

OKIDATA®

Models

ML320 Epson/IBM
ML320 MICROLINE Standard

ML321 Epson/IBM
ML321 MICROLINE Standard

ML320 Turbo & ML321 Turbo
ML390 Turbo & ML391 Turbo

ML520 & ML521

ML590 & ML591

MICROLINE® Reference Manual

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Written and produced by the OKIDATA Publications Department. Please address any comments on this publication

- by mail to:
Publications Services Department
OKIDATA
532 Fellowship Road
Mount Laurel, NJ 08054-3405
- or by eMail to:
pubs@okidata.com

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How To Use this Manual

This Programmer's Guide/Reference Manual is a supplement to the manuals for the various model printers. It contains additional information on selecting printer drivers and on the printer commands, as well as interfacing specifications.

How the Manual is Organized

Command Summary

Tabular listings of the commands for each emulation, with references to the page in the manual on which the description for the command appears.

Chapter 1: Printer Drivers

Selecting printer drivers.

Chapters 2 through 12 –Commands

- Chapter 2: Character Set Commands
- Chapter 3: Character Size & Spacing Commands
- Chapter 4: Character Style Commands
- Chapter 5: Custom Character Commands
- Chapter 6: Graphics Commands for 9-Pin Printers
- Chapter 7: Graphics Commands for 24-Pin Printers
- Chapter 8: Horizontal Control Commands
- Chapter 9: Vertical Control Commands
- Chapter 10: Bar Code Commands for 9-Pin Printers
- Chapter 11: Bar Code Commands for 24-Pin Printers
- Chapter 12: Miscellaneous Commands

Appendix A: Interfacing

Pin-out diagrams for the parallel and serial interfaces. It also includes wiring diagrams for commonly used serial cable configurations.

Appendix B: Listing of Tables

Includes a complete listing of the tables in this manual.

Conventions Used in this Manual

The following conventions are used in the command chapters of this manual:

- The emulation(s) to which each command applies is given in parentheses at the end of the heading for the command. The emulations (IBM = IBM Proprinter, E = Epson FX, and ML = OKIDATA MICROLINE Standard) are described in Chapter 1.

For example:

Proportional Spacing Commands (IBM/E/ML)

- The printer models to which each command applies are given immediately below the command heading, preceded by a check mark (✓).

ML320 E/I, ML321 E/I = Models ML320 & ML321, Epson/IBM-Compatible

ML320 Std., ML321 Std. = Models ML320 & ML321, MICROLINE Standard Emulation

ML320T, ML321T = Models ML320 Turbo & ML321 Turbo

ML390T, ML391T = Models ML320 Turbo & ML321 Turbo

ML520, ML521 = Models ML520 & ML521

ML590, ML591 = Models ML590 and ML591

For example:

Proportional Spacing Commands (IBM/E/ML)

✓ ML320 E/I, ML321 E/I ✓ ML320T, ML321T ✓ ML520, ML521

✓ ML320 Std., ML321 Std. ✓ ML390T, ML391T ✓ ML590, ML591

- Text denoting lines of BASIC programming is set in the Courier font.

For example:

```
LPRINT CHR$(27); "[@";CHR$(4);CHR$(0);CHR$(0);CHR$(0);  
CHR$(34);CHR$(0)
```

- Notes, which contain important information that you should read, are set in italics.

For example:

Note: *If you send a location value outside the set left or right margin, this command will be ignored.*

Abbreviations & Acronyms

The following abbreviations and acronyms are used in this manual:

ASCII	American Standard Codes for Information Interchange
Cpi	Characters per inch
Cpl	Characters per line
CSF	Cut Sheet Feeder
Dec	Decimal
DLL	Down Line Loading
Dpi	Dots per inch
E	Epson FX Emulation
E/I	Epson/IBM Compatible Model
Hex	Hexadecimal
HSD	High Speed Draft
IBM	IBM Proprinter Emulation
ML	OKIDATA MICROLINE Standard Emulation
NLQ	Near Letter Quality
ROM	Read Only Memory
RAM	Random Access Memory
Std.	OKIDATA MICROLINE Standard Model
TOF	Top of Form
UTL	Utility

Command Summary

This summary is in four sections:

- IBM Commands
- Epson FX Commands
- Epson LQ Commands
- Okidata MICROLINE Standard Commands

Each section is arranged numerically by the decimal value for the ASCII command. The page number given in the last column refers you to the explanation of the command in this manual.

The printer models which include that particular command are listed in the third column:

- ▶ Models ML320 and ML321 incorporate either the Epson FX and IBM Proprinter emulations (designated as "E/I" in the table) or the OKIDATA MICROLINE Standard emulation (designated as "Std." in the table).

Note: *If you're not sure which version of the ML320 or ML321 printer you have, run the Self Test (hold LF button while turning on the printer), then look at the first line that prints: if you see EI, you have the Epson/IBM version; if you see OKI, you have the OKIDATA MICROLINE Standard version.*

- ▶ Models ML 320 Turbo, ML321 Turbo, ML520 and ML521 incorporate the IBM Proprinter, Epson FX and OKIDATA MICROLINE Standard emulations.

Models ML 390 Turbo, ML391 Turbo, ML590 and ML591 incorporate the IBM Proprinter, IBM Proprinter AGM, and Epson LQ emulations.

IBM Proprinter Commands

IBM Command: ASCII Decimal	Function	Applies to Model(s)	Page
BS 8	Backspace	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	69
HT 9	Execute horizontal tab	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	73
LF 10	Line feed (with carriage return)	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	87
VT 11	Vertical tab	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	94
FF 12	Form feed	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	87
CR 13	Carriage return	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	69
SO 14	Begin double width printing line by line	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	21

IBM Command: ASCII Decimal	Function	Applies to Model(s)	Page
SI 15	Select compressed pitch	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	16
DC1 17	Print suppress mode off	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	129
DC2 18	Select 10 cpi	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	15
DC4 20	End double width printing line by line	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	21
CAN 24	Cancel	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	125
ESC SI 27 15	Select 20 cpi	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	16
ESC DLE @ P _n A ₁ A ₂ P ₁ P ₂ P ₃ P ₄ 27 16 64 P _n A ₁ A ₂ P ₁ P ₂ P ₃ P ₄	Set multiple print positions	ML320T/321T, ML390T/391T, ML520/521, ML590/591	77
ESC DLE A m n ₁ ... n ₈ 27 16 65 m n ₁ ... n ₈	Select bar code type and size	ML320T/321T, ML520/521	101- 112
ESC DLE A m n ₁ ... n ₈ 27 16 65 m n ₁ ... n ₈	Select bar code type and size	ML390T/391T, ML590/591	113- 122
ESC DLE B m n [data] 27 16 66 m n [data]	Print bar code data	ML320T/321T, ML520/521	101- 112
ESC DLE B m n [data] 27 16 66 m n [data]	Print bar code data	ML390T/391T, ML590/591	113- 122
ESC DLE C P ₁ [data] 27 16 67 P ₁ [data]	Print Postnet bar code data	ML320T/321T, ML520/521	101, 112
ESC DLE C P ₁ [data] 27 16 67 P ₁ [data]	Print Postnet bar code data	ML390T/391T, ML590/591	113, 124
ESC DLE F P _{no} P _n L _p H _p 27 16 70 P _{no} P _n L _p H _p	Select character pitch/point size	ML320T/321T, ML390T/391T, ML590/591	19
ESC EM 1 27 25 49	Select Bin 1 of Dual-Bin CSF	ML390T/391T, ML590/591	126
ESC EM 2 27 25 50	Select Bin 2 of Dual-Bin CSF	ML390T/391T, ML590/591	126
ESC EM I 27 25 73	Insert Sheet (Cut Sheet Feeder)	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	126
ESC EM R 27 25 82	Eject sheet (Cut Sheet Feeder)	ML320/321, ML390T/391T, ML520/521, ML590/591	126
ESC SP n 27 32 n	Set intercharacter spacing	ML390T/391T, ML590/591	26

IBM Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC ! n 27 33 n	Select international character set	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	9
ESC # 0 27 35 48	Select HSD print mode	ML320/321 E/I, ML320T/321T, ML520/521	29
ESC \$ 27 36	Copy ROM character set to RAM character set	ML320/321 E/I, ML320T/321T, ML520/521	40
ESC % 4 n 27 37 52 n	Perform n/360" line feed	ML390T/391T, ML590/591	88
ESC % 5 n 27 37 53 n	Perform n/144" line feed	ML320/321 E/I, ML320T/321T, ML520/521, ML590/591	88
ESC % 8 n 27 37 56 n	Set line spacing to n/360"	ML390T/391T, ML590/591	92
ESC % 9 n 27 37 57 n	Set line spacing to n/144"	ML320/321 E/I, ML320T/321T, ML520/521	90
ESC % B n ₁ n ₂ n ₃ n ₄ 27 37 66 n ₁ n ₂ n ₃ n ₄	Indent from left margin	ML320/321 E/I, ML320T/321T, ML520/521	76
ESC % G 27 37 71	Italic printing on	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	35
ESC % H 27 37 72	Italic printing off	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	35
ESC * m n ₁ n ₂ [data] 27 42 n ₁ n ₂ [data]	Graphics select/print: <i>AGM only</i>	ML390T/391T, ML590/591	63
ESC - 0 27 45 48	Underline printing off	ML320/321 E/I, ML320T/321T, ML520/521, ML590/591	36
ESC - 1 27 45 49	Underline printing on	ML320/321 E/I, ML320T/321T, ML520/521, ML590/591	36
ESC 0 27 48	Set line spacing to 1/8"	ML320/321 E/I, ML320T/321T, ML390T/ML391T, ML520/521, ML590/591	90
ESC 1 27 49	Set line spacing to 7/72"	ML320/321 E/I, ML320T/321T, ML390T/ML391T, ML520/521, ML590/591	90
ESC 2 27 50	Set line feed stored by ESC A n	ML320/321 E/I, ML320T/321T, ML390T/ML391T, ML520/521, ML590/591	89

IBM Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC 3 n 27 51 n	Set line spacing to n/216"	ML320/321 E/I, ML320T/321T, ML520/521, ML590/591	90
ESC 3 n 27 51 n	Set line spacing to n/216" in PPR, or to n/180" in AGM	ML390T/ML391T	92
ESC 4 27 52	Set top of form	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	98
ESC 5 0 27 53 48	Auto line feed off	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	89
ESC 5 1 27 53 49	Auto line feed on	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	89
ESC 6 27 54	Select IBM Set II	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	5
ESC 7 27 55	Select IBM Set I	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	5
ESC 8 27 56	Paper-out sensor off	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	128
ESC 9 27 57	Paper-out sensor on	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	128
ESC : 27 58	Select 12 cpi	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	15
ESC = n ₁ n ₂ # a ₁ a ₂ a ₃ m ad ₁ ad ₂ id ₁ id ₂ d ₁ d ₂ d ₃ d ₄ d ₅ [data] 26 61 n ₁ n ₂ 35 a ₁ a ₂ a ₃ m ad ₁ ad ₂ id ₁ id ₂ d ₁ d ₂ d ₃ d ₄ d ₅ [data]	Down line load custome characters	ML590/591	47
ESC = c ₁ c ₂ m n a ₁ a ₂ [data] 27 61 c ₁ c ₂ m n a ₁ a ₂ [data]	Down line load characters	ML320/321 E/I, ML320T/321T, ML520/521, ML590/591	41
ESC ? m n 27 63 m n	Reassign graphics codes: <i>Applies to IBM AGM only</i>	ML390/391T, ML590/591	64
ESC A n 27 65 n	Set line spacing of n/72"	ML320/321 E/I, ML320T/321T, ML520/521, ML590/591	90
ESC A n 27 65 n	Set line spacing of n/72" in PPR, or to n/60" in AGM	ML390T/ML391T	91
ESC B NUL 27 66 0	Clear vertical tabs	ML320/321 E/I, ML320T/321T, ML520/521, ML590/591	94

IBM Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC B $n_1 n_2 \dots n_k$ NUL 27 66 $n_1 n_2 \dots n_k$ 0	Set vertical tabs	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	94
ESC C n 27 67 n	Set page length in lines.	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	85
ESC C NUL n 27 67 0 n	Set page length in inches.	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	85
ESC D NUL NUL 27 68 0 0	Clear horizontal tab settings	ML320/321 E/I, ML320T/321T, ML520/521, ML590/591	76
ESC D $n_1 n_2 \dots n_k$ NUL 27 68 $n_1 n_2 \dots n_k$ 0	Set horizontal tab	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521	73
ESC E 27 69	Emphasized printing on	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	36
ESC F 27 70	Emphasized printing off	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	36
ESC G 27 71	Enhanced printing on	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	36
ESC H 27 72	Enhanced printing off	ML320/321 E/I, ML320T/321T, ML390T/391T. ML520/521, ML590/591	36
ESC I n 27 73 n	Combined select font	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	31
ESC J n 27 74 n	Perform n/216" line feed	ML320/321 E/I, ML320T/321T, ML520/521, ML590/591	88
ESC J n 27 74 n	Perform n/216" (PPR) or n/180" (AGM) line feed	ML390T/391T	88
ESC K $L_n H_n$ [data] 27 75 $L_n H_n$ [data]	Begin single density graphics	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	54
ESC L $L_n H_n$ [data] 27 76 $L_n H_n$ [data]	Double density graphics	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	54
ESC N n 27 78 n	Skip over perforation on	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	99
ESC O 27 79	Skip over perforation off	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	99

IBM Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC P 0 27 80 48	Proportional spacing off	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	25
ESC P 1 27 80 49	Proportional spacing on	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	25
ESC Q ETX 27 81 3	Print suppress mode on	ML320 E/I, ML320T, ML520	129
ESC Q SYN 27 81 16	Print suppress mode on	ML321 E/I, ML321T, ML521	129
ESC Q # 27 81 23	Print suppress mode on	ML391T, ML591	129
ESC Q \$ 27 81 24	Print suppress mode on	ML390T, ML590	129
ESC R 27 82	Clear vertical tabs (resets to default horizontal tabs)	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	94
ESC S 0 27 83 48	Start superscript printing	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	20
ESC S 1 27 83 48	Start subscript printing	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	20
ESC T 27 84	Stop superscript/subscript printing	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	20
ESC U 0 27 85 48	Uni-directional printing off	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	82
ESC U 1 27 85 49	Uni-directional printing on	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	82
ESC V n 27 86 n	Set intercharacter spacing	ML320/321 E/I, ML320T/321T, ML520/521	26
ESC W 0 27 87 48	End double width printing	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	21
ESC W 1 27 87 49	Begin double width printing	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	21
ESC X n m 27 88 n m	Set left & right margins	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	69
ESC Y L _n H _n [data] 27 89 L _n H _n [data]	Double speed/ double density graphics	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	54

IBM Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC Z L _n H _n [data] 27 90 L _n H _n [data]	Quadruple density graphics	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	54
ESC [@ L _n H _n NUL NUL n ₁ n ₂ 27 91 64 L _n H _n 0 0 n ₁ n ₂	Set character width, line spacing and character height .	ML320/321 E/I, ML320T/321T, ML520/521, ML590/591	22
ESC [@ n ₁ n ₂ m ₁ m ₂ m ₃ m ₄ 27 91 64 n ₁ n ₂ m ₁ m ₂ m ₃ m ₄	Begin/end double height printing.	ML390T/391T	23
ESC [T L _n H _n NUL NUL H _{cp} L _{cp} NUL 27 91 84 L _n H _n 0 0 H _{cp} L _{cp} 0	Print from code page	ML320T/321T, ML390T/391T, ML520/521, ML590/591	11
ESC [\ 4 0 0 0 n ₁ n ₂ 27 91 92 52 48 48 48 n ₁ n ₂	Set vertical units for the line spacing command.	ML390T/391T	93
ESC [g n ₁ n ₂ m [data] 27 91 103 n ₁ n ₂ m [data]	Set graphics resolution	ML390T/391T, ML590/591	64
ESC [I L _n H _n H _{fid} L _{fid} H _{fwd} L _{fwd} f _a 27 91 108 L _n H _n H _{fid} L _{fid} H _{fwd} L _{fwd} f _a	Select font	ML390T/391T	32
ESC \ L _n H _n 27 92 L _n H _n	Print data from the All Characters Set	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	6
ESC] 27 93	Reverse line feed	ML320/321 E/I, ML320T/321T, ML520/521,	89
ESC ^ n 27 94 n	Print one character from the All Characters Set	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	7
ESC _ 0 27 95 48	End overscore printing	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	37
ESC _ 1 27 95 49	Begin overscore printing	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521, ML590/591	37
ESC d n ₁ n ₂ 27 100 n ₁ n ₂	Set right relative position	ML390T/391T, ML590/591	80
ESC e n ₁ n ₂ 27 101 n ₁ n ₂	Set left relative position	ML390T/391T, ML590/591	80
ESC g 27 103	Select 15 cpi	ML390T/391T, ML520/521, ML590/591	15
ESC i 0 27 105 48	Incremental printing off	ML390T/391T, ML320T/321T	82
ESC i 1 27 105 49	Incremental printing on	ML390T/391T, ML320T/321T	82
ESC j 27 106	Stop printing (deselect)	ML390T/391T, ML590/591	131
ESC k n 27 107	Specify typeface	ML390T/391T, ML590/591	30
ESC L _n H _n 27 108 L _n H _n	Set relative dot position	ML320T/321T, ML520/521	79

IBM Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC n P _n 27 110 P _n	Select Graphics Aspect Ratio: <i>PPR only</i>	ML390T/391T, ML590/591	65
ESC q n 27 113 n	Specify outline/shadow	ML390T/391T, ML590/591	38
ESC r n 27 114 n	Select color	ML590/591	130
ESC x 0 27 120 48	Select Utility print mode	ML390/391T	30
ESC x 1 27 120 49	Select LQ print mode	ML390/391T	30
ESC { n 27 123 n	Change emulation	ML320/321 E/I, ML320T/321T, ML520/521	125
ESC } NUL 27 125 0	Software I-Prime	ML320/321T,ML390/391T, ML520/521, ML590/591	131

Epson FX Commands

Epson FX Command: ASCII Decimal	Function	Applies to Model(s)	Page
BS 8	Backspace	ML320/321 E/I, ML320T/321T, ML520/521	69
HT 9	Execute horizontal tab	ML320/321 E/I, ML320T/321T, ML520/521	73
LF 10	Line feed (with carriage return)	ML320/321 E/I, ML320T/321T, ML520/521	87
VT 11	Vertical tab	ML320/321 E/I, ML320T/321T, ML520/521	94
FF 12	Form feed	ML320/321 E/I, ML320T/321T, ML520/521	87
CR 13	Carriage return	ML320/321 E/I, ML320T/321T, ML520/521	69
SO 14	Begin double width printing line by line	ML320/321 E/I, ML320T/321T, ML520/521	21
SI 15	Select compressed pitch	ML320/321 E/I, ML320T/321T, ML520/521	16
DC1 17	Print suppress mode off	ML320/321 E/I, ML320T/321T, ML520/521	129
DC2 18	Cancel 20 cpi	ML320/321 E/I, ML320T/321T, ML520/521	16
DC3 19	Print suppress mode on	ML320/321 E/I, ML320T/321T, ML520/521	129
DC4 20	End double width printing line by line	ML320/321 E/I, ML320T/321T, ML520/521	21
CAN 24	Cancel	ML320/321 E/I, ML320T/321T, ML520/521	125
ESC SO 27 14	Begin double width printing line by line	ML320/321 E/I, ML320T/321T, ML520/521	21
ESC SI 27 15	Select 20 cpi	ML320/321 E/I, ML320T/321T, ML520/521	16
ESC DLE @ P _n A ₁ A ₂ P ₁ P ₂ P ₃ P ₄ 27 16 64 P _n A ₁ A ₂ P ₁ P ₂ P ₃ P ₄	Set multiple print positions	ML320T/321T, ML520/521	77
ESC DLE A m n ₁ ... n ₈ 27 16 65 m n ₁ ... n ₈	Select bar code type and size	ML320T/321T, ML520/521	101- 112
ESC DLE B m n [data] 27 16 66 m n [data]	Print bar code data	ML320T/321T, ML520/521	101- 112
ESC DLE C P ₁ [data] 27 16 67 P ₁ [data]	Print Postnet bar code data	ML320T/321T, ML520/521	113, 124

Epson FX Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC EM I 27 25 73	Insert sheet (Cut Sheet Feeder)	ML320/321 E/I, ML320T/321T, ML520/521	126
ESC EM R 27 25 82	Eject sheet (Cut Sheet Feeder)	ML320/321 E/I, ML320T/321T, ML520/521	126
ESC SP n 27 32 n	Set intercharacter spacing	ML320/321 E/I, ML320T/321T, ML520/521	26
ESC ! n 27 33 n	Combined print mode	ML320/321 E/I, ML320T/321T, ML520/521	34
ESC # 27 35	Cancel MSB control	ML320/321 E/I, ML320T/321T, ML520/521	128
ESC \$ L _n H _n 27 36	Set absolute dot position	ML320/321 E/I, ML320T/321T, ML520/521	80
ESC % 0 27 37 48	Select standard character set	ML320/321 E/I, ML320T/321T, ML520/521	44
ESC % 1 27 37 49	Select custom character set	ML320/321 E/I, ML320T/321T, ML520/521	44
ESC % 5 n 27 37 53	Perform n/144" line feed	ML320/321 E/I, ML320T/321T, ML520/521	88
ESC % 9 n 27 37 57 n	Set line spacing to n/144"	ML320/321 E/I, ML320T/321T, ML520/521	90
ESC & NUL n ₁ n ₂ a [data] 27 38 0 n ₁ n ₂ a [data]	Down line load characters	ML320/321 E/I, ML320T/321T, ML520/521	43
ESC (0 27 40 48	Select HSD print mode	ML320/321 E/I, ML320T/321T, ML520/521	29
ESC (t 3 0 P _{n1} P _{n2} P _{n3} 27 40 116 51 48 P _{n1} P _{n2} P _{n3}	Assign code page	ML320/321T	12
ESC * m L _n H _n [data] 27 42 m L _n H _n [data]	Graphics select/print	ML320/321 E/I, ML320T/321T, ML520/521	55
ESC - 0 27 45 48	Underline printing off	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521	36
ESC - 1 27 45 49	Underline printing on	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521	36
ESC / n 27 47 n	Select vertical tab channel	ML320/321 E/I, ML320T/321T, ML520/521	95
ESC 0 27 48	Set line spacing to 1/8"	ML320/321 E/I, ML320T/321T, ML520/521	90

Epson FX Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC 1 27 49	Set line spacing to 7/72"	ML320/321 E/I, ML320T/321T, ML520/521	90
ESC 2 27 50	Set line spacing to 1/6"	ML320/321 E/I, ML320T/321T, ML520/521	90
ESC 3 n 27 51 n	Set line spacing to n/216"	ML320/321 E/I, ML320T/321T, ML520/521	90
ESC 4 27 52	Italic printing on	ML320/321 E/I, ML320T/321T, ML520/521	35
ESC 5 27 53	Italic printing off	ML320/321 E/I, ML320T/321T, ML520/521	35
ESC 6 27 54	Permit printing upper range control codes	ML320/321 E/I, ML320T/321T, ML520/521	13
ESC 7 27 55	Cancel printing upper range control codes	ML320/321 E/I, ML320T/321T, ML520/521	13
ESC 8 27 56	Paper-out sensor off	ML320/321 E/I, ML320T/321T, ML520/521	128
ESC 9 27 57	Paper-out sensor on	ML320/321 E/I, ML320T/321T, ML520/521	128
ESC : NUL NUL NUL 27 58 0 0 0	Copy ROM character set to RAM character set	ML320/321 E/I, ML320T/321T	43
ESC : NUL n NUL 27 58 0 n 0	Copy ROM character set to RAM character set	ML520/521	43
ESC < 27 60	Print uni-directional for one line only	ML320/321 E/I, ML320T/321T, ML520/521	82
ESC = 27 61	Set Most Significant Bit (MSB) to zero	ML320/321 E/I, ML320T/321T, ML520/521	128
ESC > 27 62	Set MSB to 1	ML320/321 E/I, ML320T/321T, ML520/521	128
ESC ? m n 27 63 m n	Reassign graphics	ML320/321 E/I, ML320T/321T, ML520/521	57
ESC @ 27 64	Initialize printer	ML320/321 E/I, ML320T/321T, ML520/521	127
ESC A n 27 65 n	Set line spacing to n/72"	ML320/321 E/I, ML320T/321T, ML520/521	90

Epson FX Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC B NUL 27 66 0	Clear vertical tabs	ML320/321 E/I, ML320T/321T, ML520/521	94
ESC B n ₁ n ₂ ... n _k NUL 27 66 n ₁ n ₂ ... n _k 0	Set vertical tabs	ML320/321 E/I, ML320T/321T, ML520/521	94
ESC C n 27 67 n	Set page length in lines.	ML320/321 E/I, ML320T/321T, ML520/521	85
ESC C NUL n 27 67 0 n	Set page length in inches.	ML320/321 E/I, ML320T/321T, ML520/521	85
ESC D NUL NUL 27 68 0 0	Clear horizontal tab settings	ML320/321 E/I, ML320T/321T, ML520/521	76
ESC D n ₁ n ₂ ... n _k NUL 27 68 n ₁ n ₂ ... n _k 0	Set horizontal tab	ML320/321 E/I, ML320T/321T, ML520/521	73
ESC E 27 69	Emphasized printing on	ML320/321 E/I, ML320T/321T, ML520/521	36
ESC F 27 70	Emphasized printing off	ML320/321 E/I, ML320T/321T, ML520/521	36
ESC G 27 71	Enhanced printing on	ML320/321 E/I, ML320T/321T, ML520/521	36
ESC H 27 72	Enhanced printing off	ML320/321 E/I, ML320T/321T, ML520/521	36
ESC I 0 27 73 48	Cancel printing upper range control codes	ML320/321 E/I, ML320T/321T, ML520/521	13
ESC I 1 27 73 49	Permit printing upper range control codes	ML320/321 E/I, ML320T/321T, ML520/521	13
ESC K L _n H _n [data] 27 75 L _n H _n [data]	Begin single density graphics	ML320/321 E/I, ML320T/321T, ML520/521	54
ESC L L _n H _n [data] 27 76 L _n H _n [data]	Double density graphics	ML320/321 E/I, ML320T/321T, ML520/521	54
ESC M 27 77	Select 12 cpi	ML320/321 E/I, ML320T/321T, ML520/521	15
ESC N n 27 78 n	Skip over perforation on	ML320/321 E/I, ML320T/321T, ML520/521	99
ESC O 27 79	Skip over perforation off	ML320/321 E/I, ML320T/321T, ML520/521	99
ESC P 27 80	Select 10 cpi	ML320/321 E/I, ML320T/321T, ML520/521	15
ESC Q n 27 81 n	Set right margin	ML320/321 E/I, ML320T/321T, ML520/521	70
ESC R n 27 82 n	Select international character set	ML320/321 E/I, ML320T/321T, ML520/521	10
ESC S 0 27 83 48	Start superscript printing	ML320/321 E/I, ML320T/321T, ML520/521	20
ESC S 1 27 83 49	Start subscript printing	ML320/321 E/I, ML320T/321T, ML520/521	20
ESC T 27 84	Stop superscript/ subscript printing	ML320/321 E/I, ML320T/321T, ML520/521	20

Epson FX Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC U 0 27 85 48	Uni-directional printing off	ML320/321 E/I, ML320T/321T, ML520/521	82
ESC U 1 27 85 49	Uni-directional printing on	ML320/321 E/I, ML320T/321T, ML520/521	82
ESC W 0 27 88 48	End double width printing	ML320/321 E/I, ML320T/321T, ML520/521	21
ESC W 1 27 88 49	Begin double width printing	ML320/321 E/I, ML320T/321T, ML520/521	21
ESC Y L _n H _n [data] 27 89 L _n H _n [data]	Double speed/double density graphics	ML320/321 E/I, ML320T/321T, ML520/521	54
ESC Z L _n H _n [data] 27 90 L _n H _n [data]	Quadruple density graphics	ML320/321 E/I, ML320T/321T, ML520/521	54
ESC \ L _n H _n 27 92 L _n H _n	Set relative dot position	ML320/321 E/I, ML320T/321T, ML520/521	80
ESC ^ m L _n H _n [data] 27 94 m L _n H _n [data]	Select 9-pin graphics printing	ML320/321 E/I, ML320T/321T, ML520/521	57
ESC a 0 27 97 48	Left justification	ML320/321 E/I, ML320T/321T, ML520/521	83
ESC a 1 27 97 49	Center justification	ML320/321 E/I, ML320T/321T, ML520/521	83
ESC a 2 27 97 50	Right justification	ML320/321 E/I, ML320T/321T, ML520/521	83
ESC a 3 27 97 51	Full (left and right) justification	ML320/321 E/I, ML320T/321T, ML520/521	83
ESC b m n ₁ n ₂ ... n _k NUL 27 98 m n ₁ n ₂ ... n ₀	Set vertical format unit (VFU)	ML320/321 E/I, ML320T/321T, ML520/521	95
ESC g 27 103	Select 15 cpi	ML520/521	15
ESC i 0 27 105 48	Incremental printing off	ML320T/321T	82
ESC i 1 27 105 49	Incrementatl printing on	ML320T/321T	82
ESC k n 27 107 n	Select NLQ print mode	ML320/321 E/I, ML320T/321T, ML520/521	29
ESC l n 27 108 n	Set left margin	ML320/321 E/I, ML320T/321T, ML520/521	70
ESC p 0 27 112 48	Proportional spacing off	ML320/321 E/I, ML320T/321T, ML520/521	25
ESC p 1 27 112 49	Proportional spacing on	ML320/321 E/I, ML320T/321T, ML520/521	25
ESC s 0 27 115 48	Half-speed printing off	ML320/321 E/I, ML320T/321T, ML520/521	127
ESC s 1 27 115 49	Half-speed printing on	ML320/321 E/I, ML320T/321T, ML520/521	127

Epson FX Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC t 0 27 116 48	Select Epson Set 1	ML320/321 E/I, ML320T/321T, ML520/521	7
ESC t 1 27 116 49	Select Epson Set 2	ML320/321 E/I, ML320T/321T, ML520/521	7
ESC w 0 27 119 48	End double height printing	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521	21
ESC w 1 27 119 49	Begin double height printing	ML320/321 E/I, ML320T/321T, ML390T/391T, ML520/521	21
ESC x 0 27 120 48	Select Utility print mode	ML320/321 E/I, ML320T/321T, ML520/521	29
ESC x 1 27 120 49	Select NLQ print mode	ML320/321 E/I, ML320T/321T, ML520/521	29
ESC { n 27 123 n	Change emulation	ML320/321 E/I, ML320T/321T, ML520/521	125
ESC } NUL 27 125 0	Software I-Prime	ML520/521	131
DEL 127	Delete one character	ML320/321 E/I, ML320T/321T, ML520/521	127

Epson LQ Commands

Epson LQ Command: ASCII Decimal	Function	Applies to Model(s)	Page
BS 8	Backspace	ML390T/ML391T, ML590/591	69
HT 9	Execute horizontal tab	ML390T/391T, ML590/591	73
LF 10	Line feed (with carriage return)	ML390T/391T, ML590/591	87
VT 11	Vertical tab	ML390T/391T, ML590/591	94
FF 12	Form feed	ML590/591	87
CR 13	Carriage return	ML390T/391T, ML590/591	69
SO 14	Begin double width printing line by line	ML390T/391T, ML590/591	21
SI 15	Select compressed pitch	ML390T/391T, ML590/591	16
DC1 17	Print suppress mode off	ML390T/391T, ML590/591	129
DC2 18	Cancel 20 cpi	ML390T/391T, ML590/591	16
DC3 19	Print suppress mode on	ML390T/391T, ML590/591	129
DC4 20	End double width printing line by line	ML390T/391T, ML590/591	21
CAN 24	Cancel	ML390T/391T, ML590/591	125
ESC SO 27 14	Begin double width printing line by line	ML390T/391T, ML590/591	21
ESC SI 27 15	Select 20 cpi	ML390T/391T, ML590/591	16
ESC DLE @ P _n A ₁ A ₂ P ₁ P ₂ P ₃ P ₄ 27 16 64 P _n A ₁ A ₂ P ₁ P ₂ P ₃ P ₄	Set multiple print positions	ML390T/391T, ML590/591	77
ESC DLE A m n ₁ ... n ₈ 27 16 65 m n ₁ ... n ₈	Select bar code type and size	ML390T/391T, ML590/591	113- 122
ESC DLE B m n [data] 27 16 66 m n [data]	Print bar code data	ML390T/391T, ML590/591	113- 122
ESC DLE C P ₁ [data] 27 16 67 P ₁ [data]	Print Postnet bar code data	ML390T/391T, ML590/591	113, 124
ESC DLE G n 1 27 16 71 n 49	Set/reset raster graphics	ML390/391T	66
ESC EM 1 27 25 49	Select Bin 1 of Dual-Bin CSF	ML590/591	126
ESC EM 2 27 25 50	Select Bin 2 of Dual-Bin CSF	ML590/591	126

