Density	ESC L n..n	<1B><4C>n..n	3-19
Print Multiple Characters	ESC \ n..n	<1B><5C>n..n	3-6
Print Single Characters	ESC ^ n	<1B><5E>	3-6
Relative Move Inline Forward	ESC d n1n2	<1B><64>n1n2	3-14
Select 10 CPI	DC2	<12>	3-7
Select 12 CPI	ESC :	<1B><3A>	3-7
Select Character Set 1	ESC 7	<1B><37>	3-6
Select Character Set 2	ESC 6	<1B><36>	3-7

Function	Command	Hex. Code	Page
Select Code Page	ESC [T s	<1B><5B><54>s	3-7
Select Print Mode	ESC I n	<1B><49>n	3-7
Set 1/8" Line Spacing	ESC 0	<1B><30>	3-15
Set 7/72" Line Spacing	ESC 1	<1B><31>	3-15
Set All Tabs to Power-on Default Values	ESC R	<1B><52>	3-16
Set Form Length in Inches	ESC C NUL n	<1B><43><00>n	3-9
Set Form Length in Lines	ESC C n	<1B><43>n	3-10
Set Graphics Line Spacing	ESC 3 n	<1B><33>n	3-15
Set Horizontal Tabulation	ESC D n..nNUL	<1B><44>n..n<00>	3-16
Set Initial Conditions	ESC [K s	<1B><5B><4B>	3-17
Set Left/Right Margins	ESC X n,n	<1B><58>n n	3-11
Set Perforation Skip	ESC N n	<1B><4E>n	3-10
Set Top of Form	ESC 4	<1B><34>	3-10
Set Vertical Tabulation	ESC B n..nNUL	<1B><42>n..n<00>	3-16
Set/Cancel Automatic Line Feed	ESC 5 n	<1B<35>n	3-15
Start Double Strike Printing	ESC G	<1B><47>	3-12
Start Emphasized Printing	ESC E	<1B><45>	3-12
Start/End Continuous Over Scoring	ESC _ n	<1B><5F>n	3-12
Start/End Continuous Underscoring	ESC - n	<1B><2D>n	3-12
Start/End Double Width Mode	ESC W n	<1B><57>n	3-11
Start Double Width Printing	SO or ESC SO	<0E> or <1B><0E>	3-11
Start Subscript/Superscript Mode	ESC S n	<1B><53>n	3-13
Store Text Line Spacing	ESC A n	<1B><41>n	3-15
Uni/Bi-directional Printing	ESC U n	<1B><55>n	3-19
Variable Line Spacing	ESC J n	<1B><4A>n	3-15
Vertical Tabulation	VT	<0B>	3-16

3.2 Command Summary - by ascending Hex. Code

Function	Command	Hex. Code	Page
Backspace	BS	<08>	3-14
Horizontal Tabulation	HT	<09>	3-14
Line Feed	LF	<0A>	3-14
Vertical Tabulation	VT	<0B>	3-16
Form Feed	FF	<0C>	3-17
Carriage Return	CR	<0D>	3-14
Start Double Width Printing	SO or ESC SO	<0E> or <1B><0E>	3-11
Condensed Printing	SI or ESC SI	<0F> or <1B><OF>	3-7
Select 10 CPI	DC2	<12>	3-7
End Double Width Printing	DC4	<14>	3-11
Cancel	CAN	<18>	3-17
Start/End Continuous Underscoring	ESC - n	<1B><2D>n	3-12
Set 1/8" Line Spacing	ESC 0	<1B><30>	3-15
Set 7/72" Line Spacing	ESC 1	<1B><31>	3-15
Set Graphics Line Spacing	ESC 3 n	<1B><33>n	3-15
Set Top of Form	ESC 4	<1B><34>	3-10
Set/Cancel Automatic Line Feed	ESC 5 n	<1B><35>n	3-15
Select Character Set 2	ESC 6	<1B><36>	3-7
Select Character Set 1	ESC 7	<1B><37>	3-6
Select 12 CPI	ESC :	<1B><3A>	3-7
Downloading Characters	ESC = n..n	<1B><3D>n..n	3-8
Store Text Line Spacing	ESC A n	<1B><41>n	3-15
Set Vertical Tabulation	ESC B n..nNUL	<1B><42>n..n<00>	3-16
Set Form Length in Inches	ESC C NUL n	<1B><43><00>n	3-9
Set Form Length in Lines	ESC C n	<1B><43>n	3-10
Set Horizontal Tabulation	ESC D n..nNUL	<1B><44>n..n<00>	3-16
Start Emphasized Printing	ESC E	<1B><45>	3-12
End Emphasized Printing	ESC F	<1B><46>	3-12
Start Double Strike Printing	ESC G	<1B><47>	3-12
End Double Strike Printing	ESC H	<1B><48>	3-12
Select Print Mode	ESC I n	<1B><49>n	3-7
Variable Line Spacing	ESC J n	<1B><4A>n	3-15
Print Bit Image Graphics in Normal Density	ESC K n..n	<1B><4B>n..n	3-19
Print Bit Image Graphics at Half Speed, Dual Density	ESC L n..n	<1B><4C>n..n	3-19
Set Perforation Skip	ESC N n	<1B><4E>n	3-20
Cancel Perforation Skip	ESC O	<1B><4F>	3-10
Set All Tabs to Power-on Default Values	ESC R	<1B><52>	3-16

Function	Command	Hex. Code	Page
Start Subscript/Superscript Mode	ESC S n	<1B><53>n	3-13
Cancel Subscript/Superscript Mode	ESC T	<1B><54>	3-13
Uni/Bi-directional Printing	ESC U n	<1B><55>n	3-19
Start/End Double Width Mode	ESC W n	<1B><57>n	3-11
Set Left/Right Margins	ESC X n,n	<1B><58>n n	3-11
Print Bit Image Graphics at Normal Speed, Dual Density	ESC Y n..n	<1B><59>n..n	3-19
Print Bit Image Graphics in High Density	ESC Z n..n	<1B><5A>n..n	3-19
Print Attributes Definition	ESC [@ s	<1B><5B><40> s	3-13
Set Initial Conditions	ESC [K s	<1B><5B><4B>	3-17
Select Code Page	ESC [T s	<1B><5B><54>s	3-7
Print Multiple Characters	ESC \ n..n	<1B><5C>n..n	3-6
Print Single Characters	ESC ^ n	<1B><5E>	3-6
Start/End Continuous Over Scoring	ESC _ n	<1B><5F>n	3-12
Relative Move Inline Forward	ESC d n1n2	<1B><64>n1n2	3-14

3.3 Compatibility

The printer emulates **Proprinter**, **Proprinter II** and **Proprinter III** except for the following:

- Printing on the line is not enforced by inactivity
- Form width is 2.5" (64 mm) to 9.5" (242 mm) instead of 3" (76 mm) to 11" (280 mm).

The following commands are not executed and do not cause errors:

No Buzzer Available

	Command	Hex. Code
Bell	BEL	<07>

Printer Selection/Deselection

	Command	Hex. Code
Select Printer	*DC1*	<11>
Deselect Printer	*DC3*	<13>

Useless Command in LB20 Printer

	Command	Hex. Code
Select Proprinter mode	ESC BEL	<1B><07>

AGM Graphics Mode

	Command	Hex. Code
Select Graphics Mode	ESC * s	<1B><2A>s

IBM Test Restricted

	Command	Hex. Code
Deselect printer	ESC Q *n*	<1B><51> n

The following commands are ignored by IBM Printers:

Function	Command	Hex. Code
Null	NUL	<00>
Ignore End Of Form	ESC 8	<1B><38>
Honor End Of Form	ESC 9	<1B><39>
Move Head To Left Margin	ESC <	<1B><3C>
Set Horizontal Motion Index	ESC > n	<1B><3E> n
Set Parameter Attribute	ESC @ n	<1B><40> n
Auto Justify	ESC M n	<1B><4D> n
Center Auto Line	ESC V	<1B><56>
Reverse Line Feed 1/6"	ESC]	<1B><5D>
Select Auto Shift	ESC a	<1B><61>
Select Band Four	ESC b	<1B><62>
Select Band Three	ESC c	<1B><63>
Relative Move Line Backward	ESC e nm	<1B><65> nm
Select Intercharacter Spacing	ESC f n	<1B><66> n
Partial Index Down	ESC h	<1B><67>
Partial Index Up	ESC i	<1B><68>
Stop	ESC j	<1B><69>
Select Band Two	ESC m	<1B><6D>
Select Aspect Ratio	ESC n n	<1B><6E> n
End Document	ESC o	<1B><6F>
Begin Document	ESC p	<1B><70>
Select Band One	ESC y	<1B><79>

3.4 Default Settings

These are as follows:

Font	Print Mode Pitch Print Attribute * Condensed *	Draft 10 cpi Normal 17 cpi
Vertical control	Line Space Auto CR (LF/VT=>CR) Auto LF (CR=>LF) Form Length	6 LPI No No 11 inches
Characters	Character set Language set Zero type	1 USA Normal
Margins	Top/Bottom/Left/Right	0.1"
Tabulation	Horizontal * Vertical *	Each eight columns beginning at column 9 none
Direction	Bi-directional mode *	on

* Setup will not change these values

3.5 Character Commands

When executed these commands select the characters from the current code page.

3.5.1 Print Multiple Characters

This command will print up to *n* characters from a code page.

ESC Sequence - *ESC \ n1n2 c1..ck*

Hexadecimal Code - *<1B><5C>n1n2 c1..ck*

Parameters

n1n2	Number of bytes following. Number of bytes = *n1+(256*n2)*
c1..ck	ASCII codes to be printed (in the range <00> to <FF>)

Example, *ABC:*

<1B><5C><05><00><1B><3A><41><42><43> followed by the terminator code ***<0D><0A>***

3.5.2 Print Single Characters

This command prints one character from a code page.

ESC Sequence - *ESC ^ n*

Hexadecimal Code - *<1B><5E>n*

Parameter

v	The ACSII code of the character to be printed.