Epson LQ Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC EM I 27 25 73	Insert sheet (Cut Sheet Feeder)	ML390T/391T	126
ESC EM R 27 25 82	Eject sheet (Cut Sheet Feeder)	ML390T/391T	126
ESC US 0 27 31 48	End double height printing	ML390T/391T, ML590/591	21
ESC US 1 27 31 49	Begin double height printing	ML390T/391T, ML590/591	21
ESC SP n 27 32 n	Set character spacing.	ML390T/391T, ML590/591	26
ESC ! n 27 33 n	Combined print mode	ML390T/391T, ML590/591	34
ESC # 27 35	Cancel MSB control	ML390T/391T, ML590/591	128
ESC \$ L _n H _n 27 36 L _n H _n	Set absolute dot position	ML390T/391T, ML590/591	80
ESC % 0 27 37 48	Select standard character set	ML390T/391T , ML590/591	51
ESC % 1 27 37 49	Select custom character set	ML390T/391T , ML590/591	51
ESC % 5 n 27 37 53 n	Perform n/144" line feed	ML590/591	88
ESC & m n ₁ n ₂ d ₀ d ₁ d ₂ [data] 27 38 m n ₁ n ₂ d ₀ d ₁ d ₂ [data]	Down line load characters	ML390T/391T	50
ESC & NUL m n ₁ n ₂ d ₀ d ₁ d ₂ [data] 27 38 0 m n ₁ n ₂ d ₀ d ₁ d ₂ [data]	Down line load characters	ML590/591	50
ESC (- L _n H _n P _n D ₁ D ₂ 27 40 45 L _n H _n P _n D ₁ D ₂	Select score style: underline, overscore, or strike through	ML390T/391T	37
ESC (C 2 0 L _p H _p 27 40 67 40 48 L _p H _p	Set Page Length	ML390T/391T	86
ESC (G L _n H _n P _n 27 40 71 L _n H _n P _n	Select graphics mode	ML390T/391T, ML590/591	65
ESC (U L _n H _n P _n 27 40 85 L _n H _n P _n	Set increment of movement	ML390T/391T	130
ESC (V L _n H _n L _p H _p 27 40 86 L _n H _n L _p H _p	Absolute position line feed	ML390T/391T	98
ESC (^ L _n H _n [data] 27 40 94 L _n H _n [data]	Select All Character Set	ML390T/391T, ML590/591	6
ESC (c 2 0 L _t H _t L _b H _b 27 40 99 50 48 H _n L _t H _t L _b H _b	Set Page Format	ML390T/391T	98
ESC (t L _n H _n P _{n1} P _{n2} P _{n3} 27 40 116 L _n H _n P _{n1} P _{n2} P _{n3}	Select character table	ML390T/391T, ML590/591	13
ESC (v L _n H _n L _p H _p 27 40 118 L _n H _n L _p H _p	Relative position line feed	ML390T/391T	97
ESC * m n ₁ n ₂ [data] 27 42 n ₁ n ₂ [data]	Graphics select/print	ML390T/391T, ML590/591	63

Epson LQ Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC + n 27 43 n	Set line spacing to n/360"	ML390T/391T, ML590/591	92
ESC - 0 27 45 48	Underline printing off	ML390T/391T, ML590/591	36
ESC - 1 27 45 49	Underline printing on	ML390T/391T, ML590/591	36
ESC . P _c P _v P _h P _m L _n H _n [data] 27 46 P _c P _v P _h P _m L _n H _n [data]	Print Raster Graphics	ML390T/391T, ML590/591	66
ESC / n 27 47 n	Select vertical tab channel.	ML390T/391T. ml590/591	95
ESC 0 27 48	Set line spacing to 1/8"	ML390T/ML391T	90
ESC 2 27 50	Set line spacing to 1/6"	ML390T/ML391T, ML590/591	90
ESC 3 n 27 51 n	Set line spacing to n/180"	ML390T/ML391T	92
ESC 3 n 27 51 n	Set line spacing to n/216"	ML590/591	92
ESC 4 27 52	Italic printing on	ML390T/391T	35
ESC 5 27 53	Italic printing off	ML390T/391T	35
ESC 6 27 54	Permit printing upper range control codes	ML390T/391T, ML590/591	13
ESC 7 27 55	Cancel printing upper range control codes	ML390T/391T , ML590/591	13
ESC 8 27 56	Paper-out sensor off	ML390T/391T, ML590/591	128
ESC 9 27 57	Paper-out sensor on	ML390T/391T, ML590/591	128
ESC : NUL n NUL 27 58 0 n 0	Copy ROM character set to RAM character set	ML390T, ML391T, ML590/591	49
ESC < 27 60	Print uni-directional for one line only	ML390T, ML391T, ML590/591	82
ESC = 27 61	Set Most Significant Bit (MSB) to zero	ML390T/391T, ML590/591	128
ESC > 27 62	Set MSB to 1	ML390T/391T, ML590/591	128
ESC ? m n 27 63 m n	Reassign graphics	ML390T, ML391T, ML590/591	64
ESC @ 27 64	Initialize printer	ML390T/391T, ML590/591	127
ESC A n 27 65 n	Set line spacing to n/60"	ML390T/ML391T, ML590/591	91
ESC B NUL 27 66 0	Clear vertical tabs	ML590/591	94

Epson LQ Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC B n ₁ n ₂ ... n _k NUL 27 66 n ₁ n ₂ ... n _k 0	Set vertical tabs	ML390T/391T, ML590/591	94
ESC C n 26 67 n	Set page length in lines.	ML390T/391T, ML590/591	85
ESC C NUL n 27 67 0 n	Set page length in inches.	ML390T/391T, ML590/591	85
ESC D NUL NUL 27 68 0 0	Clear horizontal tab settings.	ML390T/391T, ML590/591	76
ESC D n ₁ n ₂ ... n _k NUL 27 68 n ₁ n ₂ ... n _k 0	Set horizontal tab	ML590/591	73
ESC E 27 69	Emphasized printing on	ML390T/391T, ML590/591	36
ESC F 27 70	Emphasized printing off	ML390T/391T, ML590/591	36
ESC G 27 71	Enhanced printing on	ML390T/391T, ML590/591	36
ESC H 27 72	Enhanced printing off	ML390T/391T, ML590/591	36
ESC J n 27 74 n	Execute n/180" line feed.	ML390T/391T	88
ESC K L _n H _n [data] 27 75 L _n H _n [data]	Begin single density graphics	ML390T/391T, ML590/591	62
ESC L L _n H _n [data] 27 76 L _n H _n [data]	Double density graphics	ML390T/391T, ML590/591	62
ESC M 27 77	Select 12 cpi	ML390T/391T, ML590/591	15
ESC N n 27 78 n	Skip over perforation on	ML390T/391T, ML590/591	99
ESC O 27 79	Skip over perforation off	ML390T/391T, ML590/591	99
ESC P 27 80	Select 10 cpi	ML390T/391T, ML590/591	15
ESC Q n 27 81 n	Set right margin	ML390T/391T, ML590/591	70
ESC R n 27 82 n	Select international character/Code Page set	ML390T/391T, ML590/591	10
ESC S 0 27 83 48	Start superscript printing	ML390T/391T, ML590/591	20
ESC S 1 27 83 49	Start subscript printing	ML390T/391T, ML590/591	20
ESC T 27 84	Stop superscript/ subscript printing	ML390T/391T, ML590/591	20
ESC U 0 27 85 48	Uni-directional printing off	ML390T/391T, ML590/591	82
ESC U 1 27 85 49	Uni-directional printing on	ML390T/391T, ML590/591	82

Epson LQ Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC W 0 27 87 48	End double width printing	ML390T/391T, ML590/591	21
ESC W 1 27 87 49	Begin double width printing	ML390T/391T, ML590/591	21
ESC X p P _n L _p H _p 27 88 70 P _n L _p H _p	Select character pitch/point size	ML390T/391T, ML590/591	17
ESC Y L _n H _n [data] 27 89 L _n H _n [data]	Double speed/double density graphics	ML390T/391T	62
ESC Z L _n H _n [data] 27 90 L _n H _n [data]	Quadruple density graphics	ML390T/391T	62
ESC [n 27 91 n	Set line spacing to n/360"	ML390T/391T, ML590/591	92
ESC \ L _n H _n 27 92 L _n H _n	Set relative dot position	ML390T/391T, ML590/591	80
ESC] n 27 93 n	Perform n/360" line feed	ML390T/391T, ML590/591	88
ESC a 0 27 97 48	Left justification	ML390T/391T, ML590/591	83
ESC a 1 27 97 49	Center justification	ML390T/391T, ML590/591	83
ESC a 2 27 97 50	Right justification	ML390T/391T, ML590/591	83
ESC a 3 27 97 51	Full (left and right) justification	ML390T/391T, ML590/591	83
ESC b m n ₁ n ₂ ... n _k NUL 27 98 m n ₁ n ₂ ... n _k 0	Set vertical format unit (VFU)	ML390T/391T, ML590/591	95
ESC c L _p H _p 27 99 L _p H _p	Set Horizontal Motion Index	ML390T/391T, ML590/591	27
ESC g 27 103	Select 15 cpi	ML390T/391T, ML590/591	15
ESC i 0 27 105 48	Incremental printing off	ML390T/391T	82
ESC i 1 27 105 49	Incremental printing on	ML390T/391T	82
ESC j n 27 106 n	n/180" reverse line feed	ML390T/391T, ML590/591	89
ESC k n 27 107 n	Specify typeface	ML390T/391T	30
ESC l n 27 108 n	Set left margin	ML390T/391T, ML590/591	70
ESC l 0 27 73 48	Cancel printing upper range control codes	ML390/391T, ML590/591	13
ESC l 1 27 73 49	Permit printing upper range control codes	ML390/391T, ML590/591	13
ESC n P _n 27 110 P _n	Select Graphics Aspect Ratio	ML390/391T, ML590/591	65

Epson LQ Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC p 0 27 112 48	Proportional spacing off	ML390T/391T, ML590/591	25
ESC p 1 27 112 49	Proportional spacing on	ML390T/391T, ML590/591	25
ESC q n 27 113 n	Specify outline/shadow	ML390T/391T, ML590/591	38
ESC r n 27 114 n	Select color	ML590/591	130
ESC s 0 27 115 48	Half-speed printing off	ML390T/ML391T, ML590/591	127
ESC s 1 27 115 49	Half-speed printing on	ML390T/ML391T, ML590/591	127
ESC t 0 27 116 48	Select Epson Set 1	ML390T/391T , ML590/591	7
ESC t 1 27 116 49	Select Epson Set 2	ML390T/391T , ML590/591	7
ESC t 2 27 116 50	Select Custom Character Set	ML390T/391T , ML590/591	51
ESC x n 27 120 n	Specify print quality	ML390T/391T, ML590/591	29
ESC } NUL 27 125 0	Software I-Prime	ML390/391T, ML590/591	131
DEL 127	Delete one character	ML390T/ML391T, ML590/591	127

Okidata MICROLINE Standard Commands

ML Standard Command: ASCII Decimal	Function	Applies to Model(s)	Page
ETX 3	Select graphics print mode	ML320/321 Std., ML320T/321T, ML520/521	59
ETX STX 3 2	End graphics print mode	ML320/321 Std., ML320T/321T, ML520/521	59
ETX ETX 3 3	Store graphics data in one dot column buffer	ML320/321 Std., ML320T/321T, ML520/521	60
ETX LF 3 10	Graphics line feed with carriage return, text setting	ML320/321 Std., ML320T/321T, ML520/521	60
ETX SO 3 14	Graphics line feed with carriage return, graphics setting	ML320/321 Std., ML320T/321T, ML520/521	60
ETX DC2 3 18	Graphics line feed without carriage return, text setting	ML320/321 Std., ML320T/321T, ML520/521	60
ETX DC4 3 20	Graphics line feed without carriage return, graphics setting	ML320/321 Std., ML320T/321T, ML520/521	60
BS 8	Backspace	ML320/321 Std., ML320T/321T, ML520/521	69
HT 9	Execute horizontal tab	ML320/321 Std., ML320T/321T, ML520/521	73
LF 10	Line feed (with carriage return)	ML320/321 Std., ML320T/321T, ML520/521	87
VT 11	Vertical tab	ML320/321 Std., ML320T/321T, ML520/521	94
VT n 11 n	Execute VFU vertical tab	ML320/321 Std., ML320T/321T, ML520/521	96
FF 12	Form feed	ML320/321 Std., ML320T/321T, ML520/521	87
CR 13	Carriage return	ML320/321 Std., ML320T/321T, ML520/521	69
DC1 17	Print suppress mode off	ML320/321 Std., ML320T/321T, ML520/521	129
DC3 19	Print suppress mode on	ML320/321 Std., ML320T/321T, ML520/521	129
DC4 SP1...SP1 n ... SP...SP ? 20 32...32 n ... 32...32 63	Set vertical format unit (VFU)	ML320/321 Std., ML320T/321T, ML520/521	96
CAN 24	Cancel	ML320/321 Std., ML320T/321T, ML520/521	125
ESC ETX x ₁ y ₁ z ₁ w ₁ ... x ₁₆ y ₁₆ z ₁₆ w ₁₆ CR 27 3 x ₁ y ₁ z ₁ w ₁ ... x ₁₆ y ₁₆ z ₁₆ w ₁₆ 13	Set horizontal tab by dot columns	ML320/321 Std., ML320T/321T, ML520/521	74
ESC ETX 0 CR 27 3 48 13	Clear horizontal tabs set by dot columns	ML320/321 Std., ML320T/321T, ML520/521	76
ESC HT CR 27 9 13	Clear horizontal tab settings	ML320/321 Std., ML320T/321T, ML520/521	76

ML Standard Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC HT $x_1 y_1 z_1 \dots x_{16} y_{16} z_{16}$ CR 27 9 $x_1 y_1 z_1 \dots x_{16} y_{16} z_{16}$ 13	Set horizontal tab by characters	ML320/321 Std., ML320T/321T, ML520/521	74
ESC LF 27 10	Reverse feed	ML320/321 Std., ML320T/321T, ML520/521	89
ESC VT $H_n L_n$ 27 11 $H_n L_n$	Skip down selected number of lines	ML320/321 Std., ML320T/321T, ML520/521	96
ESC DLE @ $P_n a_1 a_2 P_1 P_2 P_3 P_4$ 27 16 64 $P_n a_1 a_2 P_1 P_2 P_3 P_4$	Set multiple print positions	ML320T/321T, ML520/521	77
ESC DLE A $m n_1 \dots n_8$ 27 16 65 $m n_1 \dots n_8$	Select bar code type and size	ML320T/321T, ML520/521	101-112
ESC DLE B $m n$ [data] 27 16 66 $m n$ [data]	Print bar code data	ML320T/321T, ML520/521	101-112
ESC DLE C P_1 [data] 27 16 67 P_1 [data]	Print Postnet bar code data	ML320T/321T, ML520/521	101, 112
ESC DC2 27 18	Graphics line feed without carriage return)	ML320/321 Std., ML320T/321T, ML520/521	87
ESC CAN 27 24	Initialize printer	ML320/321 Std., ML320T/321T, ML520/521	127
ESC US 0 27 31 48	End double height printing	ML320/321 Std., ML320T/321T, ML520/521	21
ESC US 1 27 31 49	Begin double height printing	ML320/321 Std., ML320T/321T, ML520/521	21
ESC ! n 27 33 n	Select international character set	ML320/321 Std., ML320T/321T, ML520/521	9
ESC ! * 27 33 42	Italics printing off	ML320/321 Std., ML320T/321T, ML520/521	35
ESC ! / 27 33 47	Italics printing on	ML320/321 Std., ML320T/321T, ML520/521	35
ESC ! 0 27 33 48	Select standard character set	ML320/321 Std., ML320T/321T, ML520/521	8
ESC ! 1 27 33 49	Select block graphics character set	ML320/321 Std., ML320T/321T	8
ESC ! 2 27 33 50	Select line character set	ML320/321 Std., ML320T/321T, ML520/521	8
ESC # 0 27 35 48	Select HSD print mode	ML320/321 Std., ML320T/321T, ML520/521	29
ESC # 3 27 35 51	Select 20 cpi	ML320/321 Std., ML320T/321T, ML520/521	17
ESC # Q 27 35 81	Double speed/ quadruple density graphics	ML320/321 Std., ML320T/321T, ML520/521	55
ESC \$ 27 36	Copy ROM character set to RAM character set	ML320/321 Std., ML320T/321T, ML520/521	45
ESC % 5 n 27 37 53 n	Perform $n/144$ " feed	ML320/321 Std., ML320T/321T, ML520/521	88
ESC % 9 n 27 37 57 n	Set spacing to $n/144$ "	ML320/321 Std., ML320T/321T, ML520/521	90

ML Standard Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC % A m n ₁ ... n ₁₁ 27 37 65 m n ₁ ... n ₁₁	Down load ascender characters	ML320/321 Std., ML320T/321T, ML520/521	45
ESC % B n ₁ n ₂ n ₃ n ₄ 27 37 66 n ₁ n ₂ n ₃ n ₄	Indent from left margin	ML320/321 Std., ML320T/321T, ML520/521	76
ESC % C n ₁ n ₂ n ₃ 27 37 67 n ₁ n ₂ n ₃	Set left margin	ML320/321 Std., ML320T/321T, ML520/521	72
ESC % D m n ₁ ... n ₁₁ 27 37 68 m n ₁ ... n ₁₁	Down load descender characters	ML320/321 Std., ML320T/321T, ML520/521	45
ESC % E n ₁ n ₂ n ₃ n ₄ 27 37 69 n ₁ n ₂ n ₃ n ₄	Move to right	ML320/321 Std., ML320T/321T, ML520/521	81
ESC % F n ₁ n ₂ n ₃ n ₄ 27 37 70 n ₁ n ₂ n ₃ n ₄	Move to left	ML320/321 Std., ML320T/321T, ML520/521	81
ESC % R n ₁ n ₂ n ₃ n ₄ 27 37 82 n ₁ n ₂ n ₃ n ₄	Set right margin	ML320/321 Std., ML320T/321T, ML520/521	72
ESC % S 0 27 37 83 48	Skip over perforation off	ML320/321 Std., ML320T/321T, ML520/521	100
ESC % S 1 27 37 83 49	Skip over perforation on	ML320/321 Std., ML320T/321T, ML520/521	100
ESC & n ₁ n ₂ n ₃ n ₄ : 27 38 n ₁ n ₂ n ₃ n ₄ 58	Select print features	ML320/321 Std., ML320T/321T, ML520/521	24
ESC * n ₁ n ₂ : 27 42 n ₁ n ₂ 58	Select graphics mode	ML320/321 Std., ML320T/321T, ML520/521	57
ESC - 27 45	Uni-directional printing on	ML320/321 Std., ML320T/321T, ML520/521	82
ESC 0 27 48	Select Utility print mode	ML320/321 Std., ML320T/321T, ML520/521	29
ESC 1 27 49	Select NLQ print mode	ML320/321 Std., ML320T/321T, ML520/521	29
ESC 2 27 50	Select DLL in Utility mode	ML320/321 Std., ML320T/321T, ML520/521	45
ESC 3 27 51	Select NLQ Gothic font	ML320/321 Std., ML320T/321T, ML520/521	29
ESC 5 27 53	Set top of form	ML320/321 Std., ML320T/321T, ML520/521	98
ESC 6 27 54	Set spacing to 1/6"	ML320/321 Std., ML320T/321T, ML520/521	90
ESC 7 27 55	Select DLL NLQ mode	ML320/321 Std., ML320T/321T, ML520/521	45
ESC 8 27 56	Set spacing to 1/8"	ML320/321 Std., ML320T/321T, ML520/521	90
ESC < 27 60	Half-speed printing on	ML320/321 Std., ML320T/321T, ML520/521	127
ESC = 27 61	Uni-directional printing off	ML320/321 Std., ML320T/321T, ML520/521	82
ESC > 27 62	Half-speed printing off	ML320/321 Std., ML320T/321T, ML520/521	127

ML Standard Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC ? n : 27 63 n 58	Carriage return/feed selection	ML320/321 Std., ML320T/321T, ML520/521	87
ESC C 27 67	Underline printing on	ML320/321 Std., ML320T/321T, ML520/521	36
ESC D 27 68	Underline printing off	ML320/321 Std., ML320T/321T, ML520/521	36
ESC E 0 27 69 48	Paper-out sensor on	ML320/321 Std., ML320T/321T, ML520/521	128
ESC E 1 27 69 49	Paper-out sensor off	ML320/321 Std., ML320T/321T, ML520/521	128
ESC F H _n L _n 27 70 H _n L _n	Page length set in lines	ML320/321 Std., ML320T/321T, ML520/521	85
ESC G H _n L _n 26 71 H _n L _n	Page length set in inches	ML320/321 Std., ML320T/321T, ML520/521	85
ESC H 27 72	Enhanced printing on	ML320/321 Std., ML320T/321T, ML520/521	36
ESC J 27 74	Start superscript printing	ML320/321 Std., ML320T/321T, ML520/521	20
ESC K 27 75	Stop superscript printing	ML320/321 Std., ML320T/321T, ML520/521	20
ESC L 27 76	Start subscript printing	ML320/321 Std., ML320T/321T, ML520/521	20
ESC M 27 77	Stop subscript printing	ML320/321 Std., ML320T/321T, ML520/521	20
ESC N n 27 78 n	Set intercharacter spacing	ML320/321 Std., ML320T/321T, ML520/521	26
ESC P 27 80	Single density graphics	ML320/321 Std., ML320T/321T, ML520/521	55
ESC Q 27 81	Single density graphics	ML320/321 Std., ML320T/321T, ML520/521	55
ESC R 27 82	Double density graphics	ML320/321 Std., ML320T/321T, ML520/521	55
ESC S 27 83	Insert sheet (Cut Sheet Feeder)	ML320/321 Std., ML320T/321T, ML520/521	126
ESC T 27 84	Emphasized printing on	ML320/321 Std., ML320T/321T, ML520/521	36
ESC V 27 86	Eject sheet (Cut Sheet Feeder)	ML320/321 Std., ML320T/321T, ML520/521	126
ESC Y 27 89	Proportional spacing on	ML320/321 Std., ML320T/321T, ML520/521	25
ESC Z 27 90	Proportional spacing off	ML320/321 Std., ML320T/321T, ML520/521	25
ESC [T L _n H _n NUL NUL H _{cp} L _{cp} NUL 27 91 84 L _n H _n 0 0 H _{cp} L _{cp} 0	Print from code page	ML320T/321T, ML520/521	11
ESC g 27 103	Select 15 cpi	ML520/521	15

ML Standard Command: ASCII Decimal	Function	Applies to Model(s)	Page
ESC I 0 27 105 48	Incremental printing on	ML320/321T	82
ESC I 1 27 105 49	Incremental printing off	ML320/321T	82
ESC I 27 108	Emphasized/enhanced printing off	ML320/321 Std., ML320T/321T, ML520/521	36
ESC { n 27 123 n	Change emulation	ML320/321 Std., ML320T/321T, ML520/521	125
ESC } NUL 27 125 0	Software I-Prime	ML320/321T, ML520/521	131
FS 28	Select 12 cpi	ML320/321 Std., ML320T/321T, ML520/521	15
GS 29	Select 17.1 cpi	ML320/321 Std., ML320T/321T, ML520/521	15
RS 30	Select 10 cpi	ML320/321 Std., ML320T/321T, ML520/521	15
US 31	Begin double width printing	ML320/321 Std., ML320T/321T, ML520/521	21

Chapter 1: Printer Drivers

Usable Drivers

The tables below summarize usable drivers for each printer emulation. They are listed in order by decreasing compatibility as you go down the list: select one from as high up on the list as possible, based on what is available from among the drivers supplied with your software. If you don't see one from near the top of the list, give the software manufacturer a call to see if they have added any drivers to those supplied when you purchased your software.

Table 1: Printer Drivers for ML320 Epson/IBM & ML321 Epson/IBM

IBM Proprinter Emulation	Epson FX Emulation
IBM Proprinter II	Epson FX86/286
IBM Proprinter	Epson FX
IBM Graphics Printer	Epson EX800/1000

Table 2: Printer Drivers for ML320 MICROLINE Standard & ML321 MICROLINE Standard

Okidata ML Emulation
Okidata Microline 320/321
Okidata Microline 292/293
Okidata Microline 192+/193+
Okidata Microline 192/193
Okidata Microline 182/183
Okidata Microline 92/93

Table 3: Printer Drivers for Models ML320 Turbo & ML321 Turbo

IBM Proprinter Emulation	Epson FX Emulation	Okidata ML Standard Emulation
Okidata ML 320/1T IBM	Okidata ML 320/1T Epson	Okidata Microline 320/321T
IBM Proprinter III	Epson FX286e	Okidata Microline 520/521
IBM Proprinter II	Epson FX850/1050	Okidata Microline 320/321
IBM Proprinter	Epson FX86/286	Okidata Microline 292/293
IBM Graphics Printer	Epson FX	Okidata Microline 192/193
	Epson FX800/1000	Okidata Microline 182/183

Table 4: Printer Drivers for Models ML390 Turbo & ML391 Turbo

IBM Proprinter Emulation	IBM X24e AGM/XLe AGM Emulation	Epson LQ Emulation
Okidata ML390/1T IBM	Use this emulation only when you have selected an IBM Proprinter X24e/XL24e driver and you need to use Epson LQ high-density graphics.	Okidata ML390/1T Epson
IBM Proprinter X24e/XL24e		Epson LQ 870/1170
IBM Proprinter X24/XL24		Epson LQ 80/1000
IBM Proprinter XL		Epson LQ 2500
		Epson LQ 1500
		Epson LQ 1050

Table 5: Printer Drivers for Models ML520 & ML521

IBM Proprinter Emulation	Epson FX Emulation	Okidata ML Standard Emulation
Okidata ML 520/1 IBM IBM Proprinter III IBM Proprinter II IBM Proprinter IBM Graphics Printer	Okidata ML 520/1 Epson Epson FX850/1050 Epson FX86/286 Epson FX Epson EX800/1000	Okidata Microline 520/521 Okidata Microline 320/321 Okidata Microline 292/293 Okidata Microline 192/193 Okidata Microline 182/183 Okidata Microline 92/93

Table 6: Printer Drivers for Models ML590 & ML591

IBM Proprinter Emulation	IBM X24e AGM/XLe AGM Emulation	Epson LQ Emulation
Okidata ML590/1 IBM IBM Proprinter X24e/XL24e IBM Proprinter X24/XL24 IBM Proprinter XL	Use this emulation only when you have selected an IBM Proprinter X24e/XL24e driver and you need to use Epson LQ high-density graphics.	Okidata ML590/1 Epson Epson LQ 850/1050 Epson LQ 860/2250 (use for color printing) Epson LQ 2500 Epson LQ 1500 Epson LQ

Because there are some differences in characteristics such as speed or access to various features, you may wish to experiment with different drivers.

If you must select a driver that is not listed in the table, be sure to check it thoroughly for print features such as boldface, underline and changes in pitch. Don't be surprised if boldfaced items are printed twice, underlines are misplaced, wide spaces are left between lines or the printer behaves chaotically (turn off the printer if the latter occurs). These are all characteristics of an incompatible driver selection.

OKIDATA Software Drivers

Software Drivers Online

For fastest service, you can download the latest drivers for your printer directly through

- the Okidata WorldWide Web site: <http://www.okidata.com>
- the Okidata OKILINK® BBS: (609) 234-5344
- CompuServe®:
 1. GO PCHW
 2. In Library #2, select "Printer Utilities."

Table 7: Available Drivers

Printer Models	Available Drivers	If you can not download the driver:
ML320 Epson/IBM ML320 Std. ML321 Epson/IBM ML321 Std.	Microsoft Windows: 3.0, 3.1, 95 Microsoft Word (DOS): 5.0, 5.5, 6.0 WordPerfect (DOS): 5.1, 5.2, 6.0	To obtain a 3½HD diskette containing these drivers, call 1-800-OKIDATA.
ML320 Turbo ML321 Turbo	Microsoft Windows 3.1x, 95, NT 3.51	To obtain a 3½HD diskette containing the driver you need, send a written request to OKIDATA PO Box 4603 Trenton, NJ 08650-9852 <i>Select one:</i> #MS-9267 for Windows 3.1x #MS-9299 for Windows 95 #MS-9300 for Windows NT
ML390 Turbo ML391 Turbo	Microsoft Windows 3.1x, 95, NT 3.51, NT 4.0	To obtain a 3½HD diskette containing the driver you need, send a written request to OKIDATA PO Box 4603 Trenton, NJ 08650-9852 <i>Select one:</i> #MS-9351 for Windows 3.1x #MS-9352 for Windows 95 #MS-9353 for Windows NT 3.51 #MS-9354 for Windows NT 4.0
ML520 ML521	Microsoft Windows: 3.0, 3.1, 95 Microsoft Word (DOS): 5.0, 5.5, 6.0 WordPerfect (DOS): 5.1, 5.2, 6.0	To obtain a diskette containing all these drivers, send a written request to OKIDATA PO Box 4603 Trenton, NJ 08650-9852 <i>Select one:</i> #MS-8838 for 3½HD diskette #MS-8839 for 5¼HD diskette
ML590 ML591	Microsoft Windows: 3.0, 3.1, 95 Microsoft Word (DOS): 5.0, 5.5, 6.0 WordPerfect (DOS): 5.1, 5.2, 6.0	Drivers are shipped with the printer

Software Driver Selection

Selecting a software printer driver is usually a part of the software application installation process. Changing printers may require use of an external routine, or may be possible from within the application through menu selection.

Note: Refer to your software documentation for information on installing printer drivers.

Embedded Commands

In some cases, commercial software packages will permit you to create and/or modify the printer driver. Even if a driver specifically designed for the printer is available, this option can provide additional room for customization.

Typically, the driver modification routine will present a list of operations with some method for entering printer commands, permitting substitution, such as entering the italic command in place of the underline command. It also permits modification of an existing driver to better fit your printer. Driver modification does require a basic familiarity with your printer's command set, so you should study the control codes in the chapters which follow thoroughly before attempting it.

Some programs also permit you to control your printer directly through embedded commands. Usage of these commands in programs can provide access to a wide range of printer capabilities that are not ordinarily supported, or, in programs like older versions of Lotus 1-2-3, printer commands can be entered as an initialization string to set the basic format for a document.

Chapter 2: Character Set Commands

This chapter describes the character set commands for your printer, including

- IBM Character Sets I, II, and III
- Epson Character Sets
- Microline Character Sets
- International Character Sets
- Code Page Character Sets
- Upper Range Control Codes
- Character Table Selection

Special character sets can be substituted for the standard ASCII characters to provide foreign characters, line draw characters, non-printable characters such as back space (BS), form feed (FF), vertical tab (VT), etc. One of the Epson Character Sets provides italics characters.

IBM Character Set Commands

Select IBM Set I Command (IBM)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML390 Turbo, ML391 Turbo

✓ ML520, ML521

✓ ML590, ML591

Function	ASCII	Dec	Hex
Select IBM Set I	ESC 7	27 55	1B 37

This command selects IBM Character Set I in the IBM Proprinter emulation.

Select IBM Set II Command (IBM)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML390 Turbo, ML391 Turbo

✓ ML520, ML521

✓ ML590, ML591

Function	ASCII	Dec	Hex
Select IBM Set II	ESC 6	27 54	1B 36

This command selects IBM Character Set II in the IBM Proprinter emulation.

Select All Character Set [IBM Set III] Command (Epson LQ)

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	ASCII	Dec	Hex
Select All Character Set	ESC (^ L _n H _n [data]	27 40 94 L _n H _n [data]	1B 28 5E L _n H _n [data]

Use this command to engage the All Character Set (IBM Set III) and apply it to the data which follows the command. This allows normally non-printable characters to print.

Parameters L_n and H_n

Parameters L_n and H_n are used to designate how many characters you wish to print using the All Character set:

Number of characters = L_n + (H_n x 256)

For fewer than 256 characters, substitute the number of characters for L_n and set H_n = 0. For more than 256 characters, divide the number of characters by 256 and assign the whole number result to H_n, then assign the remainder to L_n.

L_n and H_n can have any value from 0 to 255 decimal.

Print Data from IBM All Characters Set [IBM Set III] Command (IBM)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	ASCII	Dec	Hex
Print Specified Data from IBM All Characters Set	ESC \ L _n H _n	27 92 L _n H _n	1B 5C L _n H _n

This command will print the amount of data you specify within the command, using the IBM All Characters set (also known as Character Set III).

The IBM All Characters set contains only printable characters with the exception of decimal codes 0 and 255, and gives you a broad range of graphics characters and other special symbols. This set is also a handy debugging tool for programmers, since you can print out and examine files that contain control codes and escape sequences.

In the above command, you must use parameters L_n and H_n to specify the total count of characters to be printed. The total count is calculated as

$$L_n + (H_n \times 256)$$

If you are printing fewer than 256 characters, substitute the number of characters for the value of L_n and replace H_n with 0.

If you are printing 256 or more characters, divide the total number of characters you wish to print by 256. Replace H_n with the whole number result and assign the remainder to L_n.

Print One Character from IBM All Character Set [IBM Set III] Command (IBM)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	ASCII	Dec	Hex
Print Specified Character from IBM Set III	ESC ^ n	27 94 n	1B 5E n

This command will print only the one character you specify within the command, using IBM Character Set III (also known as the All Characters set).

When the printer receives this command, it will print the character “n” from IBM Character Set III. The value of n can be from 0 to 255 decimal (00 to FF hexadecimal).

Epson Character Set Commands

Select Epson Set 1 [Slanted Characters] Command (Epson)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	ASCII	Dec	Hex
Select Epson Set 1	ESC t 0	27 116 48	1B 74 30

In the Epson emulation, this command specifies Epson Character Set 1 for the upper ASCII range (decimal 128 to 256). Epson Character Set 1 contains slanted characters, equivalent to italics.

Select Epson Set 2 [Graphics Characters] Command (Epson)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	ASCII	Dec	Hex
Select Epson Set 2	ESC t 1	27 116 49	1B 74 31

In the Epson emulation, this command specifies Epson Character Set 2 for the upper ASCII range (decimal 128 to 256). Epson Character Set 2 contains graphics characters.

MICROLINE Character Set Commands

Select MICROLINE Standard Character Set Command (ML)

✓ ML320 Std., ML321 Std. ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521

Function	ASCII	Dec	Hex
Select Standard Character Set	ESC ! 0	27 33 48	1B 21 30

In the Microline emulation, use this command to specify the standard Microline symbol set.