Example,- *<1B><5E><30>* followed by the terminator code ***<0D><0A>***

3.5.3 Select Character Set 1

This command selects Character Set 1 and overrides the configuration option.

ESC Sequence - *ESC 7*

Hexadecimal Code - *<1B><37>*

3.5.4 Select Character Set 2

This command selects the Character Set 2 and overrides the configuration option.

ESC Sequence - *ESC 6*

Hexadecimal Code - *<1B><36>*

3.5.5 Select Code Page

This command changes the current code page.

ESC Sequence - *ESC [T n1n2 NUL NUL k1k2*

Hexadecimal Code - *<1B><5B><54>n1n2<00><00>k1k2*

Parameters:

*n1 + (256 * n2)*	The number of bytes following.
k1k2 = <01><B5>	Code page 437 (USA)
<03><52>	Code page 850 (Multi- Latin I)

Example, select Code page 437 (USA) - *<1B><5B><54><04><00><00><00><01><B5>*

3.5.6 Character Pitch Commands

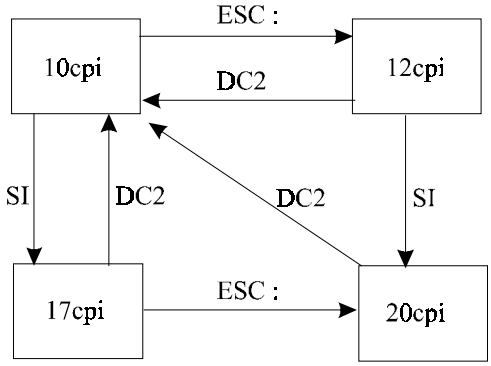
These commands select the pitch:

SI or ESC SI (condensed printing) - *<0F> or <1B><0F>*

DC2 (select 10 cpi) - *<12>*

ESC : (select 12 cpi) - *<1B><3A>*

Changing the character pitch must be performed in accordance with the following map:



3.6 Downloading and Quality Commands

Characters are printed, either from a Resident area or a Download area. It is also possible to define the quality of print from each area.

Two escape (ESC) sequences are used:

- *ESC I* - selects the quality and the source
- *ESC =* - downloads

3.6.1 Select Print Mode

This command selects the print quality, Draft or HQD, and whether the source is in the resident area or the download area.

ESC Sequence - *ESC I n*

Hexadecimal Code - *<1B><49>n*

Parameters

n = <00>	Draft Resident
<01>	Draft Resident 12 CPI
<02>	HQD Resident
<03>	HQD Resident
<04>	Draft Downloaded
<05>	Draft Downloaded 12 CPI
<06>	HQD Downloaded
<07>	HQD Downloaded
<0B>	HQD Resident with Italic Attribute
<0F>	HQD Downloaded with Italic Attribute

ESC I does not change the pitch or attribute except for the following:

n = <01> and <05>	Starts printing 12 CPI to emulate fast font
n = <0B> and <0F>	Starts printing in Italic

For other values, the only bits that are meaningful are bits 0, 1, and 2.

3.6.2 Downloading

This command downloads up to 256 characters into the download area.

In Proprinter III mode, it is possible to design Draft, NLQ and Double Pass characters. The EFP95 Proprinter emulation supports Draft and HQD character designs. It is possible to load 256 Draft and 256 HQD characters.

The cell size of all characters is 9 dots in a column and 12 dots in a row. Column 12 must be blank.

Line-drawing and shading characters are expanded to 12 dots in a column when printing. Draft characters are not checked at storage time. At printing time, adjacent consecutive black dots are removed by the firmware algorithm. Therefore it is possible to download HQD characters and print them in Draft mode.

ESC Sequence - *ESC =* Initializing and Data

Hexadecimal Code - *<1B><3D>*

The two parts of the *ESC =* are:

- Initializing, consisting of 4 bytes for count1, count2, ID and Start
- Data, consisting of 13 bytes

Initializing

Parameters:

count1 *count2*	Number of bytes referring to the *ESC =* command. The total byte count is: count1 + 256 * count2, including ID, Start and the data sequence but not count1 and count2.
ID	Printer ID byte. The only value accepted is ID = 20. The download sequence is ignored for any other value.
Start	Defines the start point for the first character (13 bytes) in the ASCII table. The next character starts at, Start + 1, and so on.

Data

The first two bytes are the attribute bytes, and the remaining eleven describe the character.

Byte 1 attributes:

Bits	Function
7	0 for ascending characters, i.e. "A" 1 for descending characters, i.e. "g"
6 to 2	Ignored
1 and 0	00 Character is not a line-drawing 01 Line drawing character. With a line drawing attribute, dots in row 8 are copied to rows 9, 10, 11, and 12 at printing time. 10 Shading character. With a shading attribute, dots in rows 1, 2, 3, and 4 are copied to rows 9, 10, 11, and 12 at printing time.

Byte 2 attributes are used for proportional spacing and are not used

Bytes 3 to **13** define the dots for each column where:

Dot	Ascending	Descending
1	bit 7	Not used
2	bit 6	bit 7
3	bit 5	bit 6
4	bit 4	bit 5
5	bit 3	bit 4
6	bit 2	bit 3
7	bit 1	bit 2
8	bit 0	bit 1
9	Not used	bit 0

3.6.3 Initializing the Download Area

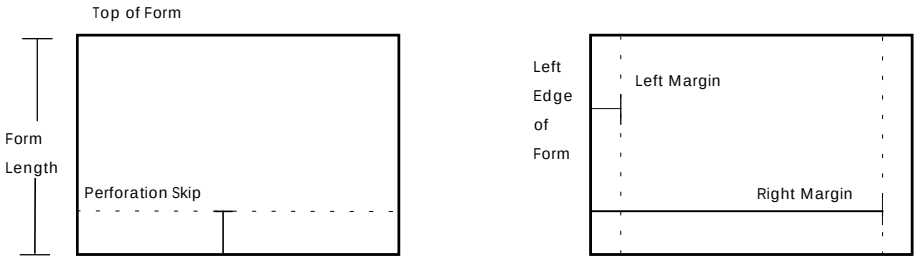
Initialize the download area to code page 437:

ESC = <00><00> or *ESC = <00><00><ID>* where ID is 20

Note: It is also possible to initialize the download area with ESC [K , Set Initial Condition.

3.7 Form Length and Margin Commands

These are shown below:



3.7.1 Set Form Length in Inches

This command sets the form length in *n* inches and cancels the perforation skip set by *ESC N* and current line will be set to top of form.

ESC Sequence - *ESC C NUL n*

Hexadecimal Code - *<1B><43><00>n*

Parameters

n	Number of inches between the top and bottom form edges where: 3" ≤ n ≤ 14". Other values are ignored and leave the current form length value unchanged.

Example, set the form length to 12" (254 mm) - *<1B><43><00><0C>*

3.7.2 Set Form Length in Lines

This command sets the form length in *n* lines with the current line spacing and cancels the perforation skip set by *ESC N* and the Top of Form set by *ESC 4.*

ESC Sequence - *ESC C n*

Hexadecimal Code - *<1B><43>n*

Parameters

n	Number of lines in the current line pitch between the top and the bottom edge of the form where: *n* = 2.5" ≤ 0.1" + n*(line spacing) ≤ 14.5" and 0.1" is the mechanical top margin

Example, set the form length to 66 lines (hex 42)- *<1B><43><42>*

3.7.3 Set Top of Form

This command sets the top of form to the current line. The current line becomes line 1. Tabulations and form length are executed from top of form.

Top of form is canceled by *ESC C n* and *ESC C NUL n.*

ESC Sequence - *ESC 4*

Hexadecimal Code - *<1B><34>*

3.7.4 Set Perforation Skip

This command sets the perforation skip size in order to emulate a bottom margin and is canceled by *ESC O, ESC C n* and *ESC C NUL n*. Last line = Top of Form + Form length - Perforation Skip.

ESC Sequence - *ESC N n*

Hexadecimal Code - *<1B><4E>n*

Parameter

n	Number of lines to skip at the bottom of the page.

3.7.5 Cancel Perforation Skip

This command cancels the perforation skip mode initiated by *ESC N.*

ESC Sequence - *ESC O*

Hexadecimal Code - *<1B><4F>*

3.7.6 Set Left/Right Margins

Left and right margins are set in units equivalent to character widths from the mechanical left margin (0.1" from the left edge of the document).

The position of each margin depends on the current character pitch. However, if the pitch is changed after the margins are set the positions of both margins do not change.

ESC Sequence - *ESC X n m*

Hexadecimal Code - *<1B><58> n m*

Parameters

n	Left margin. Any value in the range *<00>* to *<FF>* giving the number of character spaces between the 0.1" mechanical left margin (*<01>)* and the left margin to be set. The actual position depends on the character pitch. The default value is *<01>* (column 1).
m	Right margin in units as described above. The maximum and default value is *<FF>* (mechanical right margin or (right edge of form minus 0.1"). If m exceeds document width, the mechanical right margin is assumed.

Example, set a left margin of 1" (25.4 mm) ,

and a right margin of 7" (177.8 mm) in 10 cpi: - *<1B><58><0A><46>*

Notes:

1. A value of *<00>* for *n* or *m* leaves the margin unchanged
2. *n* must be lower than m by at least the equivalent of 0.5"
3. Send a CR to move the current print position to the new left margin

3.8 Print Attribute Commands

These are:

Double Width, Emphasized, Double Strike, Underscore, Overscore, Double Height, Sub/Superscript and Italic.

3.8.1 Start Double Width Printing

This command starts double width printing for the current line and is canceled by *DC4*, *CR*, *CAN*, *LF*, *FF*, *VT* and *ESC W 0.* Refer to *ESC W* for printing Double Width on multiple lines.

The width parameter in *ESC [@* can also reset double width printing.

Horizontal tab settings are not affected.