Select MICROLINE Block Graphics Symbol Set Command (ML)

✓ ML320 Std., ML321 Std. ✓ ML320 Turbo, ML321 Turbo

Function	ASCII	Dec	Hex
Select Block Graphics Symbol Set	ESC ! 1	27 33 49	1B 21 31

In the Microline emulation, use this command to specify a set of block graphics characters that can be used for drawing simple images and bar graphs. This set of characters has the standard ASCII characters decimal 32 through 127 and the block graphics in the upper ASCII range, decimal 128 through 255.

Select MICROLINE Line Character Set Command (ML)

✓ ML320 Std., ML321 Std. ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521

Function	ASCII	Dec	Hex
Select Line Character Set	ESC ! 2	27 33 50	1B 21 32

In the Microline emulation, use this command to specify the IBM (line graphics) symbol set which is comparable to IBM Set II. This set of characters has the standard ASCII characters decimal 32 through 127 and the line graphics in the upper ASCII characters, decimal 128 through 255.

International Character Set Commands

These commands allow you to select special international character sets which replace less-frequently used characters with symbols used in a variety of European languages or in the publishing industry.

Select International Character Set Command (IBM/ML)

- ✓ ML320 E/I, ML321 E/I
- ✓ ML320 Turbo, ML321 Turbo
- ✓ ML520, ML521
- ✓ ML320 Std., ML321 Std.
- ✓ ML390 Turbo, ML391 Turbo
- ✓ ML590, ML591

Function	ASCII	Dec	Hex
Select International Character Set	ESC ! n	27 33 n	1B 21 n

To access these characters, replace the n in the command with the appropriate value taken from column two in the table below.

Table 8: IBM/ML ESC ! Command — International Character Substitutions

Language	n	Character Corresponding to Decimal Value															
		35	36	38	48	64	79	91	92	93	94	95	96	123	124	125	126
American (slashed zero)	64	#	\$	&	Ø	@	o	[\]	^	-	'	{		}	~
American (unslashed zero)	65	#	\$	&	o	@	o	[\]	^	-	'	{		}	~
British	66	£	\$	&	o	@	o	[\]	^	_	'	{		}	~
Danish	70	#	\$	&	o	@	o	Æ	Ø	Å	Ü	_	'	æ	Ø	å	ü
Dutch	72	£	\$	&	o	@	o	[ij]	^	_	'	{	ij	}	~
French	68	£	\$	&	o	à	o	·	ç	§	^	_	'	é	ù	è	û
French Canadian	74	ü	\$	é	Ø	à	Ø	à	ç	é	î	ï	ó	é	ù	è	û
German	67	#	\$	&	o	§	o	Ä	Ö	Ü	^	_	'	ä	ö	ü	ß
Italian	73	£	\$	&	Ø	§	o	°	ç	é	^	_	ù	à	ò	è	ì
Latin American	76	#	\$	&	o	à	o	i	Ñ	¿	é	_	ü	ì	ñ	ó	ú
Norwegian	71	#	\$	&	o	@	o	Æ	Ø	Å	^	_	•	æ	Ø	å	~
Publisher	90	#	\$	&	o	§	o	°	'	"	¶	±*	'	©	®	†	™
Spanish	75	!	\$	&	o	i	o	Ñ	ñ	¿	ü	_	á	é	í	ó	ú
Swedish	69	§	¤	&	o	É	o	Ä	Ö	Å	^	_	é	ä	ö	å	ü

* For Models ML520 and ML521, character position number 95 in the Publisher Character Set is _ (underscore).

Select International Character Set Command (Epson)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML390 Turbo, ML391 Turbo

✓ ML520, ML521

✓ ML590, ML591

Function	ASCII	Dec	Hex
Select International Character Set	ESC R n	27 82 n	1B 52 n

This command is used to use characters from the specified international character set to replace the standard characters. To access these characters, replace m in the command with the appropriate value taken from column two in the table below. For the ML390 Turbo and ML391 Turbo printers, substitute the value of n given in Table 3 to engage characters from the Code Page indicated.

Table 9: Epson ESC R Command — International Character Substitutions

Language	n	Decimal Value of Character															
		35	36	38	64	79	91	92	93	94	95	96	123	124	125	126	
American	0	#	\$	&	@	o	[\]	^	-	'	{		}	~	
British	3	£	\$	&	@	o	[\]	^	_	`	{		}	~	
Danish I	4	#	\$	&	@	o	Æ	Ø	Å	^	_	`	æ	Ø	å	~	
Danish II	10	#	\$	&	É	o	Æ	Ø	Å	Ü	_	é	æ	Ø	å	ü	
Dutch	14	£	\$	&	@	o	[ll]	^	_	`	{	ij	}	~	
French	1	#	\$	&	à	o	•	ç	§	^	_	`	é	ù	è	..	
French Canadian	13	ü	\$	è	à	Ø	â	ç	ê	î	ï	ó	é	ù	è	ü	
German	2	#	\$	&	§	o	Ä	Ö	Ü	^	_	'	ä	ö	ü	ß	
Italian	6	#	\$	&	@	o	•	\	é	^	_	ù	à	ò	è	ì	
Japanese	8	#	\$	&	@	o	[¥]	^	_	`	{		}	~	
Latin American	12	#	\$	&	à	o	i	Ñ	¿	é	_	ü	í	ñ	ó	ú	
Norwegian	9	#	¤	&	É	o	Æ	Ø	Å	Ü	_	é	æ	Ø	å	ü	
Publisher	64	#	\$	&	§	o	°	'	¨	¶	±*	`	©	®	†		
Spanish I	7	Pt	\$	&	@	o	i	Ñ	¿	^	_	`	¨	ñ	}	~	
Spanish II	11	#	\$	&	à	o	i	Ñ	¿	é	_	`	í	ñ	ó	ú	
Swedish	5	#	¤	&	É	o	Ä	Ö	Å	Ü	_	é	ä	ö	å	ü	

* For Models ML520 and ML521, character position number 95 in the Publisher Character Set is _ (underscore).

Table 10: Epson ESC R Command — Code Page Selections for ML390/391 Turbo

Code Page	Value of n
Abicomp	81
BRASCII	80
Canada French	43
Multilingual 850	26
Norway 865	27
Portugual	28

Print from Code Page Command (IBM/ML)

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	ASCII	Dec	Hex
Print from Code Page	ESC [T L _n H _n 0 0 H _{cp} L _{cp} 0	27 91 84 L _n H _n 0 0 H _{cp} L _{cp} 0	1B 5B 54 L _n H _n 00 00 H _{cp} L _{cp} 00

This command permits you to select a Code Page character set and to print the amount of data you specify within the command from that Code Page set. It applies to both the IBM emulation (all models listed) and the Okidata Microline emulation (Models ML320/321 Turbo and ML520/521 only).

Parameters L_n and H_n

These parameters specify the total count of characters to be printed. The total count is calculated as

$$L_n + (H_n \times 256)$$

If you are printing less than 256 characters, substitute the number of characters for the value of L_n and replace H_n with 0.

If you are printing 256 or more characters, divide the total number of characters you wish to print by 256. Replace L_n with the whole number result and assign the remainder to H_n.

Parameters H_{cp} and L_{cp}

These parameters specify the Code Page set to be used when printing the characters as given in the table below.

Table 11: IBM/ML ESC [T Command — Code Page Parameters

H _{cp} value	L _{cp} value	Code Page Set
1	181	USA
3	82	Multilingual
3	92	Canadian French
3	95	Portugal
3	97	Norway
4	16	BRASCII*
4	17	Abicomp*

*ML320/321 Turbo and ML390/391 Turbo only.

Assign Code Page Command (Epson)

✓ ML320 Turbo, ML321 Turbo

Function	ASCII	Dec	Hex
Assign Code Page to Character Set	ESC (t 3 0 P _{n1} P _{n2} P _{n3}	27 40 116 51 48 P _{n1} P _{n2} P _{n3}	1B 28 74 33 30 P _{n1} P _{n2} P _{n3}

This command allows you to assign a Code Page character set (see Appendix C) to Epson Character Set 1 or Set 2, which you can then select using ESC t 0 or ESC t 1, respectively.

Parameter P_{n1}

This parameter specifies which character set you are replacing with a Code Page set:

P_{n1} = 0: replaces Epson Character Set 1

P_{n1} = 1: replaces Epson Character Set 2

Parameters P_{n2} and P_{n3}

These parameters specify the Code Page set assigned to the designated Epson Character Set, as given in the table below.

Table 12: Epson 9-Pin ESC (t Command — Code Page Parameters for P_{n2} and P_{n3} Values

P _{n2} Hex Value	P _{n3} Hex Vvalue	Code Page Set
0	0	Italic
1	0	PC437 (USA)
3	0	PC850 (Multilingual)
8	0	PC863 (Canadian French)
7	0	PC860 (Portugal)
9	0	PC865 (Norway)
25	0	BRASCII
26	0	Abicomp

Upper Range Control Code Commands (Epson)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML390 Turbo, ML391 Turbo

✓ ML520, ML521

✓ ML590, ML591

Function	ASCII	Dec	Hex
Permit Printing Upper Range Control Codes	ESC 6	27 54	1B 36
	<i>or</i>	<i>or</i>	<i>or</i>
	ESC I 1*	27 73 49*	1B 49 31*
Cancel Printing Upper Range Control Codes	ESC 7	27 55	1B 37
	<i>or</i>	<i>or</i>	<i>or</i>
	ESC I 0*	27 73 48*	1B 49 30*

* Not available for ML390 Turbo or ML391 Turbo.

In the Epson emulation, the ASCII characters from decimal 128 through 159 are normally interpreted as control codes and cannot be printed. In some cases, you may wish to store custom characters in these locations.

The ESC 6 and ESC 7 commands allow you to print custom characters stored in these areas and then return to "normal" printing. These commands are not necessary in the ML590 and ML591 printers.

The ESC I n command allows you to print custom characters stored in the following ASCII areas: 00H to 06H, 10H, 11H, 15H to 17H, 19H to 1AH, 1CH to 1FH, 80H to 86H, 90H, 91H, 95H to 97H, 99H, 9AH, or 9CH to 9FH.

Select Code Page Set Command (Epson)

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	ASCII	Dec	Hex
Select Code Page Set	ESC (t L _n H _n P _{n1} P _{n2} P _{n3}	27 40 116 L _n H _n P _{n1} P _{n2} P _{n3}	1B 28 74 L _n H _n P _{n1} P _{n2} P _{n3}

Use this command to store any four code page sets from the table below, engaged using the ESC t n command.

Parameters L_n and H_n

Parameters L_n and H_n are used to designate the number of bytes to follow in the subsequent parameters, where

$$\text{Number of bytes} = L_n + (H_n \times 256)$$

L_n and H_n can have any value from 0 to 255 decimal. Generally, L_n is set to 3 and H_n is set to 0.

Parameter P_{n1}

Parameter P_{n1} selects the table area in which the four code page sets will be stored. You can assign it to hexadecimal 00, 01, 02, 03, 30, 31, 32, or 33.

Parameters P_{n2} and P_{n3}

Parameters P_{n2} and P_{n3} determine which code page set will be used, as follows:

Table 13: Epson 24-Pin ESC (t Command —

Code Page Sets for P_{n1} , P_{n2} Values

P_{n2}	P_{n3}	Code Page Set
0	0	Italic
1	0	PC-437 (USA)
3	0	PC-850 (Multilingual)
7	0	PC-860 (Portugal)
8	0	PC-863 (Canadian French)
9	0	PC-865 (Norway)
25*	0*	BRASCII*
26*	0*	Abicomp*

* Applies only to ML390 Turbo and ML391 Turbo

For example, use the command

ESC (t 03H 00H 03H 09H 00H

to store the PC-865 Norwegian code page set in table area 03.

Chapter 3: Character Size & Spacing Commands

This chapter describes the commands used to set the size and spacing of characters printed:

- Pitch Setting Commands
- Superscript & Subscript Commands
- Double Width & Height Commands
- Combined Print Features Command
- Character Spacing Commands

Pitch Setting Commands

These commands are used to select the pitch in characters per inch (cpi) used. For example, at 10 cpi, each character is 1/10" wide. The number of characters that will fit on a line depends on the pitch you have selected and on whether you have a narrow carriage or a wide carriage printer. You can also set pitch using the printer's front panel or the menu (see "Menu Mode" in your printer manual).

Table 14: Pitch Setting Commands — Characters Per Line (CPL) for Pitches

Pitch	Characters per Line	
	Narrow Carriage Models	Wide Carriage Models
10 cpi	80 cpl	136 cpl
12 cpi	96 cpl	163 cpl
15 cpi*	120 cpl *	204 cpl *
17.1 cpi	137 cpl	233 cpl
20 cpi	160 cpl	272 cpl

* 15 cpi is *not* available on Models ML320/1 E/I, ML320/1 Std. or ML320/1 Turbo.

Pitch Setting Commands for Non-compressed Printing (IBM/E/ML)

- | | | |
|--------------------------|----------------------------|----------------|
| ✓ ML320 E/I, ML321 E/I | ✓ ML320 Turbo, ML321 Turbo | ✓ ML520, ML521 |
| ✓ ML320 Std., ML321 Std. | ✓ ML390 Turbo, ML391 Turbo | ✓ ML590, ML591 |

Function	Command: IBM	Command: Epson	Command: ML
Select 10 cpi	ASCII: DC2 Dec: 18 Hex: 12	ASCII: ESC P Dec: 27 80 Hex: 1B 50	ASCII: RS Dec: 30 Hex: 1E
Select 12 cpi	ASCII: ESC : Dec: 27 58 Hex: 1B 3A	ASCII: ESC M Dec: 27 77 Hex: 1B 4D	ASCII: FS Dec: 28 Hex: 1C
Select 15 cpi*	ASCII: ESC g Dec: 27 103 Hex: 1B 67	ASCII: ESC g Dec: 27 103 Hex: 1B 67	ASCII: ESC g Dec: 27 103 Hex: 1B 67

* 15 cpi is *not* available on Models ML320/1 E/I, ML320/1 Std. or ML320/1 Turbo.

Pitch Setting Commands for Compressed Printing (IBM)

- | | | |
|------------------------|----------------------------|----------------|
| ✓ ML320 E/I, ML321 E/I | ✓ ML320 Turbo, ML321 Turbo | ✓ ML520, ML521 |
| | | ✓ ML590, ML591 |

Function	Command
Select Compressed Pitch	ASCII: SI <i>or</i> ESC SI Dec: 15 <i>or</i> 27 15 Hex: 0F <i>or</i> 1B 0F
Cancel Compressed Pitch	Not applicable

✓ ML390 Turbo, ML391 Turbo

Function	Command	Notes
Select Compressed Pitch*	ASCII: SI <i>or</i> ESC SI Dec: 15 <i>or</i> 27 15 Hex: 0F <i>or</i> 1B 0F	<i>SI Select item in the printer Menu must be set to 12 CPI in order to select compressed pitch.</i> If 10 cpi character pitch is engaged, printer will go to 17.1 cpi pitch. If 12 cpi character pitch is engaged, printer will go to 20 cpi pitch.

* To cancel compressed pitch, enter one of the non-compressed printing pitch setting commands.

Pitch Setting Commands for Compressed Printing (Epson)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	Command	Notes
Select Compressed Pitch	ASCII: SI <i>or</i> ESC SI Dec: 15 <i>or</i> 27 15 Hex: 0F <i>or</i> 1B 0F	If 10 cpi is engaged, compressed pitch will be 17.1 cpi If 12 cpi is engaged, compressed pitch will be 20 cpi.
Cancel Compressed Pitch	ASCII: DC2 Dec: 18 Hex: 12	If 17.1 cpi is engaged, pitch will revert to 10 cpi. If 20 cpi is engaged, pitch will revert to 12 cpi.

Pitch Setting Commands for Compressed Printing (ML)

✓ ML320 Std., ML321 Std.

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

Function	ASCII	Dec.	Hex.
Select 17.1 cpi	ASCII: GS	Dec: 29	Hex: 1D
Select 20 cpi	ASCII: ESC # 3	Dec: 27 35 51	Hex: 1B 23 33

Select Character Pitch/Point Size Command (Epson)

✓ ML320 Turbo, ML321 Turbo

✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Select Character Pitch/Point Size	ESC X p P _n L _p H _p	27 88 70 P _n L _p H _p	1B 58 46 P _n L _p H _p

Use this command to place the printer in the scalable font mode and to select the character pitch and the point size. Character pitch setting range is 5 to 20 characters per inch (cpi); point size setting range is 8 to 64 points.

For the ML590 and ML591 printers, you can select any character pitch from 5 to 20 cpi for the LQ Courier, LQ Roman and LQ Swiss typefaces. The Gothic, Orator, Prestige and Swiss Bold typefaces will only print in point sizes 10, 10.5 and 21. The table below shows which typeface will print in other sizes when these typefaces are selected.

Note: If you wish to use this command to print to an ML320/321 Turbo printer in a UNIX environment, you must reboot the system after the command is entered.

**Table 15: Epson ESC X Command —
Font Substitution for Models ML590 & ML591**

Typeface	Typeface that Prints	
	8 Point	12 to 20 & 22 to 64 Point
Gothic	Swiss	Courier
Orator	Swiss	Courier
Prestige	Roman	Courier
Swiss Bold	Swiss	Courier

Parameter P_n

Parameter P_n is used to set the character pitch. It can have any value from 0 to 127 decimal for ML320/321 Turbo and for ML590/591 printers, or from 0 to 255 for ML390/391 Turbo.

Table 16: Epson ESC X Command — Character Pitch Settings for P_n Values

P _n	Character Pitch
0	Remains unchanged
1	Proportional
18 (2 to 19)	20 cpi
20	18 cpi
21 (21 to 23)	17.1 cpi
24 (24 to 29)	15 cpi
30 (30 to 35)	12 cpi
36 (36 to 41)	10 cpi
42 (42 to 47)	8.6 cpi
48 (48 to 59)	7.5 cpi
60 (60 to 71)	6 cpi
72 (72 to 127)	5 cpi

Parameters L_p and H_p

Parameters L_p and H_p are used to set the point size according to the following equation:

$$N_p = [L_p + (H_p \times 255)] \times 0.5$$

L_p and H_p can have any value from 0 to 255 decimal.

Table 17: Epson ESC X Command — Point Sizes (1 point = 1/72") for N_p

N _p	Point Size	N _p	Point Size	N _p	Point Size	N _p	Point Size
0	Unchanged	44	22 pt	74	37 pt	106	53 pt
16	8 pt	46	23 pt	76	38 pt	108	54 pt
20	10 pt	48	24 pt	78	39 pt	110	55 pt
21	10.5 pt	50	25 pt	80	50 pt	112	56 pt
22	11 pt	52	26 pt	82	41 pt	114	57 pt
24	12 pt	54	27 pt	84	42 pt	116	58 pt
26	13 pt	56	28 pt	86	43 pt	118	59 pt
28	14 pt	58	29 pt	90	45 pt	120	60 pt
30	15 pt	60	30 pt	92	46 pt	122	61 pt
32	16 pt	62	31 pt	94	47 pt	124	62 pt
34	17 pt	64	32 pt	96	48 pt	126	63 pt
36	18 pt	66	33 pt	98	49 pt	128	64 pt
38	19 pt	68	34 pt	100	50 pt		
40	20 pt	70	35 pt	102	51 pt		
42	21 pt	72	36 pt	104	52 pt		

Example

To set a point size (N_p) of 216:

$$N_p = [L_p + (H_p \times 255)] \times 0.5$$

1. Assign a value of 1 to H_p .
2. Multiply 216 by 2: $216 \times 2 = 432$.
3. Subtract 255 from 432: $432 - 255 = 177.$, then round this value down to the nearest even number, 176. Assign this value to L_p .

Here is a sample BASIC program to test your calculated values:

```
ESC$ = CHR$(27)
LPRINT ESC$; "@";
LPRINT "This is a test of the Select Pitch and Point Size Command."
LPRINT "This is the default text mode."
LPRINT "The characters below should be the maximum character height of 216
points."
LPRINT ESC$; "X"; CHR$(1); CHR$(176); CHR$(1)
LPRINT "Hy"
```

Select Character Pitch/Point Size Command (IBM-Oki unique)

- ✓ ML320 Turbo, ML321 Turbo
- ✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Select Character Pitch/ Point Size	ESC DLE F P_{no} P_n L_p H_p	27 16 70 P_{no} P_n L_p H_p	1B 10 46 P_{no} P_n L_p H_p

Use this OKI unique command to select printable fonts by character pitch and point size.

Parameter P_{no}

This parameter is used to give the number of bytes to follow in the subsequent parameters. It can have any value from 0 to 255 decimal. Generally, a value of 3 is assigned to P_{no} .

Parameter P_n

Parameter P_n is used to set the character pitch. It can have the following values:

- ML320 Turbo, ML321 Turbo: 0 to 127
- ML390 Turbo, ML391 Turbo: 0 to 255
- ML590, ML591: 0 to 127

See "Table 16: Epson ESC X Command — Character Pitch Settings for P_n Values," above.

Parameters L_p and H_p

Parameters L_p and H_p are used to set the point size according to the following equation:

$$N_p = [L_p + (H_p \times 255)] \times 0.5$$

L_p and H_p can have any value from 0 to 255 decimal.

See "Table 17: Epson ESC X Command — Point Sizes for N_p Values," above.

Superscript/Subscript Commands (IBM/E/ML)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

✓ ML320 Std., ML321 Std.

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	IBM	Epson	ML
Start Superscript Printing	ASCII: ESC S 0 Dec: 27 83 0 Hex: 1B 53 00	ASCII: ESC S 0 Dec: 27 83 0 Hex: 1B 53 00	ASCII: ESC J Dec: 27 74 Hex: 1B 4A
Stop Superscript Printing	ASCII: ESC T Dec: 27 84 Hex: 1B 54	ASCII: ESC T Dec: 27 84 Hex: 1B 54	ASCII: ESC K Dec: 27 75 Hex: 1B 4B
Start Subscript Printing	ASCII: ESC S 1 Dec: 27 83 1 Hex: 1B 53 01	ASCII: ESC S 1 Dec: 27 83 1 Hex: 1B 53 01	ASCII: ESC L Dec: 27 76 Hex: 1B 4C
Stop Subscript Printing	ASCII: ESC T Dec: 27 84 Hex: 1B 54	ASCII: ESC T Dec: 27 84 Hex: 1B 54	ASCII: ESC M Dec: 27 77 Hex: 1B 4D

Superscript characters are printed above the normal print line, and are used for exponents and special typographic effects (x^2). Subscripts are handy for chemical formulas (H_2O).

Superscripts and subscripts will print as full-width characters. They cannot be used with double-height printing.

Double Width Commands (IBM/E/ML)

✓ ML320 E/I, ML321 E/I
 ✓ ML320 Std., ML321 Std.

✓ ML320 Turbo, ML321 Turbo
 ✓ ML390 Turbo, ML391 Turbo

✓ ML520, ML521
 ✓ ML590, ML591

Function	IBM	Epson	ML
Begin Double Width Printing	ASCII: ESC W 1 Dec: 27 87 49 Hex: 1B 57 31	ASCII: ESC W 1 Dec: 27 87 49 Hex: 1B 57 31	ASCII: US Dec: 31 Hex: 1F
End Double Width Printing	ASCII: ESC W 0 Dec: 27 87 48 Hex: 1B 57 30	ASCII: ESC W 0 Dec: 27 87 48 Hex: 1B 57 30	Use any of the pitch selection commands.
Begin Double Width Printing Line by Line	ASCII: SO Dec: 14 Hex: 0E	ASCII: SO <i>or</i> ESC SO Dec: 14 <i>or</i> 27 14 Hex: 0E <i>or</i> 1B 0E	Not applicable
End Double Width Printing Line by Line	ASCII: DC4 Dec: 20 Hex: 14	ASCII: DC4 Dec: 20 Hex: 14	Not applicable

Double Height Commands (E/ML)

✓ ML320 E/I, ML321 E/I
 ✓ ML320 Std., ML321 Std.

✓ ML320 Turbo, ML321 Turbo
 ✓ ML390 Turbo, ML391 Turbo

✓ ML520, ML521
 ✓ ML590, ML591

Function	Epson	ML
Begin Double Height Printing	ASCII: ESC w 1 Dec: 27 119 1 Hex: 1B 77 01	ASCII: ESC US 1* Dec: 27 31 49 Hex: 1B 1F 31
End Double Height Printing	ASCII: ESC w 0 Dec: 27 119 0 Hex: 1B 77 00	ASCII: ESC US 0* Dec: 27 31 0 Hex: 1B 1F 00

* This command is also valid for the ML390 Turbo, ML391 Turbo, ML590 and ML591 in Epson LQ emulation; it duplicates the ESC w command.

Double height printing produces characters that are twice as tall as normal size characters. it can be combined with double width and emphasized printing for an even more striking effect.

When you use double height printing, you will need to adjust the line spacing to accommodate the taller characters.

Double Width & Height Printing Commands

The double width & height commands allow you to select double width, double height, or double width and double height printing in the IBM emulation.

Double Width & Height Printing Command, 9-Pin Printers (IBM)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

Function	ASCII	Decimal	Hexadecimal
Double Width and/or Height Printing	ESC [@ L _n H _n NUL NUL n ₁ n ₂	27 91 64 L _n H _n 0 0 n ₁ n ₂	1B 5B 40 L _n H _n 00 00 n ₁ n ₂

This command lets you specify character width and line spacing in addition to character height.

Parameters n₁ and n₂

Parameters n₁ and n₂ are used to set the width, line spacing and height used. Variable n₁ sets the character height and line spacing; variable n₂ sets the character width.

Parameters L_n H_n

These parameters specify the number of bytes of the modes, calculated as

$$L_n + (H_n \times 256)$$

Generally, L_n is 4 and H_n is 0.

Table 18: IBM ESC [@ Command — Character Height/Line Spacing for n₁ Values

Decimal Value of n ₁	Character Height	Line Spacing
0	Unchanged	Unchanged
1	Standard	Unchanged
2	Double	Unchanged
16	Unchanged	Single
17	Standard	Single
18	Double	Single
32	Unchanged	Double
33	Standard	Double
34	Double	Double

Table 19: IBM ESC [@ Command — Character Width for n₂ Values

Decimal Value of n ₂	Character Width
0	Unchanged
1	Standard
2	Double

For example, to use double height characters with double the normal line spacing, without changing the width of the characters use this BASIC statement:

```
LPRINT CHR$(27); "[ @ "; CHR$(4); CHR$(0); CHR$(0); CHR$(0); CHR$(34); CHR$(0)
```

Double Height & Width Printing Command, 24-Pin Printers (IBM)

✓ ML390 Turbo, ML391 Turbo

Function	ASCII	Decimal	Hexadecimal
Double Height Printing	ESC [@ n ₁ n ₂ m ₁ m ₂ m ₃ m ₄	27 91 64 n ₁ n ₂ m ₁ m ₂ m ₃ m ₄	1B 5B 40 n ₁ n ₂ m ₁ m ₂ m ₃ m ₄

Parameters n₁ and n₂

These variables specify the number of mode bytes in the command. Normally, n₁ is set to 4 and n₂ is set to 0.

Parameters m₁, m₂, m₃, m₄

These variables control the mode. Parameters m₁ and m₂ are set to 0. Parameter m₃ is used to set the line spacing and character height. Parameter m₄ is used to set the width of the character as shown in the tables below.

Table 20: IBM ESC [@ Command — Character Height/Line Spacing for m₃ Values

Decimal Value of m ₃	Character Height	Line Spacing
0	Unchanged	Unchanged
1	Standard	Unchanged
2	Double	Unchanged
16	Unchanged	Single
17	Standard	Single
18	Double	Single
32	Unchanged	Double
33	Standard	Double
34	Double	Double

Table 20a: IBM ESC [@ Command — Character Width for m₄ Values

Decimal Value of m ₄	Character Width
0	Unchanged
1	Standard
2	Double

Combined Print Features Command (ML)

✓ ML320 Std., ML321 Std.

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

Function	ASCII	Dec	Hex
Select Print Features	ESC & n ₁ n ₂ n ₃ n ₄ :	27 38 n ₁ n ₂ n ₃ n ₄ 58	1B 26 n ₁ n ₂ n ₃ n ₄ 3A

This command lets you select print quality, character pitch, and several other printing features with a single command. The values of the four variables (n₁ n₂ n₃ n₄) determine which features are selected.

To calculate the value for each variable, first find the features you want in the Variable Values table below. Next, add the corresponding values from column one for each variable. Then add the appropriate factor for each variable taken from Table 22.

**Table 21: ML ESC & Command —
Print Features for n₁, n₂, n₃ and n₄ Values**

Value	n ₁	n ₂	n ₃	n ₄
1	10 cpi	Cancel super/subscripts	Utility	HSD
2	12 cpi	Subscripts	NLQ	N/A
4	17.1 cpi	Superscripts	Custom characters	Underlining
8	20 cpi	Emphasized	Italics	Double height
16	Double width	Enhanced	N/A	N/A

**Table 22: ML ESC & Command —
Variable Factors for n₁, n₂, n₃, n₄**

Variable	Factor
n ₁	32
n ₂	64
n ₃	96
n ₄	112

Here are some pointers on using this command:

- You don't have to use all four variables; use only the ones that control the features you want to change.
- You can enter the variables in any order.
- Be sure to add in the variable factor when calculating the variable values—this number tells the printer which variable is which.
- You'll get unexpected results if you select incompatible features (e.g., if you pick both 10 and 12 cpi), or if you've added up the values incorrectly.

For example, to set 10 cpi, emphasized, NLO and underlining using this command, you would calculate the values for n_1 , n_2 , n_3 , and n_4 as follows:

$$n_1 = 1 + 32 = 33$$

$$n_2 = 8 + 64 = 72$$

$$n_3 = 2 + 96 = 98$$

$$n_4 = 4 + 112 = 116$$

The resulting BASIC statement looks like this:

```
LPRINT CHR$(27);"&";CHR$(33);CHR$(72);CHR$(98);CHR$(116);":"
```

Character Spacing Commands

The character spacing commands include commands to turn proportional spacing on and off, as well as commands for increasing the standard spacing between characters at a fixed value.

Proportional Spacing Commands (IBM/E/ML)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

✓ ML320 Std., ML321 Std.

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	IBM	Epson	ML
Proportional Spacing On	ASCII: ESC P 1 Dec: 27 80 1 Hex: 1B 50 01	ASCII: ESC p 1 Dec: 27 112 1 Hex: 1B 70 01	ASCII: ESC Y Dec: 27 89 Hex: 1B 59
Proportional Spacing Off	ASCII: ESC P 0 Dec: 27 80 0 Hex: 1B 50 00	ASCII: ESC p 0 Dec: 27 112 0 Hex: 1B 70 00	ASCII: ESC Z Dec: 27 90 Hex: 1B 5A

In the ML320 E/I, ML321 E/I, ML320 Std., ML321 Std., ML320 Turbo, ML321 Turbo, ML520, and ML521, proportional spacing is available only with Near Letter Quality (NLO) and Utility (UTL) printing.

In the ML390 Turbo, ML391 Turbo, ML590 and ML591, proportional spacing is available only with Letter Quality (LQ) printing.

This command adjusts the space between letters to compensate for the varying widths of individual characters. Unlike fixed spacing, where all characters are formed within a matrix of uniform width at a specified pitch, proportional spacing gives more horizontal space to wide characters, like w or M, and less to narrow characters, like l or f. The resulting print is more attractive and easier to read than fixed-space printing.

Because the characters have different widths, proportionally spaced fonts have no fixed pitch; therefore margin settings are only approximate unless your software specifically supports proportional spacing.

You can also select proportional spacing using the printer menu or the front panel buttons. In addition, proportional spacing is one of the features available through the composite command in the Epson mode.

Intercharacter Spacing Commands (IBM/E/ML)

Note: Intercharacter spacing can NOT be set in the HSD and bit image graphics modes.

- ✓ ML320 E/I, ML321 E/I ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521
 ✓ ML320 Std., ML321 Std.

Function	IBM	Epson	ML
Set Intercharacter Spacing	ASCII: ESC V n Dec: 27 86 n Hex: 1B 56 n	ASCII: ESC SP n Dec: 27 32 n Hex: 1B 20 n	ASCII: ESC N n Dec: 27 78 n Hex: 1B 4E n
Values for n	n = 0 to 11	n = 0 to 255	n = 0 to 11

- ✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	IBM	Epson
Set Intercharacter Spacing	<i>ML590/591 Only:</i> ASCII: ESC SP n Dec: 27 32 n Hex: 1B 20 n	ASCII: ESC SP n Dec: 27 32 n Hex: 1B 20 n
Values for n	n = 0 to 255	n = 0 to 255*

* For the ML390 Turbo and ML391 Turbo, bit 7 is ignored.

The standard spacing between characters is 3 dots columns. These commands are used to add additional spacing between characters, added to the right of each character. The value is expressed in dots; the number of dots per inch depends on the current print mode. The table below shows the amount of space added for each cpi setting.