Control Code/ESC Sequence - *SO or ESC SO*

Hexadecimal Code - *<0E> or <1B><0E>*

3.8.2 End Double Width Printing

This command cancels double-width printing and is initiated by *SO* or *ESC SO*.

Control Code - *DC4*

Hexadecimal Code - *<14>*

3.8.3 Start/End Double Width Mode

This command starts double-width printing of all characters. Unlike the SO command this allows double width printing on multiple lines.

ESC Sequence - *ESC W n*

Hexadecimal Code - *<1B><57>n*

Parameters

n=1 (<01>) or odd	Starts double-width printing.
n=0 (<00>) or even	Stops double-width printing.

3.8.4 Start Emphasized Printing

This command produces emphasized characters by overprinting with a horizontal offset.

ESC Sequence - *ESC E*

Hexadecimal Code - *<1B><45>*

3.8.5 End Emphasized Printing

This command ends emphasized printing.

ESC Sequence - *ESC F*

Hexadecimal Code - *<1B><46>*

3.8.6 Start Double Strike Printing

This command starts double strike printing where characters are overprinted without any horizontal offset.

ESC Sequence - *ESC G*

Hexadecimal Code - *<1B><47>*

3.8.7 End Double Strike Printing

This command ends double strike printing.

ESC Sequence - *ESC H*

Hexadecimal Code - *<1B><48>*

3.8.8 Start/End Continuous Overscoring

This command overscores all characters. This command has no effect on line graphics.

ESC Sequence - *ESC _ n*

Hexadecimal Code - *<1B><5F>n*

Parameters

n=1 (<01>) or odd	Starts overscoring.
n=0 (<00>) or even	Stops overscoring.

3.8.9 Start/End Continuous Underscoring

This command underscores all characters. This command has no effect on line graphics.

ESC Sequence - *ESC - n*

Hexadecimal Code - *<1B><2D>n*

Parameters

n=1 (<31>) or odd	Starts underscoring.
n=0 (<30>) or even	Stops underscoring.

3.8.10 Print Attributes Definition

This command defines double-height, double-width, italic and double line spacing.

ESC Sequence - *ESC [@ n1n2 m1 m2 m3 m4*

Hexadecimal Code - *<1B><5B><40> n1n2 m1m2m3m4*

Parameters

n1 + (256 * n2)	Number of bytes following.
m1 = <00> <01> <02>	No change (no effect on line graphics) Italics ON (no effect on line graphics) Italics OFF (no effect on line graphics)
m2 = <00>	Ignored.
m3 = <00> <01> <02> <10> <11> <12> <20> <21> <22>	No change Line feed unchanged / single height Line feed unchanged / double height Single LF / height unchanged Single LF / single height Single LF / double height Double LF / height unchanged Double LF / single height Double LF / double height
m4 = <00> <01> <02>	Width unchanged Single width Double width

Example, print double height, double width, italic ON, line feed unchanged

<1B><5B><40><04><00><01><00><02><02>

3.8.11 Start Subscript/Superscript Mode

This command subscript/superscripts all characters and has no effect on line graphics.

ESC Sequence - *ESC S n*

Hexadecimal Code - *<1B><53>n*

Parameters

n=0 (<00>) or even	Superscript on.
n=1 (<01>) or odd	Subscript on.

3.8.12 Cancel Subscript/Superscript Mode

This command cancels the superscript/subscript mode. It is ignored if no *ESC S* command has been received.

ESC Sequence - *ESC T*

Hexadecimal Code - *<1B><54>*

3.9 Print Position Commands

This is defined vertically and horizontally. As follows:

- vertical position Print Position is defined from the top of the form and is moved in units of line space
- horizontal position Print Position is defined from the left margin (column 1) and can be executed in two ways:
  1. Tabs, backspace, printing, in units of character width, where character width depends on the current pitch.
  2. Relative movement, in 1/120" (0.21 mm)

3.9.1 Backspace

This command moves the current horizontal print position Print one character width to the left but is ignored if the current print position is column 1.

Control Code - *BS*

Hexadecimal Code - *<08>*

3.9.2 Carriage Return

This command moves the current print position Print Position to the left margin. The command cancels double-width printing.

A line feed is executed if Auto LF *(CR=>LF)* is set active through the Setup or enabled with the *ESC 5* command.

Control Code - *CR*

Hexadecimal Code - *<0D>*

3.9.3 Relative Move Inline Forward

This command moves the print position Print to the right.

ESC Sequence - *ESC d n1n2*

Hexadecimal Code - *<1B><64>n1n2*

Parameters

n1n2	Number of 1/120"(≈0.21 mm) increments that the print position moves to the right. (Maximum 996). Number = *n1 + (n2*256)*

Example, move the print position 3/120" to the right - *<1B><64><03><00>*

3.9.4 Line Feed

This command moves the paper one line forward using the current line spacing and cancels double-width printing set by the *SO* or *ESC SO* command. A carriage return is executed if Auto CR is set active through the Setup or Set Initial Condition (ESC *[K)*.

Control Code - *LF*

Hexadecimal Code - *<0A>*

3.9.5 Variable Line Spacing

This command feeds the document n/216" (≈0.12 mm) forward. Using this command, it is possible to print in the perforation skip area. This command cancels Double Width Printing in a line set by *SO* or *ESC OS*.

ESC Sequence - *ESC J n*

Hexadecimal Code - *<1B><4A>n*

Notes:

1. *n* is in the range *<01> to <FF>*.
2. If *n = <00>*, the command is ignored.

3.9.6 Set 1/8" Line Spacing

This command sets the line space to 1/8" (≈3.175 mm) and will move the paper 1/8" upwards.

ESC Sequence - *ESC 0*

Hexadecimal Code - *<1B><30>*

3.9.7 Set 7/72" Line Spacing

This command sets the line space to 7/72" (≈2.47 mm) and will move the paper 7/72" upwards.

ESC Sequence - *ESC 1*

Hexadecimal Code - *<1B><31>*

3.9.8 Store Text Line Spacing

This command stores a line space defined as n/72” (n*0.35 mm) and is effective after the *ESC 2* command is received.

ESC Sequence - *ESC A n*

Hexadecimal Code - *<1B><41>n*

Parameters

n	A value in the range <01> to <FF>. It stores a line space defined as n/72"and is activated by an ESC 2 command. If n = <00>, the line space is not changed.

3.9.9 Start Text Line Spacing

This command activates the line space previously defined by *ESC A*. A line feed is not performed.

ESC Sequence - *ESC 2*

Hexadecimal Code - *<1B><32>*

3.9.10 Set Graphics Line Spacing

This command sets the line space to n/216" (n*0.12 mm) where *n* is a value between *<01> and <FF>*.

If *n = <00>* the command is ignored.

The current line feed value (set with the *ESC 3* n command) is used when the Line Feed command is executed.

ESC Sequence - *ESC 3 n*

Hexadecimal Code - *<1B><33>n*

3.9.11 Set/Cancel Automatic Line Feed

This command generates an automatic line feed after each carriage return and overrides the Auto LF setting in the Setup.

ESC Sequence - *ESC 5 n*

Hexadecimal Code - *<1B><35>n*

Parameters

n=1 (<01>) or odd	Auto LF ON after CR
n=0 (<00>) or even	Auto LF OFF after CR

3.9.12 Horizontal Tabulation

This command moves the current print position to the next tab stop. The default tabs are set every 8 characters spaces beginning at column 9.

Control Code - *HT*

Hexadecimal Code - *<09>*

3.9.13 Set Horizontal Tabulation

This command sets up to 28 horizontal tab stops in numbers of characters of the current pitch in ascending order.

ESC Sequence - *ESC D Tab1..Tabn NUL*

Hexadecimal Code - *<1B><44>n..n<00>*

Example, define tab stops in columns 10, 25 and 60 - *<1B><44><0A><19><3C><00>*

Notes:

1. The mechanical margin is column 1.
2. The default setting is a tab stop every eight columns, starting column 9.
3. *ESC D NUL* clears all horizontal tab settings, and
4. The tab settings are updated if the character pitch setting is changed.

3.9.14 Vertical Tabulation

This command advances paper to the next vertical tab stop. If the last vertical tab is past, a line feed is performed. A carriage return is performed if Auto CR mode (LF/CR=CR) is set active in Setup or by *ESC [K*.

Control Code - *VT*

Hexadecimal Code - *<0B>*

3.9.15 Set Vertical Tabulation

This command sets up to 64 vertical tab stops in units defined by the current line pitch in ascending order.

ESC Sequence - *ESC B tab1..tabn NUL*

Hexadecimal Code - *<1B><42>tab1..tabn<00>*

Example, define vertical tab stops at lines 10, 25 and 60 - *<1B><42><0A><19><3C><00>*

Notes:

1. The Top of Form is line 1.
2. The command clears earlier settings.
3. *ESC B NUL,* clears all vertical tabs settings and *ESC R* returns them to their default settings.
4. Tab settings are not updated if the line pitch is changed.

3.9.16 Set All Tabs to Power On Default Values

This command resets the vertical and horizontal tabs to their default values.

ESC Sequence - *ESC R*

Hexadecimal Code - *<1B><52>*

Notes:

1. Horizontal tabs every eight columns starting at column 9.
2. No vertical tabs in default values.

3.10 Printer Control Commands

3.10.1 Cancel

This command deletes the line of text in the input buffer. Normally, input buffer contents are printed when a terminator code is received. When a cancel command is received the line is removed from the input buffer.

The print position does not move. Double Width printing on a line set by *SO* or *ESC SO* is canceled.

Control Code - *CAN*

Hexadecimal Code - *<18>*

Example, ABC - *<18>DEF* will be printed as DEF.

3.10.2 Form Feed

This command ejects the document. The command cancels double width printing set by *SO* or *ESC SO* if this was selected.

Control Code - *FF*

Hexadecimal Code - *<0C>*

3.10.3 Set Initial Conditions

This command resets the printer to an initial state based on the parameters, *count1,count2, init, ID, m1 and m2*. ID, m1 and m2 can be left out according to count1 and count2. All unprinted data is printed before the initialization takes place. If a document is inserted, it is ejected.