Table 23: IBM ESC V and ESC SP & Epson ESC SP Commands — Character Spacing (in Inches)

Setting	Amount of space added
10 cpi	n/120"
12 cpi	n/144"
15 cpi	n/180"
17.1 cpi	n/206"
20 cpi	n/240"

For example, to add 8/120" spacing to your printing at 10 cpi, use this BASIC command:

```
LPRINT CHR$( 27 ) ; "N" ; CHR$( 8 )
```

**Table 24: ML ESC N Command —
Character Spacing (in Inches)**

Decimal Value of n	10 cpi	12 cpi	17.1 cpi	20 cpi
0	3/120"	3/144"	3/206"	3/240"
1	4/120"	4/144"	4/206"	4/240"
2	5/120"	5/144"	5/206"	5/240"
3	6/120"	6/144"	6/206"	6/240"
4	7/120"	7/144"	7/206"	7/240"
5	8/120"	8/144"	8/206"	8/240"
6	9/120"	9/144"	9/206"	9/240"
7	10/120"	10/144"	10/206"	10/240"
8	11/120"	11/144"	11/206"	11/240"
9	12/120"	12/144"	12/206"	12/240"
10	13/120"	13/144"	13/206"	13/240"
11	14/120"	14/144"	14/206"	14/240"

For example, if you are printing at 10 cpi and want to set the character spacing at 11/120", use this BASIC command:

```
LPRINT CHR$( @7 ) ; "N" ; CHR$( 8 )
```

Set Horizontal Motion Index [HMI] Command (Epson LQ)

✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Set Horizontal Motion Index (HMI)	ESC c L _p H _p	27 99 L _p H _p	1B 63 L _p H _p

Use this command to set the character spacing in LQ and Utility modes to any value from 1/360" up to 3".

Parameters L_p and H_p

Parameters L_p and H_p can have any value from 0 to 255 decimal and are used to designate the Horizontal Motion Index (HMI) according to the following equation:

$$\text{HMI (inches)} = [L_p + (H_p \times 256)] \div 360$$

If the HMI value is set to greater than 3":

- ML390 Turbo and ML391 Turbo printers will ignore the command
- ML590 and ML591 printers will use 1/10" spacing.

Chapter 4: Character Style Commands

This chapter describes the commands for selecting print style including the following:

- Print Mode & Fonts Commands
- Italics Print Commands
- Emphasized & Enhanced Print Commands
- Underline/Overscore/Strike-Through Commands
- Outline/Shadow Commands

Print Mode & Fonts Commands

Individual Print Mode & Font Commands for 9-Pin Printers (IBM/E/ML)

✓ ML320 E/I, ML321 E/I ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521
 ✓ ML320 Std., ML321 Std.

Function	IBM	Epson	ML
Select HSD Print Mode	ASCII: ESC # 0 Dec: 27 35 48 Hex: 1B 23 30	ASCII: ESC (0 Dec: 27 40 48 Hex: 1B 28 30	ASCII: ESC # 0 Dec: 27 35 48 Hex: 1B 23 30
Select Utility Print Mode	See Combined Commands below	ASCII: ESC x 0 Dec: 27 120 0 Hex: 1B 78 00	ASCII: ESC 0 Dec: 27 48 Hex: 1B 30
Select NLQ Print Mode	See Combined Commands below	ASCII: ESC x 1 Dec: 27 120 49 Hex: 1B 77 31 <i>and</i> ASCII: ESC k n Dec: 27 107 n Hex: 1B 6B n	ASCII: ESC 1 Dec: 27 49 Hex: 1B 31
Select NLQ Gothic Font	See Combined Commands below	Not applicable	ASCII: ESC 3 Dec: 27 51 Hex: 1B 33

Use High Speed Draft (HSD) or Utility (UTL) printing for drafts and other documents that you want to print quickly. HSD is faster and its characters somewhat rougher than utility.

Near Letter Quality (NLQ) printing is slower than HSD and UTL, but the characters are crisper and more like the characters produced by a typewriter. Use NLQ for final drafts and important documents where appearance matters.

You can also use your printer's front panel or the menu to set the print quality, but settings made using the front panel are likely to be overridden by software applications.

To select the NLQ print mode in the Epson emulation, you must send two commands: ESC x 1 and ESC k n. The ESC x 1 command must be sent to the printer first, followed by the ESC k n command. Parameter n designates which font will be used as follows:

- n=0: Courier NLQ
- n=1: Sans Serif NLQ

Individual Print Mode & Font Commands for 24-Pin Printers (IBM/E)

➤ ML390 Turbo, ML391 Turbo

Function	ASCII	Dec.	Hex.
Select Utility Print Mode	ESC x 0	27 120 48	1B 78 30
Select LQ Print Mode	ESC x 1	27 120 49	1B 78 31
Select LQ Print Mode & Font	ESC k n	27 107 n	1B 6B n

Use Utility printing for drafts and other documents that you want to print quickly.

Letter Quality (LQ) printing is slower than utility printing, but the characters are much crisper and sharper. Use LQ for top-quality printing of final drafts and important documents, where appearance matters.

You can also use your printer's front panel or the menu to set the print quality, but settings made using the front panel are likely to be overridden by software applications.

The ESC k n command allows you to select a specific font for the LQ mode. Substitute a value for n from the table below.

**Table 25: IBM/Epson ESC k Command —
Fonts for n Values**

Hex. Value of n	Font
00	Roman
01	Swiss
02	Courier
03	Prestige
04	Script
07	Orator
7A	Swiss Bold
7C	Gothic
7E	Menu Setting

Combined Select Font Command (IBM)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	ASCII	Decimal	Hexadecimal
Select Print Quality and Character Spacing	ESC I n	27 73 n	1B 49 n

This command allows you to select print quality and character spacing for resident fonts for all models listed. It also allows you to select print quality and character spacing for downline loadable (DLL) fonts for all but Models ML390 Turbo and ML391 Turbo. Substitute a value for n from the table below.

**Table 26: IBM ESC I Command —
Print Modes Corresponding to n Values for All 9-Pin Models**

Value of n	Print mode
0	10 cpi utility
1	12 cpi HSD
2	NLQ Sans Serif
3	NLQ Courier
4	10 cpi DLL utility
5	12 cpi DLL utility
6	NLQ Sans Serif DLL
7	NLQ Courier DLL
11	NLQ Courier Italic*
15	NLQ Courier DLL Italic*

* ML320T, ML321T, ML520, ML521 only

**Table 27: IBM IBM ESC I Command—
Print Modes for n Values for 24-Pin Models ML390T & ML391T**

Dec. Value of n	Print Mode
0	10 cpi Utility
2	10 cpi LQ
3	Proportional LQ
8	12 cpi Utility
10	12 cpi LQ
16	17.1 cpi Utility
18	17.1 cpi LQ
24	15 cpi Utility
26	15 cpi LQ
32	20 cpi Utility
34	20 cpi LQ

**Table 28: IBM ESC I Command —
Print Modes Corresponding to n Values for 24-Pin Models ML590 & ML591**

Dec. Value of n	Print mode	Dec. Value of n	Print mode
0	10 cpi Utility Resident	14	12 cpi LQ DLL
2	10 cpi LQ Resident	16	17.1 cpi Utility Resident
3	Proportional LQ Resident	18	17.1 cpi LQ Resident
4	10 cpi Utility DLL	20	17.1 cpi Utility DLL
6	10 cpi LQ DLL	22	17.1 cpi LQ DLL
7	Proportional LQ DLL	24	15 cpi Utility Resident
8	12 cpi Utility Resident	26	15 cpi LQ Resident
10	12 cpi LQ Resident	32	20 cpi Utility
12	12 cpi Utility DLL	24	20 cpi Utility

Select Font Command (IBM)

✓ ML390 Turbo, ML391 Turbo

Function	ASCII	Decimal	Hexadecimal
Select Typeface, Character Pitch, and Spacing	ESC [I L _n H _n H _{fid} L _{fid} H _{fwd} L _{fwd} f _a	27 91 108 L _n H _n H _{fid} L _{fid} H _{fwd} L _{fwd} f _a	1B 5B 6C L _n H _n H _{fid} L _{fid} H _{fwd} L _{fwd} f _a

This command can be used to select a typeface, plus a character pitch or proportional spacing.

Parameters L_n and H_n

Parameters L_n and H_n are used to set which of the following parameters will be activated. The value calculated by the equation

$$L_n + (H_n \times 256)$$

is used to determine how the various parameters will be treated:

**Table 29: IBM ESC [I Command —
Parameter Activated for Calculated L_n, H_n Values**

Value	Parameters Activated
0 or 1	Command invalid
2 or 3	F _{id} valid; F _{wd} and f _a unchanged
4	F _{id} and F _{wd} valid; f _a unchanged
5	F _{id} , F _{wd} and f _a valid
6 or more	F _{id} , F _{wd} and f _a valid; parameter data dumped after 6 bytes

Parameters H_{fid} and L_{fid}

Parameters H_{fid} and L_{fid} are used to select the font to be used. The value determined from the equation

$$(H_{fid} \times 256) + L_{fid}$$

is used to select the font as follows:

**Table 30: IBM ESC [| Command —
Fonts Selected for Calculated H_{fid} , L_{fid} Values**

Font Selected	Value
Invalid	0
Courier 10	011
Courier 10 Italic	018
Courier 10 Symbol	008
Courier 10/10 Shalom	049
Courier 12	085
Courier 12 Italic	092
Courier 12/12 Shalom	098
Courier 15	223
Courier 15/15 Shalom	226
Courier Proportional	171
Letter Gothic 12	087
Letter Gothic 15	222
Letter Gothic 17	255
OCR-A 10	019
OCR-B 10	003
Orator 10	005
Prestige Pica 10	012
Prestige Elite 12	086
Prestige Elite Symbol 12	080
Prestige Elite 12/12 Yasmin	100
Prestige 15	221
Prestige Proportional	164
Roman Bold Proportional	159
Roman Bold Italic Proportional	155
Roman Proportional/Proportional Barak	167
Roman Proportional/Proportional Yasmin	166
Script 12	084

Parameters H_{fwd} and L_{fwd}

Parameters H_{fwd} and L_{fwd} are used to select a character pitch. The value determined from the equation

$$[(H_{fwd} \times 256) + L_{fwd}] \times 1/1440''$$

is used to select the character pitch as follows:

Table 31: IBM ESC [| Command —

Character Pitch Settings for Calculated H_{fwd} , L_{fwd} Values

Hex Value	Character Pitch
00	Command invalid
90	10 cpi
78	12 cpi
60	15 cpi
54	17 cpi
48	20 cpi

The setting made using the H_{fwd} and L_{fwd} parameters will automatically be overridden if the f_a parameter is set to 02 hexadecimal.

Parameter f_a

Parameter f_a is used to engage proportional spacing.

$f_a = 02$ hexadecimal (2 decimal): engage proportional spacing

$f_a = 00$ hexadecimal (0 decimal): use character pitch set by parameters H_{fwd} and L_{fwd} .

Combined Print Mode Command (Epson)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	ASCII	Decimal	Hexadecimal
Select Print Features	ESC ! n	27 33 n	1B 21 n

This command lets you use any combination of the features listed in the table below. The value of n can range from 0 to 255. To determine the value of n , add up the values for all the features you wish to use. To turn off all these features and return to 10 cpi printing, substitute 0 for n .

**Table 32: Epson ESC ! Command —
Print Features for n Values**

Feature	Value
Compressed printing	4
Double width printing	32
12 cpi (Elite) printing	1
Emphasized printing	8
Enhanced printing	16
Italics printing	64
Proportional printing	2
Underline printing	128

For example, to print underlined italics at 12 cpi, assign n the value of 193 (128 + 64 + 1).

Each time you send this command, it sets or cancels the values for all nine of the features it controls (the eight features listed in the table, plus 10 cpi). This means that if you've requested 12 cpi underline italics, and then want to add emphasized printing to these features, you must add 8 to 193 and resend the command as ESC ! 210. If you send the command ESC ! 8, it will turn off all the other features as it turns on emphasized print.

To see the range of print styles you can produce with the ESC ! n command, run the following BASIC program which prints a sample of each possible combination. Please note that since the program prints all 256 combinations, it will take a few minutes and about 12 pages for the entire sample to print.

```
10 FOR I = 0 TO 255
20 LPRINT:LPRINT
30 LPRINT CHR$(27);"!" ;CHR$(I);"ESC !" ;I;" selects this combination."
40 NEXT I
```

Italics Print Commands (IBM/E/ML)

- ✓ ML320 E/I, ML321 E/I ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521
- ✓ ML320 Std., ML321 Std. ✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	IBM	Epson	ML
Italics Printing On	ASCII: ESC % G Dec: 27 37 71 Hex: 1B 25 47	ASCII: ESC 4 Dec: 27 52 Hex: 1B 34	ASCII: ESC ! / Dec: 27 33 47 Hex: 1B 21 2F
Italics Printing Off	ASCII: ESC % H Dec: 27 37 72 Hex: 1B 25 48	ASCII: ESC 5 Dec: 27 53 Hex: 1B 35	ASCII: ESC ! * Dec: 27 33 42 Hex: 1B 21 2A

Italics printing is slanted, *like this*, and is used to lend emphasis to phrases, sentences, or entire paragraphs.

If you intend to print an entire document in italics, you can use the printer menu to select italics. You will find italics in the menu under the group "Font" and the setting "Style." See "Menu Mode" in your printer manual for more information on making changes in the menu settings.

Emphasized & Enhanced Print Commands (IBM/E/ML)

- ✓ ML320 E/I, ML321 E/I
- ✓ ML320 Turbo, ML321 Turbo
- ✓ ML520, ML521
- ✓ ML320 Std., ML321 Std.
- ✓ ML390 Turbo, ML391 Turbo
- ✓ ML590, ML591

Function	IBM	Epson	ML
Emphasized Printing On	ASCII: ESC E Dec: 27 69 Hex: 1B 45	ASCII: ESC E Dec: 27 69 Hex: 1B 45	ASCII: ESC T Dec: 27 84 Hex: 1B 54
Emphasized Printing Off	ASCII: ESC F Dec: 27 70 Hex: 1B 46	ASCII: ESC F Dec: 27 70 Hex: 1B 46	ASCII: ESC I Dec: 27 73 Hex: 1B 49
Enhanced Printing On	ASCII: ESC G Dec: 27 71 Hex: 1B 47	ASCII: ESC G Dec: 27 71 Hex: 1B 47	ASCII: ESC H Dec: 27 72 Hex: 1B 48
Enhanced Printing Off	ASCII: ESC H Dec: 27 72 Hex: 1B 48	ASCII: ESC H Dec: 27 72 Hex: 1B 48	ASCII: ESC I Dec: 27 73 Hex: 1B 49

Your printer produces bold type by printing each dot of a character twice instead of once. In emphasized printing, the pairs of dots are offset horizontally. In enhanced printing, the pairs of dots are offset vertically.

You can combine emphasized and enhanced printing for an especially bold effect. For headlines, try using them in combination with double width characters; you can also combine emphasized printing with double height characters.

Underline/Overscore/Strike-Through Commands

Underline Commands (IBM/E/ML)

- ✓ ML320 E/I, ML321 E/I
- ✓ ML320 Turbo, ML321 Turbo
- ✓ ML520, ML521
- ✓ ML320 Std., ML321 Std.
- ✓ ML390 Turbo, ML391 Turbo
- ✓ ML590, ML591

Function	IBM	Epson	ML
Underline Printing On	ASCII: ESC - 1 Dec: 27 45 49 Hex: 1B 2D 31	ASCII: ESC - 1 Dec: 27 45 49 Hex: 1B 2D 31	ASCII: ESC C Dec: 27 67 Hex: 1B 43
Underline Printing Off	ASCII: ESC - 0 Dec: 27 45 48 Hex: 1B 2D 30	ASCII: ESC - 0 Dec: 27 45 48 Hex: 1B 2D 30	ASCII: ESC D Dec: 27 68 Hex: 1B 44

The underline feature underscores all characters, including the space character, but does not underscore graphics or the space produced by any horizontal positioning command such as horizontal tab.

In the Epson emulation, you can also use the Combined Print Mode (ESC ! n) command to engage underlining.

Overscore Commands (IBM)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo
✓ ML390 Turbo, ML391 Turbo

✓ ML520, ML521
✓ ML590, ML591

Function	ASCII	Dec	Hex
Overscore Printing On	ESC _ 1	27 95 1	1B 5F 01
Overscore Printing Off	ESC _ 0	27 95 0	1B 5F 00

The overscore feature prints a continuous line over all characters, including the space character, but does not overscore the space produced by a horizontal tab command. This feature is available only in the IBM emulation.

Score Style Command (Epson)

✓ ML390 Turbo, ML391 Turbo

Function	ASCII	Decimal	Hexadecimal
Select Score Style	ESC (- L _n H _n P _n D ₁ D ₂	27 40 45 L _n H _n P _n D ₁ D ₂	1B 28 2D L _n H _n P _n D ₁ D ₂

This command lets you set underline, strike-through and overscore styles: continuous, dashed, single or double lines.

Parameter P_n

Parameter P_n is set to 01 hex (1 dec, SOH ASCII).

Parameters L_n and H_n

Parameters L_n and H_n designate the quantity of data to be scored, according to the following equation:

$$L_n + (H_n \times 256)$$

If L_n and H_n are less than 3, the designated data will be dumped.

Parameters D₁ and D₂

Parameter D₁ is used to set the type of score and parameter D₂ is used to set the attributes, as indicated in the table.

**Table 33: Epson ESC (- Command —
Score Styles for D₁ and D₂ Values**

D ₁	D ₂	Score Style
1	1	Continuous, single underline
2	1	Continuous, single strike-through
3	1	Continuous, single overscore
1	2	Continuous, double underline
2	2	Continuous, double strike-through
3	2	Continuous, double overscore
1	5	Dashed, single underline
2	5	Dashed, single strike-through
3	5	Dashed, single overscore
1	6	Dashed, double underline
2	6	Dashed, double strike-through
3	6	Dashed, double overscore

Using a value of 0 for D₂ will cancel the score mode.

Note: Scores can only be used for printing characters: they can't be used to print line graphics

Outline/Shadow Commands (IBM/E)

✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Outline Printing On	ESC q 1	27 113 49	1B 71 31
Shadow Printing On	ESC q 2	27 113 50	1B 71 32
Outline and Shadow Printing On	ESC q 3	27 113 51	1B 71 33
Outline and/or Shadow Printing Off	ESC q 0	27 113 48	1B 71 30

The outline feature prints characters as outlines with hollow center. The shadow feature prints characters with a shadow behind them. Combining the features produces outline characters with a shadow behind them. These features can be used to produce more interesting and stylish headings. They can be combined with emphasized and/or enhanced printing, double width, etc., for an even more striking effect.

Note: Outline and shadow can only be used for printing characters: they can't be used to print line graphics.

Chapter 5: Custom Character Commands

Your printer's custom (down line loadable) character feature enables you to design your own characters and symbols, even entire character sets if you choose, and download them from your computer to the printer. You can design and store multiple characters. The actual designing of these characters requires some work on your part and can become tedious. We strongly recommend using a commercial software package to help you create new characters and download them to your printer. There are also packages that provide character sets that have already been designed for you.

This chapter describes the custom character commands for your printer, including

- ROM to RAM Copy Commands
- Down Line Loading Commands
- Custom Character Set Commands
- Select DLL Font Commands

The chapter is divided into two sections: one for the 9-pin printers and one for the 24-pin printers.

Custom Character Commands: 9-Pin Printers

Designing a Custom Character for 9-Pin Printers

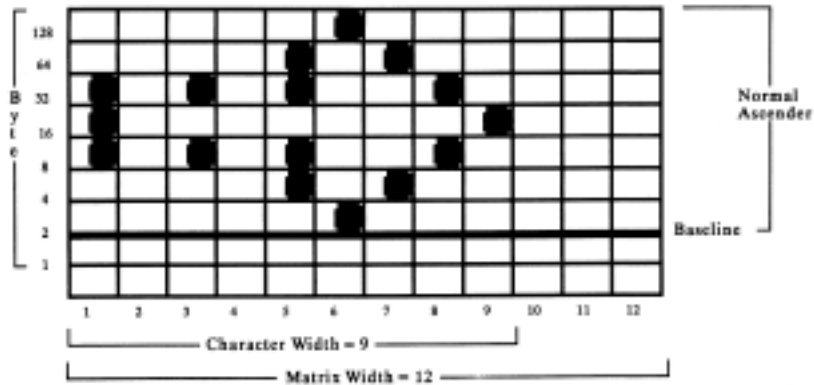
The technique of designing your own custom characters is much like that of designing a graphic image, but on a much smaller scale. You can design characters in either Utility or Near Letter Quality mode: simply activate the desired mode before you download the characters.

Begin by designing your character on a grid. The height of the grid for a normal character is 7 dots, each corresponding to a pin on the printer's printhead. The width of the grid usable for a character is a maximum of 11 dots (the twelfth dot in the grid width is reserved as blank).

The 7-dot grid can be adjusted up or down several dot positions by using the attribute byte in the print command. This byte specifies whether the character is an ascender (top 7 rows) or a descender (bottom 7 rows). The attribute byte also contains other information about the character, as explained later.

The character's baseline lies below the seventh dot from the top if it is an ascender, or below the sixth dot from the top if it is a descender. The columns of the matrix to the left and right of your character affect where it will appear in relation to the characters on either side of it. There is one mandatory blank column at the end of the character (column 12). If you don't leave blank columns, adjacent characters may appear to run right into your character.

Your arrangement of dots is translated into code that tells your printer the exact location of each dot within each column. The example which follows illustrates how this works.



This character is 9 dots wide and is flush to the left. We'll print it in 10 cpi utility mode. Just like 8-pin graphics, each byte specifies a dot column, and the value of each byte is determined by adding up the values of its bits.

Note: *In all print modes, you cannot place two dots next to each other horizontally-you must skip one column.*

Now we need to give the commands that download this data to the printer.

IBM Custom Character Commands for 9-Pin Printers

Copy ROM to RAM Command for 9-Pin Printers (IBM)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

Function	ASCII	Dec	Hex
Copy ROM Character Set to RAM Character Set	ESC \$	27 36	1B 24

This command copies a complete set of the characters resident in the printer to the area of its memory reserved for custom characters. The new character will become part of this character set. This makes it possible to mix standard characters with your custom characters when you print.

Down Line Load Characters Command for 9-Pin Printers (IBM)

➤ ML320 E/I, ML321 E/I

➤ ML320 Turbo, ML321 Turbo

➤ ML520, ML521

Function	ASCII	Decimal	Hexadecimal
Down Line Load Characters	ESC = c ₁ c ₂ m n a ₁ a ₂ [data]	27 61 c ₁ c ₂ m n a ₁ a ₂ [data]	1B 3D c ₁ c ₂ m n a ₁ a ₂ [data]

Use this command with the ML520 or the ML521 printer to begin downloading the characters.

Parameters c₁ and c₂

These parameters specify the total count of characters to be downloaded. How these variables are calculated depends on which mode is engaged: Utility printing or Near Letter Quality (NLQ) printing.

For Utility printing:

$$\text{value} = (\# \text{ of characters to be changed} \times 13) + 2$$

For NLQ printing:

$$\text{value} = (\# \text{ of characters to be changed} \times 48) + 2$$

If the value obtained is less than 256, substitute the value for c₁ and replace c₂ with 0.

If the value obtained is 256 or more, divide the value by 256. Replace c₂ with the whole number result and assign the remainder to c₁.

Parameter m

This parameter selects the print quality:

m = 20: Utility printing

m = 21: NLQ printing

Parameter n

This parameter specifies the ASCII value of the starting character in the set to be redefined (characters must be redefined in sequence) and can be assigned any value in the range 0 to 255.

Parameters a₁ and a₂

These parameters designate the attributes of the character.

Parameter a₁

Parameter a₁ denotes whether the character is an ascender or descender:

a₁ = 0: ascender

a₁ = 128: descender

Here is a breakdown of the definitions for the various bit values for a_1 :

Bit b_7 :

$b_7 = 0$: ascender

$b_7 = 1$: descender

Note: If b_0 or b_1 is 0, b_7 is ignored.

Bits b_6 , b_5 , b_4 , b_3 , b_2 : ignored

Bits b_1 and b_0 :

$b_1, b_0 = 0, 0$: No expansion to 12 dots high: b_7 valid

$b_1, b_0 = 0, 1$: Selects line draw characters; data is expanded to a total height of 12 dots in two passes: b_7 ignored.

$b_1, b_0 = 1, 0$: Shaded character; data is expanded to a total height of 12 dots in two passes: b_7 ignored.

$b_1, b_0 = 1, 1$: NUL is expanded to a total height of 12 dots in two passes: b_7 ignored.

Parameter a_2

Parameter a_2 denotes the total width of the character in dots.

Table 34: IBM ESC = Command — Character Widths for a_2 Values

a_2 (Decimal)	Character Width, in Dots
0	Ignored
1	1 column wide
2	2 columns wide
3	3 columns wide
4	4 columns wide
5	5 columns wide
6	6 columns wide
7	7 columns wide
8	8 columns wide
9	9 columns wide
10	10 columns wide
11	11 columns wide

End the command with the data for the character calculated from your grid. If you're downloading several characters, you only need one ESC & NUL command, and you only need to include m and n once, but you must include a value for parameter a in each set of character data.

Epson Custom Character Commands for 9-Pin Printers

Copy ROM to RAM Command for 9-Pin Printers (Epson)

✔ ML320 E/I, ML321 E/I

✔ ML320 Turbo, ML321 Turbo

Function	ASCII	Dec	Hex
Copy ROM Character Set to RAM Character Set	ESC : NUL NUL NUL	27 58 0 0 0	1B 3A 00 00 00

This command is used with the ML320 E/I, ML321 E/I, ML320T, or ML321T printer to copy a complete set of the characters resident in the printer to the area of its memory reserved for custom characters. The new character will become part of this character set.

✔ ML520, ML521

Function	ASCII	Dec	Hex
Copy ROM Character Set to RAM Character Set	ESC : NUL n NUL	27 58 0 n 0	1B 3A 0 n 0

This command is used with the ML520 or ML521 printer to copy a complete set of the characters resident in the printer to the area of its memory reserved for custom characters. The new character will become part of this character set. This makes it possible to mix standard characters with your custom characters when you print.

Parameter n is used to specify the NLQ font to be used:

n = 0: NLQ Courier

n = 1: NLQ Sans Serif

Down Line Load Characters Command for 9-Pin Printers (Epson)

✔ ML320 E/I, ML321 E/I

✔ ML320 Turbo, ML321 Turbo

✔ ML520, ML521

Function	ASCII	Dec	Hex
Down Line Load Characters	ESC & NUL n ₁ n ₂ a [data]	27 38 0 n ₁ n ₂ a [data]	1B 26 00 n ₁ n ₂ a [data]

Use this command to begin downloading the character(s).

Parameters n₁, n₂

These parameters specify the range of characters to be replaced with new ones. Multiple characters must be assigned to adjacent locations. Parameter n₁ indicates the first character that will be replaced; parameter n₂ indicates the last character that will be replaced.

Custom characters can normally be assigned to decimal locations 32 to 126 and 160 to 255. If IBM Character Set II is selected (ESC 6 command), characters can also be assigned to locations 128 to 159.

Parameter a

This parameter indicates how the character will be positioned within its grid as follows:

Ascenders: a is calculated as

$$\text{last dot column of character} + (\text{first dot column} \times 16) + 128$$

Descenders: a is calculated as

last dot column of character + (first dot column x 16)

Parameter a can be assigned any value in the range 0 to 255.

End the command with the data for the character calculated from your grid.

If you're downloading several characters, you only need one ESC & NUL command, and you only need to include n_1 and n_2 once, but you must include a value for parameter a in each set of character data.

Custom Character Set On/Off Commands for 9-Pin Printers (Epson)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

Function	ASCII	Dec	Hex
Select Standard Character Set	ESC % 0	27 37 48	1B 25 30
Select Custom Character Set	ESC % 1	27 37 49	1B 25 31

To switch from the standard character set to the custom character set, use the ESC % 1 command.

To switch back to the standard character set, use the ESC % 0 command. Otherwise, the custom character set will remain in the printer's memory until one of the following happens:

you turn off the printer

you reset the printer with the ESC @ command

you overwrite them with new custom characters

you use the ESC : NUL NUL NUL command to overwrite them with the standard character set.

Okidata MICROLINE Standard Custom Character Commands for 9-Pin Printers

Copy ROM to RAM Command for 9-Pin Printers (ML)

✓ ML320 Std., ML321 Std. ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521

Function	ASCII	Dec	Hex
Copy ROM Character Set to RAM Character Set	ESC \$	27 36	1B 24

This command copies a complete set of the characters resident in the printer to the area of its memory reserved for custom characters. The new character will become part of this character set. This makes it possible to mix standard characters with your custom characters when you go to print.

Down Line Load Characters Commands for 9-Pin Printers (ML)

✓ ML320 Std., ML321 Std. ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521

Function	ASCII	Dec	Hex
Down Line Load Ascender Characters	ESC % A m n ₁ ... n ₁₁	27 37 65 m n ₁ ... n ₁₁	1B 25 41 m n ₁ ... n ₁₁
Down Line Load Descender Characters	ESC % D m n ₁ ... n ₁₁	27 37 68 m n ₁ ... n ₁₁	1B 25 44 m n ₁ ... n ₁₁

To begin downloading an *ascender* character, use the ESC % A m n₁ ... n₁₁ command. This command specifies that the new character will be an ascender.

To begin downloading a *descender* character, use the ESC % D m n₁ ... n₁₁ command. This command specifies that the new character will be a descender.

Parameter m

This parameter specifies the character that will be replaced by the custom character. Custom characters can be assigned to decimal locations 32 to 127 and 160 to 223.

Data n₁ through n₁₁

n₁ through n₁₁ specify the data for the character, calculated from your grid.

Select DLL Font Commands for 9-Pin Printers (ML)

✓ ML320 Std., ML321 Std. ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521

Function	ASCII	Dec	Hex
Select DLL in Utility Mode	ESC 2	27 50	1B 32
Select DLL in Near Letter Quality Mode	ESC 7	27 55	1B 37

The ESC 2 command switches custom character printing on when the printer is set for the Utility mode.

The ESC 7 command switches custom character printing on when the printer is set for the Near Letter Quality (NLQ) print mode. NLQ custom characters are just like Utility custom characters, except that overprinting is used to make them match the NLQ character set.

Once you have selected the Custom Character Set, it will remain in memory until the printer is turned off. Any one of the following will also delete the Custom Character Set from the printer's

memory:

- you reset the printer with the ESC CAN command
- you overwrite them with new custom characters
- you use the ESC \$ command to overwrite them with the Standard Character Set.

Custom Character Commands: 24-Pin Printers

Designing a Custom Character for 24-Pin Printers

The technique for designing your own custom characters is much like that of designing a graphic image, but on a much smaller scale. You can design characters in either Utility or LQ mode: simply activate the desired mode before you download the characters.

Begin by designing your character on a grid. The height of the grid is 24 dots, each corresponding to a pin on the printhead. The width of the grid, as well as the width of the character itself, depends on the print mode.

Table 35: Custom Character Commands — Character/Grid Width for Print Modes (24-Pin Printers)

d_0 = space to the left of the character
 d_1 = width of the character itself
 d_2 = space to the right of the character

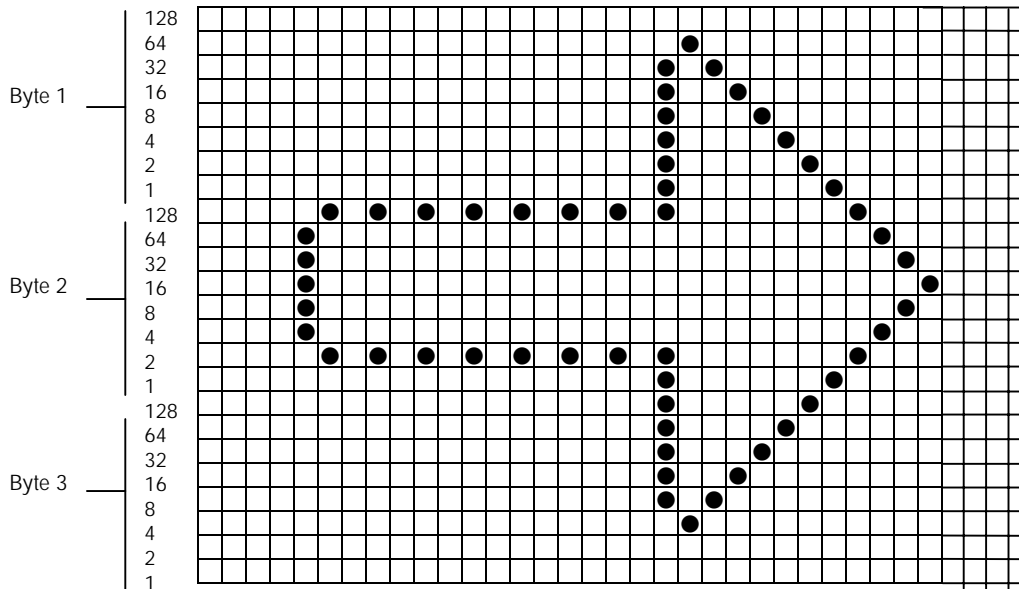
Print Mode	Max. Character Width (d_1)	Max. Total Grid Width ($d_0 + d_1 + d_2$)
Utility	15 dots	18 dots
LQ	37 dots	42 dots
Proportional	37 dots	42 dots

Note: *If the printer is in superscript or subscript mode, only the first two or last two bytes are needed for each column.*

Characters are designed on a grid made up of columns of 24 dots. Each column, in turn, is divided into three 8-dot groups, and each 8-dot group is represented by a byte of data.

When designing a character, keep the intended use for the character in mind. If the character is to be included with text, leave the top and bottom two rows of the grid blank, in keeping with general font design standards. The character's baseline occurs at the sixth dot from the bottom. The columns of the grid to the left and right of your character affect where it will appear in relation to the characters on either side. If you don't leave blank columns, adjacent characters may appear to run right into your custom character.

Your arrangement of dots is translated into code that tells the printer the exact locations of each dot in each column. The example below shows how this works.



The width of the grid in dots depends on the printing mode in use. This example character is 27 dots wide and has 4 blank columns on either side. We'll print it in 10 cpi Letter Quality. Since the character is being printed in 24-pin mode, three bytes of data are required to specify a single column. Just like high resolution 24-pin graphics, the first three bytes specify dot positions for the second column, and so on up to the last column in which dots will appear. The value of each byte is determined by adding up the values of its bits.