ESC Sequence - *ESC [K count1 count2 init ID m1 m2*

Hexadecimal Code - *<1B><5B><4B> count1 count2 init ID m1 m2*

Parameters: -

count1, count2 indicate the number of bytes that follow = count1 + count2 * 256. Selecting *<01><00>* means that only ID is used.

Init indicates what kind of initialization is used. Parameters *m1* and *m2* will override some settings. Unsupported *Init* values are treated as *<00>*. *V*alues *<FE>* and *<FF>* are used only when the printer is being set up for the first time where:

< 00> Initialize printer to USER default settings. Parameters *m1, m2* override control panel settings. Download area remains unchanged.

<01> Initialize printer to USER default settings. Parameters *m1, m2* override control panel settings. Download area is initialized to the default codepage.

<04> Initialize printer to FACTORY default settings. Parameters *m1, m2* override control panel settings. Download area remains unchanged.

<05> Initialize printer to FACTORY default settings. Parameters *m1, m2* override control panel settings. Download area is initialized to the default codepage.

<FE> Initialize printer to USER default settings. Download area is initialized to the default setting. Parameters *m1, m2* override control panel settings and are stored in the NVM as FACTORY default.

<FF> Initialize printer to FACTORY default settings. Download area is initialized to the default setting. Parameters *m1, m2* override control panel settings and are stored in the NVM as FACTORY default.

Id specifies the printer for which the following device-dependent parameter bytes are intended. If *Id* does not address the printer, the parameter bytes that follow are ignored. *IDs <03>* and *<16>* are recognized by Proprinter III.

m1, m2 these optional bytes override printer settings. However, if *init* is set to *<00>,<01>, <04>* or *<05>,* the *m1,m2* settings are overridden. If *init* is set to *<FE>* or *<FF>,* the *m1,m2* settings are used.

	Bit	**Function**	**Value1 (ON)**	**Value0 (OFF)**
m1	0 <01>	Char. Set	Select char set 2	Select char set 1
	1 <02>	Zero type	Slashed zero	Normal zero
	2 <04>	Form length	12" forms	11" forms
	3 <08>	Auto LF	Auto LF after CR	No auto LF after CR
	4 <10>	Auto CR	No CR on vertical movement	CR on vertical movement
	5 <20>	Alarm	Not used	Not used
	6 <40>	Reserved	-	
	7 <80>	Discard byte	Ignore this byte	Process this byte
m2	0 to 5	not used	-	-
	6 <40>	Code page	850	437
	7 <80>	Discard byte	Yes	No

Example, initialize to user default settings and set the Form Length to 11":

<1B><5B><4B><04><00><00><03><04><00>

Example, initialize to Factory settings, download area initializes:

<1B><5B><4B><01><00><05>

3.10.4 Uni/Bidirectional Printing

This command enables bidirectional or unidirectional printing where:

- Unidirectional means printing from left to right
- Bidirectional means both directions.

ESC Sequence - *ESC U n*

Hexadecimal Code - *<1B><55> n*

Parameter

n = <00>	enable Bidirectional printing
n = <01>	enable Unidirectional printing

3.11 Bitmap Graphics

Four commands are used. Each command defines density and speed.

3.11.1 Print Bit Image Graphics in Normal Density

This command prints a line of bitmap graphics in normal density, 60 DPI horizontal and emulates 72 DPI vertical. Two horizontal adjacent dots are allowed.

ESC Sequence - *ESC K n1n2v1..vn*

Hexadecimal Code - *<1B><4B>n1n2v1..vn*

Parameters

n1n2	number of data bytes to be printed is (n2*256) + n1.
v1..vn	data bytes representing the dots. Each byte specifies a dot pattern in a vertical column as follows: Bit 7 6 5 4 3 2 1 0 Decimal value 128 64 32 16 8 4 2 1

Example, *<1B><4B><03><00><0F><08><18>* generates the following 8-dot column, where x is a printed dot:

7 o o o
6 o o o
5 o o o
4 o o x
3 x x x
2 x o o
1 x o o
0 x o o

3.11.2 Print Bit Image Graphics at Half Speed, Dual Density

This command prints a line of bitmap graphics in 120 dpi horizontal resolution.

ESC Sequence - *ESC L n..n*

Hexadecimal Code - *<1B><4C> n..n*

Parameters

n1n2v1..vn	Has the same format as used by ESC K.

3.11.3 Print Bit Image Graphics at Normal Speed, Dual Density

This command prints a bitmap in 120 dpi horizontal resolution using the same format as *ESC K*.

Horizontal adjacent dots are automatically removed by the firmware algorithm.

ESC Sequence - *ESC Y n..n*

Hexadecimal Code - *<1B><59>n..n*

3.11.4 Print Bit Image Graphics in High Density

This command prints a bitmap in 240 dpi horizontal resolution using the same format as *ESC K*.

Horizontal adjacent dots are automatically removed by the firmware algorithm.

ESC Sequence - *ESC Z n..n*

Hexadecimal Code - *<1B><5A>n..n*

4 Glossary

A

ASCII - American Standard Code for Information Interchange. A standardized set of machine-readable 7 or 8-bit codes consisting of control codes and codes representing alphanumeric characters and symbols.

APA - All Points Addressable. The ability to address and display or not display each picture element on a display surface.

AWG - American Wire Gauge

B

Bi-directional printing - where printing occurs from left to right and from right to left.

Baud rate - The speed of data transmission measured in bits per second.

Bit - a single character of a language having just two characters, binary digits 0 or 1.

Byte - a group of bits of information.

C

CPI - Character Per Inch - the width of characters in a line. Sometimes referred to as 'pitch' or 'density'.

CPS - Characters Per Second.

CSA - Canadian Standard Association. The Canadian counterpart of U.S. Underwriters Laboratory.

CTR - Confidence Test Routine. Performed by the printer at power-on

CTS - See RTS/CTS.

Character Set - a table of characters, each associated with an ASCII code, in a given font that can be printed.

Ctrl - Control

D

DCD - Data Carrier Detect

DPI - Dots Per Inch.

Draft - printing in single strike mode where one dot impact is delivered.

DSR - Data Set Ready.

DTR - Data Terminal Ready.

Double Height - where characters are printed in two passes twice their normal height.

Double strike - where text is printed in two passes with no horizontal or vertical offset.

Double width - See expanded.

E

EC - European Community

EIA - Electronic Industries Association. Sets standards for the electrical and functional characteristics of equipment used in data communication. See RS232C.

Emulation - where software allows the printer to imitate another printer.

Emphasized - where text is printed in two passes with a horizontal offset.

Expanded - where characters are printed in one pass at twice their normal width.

ESC - A single byte ASCII code that initiates an escape sequence. Corresponding hexadecimal code is <1B>.

Escape Sequence - A series of characters beginning with the code ESC which activates a printer function.

F

FCC - Federal Communication Commission.

Flow Control - RTS/CTS or XON/XOFF protocol.

Font Quality - where characters are printed in Draft or High Quality Draft.

Form - a document type defined as single-ply, multi-ply or an envelope.

H

HO5.VVF 3 G1.0 - EC Standard

HQD - High Quality Draft. Two consecutive dot impacts are delivered (double strike).

Hz - Hertz. The measuring unit for frequency (cycles per second)

I

ISO - International Standard Organization. An organization that sets international standards.

IEC -

Intercharacter Spacing - the space left blank between two consecutive characters.

L

Loadable Character Set - where resident and/or downloaded characters are used.

LPI - Lines Per Inch. Number of lines per inch. LPI = (number Lines) / (number inch). 1 inch = 25.4 mm.

Line Graphic - Graphics provided through the character sets.

M

Mechanical Margin - defined by the hardware, this is 0.1" (2.5 mm) from the left, right and top edges of the document.

N

NVM - Non Volatile Memory. Memory that holds its content without power. ROMs, PROMs, EPROMs and flash memory are examples. Sometimes the term refers to memory that is inherently volatile, but maintains its content because it is connected to a battery.

O

Offline - the state when the communications line between the printer and the host is not ready for data exchange.

Online - the state when the communications line between the printer and the host is ready for data exchange.

Overscore - To draw a line above printed characters and space.

R

RAM - Random Access Memory. Primary workspace in computers. The “random” means that the contents of each byte can be directly accessed without regards to the bytes before and after it. This is also true of other types of memory chips, including ROMs and PROMs. However, unlike ROMs and PROMs, RAM chips require power to maintain their content.

RS232C - serial interface standard used to connect the printer to the host.

RTS/CTS - Request To Send / Clear To Send. One of the standards used by the RS232C protocol for controlling the flow of data between two communicating devices using handshake signals. When the host wants to send data to the printer, it must wait for the printer RTS line to go on. If the printer RTS line goes off, the host must stop transmission and wait for it to go on again before sending any data. If the host input buffer is full, when receiving an incoming message from the printer, it must turn the printer CTS line off so that the printer stops transmitting data. To restart communication, the host turns the printer's CTS line on.

RXD - RX Data Line in RS232C serial interface. This line receives data from the host. The serial interface ignores received data when DSR is low.

Resident Character Set - permanently available in the printer.

Reversed - where characters are printed in white on a black background.

S

Stop bit - The bit which signals the end of data.

SVT - Standard Voltage Temperature

T

TXD - TX Data line in RS232C serial interface. This line is for XON/XOFF transmission from the printer to the host only. CTS must be high to enable transmission. The printer does not transmit data when RTS/CTS is selected.

U

Underscore - To draw a line under printed characters and spaces.

UL - Underwriters Laboratory.

Unidirectional print mode - where the printer prints from left to right only.

V

V - Volt

VA - Volt Ampere

X

XON/XOFF - A software protocol for controlling the flow of data between two communicating devices. By sending the XON (Transmit on) code, the receiving device informs the transmitter that it is ready to receive data. By sending the XOFF (transmit off) code, the receiver instructs the transmitter to stop sending data.

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