Note: In all print modes, you can NOT place two dots next to each other horizontally-you must skip one column.

The commands below are used to download this data to the printer.

IBM Custom Character Commands for 24-Pin Printers

Down Line Load Characters Command (IBM)

✓ ML590, ML591

Function	ASCII	Dec	Hex
Download Custom Character	ESC = n ₁ n ₂ # a ₁ a ₂ a ₃ m ad ₁ ad ₂ id ₁ id ₂ d ₁ d ₂ d ₃ d ₄ d ₅ [data]	27 61 n ₁ n ₂ 35 a ₁ a ₂ a ₃ m ad ₁ ad ₂ id ₁ id ₂ d ₁ d ₂ d ₃ d ₄ d ₅ [data]	1B 3D n ₁ n ₂ 23 a ₁ a ₂ a ₃ m ad ₁ ad ₂ id ₁ id ₂ d ₁ d ₂ d ₃ d ₄ d ₅ [data]

Parameters n₁ n₂

These parameters specify the number of bytes in the command string. The total number of bytes is calculated as follows:

$$\text{No. of bytes} = n_1 + (n_2 \times 256)$$

Parameters a₁ a₂ a₃

Parameters a₁ and a₂ specify the starting address of the custom character data, calculated as

follows:

$$\text{starting address} = a_1 + (a_2 \times 256)$$

Parameter a_3 indicates the number of characters to be down loaded.

Note: *If fewer than 256 characters are loaded, all character codes must be consecutive from the starting point.*

Parameter m

The bits of this parameter determine the character pitch and print mode as follows:

b_0 : always 0

b_1 : ignored

$b_2, b_3 = 0, 0$: Utility, all pitches
0, 1: LQ, 10 cpi
1, 0: LQ, 12 cpi
1, 1: LQ, proportional

$b_6 = 0$: Last data table
1: Another data table follows

Note: *The command up to parameter m need only be included once for each down loading sequence. The following parameters apply to the specific characters, and must be included for each individual character in the sequence.*

Parameters ad_1, ad_2

These parameters specify the starting address of the character, as follows:

$$\text{character address} = ad_1 + (ad_2 \times 256)$$

Parameter id_1

Here is a breakdown of the bit values for id_1 :

b_0 to $b_5 =$ Number of columns to be loaded (1 to 63)

$b_6 = 0$: Load to RAM
1: Copied from ROM character generator

$b_7 = 0$: Normal character
1: Elongated character

Parameter id_2

Here is a breakdown of the bit values for id_2 :

b_0 to $b_5 =$ Character width (1 to 63, proportional)

$b_6, b_7 = 0, 0$: Data for pins 19 to 24 copied to pins 25 to 30
0, 1: Data for pins 23, 24, duplicated for pins 25, 26, 27, 28, 29, 30
1, 0: Underline
1, 1: No elongation

Parameters d_1, d_2, d_3, d_4, d_5

Each bit of the parameter bytes indicates whether the data in the specified column is identical to the previous column or is new.

bit = 0: data is new

bit = 1: data is a repeat of previous column

The parameters specify data repetition as follows:

- d₁**: columns 1 to 8
- d₂**: columns 9 to 16
- d₃**: columns 17 to 24
- d₄**: columns 25 to 32
- d₅**: columns 33 to 40

Epson Custom Character Commands for 24-Pin Printers

First use the Copy ROM to RAM command to copy a complete set of the characters resident in the printer to the area of its memory reserved for custom characters. The new character you designed will become part of this character set.

To begin downloading the custom character, use the Download Custom Characters Command to specify the range of characters that you will be replacing with new ones, to indicate how you have positioned the character within its grid, and to supply the data for the character(s), calculated from your grid(s).

To switch between the standard character set and your custom character set, use the Custom Character Set On/Off Command.

Copy ROM to RAM Command for 24-Pin Printers (Epson)

✔ ML390 Turbo, ML391 Turbo ✔ ML590, ML591

Function	ASCII	Dec	Hex
Copy ROM Character Set to RAM Character Set	ESC : NUL n NUL	27 58 0 n 0	1B 3A 00 n 00

This command is used to copy a complete set of the characters resident in the printer to the area of its memory reserved for custom characters. The new character will become part of this character set.

Parameter n

Parameter n is used to specify the font to be used.

Table 36: Epson ESC : Command — Fonts for n Values

Value of n	Font	Value of n	Font
0	Roman	6	OCR-A
1	Swiss	7	Orator
2	Courier (default)	8	Orator-S
3	Prestige	122	Swiss Bold
4	Script	124	Letter Gothic
5	OCR-B	126	Font set on Menu

Down Line Load Characters Commands for 24-Pin Printers (Epson)

✓ ML390 Turbo, ML391 Turbo

Function	ASCII	Dec	Hex
Load Custom Characters	ESC & m n ₁ n ₂ d ₀ d ₁ d ₂ [data]	27 38 m n ₁ n ₂ d ₀ d ₁ d ₂ [data]	1B 26 m n ₁ n ₂ d ₀ d ₁ d ₂ [data]

✓ ML590, ML591

Function	ASCII	Dec	Hex
Load Custom Characters	ESC & NUL m n ₁ n ₂ d ₀ d ₁ d ₂ [data]	27 38 0 m n ₁ n ₂ d ₀ d ₁ d ₂ [data]	1B 26 00 m n ₁ n ₂ d ₀ d ₁ d ₂ [data]

Use these commands to begin downloading the character(s) to the printer.

Parameter m

This parameter selects the available area in RAM. The only available values/locations are m = 0 or m = 128.

Parameters n₁ n₂

These parameters specify the range of characters to be replaced with new ones. Multiple characters must be assigned to adjacent locations.

Parameter n₁ indicates the first character that will be replaced: range 0 to 127.

Parameter n₂ indicates the last character that will be replaced: range 1 to 127.

Parameters d₀ d₁ d₂

These parameters define the width of the character grid in dots as follows:

d₀ = width of space before the character

d₁ = width of the character

d₂ = width of space after the character

Follow these parameters with the data calculated from your grid as shown above in the section "Designing a Custom Character for 24-Pin Printers."

Custom Character Set On/Off Command for 24-Pin Printers (Epson)

✔ ML390 Turbo, ML391 Turbo ✔ ML590, ML591

Function	ASCII	Dec	Hex
Select Standard Character Set	ESC % 0	27 37 0	1B 25 00
Select Custom Character Set	ESC % 1	27 37 1	1B 25 01

To switch from the standard character set to the custom character set, use the ESC % 1 command.

To switch back to the standard character set, use the ESC % 0 command. Otherwise, the custom character set will remain in the printer's memory until one of the following happens:

- you turn off the printer
- you reset the printer with the ESC @ command
- you overwrite them with new custom characters
- you use the ESC : NUL NUL NUL command to overwrite them with the standard character set.

Load Custom Character Set into Upper ASCII Command for 24-Pin Printers (Epson)

✔ ML390 Turbo, ML391 Turbo ✔ ML590, ML591

Function	ASCII	Dec	Hex
Select Custom Character Set	ESC t 2	27 116 2	1B 74 02

This command loads the custom character set (decimal 0 to 127) into the upper ASCII range (128 to 255).

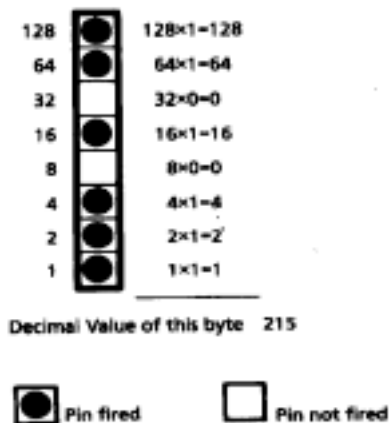
Chapter 6: Graphics Commands for 9-Pin Printers

Overview

Your printhead has one column of pins. Images are created as the pins “fire,” striking the ribbon against the paper to produce dots. White spaces appear where the pins don't fire. In 8-pin graphics, each column of dots is represented by a single byte of data. Models ML320, ML321, ML320 Turbo, ML321 Turbo, ML520, and ML521 use the 9-pin mode in cases where a slightly higher resolution is required: it uses two bytes to represent each dot column.

When you program a graphic image, your program has to describe the pattern of dots you want to print. Graphics data, like all other data sent to the printer, consists of a series of bytes. Each of the eight bits in a byte of graphics data corresponds to one pin on the printhead. A bit's value can be either 1 or 0. When the printer receives the data, it interprets a bit with a value of 1 as a command to fire the corresponding pin. Bits that are set to 0 don't cause pins to fire.

You can picture the byte as a column of 8 bits. In 8-pin graphics, the body of data is a series of these columns lined up next to each other. Instead of sending the data to the printer bit by bit, you'll probably want to convert this binary information into decimal or hexadecimal format for use with your programming language. In the figure below we show how to determine the decimal value for a given pattern of pins.



For optimum registration when printing graphics using bi-directional printing, use the Print Registration item in the printer menu to fine-tune the alignment of the vertical bars which print as part of the menu. Keep changing the setting until the lines of the vertical bar characters have the straightest vertical column.

Programming Graphics in BASIC

One important thing to remember when you're programming graphics is not to include extraneous line feeds in your programs. Using a semicolon after the data in an LPRINT statement will keep the print position on the same line.

However, there is an additional complication: by default, BASIC assigns to all printers a maximum line length of 80 characters. After the printer has received 80 bytes of data, it will automatically perform a carriage return and line feed. Since graphics data typically consists of many bytes, it's quite easy to exceed this limit. The resulting output will be garbled. You can work around this problem by setting the line length to the maximum allowable value, 255. Put one of these statements at the beginning of your program:

For parallel printers:

```
WIDTH "LPT1:",255
```

For serial printers that have been opened as #1:

```
WIDTH #1,255
```

Graphics Density Selection Commands (IBM/E)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

Function	ASCII	Dec	Hex
Begin Single Density Graphics	ESC K L _n H _n [data]	27 75 L _n H _n [data]	1B 4B L _n H _n [data]
Double Density Graphics Command	ESC L L _n H _n [data]	27 76 L _n H _n [data]	1B 4C L _n H _n [data]
Double Speed/ Double Density Graphics Command	ESC Y L _n H _n [data]	27 89 L _n H _n [data]	1B 59 L _n H _n [data]
Quadruple Density Graphics Command	ESC Z L _n H _n [data]	27 90 L _n H _n [data]	1B 5A L _n H _n [data]

These graphics modes correspond to the 8-pin modes and are supported by most current DOS-based graphics software.

Parameters L_n and H_n

These parameters tell the printer how many bytes of graphics data to expect. Eight-pin graphics have one byte of data per column. To calculate the values for L_n and H_n, first determine how many columns of dots there will be in your graphics image. Divide this number by 256 and assign the whole number result to H_n; assign the remainder to L_n.

Graphics Density Selection Commands (ML)

✓ ML320 Std., ML321 Std.

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

Function	ASCII	Dec	Hex
Select Single Density Graphics	ESC P or ESC Q	27 80 or 27 81	1B 50 or 1B 51
Select Double Density Graphics	ESC R	27 82	1B 52
Select Double Speed & Quadruple Density Graphics	ESC # Q	27 35 81	1B 23 51

Use these commands to select the density of the printing that will be used: single density (60 dpi), double density (120 dpi), or quadruple density (240 dpi). The quadruple density selection command also engages double speed.

Graphics Select/Print Command (Epson)

✓ ML320 Std., ML321 Std.

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

Function	ASCII	Dec	Hex
Graphics Select/Print	ESC * m L _n H _n [data]	27 42 m L _n H _n [data]	1B 2A m L _n H _n [data]

This command is used to select the density, to designate the number of columns of data you'll be sending, and to specify the data to be sent.

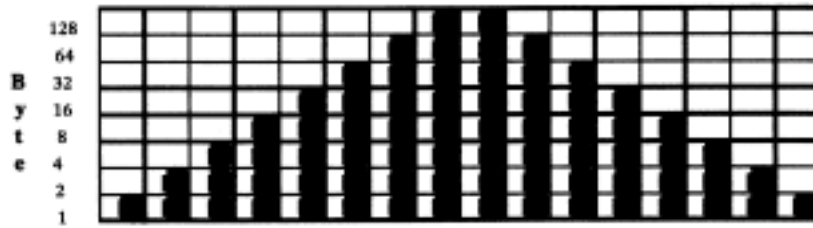
Parameter m

This parameter specifies which density to use when printing the graphic image. The table below indicates the type of density for each value of m.

**Table 37: Epson ESC * m Command —
8-Pin Graphics Density Codes for m Values (9-Pin Printers)**

Value of m	Graphics Type	Horizontal Density (dots per inch)
0	Single Density	60 dpi
1	Double Density	120 dpi
2	High Speed Double Density	120 dpi
3	Quadruple Density	240 dpi
4	CRT I	80 dpi
5	Plotter (Single Density)	72 dpi
6	CRT II	90 dpi
7	Double Density Plotter	144 dpi

Once you've selected the density you want to use, you have to design your graphic image. Begin by mapping out the pattern you want to print on a piece of graph paper. Here is a sample pattern for a triangle:



Parameters L_n and H_n

These parameters tell the printer how many columns of data you'll be sending: 8-pin modes have one byte of data per column. To calculate the values, first determine how many columns of dots there will be in your graphics image. Divide this number by 256 and assign the whole number to H_n ; assign the remainder to L_n .

In our triangle example, each triangle requires 16 columns. We'll be printing a row of 6 triangles, so the total number of columns in the image is 6×16 , or 96. Dividing 96 by 256 gives a value of 0 for H_n with a remainder of 96, which we'll assign to L_n .

Next, we can write a BASIC statement that sends the command begin 8-pin graphics:

```
LPRINT CHR$(27); "*" ; CHR$(3) ; CHR$(96) ; CHR$(0) ;
```

Note: Be sure to include the semicolon(;) at the end of this statement. That way, the printer won't insert a carriage return and line feed before your graphics data.

The listing below is a BASIC program for the Epson emulation that will generate a row of six of our triangles in quadruple density. To print the pattern at another density, change the value of D in line 10 to one of the other density codes.

```
10 D=3 `Density code for quadruple density (Epson)
20 WIDTH "LPT1:",255 `Set printer for maximum line width
30 LPRINT CHR$(27); "*" ; CHR$(D) ; CHR$(96) ; CHR$(0) ;
40 REM CHR$(D) is the density; in this case D=3 for quadruple density
50 REM CHR$(96) and CHR$(0) indicate the number of columns
60 FOR I=1 TO 6 `Repeat triangle pattern six times
70 FOR J=1 TO 16 `Each triangle has 16 columns
80 READ A `Read the column
90 LPRINT CHR$(A) ; `Send the byte to the printer
100 NEXT J `Now print the next column
110 RESTORE `Go back to the beginning of the DATA statements
120 NEXT I `Now print the next triangle
130 END
140 DATA 1,3,7,15,31,63,127,255,255,127,63,31,15,7,3,1
```

Your printout will look like this:



Reassign Graphics Codes Command (Epson)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

Function	ASCII	Dec	Hex
Reassign Graphics	ESC ? m n	27 63 m n	1B 3F m n

You can use this command to reassign any of the 8-pin graphics modes to one of the graphics commands (ESC K, ESC L, ESC Y, or ESC Z).

Parameter m

This parameter designates which of the four commands you're redefining. Substitute one of the four letters (K, L, Y, or Z) for m in the command.

Parameter n

This parameter designates the density of the mode you are reassigning to the redefined code. Substitute the appropriate value (0 through 7) for the density you wish to select, as taken from the 8-Pin Graphics Density Codes table earlier in this chapter.

When you are ready to print a graphics pattern, send the redefined command, followed by the graphics data.

For example, the following BASIC statement reassigns quadruple density to the command ESC L:

```
LPRINT CHR$(27);"?";"L";CHR$(3)
```

Select Graphics Command (Epson)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

Function	ASCII	Dec	Hex
Select 9-pin Graphics Printing	ESC ^ m Ln Hn [data]	27 94 m Ln Hn [data]	1B 5E m Ln Hn [data]

This command permits use of all nine pins on the printhead. It operates exactly like the ESC * command, except that dot columns are given two bytes each instead of one. The first byte for each column represents the top eight pins, just like the ESC * command. The second byte is 128 if the bottom (9th) pin is to be fired, and zero if it's not to be fired.

Select Graphics Mode Command (ML)

✓ ML320 Std., ML321 Std.

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

Function	ASCII	Dec	Hex
Select Graphics Mode	ESC * n ₁ n ₂ :	27 42 n ₁ n ₂ 58	1B 2A n ₁ n ₂ 3A

Use this command to select the density and to define the speed and "word size."

Parameter n₁

This parameter specifies the density. To calculate the value of n₁, first select the dpi and density you want, then determine the n₁ values for each from the table below. Add them together, then add 96 to the total.

**Table 38: ML ESC * Command —
Densities for n_1 Values (9-Pin Printers)**

Dots per inch/Density	Value of n_1
60 dpi	1
72 dpi	2
Single density	4
Double density	8
Quadruple density	16

For example, for 60 dpi printing at quadruple density, the value of n_1 would be calculated as follows:

$$n_1 = 1 + 16 + 96 = 113$$

Parameter n_2

This parameter specifies the speed of the printing and a word length of 8 bits. To calculate the value of n_2 , first select the speed and determine the value of n_2 for that speed from the table below. Next, select 7 or 8-bit graphics and determine the value of n_2 for that word size from the table. Add each of these two values together, then add 64 to the total.

**Table 39: ML ESC * Command —
Speed & Word Sizes for n_2 Values (9-Pin Printers)**

Speed/Word Size	Value n_2
Normal speed	0
Double speed	8
7-bit graphics	0
8-bit graphics	16

For example, for double speed, 8-bit graphics, the value of n_2 would be calculated as follows:

$$n_2 = 8 + 16 + 64 = 80$$

Graphics Print Mode Commands (ML)

✓ ML320 Std., ML321 Std.

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

Function	ASCII	Dec	Hex
Select Graphics Print Mode	ETX	3	03
End Graphics Print Mode	ETX STX	3 2	03 02

To begin printing graphics, you must first send the ETX command. This is followed by graphics data—bytes representing the individual dot columns you will be printing. The graphics data is followed by the ETX STX command which ends graphics printing. The listing below is a BASIC program that generates a row of six triangles in quadruple density.

```
10 WIDTH "LPT1:,"255 `Set printer for maximum line width
20 LPRINT CHR$(27);"*";CHR$(113);CHR$(80);":":CHR$(3);
30 REM CHR$(113) and CHR$(80) are the attribute codes for normal speed,
   quadruple density graphics
40 REM CHR$(3) Begins graphics printing
50 FOR I=1 TO 6 `Repeat triangle pattern six times
60 FOR J=1 TO 16 `Each triangle has 16 columns
70 READ A `Read the column
80 LPRINT CHR$(A); `Send the byte to the printer
90 NEXT J `Now print the next column
100 RESTORE `Go back to the beginning of the DATA statements
110 NEXT I `Now print the next triangle
120 LPRINT CHR$(3);CHR$(2); `End graphics printing
130 END
140 DATA 128,192,224,240,248,252,254,255,255,254,252,248,240,224,192,128
```

Your printout will look like this:



Special Purpose Line Feed Commands (ML)

✓ ML320 Std., ML321 Std.

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

If you are printing more than one line of graphics, you will need to use line feeds. In the Okidata MICROLINE Standard emulation, your printer has a variety of special purpose line feed commands for use in graphics printing:

Function	Setting	ASCII	Dec	Hex
Graphics line feed with carriage return	Text	ETX LF	3 10	03 0A
Graphics line feed with carriage return	Graphics	ETX SO	3 14	03 0E
Graphics line feed without carriage return	Text	ETX DC2	3 18	03 12
Graphics line feed without carriage return	Graphics	ETX DC4	3 20	03 14
Stores graphics data in one dot column buffer	N/A	ETX ETX	3 3	03 03

The graphics setting is determined by whether you are using 7 or 8-bit graphics. In 7-bit graphics mode, the graphics setting is 14/144"; in 8-bit graphics mode, it is 16/144".

The text setting is determined by the current text line spacing, as set by the ESC 6 and ESC 8 commands.

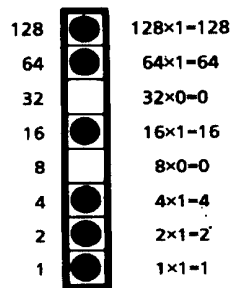
Chapter 7: Graphics Commands for 24-Pin Printers

Overview

Your printhead has one column of pins. Images are created as the pins “fire,” striking the ribbon against the paper to produce dots. White spaces appear where the pins don't fire. In 8-pin graphics, each column of dots is represented by a single byte of data. In the Epson LQ mode, Models ML390 Turbo, ML391 Turbo, ML590 and ML591 support 24-pin graphics, in which each dot column is represented by three bytes of data.

When you program a graphic image, your program has to describe the pattern of dots you want to print. Graphics data, like all other data sent to the printer, consists of a series of bytes. Each of the eight bits in a byte of graphics data corresponds to one pin on the printhead. A bit's value can be either 1 or 0. When the printer receives the data, it interprets a bit with a value of 1 as a command to fire the corresponding pin. Bits that are set to 0 don't cause pins to fire.

You can picture the byte as a column of 8 bits. In 8-pin graphics, the body of data is a series of these columns lined up next to each other. Instead of sending the data to the printer bit by bit, you'll probably want to convert this binary information into decimal or hexadecimal format for use with your programming language. In the figure below we show how to determine the decimal value for a given pattern of pins. For 24-pin graphics, you must perform this process a total of three times.



Decimal Value of this byte 215



For optimum registration when printing graphics using bi-directional printing, use the Print Registration item in the printer menu to fine-tune the alignment of the vertical bars which print as part of the menu. Keep changing the setting until the lines of the vertical bar characters have the straightest vertical column.

Programming Graphics in BASIC

One important thing to remember when you're programming graphics is not to include extraneous line feeds in your programs. Using a semicolon after the data in an LPRINT statement will keep the print position on the same line.

However, there is an additional complication: by default, BASIC assigns to all printers a maximum line length of 80 characters. After the printer has received 80 bytes of data, it will automatically perform a carriage return and line feed. Since graphics data typically consists of many bytes, it's quite easy to exceed this limit. The resulting output will be garbled. You can work around this problem by setting the line length to the maximum allowable value, 255. Put one of these statements at the beginning of your program:

For parallel printers:

```
WIDTH "LPT1:",255
```

For serial printers that have been opened as #1:

```
WIDTH #1,255
```

Graphics Density Selection Commands (IBM/E)

✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Begin Single Density Graphics	ESC K L _n H _n [data]	27 75 L _n H _n [data]	1B 4B L _n H _n [data]
Double Density Graphics Command	ESC L L _n H _n [data]	27 76 L _n H _n [data]	1B 4C L _n H _n [data]
Double Speed/ Double Density Graphics Command	ESC Y L _n H _n [data]	27 89 L _n H _n [data]	1B 59 L _n H _n [data]
Quadruple Density Graphics Command	ESC Z L _n H _n [data]	27 90 L _n H _n [data]	1B 5A L _n H _n [data]

These graphics modes correspond to the 8-pin modes and are supported by most current DOS-based graphics software.

Parameters L_n and H_n

These parameters tell the printer how many bytes of graphics data to expect. Eight-pin graphics have one byte of data per column. To calculate the values for L_n and H_n, first determine how many columns of dots there will be in your graphics image. Divide this number by 256 and assign the whole number result to H_n; assign the remainder to L_n.

Graphics Select/Print Command (IBM AGM/E)

✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Graphics Select/Print	ESC * m n ₁ n ₂ [data]	27 42 m n ₁ n ₂ [data]	1B 2A m n ₁ n ₂ [data]

Note: The IBM AGM emulation combines the IBM Proprinter emulation with Epson LQ graphics for special graphics applications.

This command is used to select the density, to designate the number of columns of data you'll be sending, and to specify the data to be sent.

Parameter m

This parameter specifies which density to use when printing the graphic image. The table below indicates the type of density for each value of m.

**Table 40: Epson ESC * m Command —
8-Pin Graphics Density Codes for m Values (24-Pin Printers)**

Value of m	Graphics Type	Pins	Horizontal Density (dots per inch)
0	Single Density	8	60 dpi
1	Double Density	8	120 dpi
2	High Speed Double Density	8	120 dpi*
3	Quadruple Density	8	240 dpi*
4	CRT I	8	80 dpi
6	CRT II	8	90 dpi
32	Single Density	24	60 dpi
33	Double Density	24	120 dpi
38	CRT III	24	90 dpi
39	Triple Density	24	180 dpi
40	Hex Density	24	360 dpi*

* Extrapolated (quasi density)

Parameters L_n and H_n

These parameters tell the printer how many columns of data you'll be sending: 8-pin modes have one byte of data per column, 24-pin modes have three bytes of data per column. These parameters can be assigned any value from 0 to 255. To calculate the values, first determine how many columns of dots there will be in your graphics image. Divide this number by 256 and assign the whole number to H_n; assign the remainder to L_n.

Reassign Graphics Codes Command (IBM AGM/E)

✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Reassign Graphics	ESC ? m n	27 63 m n	1B 3F m n

Note: *The IBM AGM emulation combines the IBM Proprinter emulation with Epson LQ graphics for special graphics applications.*

You can use this command to reassign any of the graphics modes to one of the graphics commands (ESC K, ESC L, ESC Y, or ESC Z).

Parameter m

This parameter designates which of the four commands you're redefining. Substitute one of the four letters—K (single density), L (double density), Y (high speed double density), or Z (quadruple density)—for m in the command.

Parameter n

This parameter designates the density of the mode you are reassigning to the redefined code. Substitute the appropriate value for the density you wish to select, as taken from the "Epson ESC * m Command — 8-Pin Graphics Density Codes for m Values (24-Pin Printers)" table in the previous command description.

When you are ready to print a graphics pattern, send the redefined command, followed by the graphics data.

Graphics Resolution Command (IBM)

✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Select Graphics Resolution/ Print	ESC [g n ₁ n ₂ m [data]	27 93 103 n ₁ n ₂ m [data]	1B 5D 67 n ₁ n ₂ m [data]

This command sets the graphics resolution and prints the graphic data.

Parameters n₁ n₂

Range 0 to 255. These parameters specify the number of dot columns according to the following formula:

$$\text{dot columns} = n_1 + (n_2 * 256) + 1$$

Parameter m

This parameter specifies the horizontal resolution of the graphics according to the following table.

**Table 41: IBM ESC [g Command —
Horizontal Graphics Resolution for m Values (24-Pin Printers)**

Value of m	Resolution (dpi)	Pins	Notes
0	60	8	Same as ESC K
1	120	8	Same as ESC L
2	120	8	Same as ESC Y
3	240	8	Same as ESC Z
8	60	24	High resolution for ESC K
9	120	24	High resolution for ESC L
11	180	24	
12	360	24	

Select Graphics Aspect Ratio Command (IBM)

✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Set graphics aspect ratio	ESC n P _n	27 110 P _n	1B 6E P _n

This command sets the vertical-to-horizontal ratio of graphics printed using the ESC K, ESC L, ESC Y, and ESC Z graphics commands.

The possible values for P_n are:

P_n = 0, 1: Sets aspect ratio of 5:6

P_n = 2: Sets aspect ratio of 1:1

P_n ≥ 3: Dumps data up to receipt of ESC n p_n command

Select Graphics Mode Command (Epson)

✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Select Graphics Mode	ESC (G L _n H _n P _n	27 40 71 L _n H _n P _n	1B 28 47 L _n H _n P _n

Use this command to place the printer in graphics mode.

Parameters L_n and H_n

Parameters L_n and H_n are used to designate the number of bytes to follow in the subsequent parameters, where

$$\text{Number of Bytes} = L_n + (H_n \times 256)$$

L_n and H_n can have any value from 0 to 255 decimal. Generally, L_n is set to 1 and H_n is set to 0.

Parameter P_n

Parameter P_n sets the graphics mode. It can have a hexadecimal value of 01 or 31.

Note: To cancel the graphics mode, enter the ESC @ command.

Set/Reset Graphics Mode Command (Epson)

✓ ML390 Turbo, ML391 Turbo

Function	ASCII	Dec	Hex
Engage Raster Graphics Mode	ESC DLE G n 1	27 16 71 n 49	1B 10 47 n 31
Disengage Raster Graphics Mode	ESC DLE G n 0	27 16 71 n 48	1B 10 47 n 30

Use this command to engage and disengage the graphics mode.

Parameter n

This parameter determines how this command is handled:

n = 0: Command invalid

n = 1: data valid

n > 1: data valid; data that follows is discarded after the command has been executed.

Print Raster Graphics Command (Epson)

✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Print Raster Graphics	ESC . P _c P _v P _h P _m L _n H _n [data]	27 46 P _c P _v P _h P _m L _n H _n [data]	1B 2E P _c P _v P _h P _m L _n H _n [data]

Use this command to print bit-image graphics horizontally.

Parameter P_c

Parameter P_c sets the mode:

P_c = 0: Full Graphics Mode

P_c = 1: Compressed Mode

Parameter P_v

Parameter P_v sets the vertical dot density:

P_v = 10: 360 dots per inch (dpi)

P_v = 20: 180 dpi

Parameter P_h

Parameter P_h sets the horizontal dot density:

P_h = 10: 360 (dpi)

P_h = 20: 180 dpi

Parameter P_m

Parameter P_m sets the number of vertical dots.

Table 42: Epson ESC . Command — Valid Range of P_m Values for P_v Values

P _v Value	Valid P _m Range
10	0 to 48
20	0 to 24

Note: If P_m value is set to 0, graphics will not print.

Parameters L_n and H_n

Parameters L_n and H_n are used to designate the number of horizontal dots to be printed, where

$$\text{No. of dots} = L_n + (H_n \times 256)$$

For fewer than 256 dots, substitute the number of dots for L_n and set H_n = 0. For more than 256 dots, divide the number of dots by 256 and assign the whole number result to H_n, then assign the remainder to L_n.

L_n and H_n can have any value from 0 to 255 decimal.

The maximum number of dots allowed depends on the value of P_h and the width of the printer carriage as follows:

Table 43: Epson ESC . Command — Maximum Horizontal Dots for P_h Values

P _h Value	Model	Maximum Dots
10	ML590	2880
	ML591	4896
20	ML590	1440
	ML591	2448

Chapter 8: Horizontal Control Commands

This chapter describes the commands for horizontal control including the following:

- Backspace/Carriage Return Commands
- Margin Setting Commands
- Horizontal Tab Commands
- Indent Commands
- Print Position Commands
- Uni-directional Printing Commands
- Incremental Printing Commands
- Justification Commands

Backspace & Carriage Return Commands (IBM/E/ML)

✓ ML320 E/I, ML321 E/I ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521
✓ ML320 Std., ML321 Std. ✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Backspace	BS	8	08
Carriage Return	CR	13	0D

The backspace command moves the printhead one character to the left. The actual width of the backspace depends on the current pitch. If you're using proportional spacing, the BS command moves the printhead 1/10" to the left.

The carriage return command causes the printer to print data from the print buffer and return the printing position to the beginning of the line. If the printer menu item Auto LF (under Set-Up group) has been set to YES (factory default is NO), the printer automatically adds a line feed to each carriage return.

Margin Setting Commands

Set Left & Right Margins Command (IBM)

✓ ML320 E/I, ML321 E/I ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521
✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Set Left & Right Margins	ESC X n m	27 88 n m	1B 58 n m

In the IBM emulation, the margins set by the Left & Right Margin command are set by character columns. The actual position of the margin depends on the current pitch: a margin of 10 columns will come out as 1" in 10 cpi and 1/2" in 20 cpi. If the current pitch is proportional, the margin is set as though it were 10 cpi. However, once you've set a margin, its absolute position remains the same, even if you change the pitch, until you specifically reset the margin. This saves you the work of adjusting margins with every pitch change in your document.

Note: *You should always send margin commands at the beginning of a line.*

Parameter n

Parameter n sets the left margin and can be any value from 0 to 254. Use a value of 0 if you want to change the right margin only. The default setting for the left margin in the IBM emulation is 1.

Parameter m

Parameter m sets the right margin and can be any value from 0 to 255.

Note: Be sure to specify a right margin that is at least one more than the left margin. The only time you should use a value of 0 for the right margin is if you don't want to change the value for the right margin when you are changing the value for the left margin.

The default settings for the right margin are specified in the table below.

**Table 44: IBM ESC X Command —
Default Settings for Right Margin**

Pitch	Narrow Carriage Models	Wide Carriage Models
10 cpi/proportional	80	136
12 cpi	96	163
15 cpi	120	204
17.1 cpi	137	233
20 cpi	160	255

Left and Right Margin Commands (Epson)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo
✓ ML390 Turbo, ML391 Turbo

✓ ML520, ML521
✓ ML590, ML591

Function	ASCII	Dec	Hex
Set Left Margin	ESC I n	27 108 n	1B 6C n
Set Right Margin	ESC Q n	27 81 n	1B 51 n

These commands set the margins by character columns. The actual position of the margin depends on the current pitch: a margin of 10 columns will come out as one inch in 10 cpi and one-half inch in 20 cpi. If the current pitch is proportional, the margin is set as though it were 10 cpi. However, once you've set a margin, its absolute position remains the same, even if you change the pitch, until you specifically reset the margin. This saves you the work of adjusting margins with every pitch change in your document.

Sending the left margin command will cancel any horizontal tab stops you may have set, returning the printer to its default setting (tab stops every eight columns).

You should always send margin commands at the beginning of a line.

Parameter n

This parameter can range in value from 0 to 254 for the left margin and from 1 to 255 for the right margin.

Note: You must always specify a right margin that is at least one more than the left margin.

**Table 45: Epson ESC L and ESC Q Commands —
Range of Margin Settings, All 9-Pin Printers**

Pitch	ML320 E/I, ML320 Turbo, ML520		ML321 E/I, ML321 Turbo, ML521	
	Left	Right	Left	Right
10 cpi	0-79	1-80	0-135	1-136
12 cpi	0-95	1-96	0-162	1-163
17.1 cpi	0-136	1-137	0-232	1-233
20 cpi	0-159	1-160	0-254	1-255
Proportional	0-79	1-80	0-135	1-136

**Table 46: Epson ESC L and ESC Q Commands —
Range of Margin Settings, 24-Pin Models ML390/391 Turbo**

Pitch	ML390 Turbo		ML391 Turbo	
	Left	Right	Left	Right
10 cpi	0-70	4-80	0-126	4-136
12 cpi	0-84	5-96	0-151	5-163
15 cpi	0-105	6-120	0-189	6-204
17.1 cpi	0-119	7-137	0-215	7-233
20 cpi	0-140	8-160	0-252	8-255
Proportional	0-140	8-160	0-252	8-255

**Table 47: Epson ESC L and ESC Q Commands —
Range of Margin Settings, 24-Pin Models ML590/591**

Pitch	ML590		ML591	
	Left	Right	Left	Right
10 cpi	0-76	4-80	0-132	4-136
12 cpi	0-91	5-96	0-158	5-163
15 cpi	0-114	6-120	0-198	6-204
17.1 cpi	0-130	7-137	0-226	7-233
20 cpi	0-152	8-160	0-255	8-255
Proportional	0-76	4-80	0-132	4-136

Left and Right Margin Commands (ML)

✓ ML320 Std., ML321 Std.

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

Function	ASCII	Dec	Hex
Set Left Margin	ESC % C n ₁ n ₂ n ₃	27 37 67 n ₁ n ₂ n ₃	1B 25 43 n ₁ n ₂ n ₃
Set Right Margin	ESC % R n ₁ n ₂ n ₃ n ₄	27 37 82 n ₁ n ₂ n ₃ n ₄	1B 25 52 n ₁ n ₂ n ₃ n ₄

In the MICROLINE Standard emulation, margins for these commands are measured in units of 1/120" from the leftmost printing position.

Left Margin Parameters n₁ n₂ n₃

Parameters n₁ n₂ n₃ represent a three-digit ASCII number for the value of the location for the left margin. If the value you wish to assign to the left margin is 99 or less, use zero for the first digit.

Right Margin Parameters n₁ n₂ n₃ n₄

Parameters n₁ n₂ n₃ n₄ represent a four-digit ASCII number for the value of the location for the right margin. If the value you wish to assign is less than four digits, use zeros for the first digit(s). The right margin must be at least 60 units greater than the left margin. If no left margin has been set, the minimum value for the right margin is 60 units.

You must set the right margin before sending any data for the line on which it is to take effect.

The Maximum Margin Values table below lists the widest allowable margins.

**Table 48: ML ESC % C and ESC % R Commands —
Maximum Margin Values**

Model	Left Margin n Value	Right Margin n Value
ML320 Std., ML320 Turbo, ML520	0899	0960
ML321 Std., ML321 Turbo, ML521	0999	1632

For example, suppose you want to set one-inch margins on a standard 8-1/2" page. The left margin will be 120/120" from the leftmost position, so the command to set it is:

```
LPRINT CHR$(27);"%C";"120"
```

The right margin is 7-1/2", or 900/120" from the leftmost position, so the command to set it is:

```
LPRINT CHR$(27);"%R";"0900"
```

Horizontal Tab Commands

Execute Horizontal Tab Command (IBM/E/ML)

✓ ML320 E/I, ML321 E/I
✓ ML320 Std., ML321 Std.

✓ ML320 Turbo, ML321 Turbo
✓ ML390 Turbo, ML391 Turbo

✓ ML520, ML521
✓ ML590, ML591

Function	ASCII	Dec	Hex
Execute Horizontal Tab	HT	9	09

When you turn on your printer, its tab stops are automatically set for every eight columns. Each time you send the tab character (HT), the printhead moves eight columns to the right before printing the next character.

Set Horizontal Tab Command (IBM/E)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521
✓ ML590, ML591

Function	ASCII	Dec	Hex
Set Horizontal Tab	ESC D n ₁ n ₂ ... n _k NUL	27 68 n ₁ n ₂ ... n _k 0	1B 44 n ₁ n ₂ ... n _k 00

This command lets you set horizontal tab stops at specific columns on the page. As with margins, the actual position of the stops depends on the pitch you're using, and won't change if you switch to a different character width. Be sure to give the stops in ascending order. After you have specified all the stops, end the sequence with a NUL character (use CHR\$(0) in BASIC).

If you send the command as ESC D NUL, with no stops specified, all horizontal tab stops will be cleared, including the 8-column default stops. Turning the printer off and on again restores the printer's default tab stops.

**Table 49: IBM/Epson ESC D Command —
Maximum Number of Horizontal Tab Stops**

Emulation	Max. Tab Stops
IBM	28
Epson	32

**Table 50: IBM/Epson ESC D Command —
Maximum Values for Horizontal Tab Stops**

Pitch	Narrow Carriage models	Wide Carriage Models
10 cpi/proportional	79	135
12 cpi	95	162
15 cpi*	119	203
17.1 cpi	136	232
20 cpi	159	255

* 15 cpi available only on ML390/391 Turbo, ML520/521 and ML590/591.

Set Tabs by Character Space Command (ML)

✓ ML320 Std., ML321 Std.

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

Function	ASCII	Dec	Hex
Set Horizontal Tab by Characters	ESC HT $x_1y_1z_1 \dots$ $x_{16}y_{16}z_{16}$ CR	27 9 $x_1y_1z_1 \dots$ $x_{16}y_{16}z_{16}$ 13	1B 09 $x_1y_1z_1 \dots$ $x_{16}y_{16}z_{16}$ 0D

This command can be used to set up to 16 horizontal tab stops at the intervals of your choice. The actual distance represented by the tab depends on the character pitch in effect when the printer receives the HT command.

The tab information must be entered as three-digit ASCII numbers (xyz) separated by commas, and must be in ascending order. For tabs less than 100, enter a zero for the x and/or y digits as appropriate.

For example, suppose you wish to set tabs at the 5th, 10th, 15th and 20th columns. The value for $x_1y_1z_1$ would be 005; the value for $x_2y_2z_2$ would be 010, etc. So, you would enter the BASIC statement

```
LPRINT CHR$(27);CHR$(09);"005,010,015,020";CHR$(13)
```

Here are the maximum values for $x_ny_nz_n$ for each pitch and printer model:

**Table 51: ML ESC HT Command —
Maximum Values for $x_ny_nz_n$**

Pitch	Maximum xyzw		Maximum xyzw	
	ML320	ML520	ML321	ML521
10 cpi	80	080	136	136
12 cpi	96	096	163	163
15 cpi*	N/A	120	N/A	204
17.1 cpi	137	137	233	233
20 cpi	160	160	272	272

* 15 cpi applies only to ML520 and ML521.

Set Tabs by Dot Columns Command (ML)

✓ ML320 Std., ML321 Std. ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521

Function	ASCII	Dec	Hex
Set Horizontal Tab by Dot Columns	ESC ETX $x_1y_1z_1w_1 \dots$ $x_{16}y_{16}z_{16}w_{16}$ CR	27 3 $x_1y_1z_1w_1 \dots$ $x_{16}y_{16}z_{16}w_{16}$ 13	1B 03 $x_1y_1z_1w_1 \dots$ $x_{16}y_{16}z_{16}w_{16}$ 0D

This command can be used to set up to 16 horizontal tab stops at the intervals of your choice. Setting tabs by dot columns gives you more precise control than setting tabs by character space.

The distance represented by the tab (distance from the center of one dot to the center of the next dot) depends on the character pitch in effect when the printer receives the HT command, as follows:

Table 52: MML ESC ETX Command — Shift Increment for Character Pitches

Pitch	Increment of Shift
10 cpi	1/120"
12 cpi	1/144"
15 cpi*	1/180"
17.1 cpi	1/206"
20 cpi	1/240"
Proportional	1/120"

* 15 cpi applies only to ML520 and ML521.

The tab information must be entered as four-digit ASCII numbers separated by commas, and must be in ascending order. For tab values less than 1000, enter a zero for the x, y and/or z digits as appropriate.

For example, suppose you want to set tabs by dot columns at 1/2", 2", 4", and 6" from the left margin, using 12 cpi pitch. From the table above, at 12 cpi pitch, each dot produces a shift of 1/144". So, to move over 1/2" from the home position (0001, or 1/144"), the value would be 0071 ([1/2 x 144 dpi] - 1); for 2", the value would be 0287; for 4", 0575; and for 6", 0863. To set these tabs enter the BASIC statement

```
LPRINT CHR$(27);CHR$(3);"0071,0287,0575,0863";CHR$(13)
```

Here are the maximum values for x_n, y_n, z_n, w_n for each pitch and printer model:

Table 53: ML ESC ETX Command — XYZW Values for Setting Horizontal Tabs

Pitch	Maximum xyzw		Maximum xyzw	
	ML320	ML520	ML321	ML521
10 cpi	0959	0960	1631	1632
12 cpi	1151	1152	1956	1956
15 cpi*	N/A	1440	N/A	2448
17.1 cpi	1643	1644	2795	2796
20 cpi	1917	1920	3261	3264

* 15 cpi applies only to ML520 and ML521.

Note: Using the maximum value for the x_n, y_n, z_n, w_n tab setting may not leave enough room between the tab stop and the right margin for a full character to print.

Clear Horizontal Tab Settings Commands (IBM/E)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo
✓ ML390 Turbo, ML391 Turbo

✓ ML520, ML521
✓ ML590, ML591

Function	IBM	Epson
Clear Horizontal Tab	ASCII: ESC D NUL NUL Dec: 27 68 0 0 Hex: 1B 44 00 00	ASCII: ESC D NUL NUL Dec: 27 68 0 0 Hex: 1B 44 00 00
Reset Horizontal Tabs to Default	ASCII: ESC R Dec: 27 82 Hex: 1B 52	Not applicable

In the IBM emulation, the ESC D NUL command will clear all horizontal tabs, including the default tabs. In the Epson and MICROLINE Standard emulations, these commands will clear out the tab settings and return the printer to the default horizontal tab settings (every eight spaces).

Clear Horizontal Tab Settings Commands (ML)

✓ ML320 Std., ML321 Std.

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

Function	ASCII	Dec	Hex
Clear Horizontal Tabs Set by Characters	ESC HT CR	27 9 13	1B 09 0D
Clear Horizontal Tabs Set by Dot Columns	ESC ETX 0 CR	27 3 48 141	1B 3 30 8D

Horizontal Print Position Commands

Indent from Left Margin Command (IBM/ML)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

✓ ML320 Std., ML321 Std.

Function	ASCII	Decimal	Hexadecimal
Indent from Left Margin	ESC % B $n_1 n_2 n_3 n_4$	27 37 66 $n_1 n_2 n_3 n_4$	1B 25 42 $n_1 n_2 n_3 n_4$

This command causes the printing to be indented from the left margin by the number of dot columns you specify (relative to home position, 0001).

The distance of the shift depends on the pitch engaged:

Table 54: IBM/ML ESC % B Command — Shift Increments for Left Margin Indents

Pitch	Increment of Shift
10 cpi	1/120"
12 cpi	1/144"
15 cpi	1/180"
17.1 cpi	1/206"
20 cpi	1/240"
Proportional	1/120"

Parameters n₁ through n₄

These parameters represent a four-digit ASCII number. If the value you wish to assign is less than four digits, use zeros for the first digit(s). The value is calculated relative to the home position which is 0001 in from the left margin.

For example, suppose you wish to indent 1" from the left margin, using 12 cpi pitch. The print position will be indented 143/144" from the home position (1/144"), so the command to set it is:

```
LPRINT CHR$(27); "%B"; "0144"
```

This command will be ignored if you set the print position outside either margin.

Set Multiple Print Positions Command (IBM/E/ML)

- ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521
- ✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	IBM	Epson	ML
Set Multiple Print Positions Command	ASCII: ESC DLE @ P _n A ₁ A ₂ P ₁ P ₂ P ₃ P ₄ Dec: 27 16 64 P _n A ₁ A ₂ P ₁ P ₂ P ₃ P ₄ Hex: 1B 10 40 P _n A ₁ A ₂ P ₁ P ₂ P ₃ P ₄	ASCII: ESC DLE @ P _n A ₁ A ₂ P ₁ P ₂ P ₃ P ₄ Dec: 27 16 64 P _n A ₁ A ₂ P ₁ P ₂ P ₃ P ₄ Hex: 1B 10 40 P _n A ₁ A ₂ P ₁ P ₂ P ₃ P ₄	ASCII: ESC DLE @ P _n a ₁ a ₂ P ₁ P ₂ P ₃ P ₄ Dec: 27 16 64 P _n a ₁ a ₂ P ₁ P ₂ P ₃ P ₄ Hex: 1B 10 40 P _n a ₁ a ₂ P ₁ P ₂ P ₃ P ₄

This command is used to move the print position either to the right or to the left, either as an absolute print position or a relative print position.

Parameter P_n

This parameter sets the number of parameter bytes to follow:

- value = 0 to 127 for ML320/321 Turbo & ML520/521
- value = 0 to 255 for ML390/391 Turbo & ML590/591

Parameter a₁

This parameter establishes whether the print position is absolute or relative:

a₁ = 0: Absolute print position

a₁ = 1: Relative print position

Parameter a₂

This parameter determines whether the movement will be to the left or right:

a₂ = 0: Move to right (forward)

a₂ = 1: Move to left (backward)

Parameters P₁ P₂ P₃ P₄

These parameters represent a four-digit ASCII number for the value of the amount of movement to take place. If the value you wish to assign is less than four digits, use zeros for the first digit(s). The actual amount of movement depends on the pitch engaged:

Table 55: IBM/E/ML ESC DLE @ Command — Shift Increments for 9-Pin Models

Pitch	Shift Increment
10 cpi	1/240"
12 cpi	1/288"
15 cpi	1/360"
17.1 cpi	1/411"
20 cpi	1/480"
Proportional	1/240" for IBM & Epson, same as the corresponding value for each cpi for ML Std.

Table 56: IBM/E/ML ESC DLE @ Command — Shift Increments for 24-Pin Models

Print Quality	Shift Increment
Letter Quality	1/360"
Utility	1/240"

Suppose you have your pitch set at 20 cpi and want your ML 520 printer to move to a relative dot position (a₁ = 1) 1" backwards (a₂ = 1). From the table above, at 20 cpi your shift will be in increments of 1/480", so the value of P₁P₂P₃P₄ would be 0480. Send the BASIC statement

```
LPRINT CHR$(27);CHR$(16);"@";"1";"1";"0480"
```

The table below gives the maximum values which can be designated for P₁P₂P₃P₄ for each model printer, for each pitch, with the default margins engaged.

Note: *If you send a location value outside the set left or right margin, this command will be ignored.*

**Table 57: IBM/E/ML ESC DLE @ Command —
Maximum P₁P₂P₃P₄ Values for 9-Pin Models**

Pitch	ML320 Turbo, ML520	ML321 Turbo, ML521
10 cpi	1920	3264
12 cpi	2304	3916
15	2880	4896
17.1	3291	5595
20 cpi	3840	6528

**Table 58: IBM/E/ML ESC DLE @ Command —
Maximum P₁P₂P₃P₄ Values for 24-Pin Models**

Print Quality	ML390 Turbo, ML590	ML391 Turbo, ML591
Letter Quality	2280	4896
Utility	1920	3264

Set Relative Dot Position Command (IBM)

✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521

Function	ASCII	Dec	Hex
Set Relative Dot Position	ESC L _n H _n	27 124 L _n H _n	1B 7C L _n H _n

This command lets you move the print position very precisely to either the right or the left of the current print position. Overscore and underline characters don't print in the space between the two positions.

Parameters L_n and H_n

These parameters set the amount and direction of the movement. To determine their value, first decide the distance you want to move the text or graphics, in dots, based on 120 dots per inch.

If you want to move to the right, multiply the distance by 120 dpi, then divide the result by 256. Assign the whole number result to H_n and the remainder to L_n. For example, to move 3" to the right: (3 x 120)/256 = 1 with a remainder of 104, so H_n = 1 and L_n = 104.

If you want to move to the left, multiply the distance you wish to move by 120 dpi, then subtract the result from 65536. Take that value and divide it by 256: assign the whole number result to H_n and the remainder to L_n. For example, to move 3" to the left:

$$\begin{aligned}
 3 \times 120 &= 360 \\
 65536 - 360 &= 65176 \\
 65176/256 &= 254 (H_n), \text{ with a remainder of } 152 (L_n)
 \end{aligned}$$

Set Relative Dot Position Command (IBM)

✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Set Relative Dot Position to Right	ESC d $n_1 n_2$	27 100 $n_1 n_2$	1B 101 $n_1 n_2$
Set Relative Dot Position to Left	ESC e $n_1 n_2$	27 64 $n_1 n_2$	1B 65 $n_1 n_2$

These commands move the printhead to the left or right of the current print position in increments of 1/120". The number of increments equals $n_1 + (n_2 \times 255)$. The maximum value is 1632.

Set Relative Dot Position Command (Epson)

✓ ML320 E/I, ML321 E/I

✓ ML390 Turbo, ML391 Turbo

✓ ML520, ML521

✓ ML590, ML591

Function	ASCII	Dec	Hex
Set Relative Dot Position	ESC \ $L_n H_n$	27 92 $L_n H_n$	1B 5C $L_n H_n$

This command lets you move the print position very precisely to either the right or the left of the current print position. Overscore characters don't print in the space between the two positions.

For the ML390 Turbo and ML391 Turbo printers, this command will move in increments established by the Set Unit command (see Chapter 12). The default basic increment of movement in the LQ mode is 1/80"; in the Utility mode, 1/120".

Parameters L_n and H_n

These parameters set the amount and direction of the movement. To determine their value, first decide the distance you want to move the text or graphics, in dots, then multiply the distance by 120 dots per inch. Next, divide the result by 256. Assign the whole number result to H_n and the remainder to L_n .

Set Absolute Dot Position Command (Epson)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	ASCII	Dec	Hex
Set Absolute Dot Position	ESC \$ $L_n H_n$	27 36 $L_n H_n$	1B 24 $L_n H_n$

This command lets you place text or graphics very precisely on the page. It uses the left margin as a reference point, and moves the print position in 1/60" increments.

Parameters L_n and H_n

These variables determine the amount of movement. To calculate their values, multiply the distance you wish to move by 60, then divide the result by 256 and assign the whole number result to H_n and the remainder to L_n .

For example:

to move the print position over 2":

$2 \times 60 = 120$
 $120/256 = 0 (H_n)$, with a remainder of 120 (L_n)
 to move the print position over 5":
 $5 \times 60 = 300$
 $300/256 = 1 (H_n)$, with a remainder of 44 (L_n)

Move to the Right & Left Commands (ML)

✓ ML320 Std., ML321 Std. ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521

Function	ASCII	Dec	Hex
Move to Left	ESC % F $n_1 n_2 n_3 n_4$	27 37 70 F $n_1 n_2 n_3 n_4$	1B 25 46 F $n_1 n_2 n_3 n_4$
Move to Right	ESC % E $n_1 n_2 n_3 n_4$	27 37 69 $n_1 n_2 n_3 n_4$	1B 25 45 $n_1 n_2 n_3 n_4$

These commands move the print position to the right or to the left of the current position in the amount you specify. Underline characters don't print in the space between the two positions.

Parameters $n_1 n_2 n_3 n_4$

These parameters represent a four-digit ASCII number for the value of the amount of movement to take place. If the value you wish to assign is less than four digits, use zeros for the first digit(s). The actual amount of movement depends on the pitch engaged:

Table 59: ML ESC % F and ESC % E Commands — Movement Increments for Pitch Settings

Pitch	Movement Increments
10 cpi	1/120"
12 cpi	1/144"
15 cpi	1/180"
17.1 cpi	1/206"
20 cpi	1/240"
Proportional	Same as the corresponding value for each cpi

For example, suppose you have your pitch set at 20 cpi and want your printer to move 1" to the right. From the table above, at 20 cpi your shift will be in increments of 1/240", so the value of $n_1 n_2 n_3 n_4$ would be 0240 (1" / 1/240"). Send the BASIC statement

```
LPRINT CHR$(27);CHR$(37);CHR$(69);"0240"
```

Note: If you send a location value outside the set left or right margin, this command will be ignored.

Uni-directional Printing Commands (IBM/E/ML)

✓ ML320 E/I, ML321 E/I ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521
 ✓ ML320 Std., ML321 Std. ✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	IBM	Epson	ML*
Uni-directional Printing On	ASCII: ESC U 1 Dec: 27 85 1 Hex: 1B 55 01	ASCII: ESC U 1 Dec: 27 85 1 Hex: 1B 55 01	ASCII: ESC - Dec: 27 45 Hex: 1B 2D

Uni-directional Printing Off	ASCII: ESC U 0 Dec: 27 85 0 Hex: 1B 55 00	ASCII: ESC U 0 Dec: 27 85 0 Hex: 1B 55 00	ASCII: ESC = Dec: 27 61 Hex: 1B 3D
Print Uni-directional for One Line Only	Not applicable	ASCII: ESC < Dec: 27 60 Hex: 1B 3C	Not applicable

Your printer is designed to maximize speed by printing alternately from the left and right (bi-directional printing), rather than moving the printhead back to the left margin so that each line prints from left to right (uni-directional printing). Use uni-directional printing when precise vertical alignment from line to line is critical.

You can also select uni-directional graphics printing in the printer menu (see "Menu Mode" in your printer manual).

Incremental Printing Commands (IBM/E/ML)

- ✓ ML320 Turbo, ML321 Turbo
- ✓ ML390 Turbo, ML391 Turbo

Function	ASCII	Dec	Hex
Incremental Printing On	ESC i 1	27 105 1	1B 69 01
Incremental Printing Off	ESC i 0	27 105 0	1B 69 00

The Incremental Printing On command causes the printer to print each individual character as it is received, as opposed to storing information and printing a line at a time. If you have a software application that passes information to the printer one keystroke at a time, this command allows your printer to function as a typewriter.

The print location of the next character is indicated by a red "M" to the left of the printhead on the ribbon shield.

Justification Commands (Epson)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	ASCII	Dec	Hex
Select Left Justification	ESC a 0	27 97 0	1B 61 00
Select Center Justification	ESC a 1	27 97 1	1B 61 01
Select Right Justification	ESC a 2	27 97 2	1B 61 02
Select Full (Left & Right) Justification	ESC a 3	27 97 3	1B 61 03

These commands let you specify the alignment of text on the page: along the left or right margin, centered between the margins, or along both the left and right margins. When you are using center, right or full justification, the backspace character (ASCII BS, decimal 8) and horizontal tabs won't function. If you're using full justification, use a carriage return only at the end of a paragraph, not at the end of each line.

Chapter 9: Vertical Control Commands

This chapter describes the commands for vertical control including the following:

- Page Length Commands
- Form Feed Command
- Line Feed Commands
- Line Spacing Commands
- Vertical Tab Commands
- Vertical Position Commands
- Top of Form Commands
- Top & Bottom Margin Command
- Skip Over Perforation Commands

Set Page Length Commands

Set Page Length in Inches Command (IBM/E/ML)

- ✓ ML320 E/I, ML321 E/I
- ✓ ML320 Turbo, ML321 Turbo
- ✓ ML520, ML521
- ✓ ML320 Std., ML321 Std.
- ✓ ML390 Turbo, ML391 Turbo
- ✓ ML590, ML591

Function	IBM	Epson	ML
Set Page Length in Inches	ASCII: ESC C NUL n Dec: 27 67 0 n Hex: 1B 43 00 n	ASCII: ESC C NUL n Dec: 27 67 0 n Hex: 1B 43 00 n	ASCII: ESC G H _n L _n Dec: 27 71 H _n L _n Hex: 1B 47 H _n L _n

This command sets the page length in inches. If you will most often be using one of the standard page lengths available through the printer menu (see "Menu Mode" in your printer manual), it's a good idea to use the printer menu to set the default page length and then use the page length command whenever you wish to change it temporarily.

To set the page length in inches in either the IBM or Epson emulation, use the command ESC C NUL n. This sets the page length in increments of 1" times the value of the variable "n." The value of n can be from 1 to 22.

To set the page length in inches in the MICROLINE Standard emulation, use the command ESC G Hn Ln. This sets the page length in increments of 1/2x the value of the variables Hn Ln. Variables Hn Ln represent a 2-digit ASCII number ranging from 00 to 99. For lengths of less than 4 1/2 use a zero for Hn. For example, to set a page length of 14 inches, enter the BASIC statement

```
LPRINT CHR$(27); "G"; "28"
```

Set Page Length in Lines Command (IBM/E/ML)

- ✓ ML320 E/I, ML321 E/I
- ✓ ML320 Turbo, ML321 Turbo
- ✓ ML520, ML521
- ✓ ML320 Std., ML321 Std.
- ✓ ML390 Turbo, ML391 Turbo
- ✓ ML590, ML591

Function	IBM	Epson	ML
Set Page Length in Lines	ASCII: ESC C n Dec: 27 67 n Hex: 1B 43 n	ASCII: ESC C n Dec: 27 67 n Hex: 1B 43 n	ASCII: ESC F H _n L _n Dec: 27 70 H _n L _n Hex: 1B 46 H _n L _n

You can set the page length in either inches or lines. If you will most often be using one of the standard page lengths available through the printer menu (see "Menu Mode" in your printer manual), it's a good idea to use the printer menu to set the default page length and then use the page length command whenever you wish to change it temporarily.

To set the page length by lines in either the IBM or Epson emulation, use the command ESC C

n. The page length will be the result of multiplying the line pitch by the value of the variable "n." In the IBM emulation, the value of n can be from 1 to 255; in the Epson emulation, it can be from 1 to 127. The actual page length will depend on the line spacing engaged.

To set the page length by lines in the MICROLINE Standard emulation, use the command ESC F Hn Ln. The page length will be the result of multiplying the line pitch by the value of the variables Hn Ln. Variables Hn Ln represent a 2-digit ASCII number ranging from 00 to 99. For Hn Ln numbers less than 10, use a zero for Hn. For example, to set a page length of nine lines, enter the BASIC statement

```
LPRINT CHR$(27);"H";"09"
```

The actual page length will depend on the line pitch engaged.

Set Page Length in Defined Unit Command (Epson)

✓ ML390 Turbo, ML391 Turbo

Function	ASCII	Dec	Hex
Set Page Length in Defined Unit	ESC (C 2 0 L _p H _p	27 40 67 50 48 L _p H _p	1B 28 43 32 30 L _p H _p

You can use this command to set the page length in multiples of the line spacing established by the Set Unit command (see Chapter 12).

Parameters L_p and H_p

Parameters L_p and H_p are used to designate the page length, as a multiple of whatever line spacing is engaged:

$$\text{Page length} = [L_p + (H_p \times 256)] \times \text{line spacing increment engaged}$$

L_p and H_p can have any value from 0 to 255 decimal.

You can set the page length over a range of from 0 to 22 inches. If you will most often be using one of the standard page lengths available through the printer menu (see "Menu Mode" in your printer manual), it's a good idea to use the printer menu to set the default page length and then use this command whenever you wish to change it temporarily.

Form Feed Command (IBM/E/ML)

- ✓ ML320 E/I, ML321 E/I ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521
- ✓ ML320 Std., ML321 Std. ✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Form Feed	FF	12	0C

When you send a form feed command, the printer prints any data that is in its buffer, and the print position moves to the top of the next page. You can also use the FORM FEED button on the control panel to feed a page through the printer.

Line Feed Commands

Line Feed with Carriage Return Command (IBM/E/ML)

- ✓ ML320 E/I, ML321 E/I ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521
- ✓ ML320 Std., ML321 Std. ✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Line Feed, with Carriage Return	LF	10	0A

This command makes the printer print a line, then moves the print position down one line and executes a carriage return, putting the print position at the left margin. The amount of vertical movement depends on the current line spacing. (See "Line Spacing," below for details.)

In the IBM and Epson emulations, this command cancels one-line double width printing.

Line Feed without Carriage Return Command (ML)

- ✓ ML320 Std., ML321 Std. ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521

Function	ASCII	DEC	Hex
Graphics Line Feed, <i>without</i> Carriage Return	ESC DC2	27 18	1B 12

This command drops the printing down a line without returning to the left margin. This makes it possible to overstrike a line of printing or create special effects such as double underlines.

Line Feed & Carriage Return Selection Command (ML)

- ✓ ML320 Std., ML321 Std. ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521

Function	ASCII	Dec	Hex
Select Line Feed & Carriage Return	ESC ? n :	25 63 n 58	1B 3F n 3A

This command performs a number of different carriage return/line feed combinations, depending on the value of n:

**Table 60: ML ESC ? Command —
Carriage Return/Line Feed Codes for n Values**

Value of n	Operation
------------	-----------

33	Carriage return only
34	Forward line feed, no carriage return
35	Forward line feed with a carriage return
48	Reverse line feed, no carriage return
49	Reverse line feed with a carriage return

Fine Line Feed Commands (IBM/E/ML)

✓ ML320 E/I, ML321 E/I ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521
 ✓ ML320 Std., ML321 Std.

Function	IBM	Epson	ML
Perform n/216" Line Feed	ASCII: ESC J n Dec: 27 74 n Hex: 1B 4A n	ASCII: ESC J n Dec: 27 74 n Hex: 1B 4A n	Not applicable
Perform n/144" Line Feed	ASCII: ESC % 5 n Dec: 27 37 53 n Hex: 1B 25 35 n	ASCII: ESC % 5 n Dec: 27 37 53 n Hex: 1B 25 35 n	ASCII: ESC % 5 n Dec: 27 37 53 n Hex: 1B 25 35 n

✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	IBM	Epson	ML
Perform n/180" Line Feed	ASCII: ESC J n Dec: 27 74 n Hex: 1B 4A n	ASCII: ESC J n Dec: 27 74 n Hex: 1B 4A n	Not applicable
Perform n/360" Line Feed	ASCII: ESC % 4 n Dec: 27 37 52 n Hex: 1B 25 34 n	ASCII: ESC] n Dec: 27 93 n Hex: 1B 5D n	Not applicable

Unlike the ESC % 5 n command, the ESC J n command is not accompanied by a carriage return, and, in the IBM and Epson emulations, does not cancel one-line double width printing.

In the IBM and Epson emulations, the value of n can be any whole number from 0 to 255.

In the MICROLINE Standard emulation, the value of n can be any whole number from 0 to 127.

If you use n = 0, no line feed will be performed.

Perform Line Feed Command (IBM)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo
✓ ML390 Turbo, ML391 Turbo

✓ ML520, ML521
✓ ML590, ML591

Function	ASCII	Dec	Hex
Set Line Feed Stored by ESC A n	ESC 2	27 50	1B 32

The ESC 2 command sets the line feed value stored using the ESC A n command described later in this chapter under "Line Spacing Commands." It must follow the ESC A n command—if it doesn't, the printer will reset the line spacing to the current menu setting.

Auto Line Feed On/Off Commands (IBM)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo
✓ ML390 Turbo, ML391 Turbo

✓ ML520, ML521
✓ ML590, ML591

Function	ASCII	Dec	Hex
Auto Line Feed On	ESC 5 1	27 53 1	1B 35 01
Auto Line Feed Off	ESC 5 0	27 53 0	1B 35 00

When you activate automatic line feed, the printer will add a line feed to each carriage return code it receives. You can also control this feature through the printer menu (see "Menu Mode" in your printer manual).

Reverse Line Feed Commands (IBM/E/ML)

✓ ML320 E/I, ML321 E/I
✓ ML320 Std., ML321 Std.

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521
✓ ML590, ML591

Function	IBM	Epson	ML
9-Pin Models			
Reverse Line Feed	ASCII: ESC] Dec: 27 93 Hex: 1B 5D	Set in multiples of 1/216": see command below	ASCII: ESC LF Dec: 27 10 Hex: 1B 0A
n/216" Reverse Line Feed	Not applicable	ASCII: ESC j n Dec: 27 106 n Hex: 1B 6A n	Not applicable
24-Pin Models			
n/180" Reverse Line Feed	Not applicable	ASCII: ESC j n Dec: 27 106 n Hex: 1B 6A n	Not applicable

Use the reverse line feed command to move the print position up instead of down. Be careful when using reverse line feeds with the optional pull tractor: print registration may be affected.

In the Epson emulation, the reverse line feed command causes the printer to finish printing the line, then move the print position up an amount equal to n/216": n can be any whole number from 0 to 255. If you use n = 0, the command will be ignored. No carriage return is executed, regardless of the setting for Auto CR in the menu (see "Menu Mode" in your printer manual).

Line Spacing Commands

General Line Spacing Commands (IBM/E/ML)

- ✓ ML320 E/I, ML321 E/I ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521
- ✓ ML320 Std., ML321 Std. ✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	IBM PPR	IBM AGM	Epson	ML
Set Line Spacing to 1/6"	Not applicable	Not applicable	ASCII: ESC 2 Dec: 27 50 Hex: 1B 32	ASCII: ESC 6 Dec: 27 54 Hex: 1B 36
Set Line Spacing to 1/8"	ASCII: ESC 0 Dec: 27 48 Hex: 1B 30	ASCII: ESC 0 Dec: 27 48 Hex: 1B 30	ASCII: ESC 0 Dec: 27 48 Hex: 1B 30	ASCII: ESC 8 Dec: 27 56 Hex: 1B 38
Set Line Spacing to 7/72"	ASCII: ESC 1 Dec: 27 49 Hex: 1B 31	ASCII: ESC 1 Dec: 27 49 Hex: 1B 31	ASCII: ESC 1 Dec: 27 49 Hex: 1B 31	Not applicable

The most common line spacings for text are six and eight lines per inch (lpi). A spacing of 8 lpi works well with compressed character pitches, and lets you fit more lines on a page. In the IBM and Epson emulations you can also set a line spacing of 7/72".

Fine-Increment Line Spacing Commands for 9-Pin Printers (IBM/E/ML)

- ✓ ML320 E/I, ML321 E/I ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521
- ✓ ML320 Std., ML321 Std.

Function	IBM	Epson	ML
Set Line Spacing to n/72"	ASCII: ESC A n* Dec: 27 65 n Hex: 1B 41 n	ASCII: ESC A n Dec: 27 65 n Hex: 1B 41 n	Not applicable
Set Line Spacing to n/144"	ASCII: ESC % 9 n Dec: 27 37 57 n Hex: 1B 25 39 n	ASCII: ESC % 9 n Dec: 27 37 57 n Hex: 1B 25 39 n	ASCII: ESC % 9 n Dec: 27 37 57 n Hex: 1B 25 39 n
Set Line Spacing to n/216"	ASCII: ESC 3 n Dec: 27 51 n Hex: 1B 33 n	ASCII: ESC 3 n Dec: 27 51 n Hex: 1B 33 n	Not applicable

* In the IBM mode, the ESC A n command must be followed by the ESC 2 Perform Line Feed command (described earlier in this chapter) to set the value of n.

These commands let you control vertical movement in very fine increments, which helps with the precise placement of graphics. The actual amount of movement is set by the value of parameter n which can vary, depending on the emulation.

Table 61: IBM/E/ML Fine Increment Line Spacing Commands — Values of Parameter n

Increment	Emulation	Values of n
n/72"	IBM	0 to 255
	Epson	0 to 85, 128 to 213

n/144"	IBM Epson ML	0 to 127 0 to 127 0 to 127
n/216"	IBM Epson	0 to 255 0 to 255

Whenever a value of zero is assigned to n, the line spacing command will be ignored.

ESC A n Line Spacing Command for 24-Pin Printers (IBM/E)

✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	IBM PPR	IBM AGM	Epson
Set Line Spacing to n/60	Not applicable	ASCII: ESC A n Dec: 27 65 n Hex: 1B 41 n	ASCII: ESC A n Dec: 27 65 n Hex: 1B 41 n
Set Line Spacing to n/72"	ASCII: ESC A n* Dec: 27 65 n Hex: 1B 41 n	Not applicable	Not applicable

* In the IBM ProPrinter mode, the ESC A n command must be followed by the ESC 2 Perform Line Feed command (described earlier in this chapter) to set the value of n.

This command sets the line spacing to either n/60" or n/72", depending on the emulation selected. The actual amount of movement is set by the value of parameter n which can vary, depending on the emulation:

Table 62: IBM/Epson ESC A Command — Values of Parameter n

Increment	Emulation(s)	Values of n
n/60	IBM AGM, Epson	0 to 127
n/72	IBM PPR	1 to 255

Whenever a value of zero is assigned to n, the line spacing command will be ignored.

ESC 3 n Line Spacing Command for 24-Pin Printers (IBM/E)

✔ ML390 Turbo, ML391 Turbo ✔ ML590, ML591

Function	IBM PPR	IBM AGM	Epson
Set Line Spacing to n/180"	Not applicable	ASCII: ESC 3 n** Dec: 27 51 n Hex: 1B 33 n	ASCII: ESC 3 n Dec: 27 51 n Hex: 1B 33 n
Set Line Spacing to n/216"	ASCII: ESC 3 n** Dec: 27 51 n Hex: 1B 33 n	ASCII: ESC 3 n** Dec: 27 51 n Hex: 1B 33 n	Not applicable

** In the IBM mode, the line spacing increment for the ESC 3 n command is controlled by the Set Vertical Unit commands described below.

This command lets you control vertical movement in fine increments, which helps with the precise placement of graphics.

In the IBM emulations, the increment of the line spacing set by this command is controlled by the Set Vertical Unit commands described below.

The actual amount of movement is set by the value of parameter n which can vary, depending on the emulation:

Table 63: IBM/Epson ESC 3 Command — Values of Parameter n

Emulation	Values of n
IBM PPR	1 to 255
Epson, IBM AGM	0 to 255

Whenever a value of zero is assigned to n, the line spacing command will be ignored.

n/360-Inch Line Spacing Commands for 24-Pin Printers (IBM/E)

✔ ML390 Turbo, ML391 Turbo ✔ ML590, ML591

Function	IBM PPR	Epson
Set Line Spacing to n/360"	ASCII: ESC % 8 n Dec: 27 37 56 n Hex: 1B 25 38 n	ASCII: ESC [n Dec: 27 91 n Hex 1B 5B n <i>or</i> ASCII: ESC + n Dec: 27 43 n Hex: 1b 2b n

These commands let you set the line spacing in 1/360" increments for precise placement of graphics. The actual amount of movement is set by the value of parameter n which can vary, depending on the emulation:

Table 64: IBM/Epson n/360" Line Spacing Commands — Values of Parameter n

Emulation	Values of n
IBM	1 to 255
Epson	0 to 255

Whenever a value of zero is assigned to n, the line spacing command will be ignored.

Set Vertical Units (IBM)

✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Set Vertical Units	ESC [\ 4 0 0 0 0 0 n	27 91 92 52 48 48 48 48 48 n	1B 5B 5C 34 30 30 30 30 30 n

This command defines the vertical spacing units used by the ESC 3 n command in the IBM emulation (described above), as follows:

Table 65: IBM ESC [\ Command — Values of Parameter n

Values of n	Spacing Unit
180	1/180"
216	1/216"

Vertical Tab Commands

When you turn your printer on, it doesn't have any vertical tab stops. Sending a VT command with no stops set will produce a single line feed.

The commands described below are used to set vertical tab stops. In the Epson and MICROLINE Standard emulations, you have the option of entering a single set of vertical tab stops or of using the electronic Vertical Format Unit (VFU) to program multiple sets of vertical tabs, called channels. The IBM emulation permits you to enter one set of stops, but does not have the VFU feature.

The actual position of the stops depends on the line spacing in effect when you send the command. For example, at 6 lines per inch, a tab stop of 24 will appear four inches from the top of the page, whereas at 8 lines per inch, the stop will be positioned three inches from the top of the page. However, once you've set the vertical tab stops, their position is absolute, and won't move, even if you later change the line spacing.

Execute Vertical Tab Command (IBM/E/ML)

- ✓ ML320 E/I, ML321 E/I ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521
- ✓ ML320 Std., ML321 Std. ✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Execute Vertical Tab	VT	11	1B

Set Vertical Tabs Command (IBM/E)

- ✓ ML320 E/I, ML321 E/I ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521
- ✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	IBM	Epson
Set Vertical Tabs	ASCII: ESC B $n_1 n_2 \dots n_k$ NUL Dec: 27 66 $n_1 n_2 \dots n_k 0$ Hex: 1B 42 $n_1 n_2 \dots n_k 00$	ASCII: ESC B $n_1 n_2 \dots n_k$ NUL Dec: 27 66 $n_1 n_2 \dots n_k 0$ Hex: 1B 42 $n_1 n_2 \dots n_k 00$

In the IBM and Epson emulations, you can use the ESC B $n_1 n_2 \dots n_k$ NUL command to set vertical tab stops. Once you've set the stops, each time you issue a VT command, the print position will move down to the next stop position.

Parameters n_1 through n_k

These parameters designate the individual stops. In the IBM emulation, you can set up to 64 stops (n_1 through n_{64}). In the Epson emulation, you can set up to 16 stops. In both emulations, the value of each n can be any whole number from 1 to 255 (0 to 255 for Models ML390T and ML391T), designating how many lines to skip down to that tab stop. You must enter the stops in increasing order ($n_1 > n_2 > n_3$, etc.), and end the series with the NUL character.

Clear Vertical Tabs Command (IBM/E)

- ✓ ML320 E/I, ML321 E/I ✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521
- ✓ ML590, ML591

Function	IBM Only	IBM & Epson
Clear Vertical Tabs	ASCII: ESC R Dec: 27 82 Hex: 1B 52	ASCII: ESC B NUL Dec: 27 66 0 Hex: 1B 42 00

These commands will delete all vertical tab stops. In the IBM emulation, the ESC R command will reset the tabs to the default settings.

Vertical Format Unit [VFU] Commands (Epson)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo
✓ ML390 Turbo, ML391 Turbo

✓ ML520, ML521
✓ ML590, ML591

Function	ASCII	Dec	Hex
Set Vertical Format Unit (VFU)	ESC b m n ₁ n ₂ ... n _k NUL	27 98 m n ₁ n ₂ ... n _k 0	1B 62 m n ₁ n ₂ ... n _k 00
Select Vertical Tab Channel	ESC / n	27 47 n	1B 2F n

The Epson emulation gives you the option of setting up to eight separate channels of vertical tab stops using the command ESC b m n₁ n₂ ... n_k NUL.

Parameter m

Parameter m designates the channel to which the tab stops are being assigned and can have any whole number value from 0 to 7.

Parameters n₁ through n_k

Parameters n₁ through n_k designate the individual stops for each channel. You can set up to 16 stops (n₁ through n₁₆). The value of n can be any whole number from 0 to 255, designating how many lines to skip down to that tab stop. You must enter the stops in increasing order (n₁ > n₂ > n₃, etc.), and end the series with the NUL character.

Once you've set up the channels you're using, send the ESC / n command to specify which channel to select (replace n with desired channel number, 0 through 7), followed by the VT command to advance to the next tab stop in the selected sequence.

For example, the following BASIC program will set stops in three channels, and then perform a series of vertical tabs in the different channels:

```

5 REM Stops in channel 0: lines 10, 20, 30, 40, 50
10 LPRINT CHR$(27);"b";CHR$(0);CHR$(10);CHR$(20);CHR$(30);
   CHR$(40);CHR$(50);CHR$(0)
20 REM Stops in channel 1: lines 5, 15, 35, 45, 55 30 LPRINT
   CHR$(27);"b";CHR$(1);CHR$(5);CHR$(15);CHR$(35);CHR$(45);
   CHR$(55);CHR$(0)
40 REM Stops in channel 2: lines 12, 24, 48
50 LPRINT CHR$(27);"b";CHR$(2);CHR$(12);CHR$(24); CHR$(48);CHR$(0)
60 LPRINT CHR$(27);"/";CHR$(1): REM Select channel 1
70 LPRINT CHR$(11);"This prints on line 5"
80 LPRINT CHR$(11);CHR$(11);"This prints on line 35"
90 LPRINT CHR$(27);"/";CHR$(2): REM Select channel 2
100 LPRINT CHR$(11);"This prints on line 48"
110 LPRINT CHR$(27);"/";CHR$(0): REM Select channel 0
120 LPRINT CHR$(11);"This prints on line 50"

```

Vertical Format Unit (VFU) Commands (ML)

✓ ML320 Std., ML321 Std.

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

Function	ASCII	Dec	Hex
Set Vertical Format Unit (VFU)	DC4 SP1...SP1 n ... SP...SP ?	20 32...32 n ... 32...32 63	14 20...20 n ... 20...20 3F
Execute VFU Vertical Tab	VT n	11 n	1B n

In the MICROLINE Standard emulation, the electronic Vertical Format Unit lets you program up to 12 different sets of vertical tabs. You can load a maximum of 54 tab stops into one set of channels. The command DC4 SP...SP n ... SP...SP ? is used to set up the tabs. Then whenever the printer receives a VT code followed by a channel code, it will skip to the next tab stop in that channel.

To load in your selected tabs, follow the DC4 code with one SP code (decimal 32) for each line to be skipped to advance down the point where you want the first tab stop. For example, to advance down three lines, use DC4 SP SP SP. Then enter the value you wish to assign for the channel code n, taken from the table below. Next add more SP codes equal to the number of lines to be skipped down to the next tab stop, followed by the next channel code value. Continue this process until you've entered all the stops you want (up to a maximum of 12) for that channel. Add enough spaces at the end of the sequence so that the number of spaces in the sequence equals the number of lines on your page. Follow this with the ? character (decimal 63).

Once you've set up the channels, send the VT n command to execute a vertical tab to the next stop in the channel code sequence specified by n.

Table 66: ML VFU Commands — Usable Channel Codes for Parameter n

ASCII	1	2	3	4	5	6	7	8	9	:	;	<
Dec	49	50	51	52	53	54	55	56	57	58	59	60

Vertical Position Commands

Skip Down Command (ML)

✓ ML320 Std., ML321 Std.

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

Function	ASCII	Dec	Hex
Skip Down Selected Number of Lines	ESC VT H _n L _n	27 11 H _n L _n	1B 0B H _n L _n

The skip down command makes it easy to move rapidly down a page. This is a useful feature when you are creating headings or filling in forms. The variables H_n L_n represent a 2-digit ASCII number from 00 to 99 which allows you to skip up to 99 lines; a value of 00 for H_n L_n in the command results in no line feed.

Set Relative Vertical Position Command (Epson)

✓ ML390 Turbo, ML391 Turbo

Function	ASCII	Dec	Hex
Set Relative Vertical Print Position	ESC (v L _n H _n L _p H _p	27 40 118 L _n H _n L _p H _p	1B 28 76 L _n H _n L _p H _p

This command lets you move the print position very precisely either upward (up to 0.5-inch) or downward (up to 46.2 inches) from the current print position, in increments established by the Set Unit command (see Chapter 12).

Parameters L_n and H_n

Normally L_n is set to 2 and H_n is set to 0.

Parameters L_p and H_p

These parameters can have a value of 0 to 255 and are used to set the actual amount of vertical movement, using the following equation:

$$[L_p + (H_p \times 256)] \times \text{increment set by ESC (U L}_n \text{ H}_n \text{ P}_n \text{ command}$$

For reverse (upward) movement, set bit 6 of H_p to 1. For forward (downward) movement, set bit 6 of H_p to 0.

**Table 67: Epson ESC (v Command —
Hexadecimal Values for L_p H_p**

	1/360"	1/180"	1/120"	1/90"	1/72"	1/60"	
Forward		0001-3FFF	0001-207F	0001-15AA	0001-103F	0001-0CFF	0001-0AD5
Reverse		7F40-7FFF	7FA7-7FFF	7FC5-7FFF	7FD4-7FFF	7FDD-7FFF	7FE3-7FFF

Notes: *If the reverse line feed value exceeds the Top of Form position or the top margin, the print position will start at the TOF or top margin position.*

If the forward line feed value exceeds the bottom margin, the print position will start at the top margin position on the following page. If Skip Over Perforation is set and the forward line feed value exceeds the skip over perforation area, the print position will start at the Top of Form position on the next page.

Set Absolute Vertical Position Command (Epson)

✓ ML390 Turbo, ML391 Turbo

Function	ASCII	Dec	Hex
Set Absolute Vertical Print Position	ESC (V L _n H _n L _p H _p	27 40 86 L _n H _n L _p H _p	1B 28 56 L _n H _n L _p H _p

This command lets you place text or graphics very precisely on the page. It uses the top margin as a reference point, and moves the print position in increments established by the Set Unit command (see Chapter 12).

Parameters L_n and H_n

Normally L_n is set to 2 and H_n is set to 0.

Parameters L_p and H_p

These parameters are used to set the actual amount of vertical movement, using the following equation:

$$[L_p + (H_p \times 256)] \times \text{increment set by ESC (U L}_n \text{ H}_n \text{ P}_n \text{ command}$$

Top of Form Commands (IBM/ML)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

✓ ML320 Std., ML321 Std.

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	IBM	ML
Set Top of Form	ASCII: ESC 4 Dec: 27 52 Hex: 1B 34	ASCII: ESC 5 Dec: 27 53 Hex: 1B 35

When you send these commands, a new top of form is set at the current position of the printhead. In both emulations, you can also set a new top of form using the front panel (see "Top of Form" in the index of your printer manual).

Set Page Format Command (Epson)

✓ ML390 Turbo, ML391 Turbo

Function	ASCII	Dec	Hex
Set Top & Bottom Margins	ESC (c 2 0 L _t H _t L _b H _b	27 40 99 50 48 L _t H _t L _b H _b	1B 28 63 32 30 L _t H _t L _b H _b

This command is used to set the top and bottom margins as a multiple of the line spacing increment established by the Set Unit command (see Chapter 12)..

Parameters L_t and H_t

Parameters L_t and H_t are used to set the top margin, as a multiple of whatever line spacing is engaged:

$$\text{Top margin} = [L_t + (H_t \times 256)] \times \text{line spacing increment engaged}$$

L_t and H_t can have any value from 0 to 255 decimal.

Note: *The top margin must be set at a value less than the bottom margin.*

Parameters L_b and H_b

Parameters L_b and H_b are used to set the top margin, as a multiple of whatever line spacing is engaged:

$$\text{Bottom margin} = [L_b + (H_b \times 256)] \times \text{line spacing increment engaged}$$

L_b and H_b can have any value from 0 to 255 decimal.

Note: *The bottom margin must be set at a value greater than the top margin and less than the page length.*

Skip Over Perforation Commands

Skip Over Perforation On/Off Commands (IBM/E)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	ASCII	Dec	Hex
Skip Over Perforation On	ESC N n	27 78 n	1B 4E n
Skip Over Perforation Off	ESC O	27 79	1B 4F

If the skip over perforation is set to Yes (factory default is No) on the menu, the printer will automatically skip an inch from the bottom of one page to the top of the next.

This command changes the number of lines skipped at the bottom of the page for the IBM and Epson emulations.

Parameter n

This parameter sets the amount of the skip. "n" is any whole number from 1 to 255 for both emulations and all models except the ML390 Turbo and ML391 Turbo: for the Epson emulation in the ML390/391 Turbo printers, "n" is any whole number from 1 to 127.

The amount of skip is calculated by multiplying the current line spacing by the value of n. Once you've set the amount of skip, it won't increase or decrease if you change the line spacing.

To return the perforation skip to its default setting, enter the command ESC O.

Skip Over Perforation On/Off Commands (ML)

➤ ML320 Std., ML321 Std.

➤ ML320 Turbo, ML321 Turbo

➤ ML520, ML521

Function	ASCII	Dec	Hex
Skip Over Perforation On	ESC % S 1	27 37 83 49	1B 25 53 31
Skip Over Perforation Off	ESC % S 0	27 37 83 48	1B 25 53 30

If the skip over perforation is set to Yes (factory default is No) on the menu, the printer will automatically skip an inch from the bottom of one page to the top of the next.

Chapter 10: Bar Code Commands for 9-Pin Printers

9-Pin models ML320 Turbo, ML321 Turbo, ML520 and ML521 incorporate eight bar codes in both the Epson FX and IBM emulations:

- Code 39
- Code 128
- Interleaved 2 of 5
- UPC* A
- UPC* E
- EAN** 8
- EAN** 13
- Postnet

*UPC = Universal Product Code

**EAN = European Article Numbering

These commands are the same as those given in Chapter 11 for the 24-pin printers; however, the values for the various parameters are different for the 24-pin printers.

Note: 9-pin models ML320 Epson/IBM, ML321 Epson/IBM, ML320 Standard and ML321 Standard do NOT have bar code commands

Bar Code Commands

✓ ML320 Turbo, ML321 Turbo ✓ ML520, ML521

Function	ASCII	Dec	Hex
Select Bar Code Type and Size	ESC DLE A m n ₁ ... n ₈	27 16 65 m n ₁ ... n ₈	1B 10 41 m n ₁ ... n ₈
Print Bar Code Data	ESC DLE B m n [data]	27 16 66 m n [data]	1B 10 42 m n [data]
Print Postnet Bar Code Data	ESC DLE C P ₁ [data]	27 16 67 P ₁ [data]	1B 10 43 P ₁ [data]

To print bar codes other than Postnet, you must enter two commands:

- Select Bar Code Type & Size
- Print Bar Code Data (provides data and initiates printing)

To print Postnet bar codes, use the command ESC DLE C P₁ [data] discussed at the end of this chapter.

Code 39 Bar Code Commands

Also known as 3 of 9 Code, Code 39 is used in non-retail applications. Each character has five bars and four spaces. Code patterns have been developed for 44 different alphabetic, numeric and graphic characters. The digits can be any ASCII character from SP to Z (32 to 102 Dec, 20 to 66 Hex).

Select Code 39 Bar Code Command

The command for selecting Code 39 is

$$\text{ESC DLE A m 2 0 } n_3 n_4 n_5 n_6 n_7 n_8$$

Code 39 Parameter m

Parameter m designated the number of parameters to be set. The value of m is normally set to hexadecimal 08.

Code 39 Parameters n_3 and n_4

These parameters set the vertical length of the bars in units of $6/72''$, as calculated by the equation

$$[(n_3 \times 10) + n_4] \times 6/72''$$

where the total value must be less than or equal to 25.

Code 39 Parameter n_5

This parameter sets the width of the narrow bars in $1/144''$ increments.

**Table 68: IBM/Epson Select Code 39 Command —
Narrow Bar Widths for Parameter n_5 Values (9-Pin Printers)**

Value of n_5	Character Width
1	$1/144''$
2	$2/144''$
3	$3/144''$
4	$4/144''$
5	$5/144''$
6	$6/144''$
7	$7/144''$

Code 39 Parameter n_6

This parameter sets the width of the narrow space characters in $1/144''$ increments.

**Table 69: IBM/Epson Select Code 39 Command —
Narrow Space Widths for Parameter n_6 Values (9-Pin Printers)**

Value of n_6	Character Width
1	$4/144''$
2	$5/144''$
3	$6/144''$
4	$7/144''$
5	$8/144''$
6	$9/144''$
7	$10/144''$

Code 39 Parameter n_7

Parameter n_7 is used in combination with parameters n_5 and n_6 to set the width of the wide bars and the wide spaces.

Table 70: IBM/Epson Select Code 39 Command — Wide Bar Widths for Parameter n_5 , n_6 , n_7 Values (9-Pin Printers)

	$n_5 = 1$	$n_5 = 2$	$n_5 = 3$	$n_5 = 4$	$n_5 = 5$	$n_5 = 6$	$n_5 = 7$
$n_7 = 1$	4/144"	6/144"	8/144"	10/144"	12/144"	14/144"	16/144"
$n_7 = 2$	5/144"	7/144"	10/144"	12/144"	15/144"	17/144"	20/144"
$n_7 = 3$	6/144"	9/144"	12/144"	15/144"	18/144"	21/144"	24/144"
$n_7 = 4$	7/144"	11/144"	14/144"	18/144"	21/144"	25/144"	28/144"
$n_7 = 5$	9/144"	13/144"	17/144"	21/144"	25/144"	29/144"	33/144"
$n_7 = 6$	10/144"	14/144"	19/144"	23/144"	28/144"	32/144"	37/144"
$n_7 = 7$	11/144"	16/144"	21/144"	26/144"	31/144"	36/144"	41/144"

Table 71: IBM/Epson Select Code 39 Command — Wide Space Widths for Parameter n_5 , n_6 , n_7 Values (9-Pin Printers)

	$n_6 = 1$	$n_6 = 2$	$n_6 = 3$	$n_6 = 4$	$n_6 = 5$	$n_6 = 6$	$n_6 = 7$
$n_7 = 1$	7/144"	9/144"	11/144"	13/144"	15/144"	17/144"	19/144"
$n_7 = 2$	8/144"	10/144"	13/144"	15/144"	18/144"	20/144"	23/144"
$n_7 = 3$	9/144"	12/144"	15/144"	18/144"	21/144"	24/144"	27/144"
$n_7 = 4$	10/144"	14/144"	18/144"	21/144"	25/144"	28/144"	31/144"
$n_7 = 5$	12/144"	16/144"	20/144"	24/144"	28/144"	32/144"	36/144"
$n_7 = 6$	13/144"	18/144"	22/144"	27/144"	31/144"	36/144"	40/144"
$n_7 = 7$	14/144"	19/144"	24/144"	29/144"	34/144"	39/144"	44/144"

Code 39 Parameters n_5 , n_6 , and n_7

Together, parameters n_5 through n_7 are used to calculate the maximum width of Code 39 characters and the start and stop characters by means of the following equation:

$$[(n_5 \times 5) + n_6 + 3 + A]/144"$$

The value of A is determined by n_6 and n_7 :

Code 39 Parameter n_8

This parameter sets whether or not the readable characters are printed.

$n_8 = 0$: print readable characters in Utility mode

$n_8 = 1$: print readable characters in NLQ mode

Print Code 39 Bar Code Command

The command for printing Code 39 bar codes is

ESC DLE B m [data]

where parameter m designates the number of characters which will follow in the data. If you wish to include a check digit, enter the ASCII character @ (64 Dec, 40 Hex) at the end of the data.

Code 128 Bar Code Commands

Code 128 has 128 different characters, each of which can have any one of three different meanings, depending on which code set is engaged:

Table 72: IBM/Epson Select Code 128 Command — Usable Characters for Code Sets (9-Pin Printers)

Code Set	Characters		
	ASCII	Dec	Hex
A	NUL to '	0 to 96	00 to 60
B	DC3 to DLE	25 to 127	19 to 7F
C	0 to 9	48 to 57	30 to 39, in 2-digit pairs

A special code at the beginning indicates which set is engaged: three shift codes are also available for use within the bar code to indicate a change in the code set engaged.

Select Code 128 Bar Code Command

The command for selecting Code 128 is

ESC DLE A m 4 0 n₃ n₄ n₅ 0 0 n₈

Which set will be engaged is entered using the Print Code 128 Bar Code Command described below.

Code 128 Parameters n₃ and n₄

These parameters set the vertical length of the bars in 6/72", as calculated by the equation

$$[(n_3 \times 10) + n_4] \times 6/72''$$

where the total value must be less than or equal to 25.

Code 128 Parameter n_5

This parameter sets the maximum width of one character in 1/144" increments as follows:

Table 73: IBM/Epson Select Code 128 Command — Character Widths for Parameter n_5 Values (9-Pin Printers)

Value of n_5	Character Width
1	30/144"
2	45/144"
3	58/144"
4	71/144"
5	84/144"
6	97/144"
7	110/144"

When calculating the width of the printout, you must take into consideration the Start and Stop Code patterns:

Table 74: IBM/Epson Select Code 128 Command — Start and Stop Codes for Parameter n_5 Values (9-Pin Printers)

Value of n_5	Start Code	Stop Code
1	30/144"	32/144"
2	45/144"	45/144"
3	58/144"	58/144"
4	71/144"	71/144"
5	84/144"	84/144"
6	97/144"	97/144"
7	110/144"	110/144"

Code 128 Parameter n_8

This parameter sets whether or not the readable characters are printed.

$n_8 = 1$: print readable characters

$n_8 = 0$: do not print readable characters

Print Code 128 Bar Code Command

The command for printing Code 128 bar codes is

ESC DLE B m [data]

where parameter m designates the number of characters which will follow in the data. To indicate which code set to use, use the set letter as the first digit of the data within the command.

Each set has a different check digit.

**Table 75: IBM/Epson Print Code 128 Command —
Check Digits for Code 128 Code Sets (9-Pin Printers)**

Code Set	Check Digit		
	ASCII	Dec	Hex
A	g	103	67
B	CAN	24	18
C	@	64	40

Interleaved 2 of 5 Bar Code Commands

Interleaved 2 of 5 bar coding is used mainly in the distribution industry. Two digits are encoded: one in the bars and one in the spaces. Ten characters are encoded, each any ASCII character from 0 to 9 (48 to 57 Dec, 30 to 39 Hex).

The sum of the black bars and spaces becomes the maximum width of two characters.

Select Interleaved 2 of 5 Bar Code Command

The command for selecting Interleaved 2 of 5 is

ESC DLE A m 3 0 n₃ n₄ n₅ n₆ n₇ n₈

Interleaved 2 of 5 Parameters n₃ and n₄

These parameters set the vertical length of the bars in 6/72", as calculated by the equation

$$(n_3 \times 10) + n_4 \times 6/72"$$

where the total value must be less than or equal to 25.

Interleaved 2 of 5 Parameter n₅

Parameter n₅ is used in combination with parameter n₇ to set the width of one character of the black bars, as follows:

**Table 76: IBM/Epson Select Interleaved 2 of 5 Command —
Black Bar Width for Parameter n₅, n₇ Values (9-Pin Printers)**

	n ₅ = 1	n ₅ = 2	n ₅ = 3	n ₅ = 4	n ₅ = 5	n ₅ = 6	n ₅ = 7
n ₇ = 1	11/144"	18/144"	25/144"	32/144"	39/144"	46/144"	53/144"
n ₇ = 2	13/144"	20/144"	29/144"	36/144"	45/144"	52/144"	61/144"
n ₇ = 3	15/144"	24/144"	33/144"	42/144"	51/144"	60/144"	69/144"
n ₇ = 4	17/144"	28/144"	37/144"	48/144"	57/144"	68/144"	77/144"
n ₇ = 5	21/144"	32/144"	43/144"	54/144"	65/144"	76/144"	87/144"
n ₇ = 6	23/144"	34/144"	47/144"	58/144"	71/144"	82/144"	95/144"
n ₇ = 7	25/144"	38/144"	51/144"	64/144"	77/144"	90/144"	103/144"

Interleaved 2 of 5 Parameter n_6

Parameter n_6 is used in combination with parameter n_7 to set the width of one character of the spaces, as follows:

Table 77: IBM/Epson Select Interleaved 2 of 5 Command — Space Widths for Parameter n_6 , n_7 Values (9-Pin Printers)

	$n_6 = 1$	$n_6 = 2$	$n_6 = 3$	$n_6 = 4$	$n_6 = 5$	$n_6 = 6$	$n_6 = 7$
$n_7 = 1$	26/144"	33/144"	40/144"	47/144"	54/144"	61/144"	68/144"
$n_7 = 2$	28/144"	35/144"	44/144"	51/144"	60/144"	67/144"	76/144"
$n_7 = 3$	30/144"	39/144"	48/144"	57/144"	66/144"	75/144"	84/144"
$n_7 = 4$	32/144"	43/144"	52/144"	63/144"	72/144"	83/144"	92/144"
$n_7 = 5$	36/144"	47/144"	68/144"	69/144"	80/144"	91/144"	102/144"
$n_7 = 6$	38/144"	51/144"	62/144"	75/144"	86/144"	99/144"	110/144"
$n_7 = 7$	40/144"	53/144"	66/144"	79/144"	92/144"	105/144"	118/144"

Interleaved 2 of 5 Parameter n_8

This parameter sets whether or not the readable characters are printed.

$n_8 = 1$: print readable characters

$n_8 = 0$: do not print readable characters

Print Interleaved 2 of 5 Bar Code Command

The command for printing Interleaved 2 of 5 bar codes is

ESC DLE B m [data]

where parameter m designates the number of characters which will follow in the data. If you wish to include a check digit, enter the ASCII character @ (64 Dec, 40 Hex) at the end of the data.

UPC A Bar Code Commands

UPC bar coding is used in the supermarket industry. UPC A coding contains twelve digits: the first six digits represent the manufacturer, the second six digits identify the product. The digits can be any ASCII character from 0 to 9 (48 to 57 Dec, 30 to 39 Hex).

Select UPC A Bar Code Command

The command for selecting UPC A is

ESC DLE A m 1 0 n_3 n_4 n_5 0 0 n_8

UPC A Parameters n_3 and n_4

These parameters set the vertical length of the bars in units of $6/72"$, as calculated by the equation

$$[(n_3 \times 10) + n_4] \times 6/72"$$

where the total value must be less than or equal to 25.

UPC A Parameter n_5

This parameter sets the maximum width of one character in $1/144"$ increments as follows:

**Table 78: IBM/Epson Select UPC A Command —
Character Widths for Parameter n_5 Values (9-Pin Printers)**

Value of n_5	Character Width
1	19/144"
2	26/144"
3	33/144"
4	40/144"
5	47/144"
6	54/144"
7	61/144"

When calculating the width of the printout, you must take into consideration the Start Code pattern, the Center bar pattern, and the Stop Code pattern as shown in the table which follows.

**Table 79: IBM/Epson Select UPC A Command —
Start/Stop Codes and Center Bar Widths for Parameter n_5 Values (9-Pin Printers)**

Value of n_5	Start Code	Center Bar	Stop Code
1	6/144"	14/144"	6/144"
2	9/144"	19/144"	9/144"
3	12/144"	24/144"	12/144"
4	15/144"	29/144"	15/144"
5	18/144"	34/144"	18/144"
6	21/144"	39/144"	21/144"
7	24/144"	44/144"	24/144"

UPC A Parameter n_8

This parameter sets whether or not the readable characters are printed.

$n_8 = 1$: print readable characters

$n_8 = 0$: do not print readable characters

Print UPC A Bar Code Command

The command for printing a UPC A bar code is

ESC DLE B m [data]

where parameter m designates the number of characters which will follow in the data. If you wish to include a check digit, enter the ASCII character @ (64 Dec, 40 Hex) at the end of the data.

UPC E Bar Code Commands

UPC E bar coding is a six-digit variation of UPC A, used for labeling small items. The digits can be any ASCII character from 0 to 9 (48 to 57 Dec, 30 to 39 Hex).

Select UPC E Bar Code Command

The command for selecting UPC E is

ESC DLE A m 1 4 n₃ n₄ n₅ 0 0 n₈

UPC E Parameters n₃ and n₄

These parameters set the vertical length of the bars in units of 6/72", as calculated by the equation

$$[(n_3 \times 10) + n_4] \times 6/72''$$

where the total value must be less than or equal to 25.

UPC E Parameter n₅

This parameter sets the maximum width of one character in 1/144" increments as follows:

Table 80: IBM/Epson Select UPC E Command — Character Widths for Parameter n₅ Values (9-Pin Printers)

Value of n ₅	Character Width
1	19/144"
2	26/144"
3	33/144"
4	40/144"
5	47/144"
6	54/144"
7	61/144"

When calculating the width of the printout, you must take into consideration the Start Code and Stop Code patterns as shown in the table which follows.

Table 81: IBM/Epson Select UPC E Command — Start and Stop Codes for Parameter n₅ Values (9-Pin Printers)

Value of n ₅	Start Code	Stop Code
1	6/144"	15/144"
2	9/144"	21/144"
3	12/144"	27/144"
4	15/144"	33/144"
5	18/144"	39/144"
6	21/144"	45/144"
7	24/144"	51/144"

UPC E Parameter n₈

This parameter sets whether or not the readable characters are printed.

n₈ = 1: print readable characters

$n_8 = 0$: do not print readable characters

Print UPC E Bar Code Command

The command for printing a UPC E bar code is

ESC DLE B m [data]

where m designates the number of characters which will follow in the data. A check digit cannot be used with UPC E bar codes.

EAN 8 Bar Code Command s

EAN bar coding is a variation of UPC coding. EAN 8 encodes eight digits. The digits can be any ASCII character from 0 to 9 (48 to 57 Dec, 30 to 39 Hex).

Select EAN 8 Bar Code Command

The command for selecting EAN 8 is

ESC DLE A m 0 1 n_3 n_4 n_5 0 0 n_8

EAN 8 Parameters n_3 and n_4

These parameters set the vertical length of the bars in $6/72''$, as calculated by the equation

$$[(n_3 \times 10) + n_4] \times 6/72''$$

where the total value must be less than or equal to 25.

EAN 8 Parameter n_5

This parameter sets the maximum width of one character in $1/144''$ increments as follows:

**Table 82: IBM/Epson Select EAN 8 Command —
Maximum Character Widths for Parameter n_5 Values (9-Pin Printers)**

Value of n_5	Character Width
1	19/144"
2	26/144"
3	33/144"
4	40/144"
5	47/144"
6	54/144"
7	61/144"

When calculating the width of the printout, you must take into consideration the left hand guard pattern, the center guard pattern and the right hand guard pattern.

EAN 8 Parameter n_8

This parameter sets whether or not the readable characters are printed.

$n_8 = 1$: print readable characters

$n_8 = 0$: do not print readable characters

Print EAN 8 Bar Code Command

The command for printing an EAN 8 bar code is

ESC DLE B m [data]

where parameter m designates the number of characters which will follow in the data. If you wish to include a check digit, enter the ASCII character @ (64 Dec, 40 Hex) at the end of the data.

EAN 13 Bar Code Commands

EAN 13 encodes 13 digits and contains the same number of bars as UPC A. The thirteenth digit combined with the twelfth digit provides a code representing a country. The digits can be any ASCII character from 0 to 9 (48 to 57 Dec, 30 to 39 Hex).

Select EAN 13 Bar Code Command

The command for selecting EAN 13 is

ESC DLE A m 0 2 n₃ n₄ n₅ 0 0 n₈

EAN 13 Parameters n₃ and n₄

These parameters set the vertical length of the bars in 6/72", as calculated by the equation

$$[(n_3 \times 10) + n_4] \times 6/72''$$

where the total value must be less than or equal to 25.

EAN 13 Parameter n₅

This parameter sets the maximum width of one character in 1/144" increments as follows:

**Table 83: IBM/Epson Select EAN 13 Command —
Maximum Character Widths for Parameter n₅ Values (9-Pin Printers)**

Value of n ₅	Character Width
1	19/144"
2	26/144"
3	33/144"
4	40/144"
5	47/144"
6	54/144"
7	61/144"

When calculating the width of the printout, you must take into consideration the left hand guard pattern, the center guard pattern and the right hand guard pattern.

EAN 13 Parameter n₈

This parameter sets whether or not the readable characters are printed.

n₈ = 1: print readable characters

n₈ = 0: do not print readable characters

Print EAN 13 Bar Code Command

The command for printing EAN 13 bar codes is

ESC DLE B m [data]

where parameter m designates the number of characters which will follow in the data. If you wish to include a check digit, enter the ASCII character @ (64 Dec, 40 Hex) at the end of the data.

Postnet Bar Code Command

Postnet bar coding is used by the United States Post Office for sorting mail by automated equipment. It incorporates a coding system using five bars and four spaces for each digit.

Select/Print Postnet Bar Code Data Command

The command

ESC DLE C P₁ [data]

selects Postnet bar codes and initiates the printing of the zip code + 4 data which you enter as part of the command. Each digit of data can be any ASCII character from 0 to 9 (48 to 57 Dec, 30 to 39 Hex). *The data must be the full ZIP + 4 code.*

Postnet Parameter P₁

Parameter P₁ tells the printer how many bytes of bar code data to expect. Its value can be any ASCII character from NUL to DC4 (1 to 20 Dec, 01 to 14 Hex): any values for P₁ outside this range will cause the data to be ignored.

The print density for Postnet bar codes will be 240 dpi. Printing is accomplished in two print passes with a 1/144" line feed. The bar height will be as follows:

High Bar: 16/144" (eight dots in two passes)

Low Bar: 6/144" (three dots in two passes)

To include the check digit, enter the ASCII character @ (64 Dec, 40 Hex) at the end of the data.

Chapter 11: Bar Code Commands for 24-Pin Printers

24-pin models ML390 Turbo, ML391 Turbo, ML590 and ML591 incorporate eight bar codes, in both the Epson LQ and IBM emulations:

- Code 39
- Code 128
- Interleaved 2 of 5
- UPC* A
- UPC* E
- EAN** 8
- EAN** 13
- Postnet

*UPC = Universal Product Code

**EAN = European Article Numbering

These commands are the same as those given in Chapter 10 for the 9-pin printers; however, the values for the various parameters are different for the 9-pin printers.

Bar Code Commands

✓ ML390 Turbo, ML391 Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Select Bar Code Type and Size	ESC DLE A m n ₁ ... n ₈	27 16 65 m n ₁ ... n ₈	1B 10 41 m n ₁ ... n ₈
Print Bar Code Data	ESC DLE B m n [data]	27 16 66 m n [data]	1B 10 42 m n [data]
Print Postnet Bar Code Data	ESC DLE C P ₁ [data]	27 16 67 P ₁ [data]	1B 10 43 P ₁ [data]

To print bar codes other than Postnet, you must enter two commands:

- Select Bar Code Type & Size
- Print Bar Code Data (provides data and initiates printing)

To print Postnet bar codes, use the command ESC DLE C P₁ [data] discussed at the end of this chapter.

Code 39 Bar Code Commands

Also known as 3 of 9 Code, Code 39 is used in non-retail applications. Each character has five bars and four spaces. Code patterns have been developed for 44 different alphabetic, numeric and graphic characters. The digits can be any ASCII character from SP to Z (32 to 102 Dec, 20 to 66 Hex).

Select Code 39 Bar Code Command

The command for selecting Code 39 is

ESC DLE A m 2 0 n₃ n₄ n₅ n₆ n₇ n₈

Code 39 Parameters n_3 and n_4

These parameters set the vertical length of the bars in units of $15/180''$, as calculated by the equation

$$[(n_3 \times 10) + n_4] \times 15/180''$$

where the total value must be less than or equal to 25.

Code 39 Parameter n_5

This parameter sets the width of the narrow bars in $1/360''$ increments.

**Table 84: IBM/Epson Select Code 39 Command —
Narrow Bar Widths for Parameter n_5 Values (24-Pin Printers)**

Value of n_5	Character Width
1	$2/360''$
2	$4/360''$
3	$7/360''$
4	$9/360''$
5	$12/360''$
6	$14/360''$
7	$17/360''$

Code 39 Parameter n_6

This parameter sets the width of the narrow space characters in $1/360''$ increments.

**Table 85: IBM/Epson Select Code 39 Command —
Narrow Space Widths for Parameter n_6 Values (24-Pin Printers)**

Value of n_6	Character Width
1	$8/360''$
2	$10/360''$
3	$13/360''$
4	$15/360''$
5	$18/360''$
6	$20/360''$
7	$23/360''$

Code 39 Parameter n_7

Parameter n_7 is used in combination with parameters n_5 and n_6 to set the width of the wide bars and the wide spaces.

Table 86: IBM/Epson Select Code 39 Command — Wide Bar Widths for Parameter n_5 , n_7 Values (24-Pin Printers)

	$n_5 = 1$	$n_5 = 2$	$n_5 = 3$	$n_5 = 4$	$n_5 = 5$	$n_5 = 6$	$n_5 = 7$
$n_7 = 1$	7/360"	11/360"	17/360"	21/360"	27/360"	31/360"	37/360"
$n_7 = 2$	9/360"	14/360"	22/360"	27/360"	32/360"	39/360"	47/360"
$n_7 = 3$	12/360"	18/360"	27/360"	33/360"	42/360"	48/360"	57/360"
$n_7 = 4$	14/360"	21/360"	32/360"	39/360"	49/360"	56/360"	67/360"
$n_7 = 5$	17/360"	25/360"	36/360"	45/360"	57/360"	65/360"	77/360"
$n_7 = 6$	19/360"	28/360"	41/360"	51/360"	64/360"	73/360"	87/360"
$n_7 = 7$	22/360"	32/360"	47/360"	57/360"	72/360"	82/360"	97/360"

Table 87: IBM/Epson Select Code 39 Command — Wide Space Widths for Parameter n_6 , n_7 Values (24-Pin Printers)

	$n_6 = 1$	$n_6 = 2$	$n_6 = 3$	$n_6 = 4$	$n_6 = 5$	$n_6 = 6$	$n_6 = 7$
$n_7 = 1$	13/360"	17/360"	23/360"	27/360"	33/360"	37/360"	43/360"
$n_7 = 2$	16/360"	21/360"	28/360"	33/360"	41/360"	46/360"	53/360"
$n_7 = 3$	18/360"	24/360"	33/360"	39/360"	48/360"	54/360"	63/360"
$n_7 = 4$	21/360"	28/360"	38/360"	45/360"	56/360"	63/360"	73/360"
$n_7 = 5$	23/360"	31/360"	43/360"	51/360"	63/360"	71/360"	80/360"
$n_7 = 6$	26/360"	35/360"	48/360"	57/360"	71/360"	80/360"	93/360"
$n_7 = 7$	28/360"	38/360"	53/360"	63/360"	78/360"	88/360"	103/360"

Code 39 Parameter n_8

This parameter sets whether or not the readable characters are printed.

$n_8 = 1$: print readable characters

$n_8 = 0$: do not print readable characters

Print Code 39 Bar Code Command

The command for printing Code 39 bar codes is

ESC DLE B m [data]

where parameter m designates the number of characters which will follow in the data. If you wish to include a check digit, enter the ASCII character @ (64 Dec, 40 Hex) at the end of the data.

Code 128 Bar Code Commands

Code 128 has 106 different characters, each of which can have any one of three different meanings depending on which code set is engaged:

Table 88: IBM/Epson Select Code 128 Command — Characters for Each Code Set (24-Pin Printers)

Code Set	Characters		
	ASCII	Dec	Hex
A	NUL to '	0 to 96	00 to 60
B	DC3 to DLE	25 to 127	19 to 7F
C	0 to 9	48 to 57	30 to 39, in 2-digit pairs

A special code at the beginning indicates which set is engaged: three shift codes are also available for use within the bar code to indicate a change in the code set engaged.

Select Code 128 Bar Code Command

The command for selecting Code 128 is

ESC DLE A m 4 0 n₃ n₄ n₅ 0 0 n₆

Which set will be engaged is entered using the Print Code 128 Bar Code Command described below.

Code 128 Parameters n₃ and n₄

These parameters set the vertical length of the bars in units of 15/180", as calculated by the equation

$$[(n_3 \times 10) + n_4] \times 15/180''$$

where the total value must be less than or equal to 25.

Code 128 Parameter n₅

This parameter sets the maximum width of one character in 1/360" increments as follows:

Table 89: IBM/Epson Select Code 128 Command — Character Widths for Parameter n₅ Values (24-Pin Printers)

Value of n ₅	Character Width
1	55/360"
2	77/360"
3	110/360"
4	132/360"
5	165/360"
6	187/360"
7	220/360"

When calculating the width of the printout, you must take into consideration the Start and Stop Code patterns:

Table 90: IBM/Epson Select Code 128 Command — Start and Stop Codes for Parameter n_5 Values (24-Pin Printers)

Value of n_5	Start Code	Stop Code
1	55/360"	62/360"
2	77/360"	88/360"
3	110/360"	127/360"
4	132/360"	153/360"
5	165/360"	192/360"
6	187/360"	218/360"
7	220/360"	257/360"

Code 128 Parameter n_8

This parameter sets whether or not the readable characters are printed.

$n_8 = 1$: print readable characters

$n_8 = 0$: do not print readable characters

Print Code 128 Bar Code Command

The command for printing Code 128 bar codes is

ESC DLE B m [data]

where parameter m designates the number of characters which will follow in the data. To indicate which set to use (A, B, or C), use the set letter as the first digit of the data within the command.

Each set has a different check digit.

Table 91: IBM/Epson Print Code 128 Command — Check Digits (24-Pin Printers)

Code Set	Check Digit		
	ASCII	Dec	Hex
A	g	103	67
B	CAN	24	18
C	@	64	40

Interleaved 2 of 5 Bar Code Commands

Interleaved 2 of 5 bar coding is used mainly in the distribution industry. Two digits are encoded: one in the bars and one in the spaces. Ten characters are encoded, each any ASCII character from 0 to 9 (48 to 57 Dec, 30 to 39 Hex).

The sum of the black bars and spaces becomes the maximum width of two characters.

Select Interleaved 2 of 5 Bar Code Command

The command for selecting Interleaved 2 of 5 is

ESC DLE A m 3 0 n_3 n_4 n_5 n_6 n_7 n_8

Interleaved 2 of 5 Parameters n_3 and n_4

These parameters set the vertical length of the bars in units of 15/180", as calculated by the equation

$$[(n_3 \times 10) + n_4] \times 15/180''$$

where the total value must be less than or equal to 25.

Interleaved 2 of 5 Parameter n_5

Parameter n_5 is used in combination with parameter n_7 to set the width of one character of the black bars, as follows:

Table 92: IBM/Epson Select Interleaved 2 of 5 Command — Black Bar Widths for Parameter n_5 , n_7 Values (24-Pin Printers)

	$n_5 = 1$	$n_5 = 2$	$n_5 = 3$	$n_5 = 4$	$n_5 = 5$	$n_5 = 6$	$n_5 = 7$
$n_7 = 1$	20/360"	34/360"	55/360"	69/360"	90/360"	184/360"	125/360"
$n_7 = 2$	24/360"	40/360"	65/360"	81/360"	100/360"	120/360"	145/360"
$n_7 = 3$	30/360"	48/360"	75/360"	93/360"	120/360"	138/360"	165/360"
$n_7 = 4$	34/360"	54/360"	85/360"	105/360"	134/360"	154/360"	185/360"
$n_7 = 5$	40/360"	62/360"	93/360"	117/360"	150/360"	172/360"	205/360"
$n_7 = 6$	44/360"	68/360"	103/360"	129/360"	164/360"	188/360"	225/360"
$n_7 = 7$	50/360"	76/360"	115/360"	141/360"	180/360"	206/360"	245/360"

Interleaved 2 of 5 Parameter n_6

Parameter n_6 is used in combination with parameter n_7 to set the width of one character of the spaces, as follows:

Table 93: IBM/Epson Select Interleaved 2 of 5 Command — Space Widths for Parameter n_6 , n_7 Values (24-Pin Printers)

	$n_6 = 1$	$n_6 = 2$	$n_6 = 3$	$n_6 = 4$	$n_6 = 5$	$n_6 = 6$	$n_6 = 7$
$n_7 = 1$	50/360"	64/360"	85/360"	99/360"	120/360"	134/360"	155/360"
$n_7 = 2$	56/360"	72/360"	95/360"	111/360"	136/360"	152/360"	175/360"
$n_7 = 3$	60/360"	78/360"	105/360"	123/360"	150/360"	168/360"	195/360"
$n_7 = 4$	66/360"	86/360"	115/360"	135/360"	166/360"	186/360"	215/360"
$n_7 = 5$	70/360"	92/360"	125/360"	147/360"	180/360"	202/360"	235/360"
$n_7 = 6$	76/360"	100/360"	135/360"	159/360"	196/360"	220/360"	255/360"
$n_7 = 7$	80/360"	106/360"	146/360"	171/360"	210/360"	236/360"	275/360"

Interleaved 2 of 5 Parameter n_8

This parameter sets whether or not the readable characters are printed.

$n_8 = 1$: print readable characters

$n_8 = 0$: do not print readable characters

Print Interleaved 2 of 5 Bar Code Command

The command for printing Interleaved 2 of 5 bar codes is

ESC DLE B m [data]

where parameter m designates the number of characters which will follow in the data. If you wish to include a check digit, enter the ASCII character @ (64 Dec, 40 Hex) at the end of the data.

UPC A Bar Code Commands

UPC bar coding is used in the supermarket industry. UPC A coding contains twelve digits: the first six digits represent the manufacturer, the second six digits identify the product. The digits can be any ASCII character from 0 to 9 (48 to 57 Dec, 30 to 39 Hex).

Select UPC A Bar Code Command

The command for selecting UPC A is

ESC DLE A m 1 0 n_3 n_4 n_5 0 0 n_8

UPC A Parameters n_3 and n_4

These parameters set the vertical length of the bars in units of 15/180", as calculated by the equation

$$[(n_3 \times 10) + n_4] \times 15/180''$$

where the total value must be less than or equal to 25.

UPC A Parameter n_5

This parameter sets the maximum width of one character in 1/360" increments as follows:

Table 94: IBM/Epson Select UPC A Command — Character Widths for Parameter n_5 Values (24-Pin Printers)

Value of n_5	Character Width
1	35/360"
2	49/360"
3	70/360"
4	84/360"
5	105/360"
6	119/360"
7	140/360"

When calculating the width of the printout, you must take into consideration the Start Code pattern, the Center bar pattern, and the Stop Code pattern as shown in the table which follows.

**Table 95: IBM/Epson Select UPC A Command —
Start/Stop Codes and Center Bars for Parameter n_5 Values (24-Pin Printers)**

Value of n_5	Start Code	Center Bar	Stop Code
1	12/360"	28/360"	12/360"
2	18/360"	38/360"	18/360"
3	27/360"	53/360"	27/360"
4	33/360"	63/360"	33/360"
5	42/360"	78/360"	42/360"
6	48/360"	88/360"	48/360"
7	57/360"	103/360"	57/360"

UPC A Parameter n_8

This parameter sets whether or not the readable characters are printed.

$n_8 = 1$: print readable characters

$n_8 = 0$: do not print readable characters

Print UPC A Bar Code Command

The command for printing a UPC A bar code is

ESC DLE B m [data]

where parameter m designates the number of characters which will follow in the data. If you wish to include a check digit, enter the ASCII character @ (64 Dec, 40 Hex) at the end of the data.

UPC E Bar Code Commands

UPC E bar coding is a six-digit variation of UPC A, used for labeling small items. The digits can be any ASCII character from 0 to 9 (48 to 57 Dec, 30 to 39 Hex).

Select UPC E Bar Code Command

The command for selecting UPC E is

ESC DLE A m 1 4 n_3 n_4 n_5 0 0 n_8

UPC E Parameters n_3 and n_4

These parameters set the vertical length of the bars in units of 15/180", as calculated by the equation

$$[(n_3 \times 10) + n_4] \times 15/180"$$

where the total value must be less than or equal to 25.

UPC E Parameter n_5

This parameter sets the maximum width of one character in 1/360" increments as follows:

**Table 96: IBM/Epson Select UPC E Command —
Maximum Character Widths for Parameter n_5 Values (24-Pin Printers)**

Value of n_5	Character Width
1	35/360"
2	49/360"
3	70/360"
4	84/360"
5	105/360"
6	119/360"
7	140/360"

When calculating the width of the printout, you must take into consideration the Start Code and Stop Code patterns as shown in the table which follows.

UPC E Parameter n_8

This parameter sets whether or not the readable characters are printed.

$n_8 = 1$: print readable characters

$n_8 = 0$: do not print readable characters

Print UPC E Bar Code Command

The command for printing a UPC E bar code is

ESC DLE B m [data]

where m designates the number of characters which will follow in the data. A check digit cannot be used with UPC E bar codes.

EAN 8 Bar Code Commands

EAN bar coding is a variation of UPC coding. EAN 8 encodes eight digits. The digits can be any ASCII character from 0 to 9 (48 to 57 Dec, 30 to 39 Hex).

Select EAN 8 Bar Code Command

The command for selecting EAN 8 is

ESC DLE A m 0 1 n_3 n_4 n_5 0 0 n_8

EAN 8 Parameters n_3 and n_4

These parameters set the vertical length of the bars in units of 15/180", as calculated by the equation

$$[(n_3 \times 10) + n_4] \times 15/180"$$

where the total value must be less than or equal to 25.

EAN 8 Parameter n_5

This parameter sets the maximum width of one character in 1/360" increments as follows:

**Table 97: IBM/Epson Select EAN 8 Command —
Maximum Character Widths for Parameter n_5 Values (24-Pin Printers)**

Value of n_5	Character Width
1	35/360"
2	49/360"
3	70/360"
4	84/360"
5	105/360"
6	119/360"
7	140/360"

When calculating the width of the printout, you must take into consideration the left hand guard pattern, the center guard pattern and the right hand guard pattern.

EAN 8 Parameter n_8

This parameter sets whether or not the readable characters are printed.

$n_8 = 1$: print readable characters

$n_8 = 0$: do not print readable characters

Print EAN 8 Bar Code Command

The command for printing an EAN 8 bar code is

ESC DLE B m [data]

where parameter m designates the number of characters which will follow in the data. If you wish to include a check digit, enter the ASCII character @ (64 Dec, 40 Hex) at the end of the data.

EAN 13 Bar Code Commands

EAN 13 encodes 13 digits and contains the same number of bars as UPC A. The thirteenth digit combined with the twelfth digit provides a code representing a country. The digits can be any ASCII character from 0 to 9 (48 to 57 Dec, 30 to 39 Hex).

Select EAN 13 Bar Code Command

The command for selecting EAN 13 is

$$\text{ESC DLE A m 0 2 } n_3 n_4 n_5 0 0 n_8$$

EAN 13 Parameters n_3 and n_4

These parameters set the vertical length of the bars in units of 15/180", as calculated by the equation

$$[(n_3 \times 10) + n_4] \times 15/180''$$

where the total value must be less than or equal to 25.

EAN 13 Parameter n_5

This parameter sets the maximum width of one character in 1/360" increments as follows:

**Table 98: IBM/Epson Select EAN 13 Command —
Maximum Character Widths for Parameter n_5 Values (24-Pin Printers)**

Value of n_5	Character Width
1	35/360"
2	49/360"
3	70/360"
4	84/360"
5	105/360"
6	119/360"
7	140/360"

When calculating the width of the printout, you must take into consideration the left hand guard pattern, the center guard pattern and the right hand guard pattern.

EAN 13 Parameter n_8

This parameter sets whether or not the readable characters are printed.

$n_8 = 1$: print readable characters

$n_8 = 0$: do not print readable characters

Print EAN 13 Bar Code Command

The command for printing EAN 13 bar codes is

$$\text{ESC DLE B m [data]}$$

where parameter m designates the number of characters which will follow in the data. If you wish to include a check digit, enter the ASCII character @ (64 Dec, 40 Hex) at the end of the data.

Postnet Bar Code Command

Postnet bar coding is used by the United States Post Office for sorting mail by automated equipment. It incorporates a coding system using five bars and four spaces for each digit.

Select/Print Postnet Bar Code Data Command

The command

ESC DLE C P₁ [data]

selects Postnet bar codes and initiates the printing of the zip code + 4 data which you enter as part of the command. Each digit of data can be any ASCII character from 0 to 9 (48 to 57 Dec, 30 to 39 Hex). *The data must be the full ZIP + 4 code.*

Postnet Parameter P₁

Parameter P₁ tells the printer how many bytes of bar code data to expect. Its value can be any ASCII character from NUL to DC4 (1 to 20 Dec, 01 to 14 Hex): any values for P₁ outside this range will cause the data to be ignored.

The print density for Postnet bar codes will be 240 dpi. Printing is accomplished in two print passes with a 1/144" line feed. The bar height will be as follows:

High Bar: 16/144" (eight dots in two passes)

Low Bar: 6/144" (three dots in two passes)

To include the check digit, enter the ASCII character @ (64 Dec, 40 Hex) at the end of the data.

Chapter 12: Miscellaneous Commands

This chapter describes the following commands:

- Cancel Command
- Change Emulation Command
- Cut Sheet Feeder Commands
- Delete Command
- Half-Speed Printing Command
- Initialize Printer Commands
- Most Significant Bit Commands
- Paper-Out Sensor Commands
- Print Suppress Mode Commands
- Select Color Command
- Set Unit Command
- Software I-Prime Command
- Stop Printing Command

Cancel Command (IBM/E/ML)

- ✓ ML320 E/I, ML321 E/I
- ✓ ML320 Turbo, ML321 Turbo
- ✓ ML520, ML521
- ✓ ML320 Std., ML321 Std.
- ✓ ML390 Turbo, ML391 Turbo
- ✓ ML590, ML591

Function	ASCII	Dec	Hex
Cancel	CAN	24	18

This command clears all the data from the print buffer, but does not reset printing features that have been set using control codes.

Change Emulation Command (IBM/E/ML)

- ✓ ML320 E/I, ML321 E/I
- ✓ ML320 Turbo, ML321 Turbo
- ✓ ML520, ML521

Function	ASCII	Dec	Hex
Change Emulation	ESC { n	27 123 n	1B 7B n

This command allows you to change the emulation as follows:

Table 99: IBM/E/ML ESC { Command — Emulations for n Values

Decimal Value of n	Emulation
2	IBM Proprinter III
33	OKIDATA MICROLINE Standard
65	Epson

Appendix A: Interfacing

This appendix gives the pin assignments for the parallel and serial interfaces of MICROLINE printers. It also includes the most common serial cable configurations.

Parallel Interface

Note: *The parallel cable should be no longer than 6 ft. (1.8m). The cable must be shielded in order to comply with FCC requirements.*

Table 102: Pin Assignments for Parallel Interface Signals

Pin	Signal	Return Pin	Direction
1	Strobe	19	To Printer
2	Data 1	20	To Printer
3	Data 2	21	To Printer
4	Data 3	22	To Printer
5	Data 4	23	To Printer
6	Data 5	24	To Printer
7	Data 6	25	To Printer
8	Data 7	26	To Printer
9	Data 8	27	To Printer
10	Acknowledge	28	From Printer
11	Busy	29	From Printer
12	Paper end	30	From Printer
13	Select	No return	From Printer
14†	Autofeed	–	To Printer
15	Not used	–	–
16	0V	No return	Signal Ground
17	Chassis Ground	No return	Frame Ground
18†	+5V*	–	From Printer
19-30	0V	–	Ground
31†	I-Prime	–	To Printer
32	Fault	–	From Printer
33	0V	–	Signal Ground
34-35	Not used	–	–

† Pins controlled by jumper plugs in the printer.

* 50 mA maximum.

Serial Interface

See your Printer Handbook for serial menu settings

Note: The serial cable should be no longer than 50 ft. (15.25m). The cable must be shielded in order to comply with FCC requirements.

Table 103: Pin Assignments for Serial Interface Signals

Pin	Signal	Symbol	Direction
1	Protective Ground	PG	–
2	Transmitted Data	TD	From Printer
3	Received Data	RD	To Printer
4	Request to Send	TRS	From Printer
5	Not used	–	–
6	Data Set Ready	DSR	To Printer
7	Signal Ground	SG	–
8–10	Not used	–	–
11	Supervisory Send Data	SSD	From Printer
12–19	Not used	–	–
20	Data Terminal Ready	DTR	From Printer
21–25	Not used	–	–

Commonly Used Serial Cable Configurations

IBM 25-Pin Cable Configuration

Computer	Printer
PG 1	1 PG
TD 2	3 RD
RD 3	2 TD
CTS 5	11 SSD
DSR 6	20 DTR 6 DSR
SG 7	7 SG 4 RTS 5 CTS

IBM 9-Pin Cable Configuration

Computer	Printer
RD 2	2 TD
TD 3	3 RD
SG 5	7 SG
DSR 6	20 DTR 6 DSR
CTS 8	11 SSD 4 RTS 5 CTS

Cut Sheet Feeder (CSF) Commands

CSF Commands (IBM/E)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321Turbo

✓ ML520, ML521

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	ASCII	Dec	Hex
Insert Sheet	ESC EM I	27 25 73	1B 19 49
Eject Sheet	ESC EM R	27 25 82	1B 19 52

The insert page command feeds a sheet of paper from the cut sheet feeder (CSF) to the top of form position. If CSF paper is already in the printer, the printer will eject the page and load another.

The eject page command prints data in the print buffer and ejects the page. A line feed code (LF) at the end of the page causes the next page to feed into the printer automatically.

Bin Select Command for Dual-Bin CSF (IBM/E)

✓ ML520, ML521

✓ ML590, ML591

Function	ASCII	Dec	Hex
Select Bin 1	ESC EM 1	27 25 49	1B 19 31
Select Bin 2	ESC EM 2	27 25 50	1B 19 32

The bin select command chooses the active bin when the optional dual-bin cut sheet feeder is installed.

CSF Commands (ML)

✓ ML320 Std., ML321 Std.

✓ ML320 Turbo, ML321Turbo

✓ ML520, ML521

Function	ASCII	Dec	Hex
Insert Sheet	ESC S	27 83	1B 53
Eject Sheet	ESC V	27 86	1B 56

The insert page command feeds a sheet of paper from the cut sheet feeder (CSF) to the top of form position. If CSF paper is already in the printer, the printer will eject the page and load another.

The eject page command prints data in the print buffer and ejects the page. A line feed code (LF) at the end of the page causes the next page to feed into the printer automatically.

Delete Command (Epson)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	ASCII	Dec	Hex
Delete One Character Command	DEL	127	7F

This command deletes the last character sent to the printer. It will not delete graphics data.

Half-Speed Printing Commands (E/ML)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

✓ ML320 Std., ML321 Std.

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	IBM	Epson	ML
Half-Speed Printing On	Not applicable	ASCII: ESC s 1 Dec: 27 115 49 Hex: 1B 73 31	ASCII: ESC < Dec: 27 60 Hex: 1B 3C
Half-Speed Printing Off	Not applicable	ASCII: ESC s 0 Dec: 27 115 48 Hex: 1B 73 30	ASCII: ESC > Dec: 27 62 Hex: 1B 3E

This command controls the speed of printing. Half-speed printing is quieter than full speed.

Initialize Printer Commands (E/ML)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321 Turbo

✓ ML520, ML521

✓ ML320 Std., ML321 Std.

✓ ML390 Turbo, ML391 Turbo

✓ ML590, ML591

Function	IBM	Epson	ML
Initialize Printer	Not applicable	ASCII: ESC @ Dec: 27 64 Hex: 1B 40	ASCII: ESC CAN Dec: 27 24 Hex: 1B 18

These commands remove any data in the printer's buffer and return the printer to the current menu settings. They will override any features set on the printer's front panel or through previous commands. Also known as the initialize printer or reset commands.

Note: *In order for this command to be effective, the Reset Inhibit item in the printer Menu must be set to NO (the factory default). If the setting has been changed to YES, this command will be ignored.*

Most Significant Bit Commands (Epson)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321Turbo

✓ ML520, ML521

✓ ML390 Turbo, ML391Turbo

✓ ML590, ML591

Function	ASCII	Dec	Hex
Set Most Significant Bit (MSB) to Zero	ESC =	27 61	1B 3D
Set MSB to 1	ESC >	27 62	1B 3E
Cancel MSB Control	ESC #	27 35	1B 23

The ESC = command sets the most significant bit (MSB) of an 8-bit data input to zero. The ESC > command sets the MSB to one. The ESC # command cancels the MSB control established by either command and all data is interpreted exactly as sent from the computer.

Paper-Out Sensor Commands (IBM/E/ML)

✓ ML320 E/I, ML321 E/I

✓ ML320 Turbo, ML321Turbo

✓ ML520, ML521

✓ ML320 Std., ML321 Std.

✓ ML390 Turbo, ML391Turbo

✓ ML590, ML591

Function	IBM	Epson	ML
Paper-Out Sensor On	ASCII: ESC 9 Dec: 27 57 Hex: 1B 39	ASCII: ESC 9 Dec: 27 57 Hex: 1B 39	ASCII: ESC E 0 Dec: 27 69 48 Hex: 1B 45 30
Paper-Out Sensor Off	ASCII: ESC 8 Dec: 27 56 Hex: 1B 38	ASCII: ESC 8 Dec: 27 56 Hex: 1B 38	ASCII: ESC E 1 Dec: 27 69 49 Hex: 1B 45 31

The paper-out sensor detects when less than one inch of paper remains (0.5-inch for ML390/391T printers). When this happens, the alarm light goes on and the printer is deselected. This command overrides the sensor so that you can print closer to the bottom of the page. (The feature is also menu selectable.) Be careful if you use this feature, since it lets the printer continue printing when there's no more paper. This can cause loss of data and may damage the printhead.

Print Suppress Mode Commands

Print Suppress Mode On/Off Commands (IBM)

- ✔ ML320 E/I, ML321 E/I
- ✔ ML320 Turbo, ML321Turbo
- ✔ ML520, ML521
- ✔ ML390 Turbo, ML391Turbo
- ✔ ML590, ML591

Function	ML320 E/I, ML320T, ML520	ML321 E/I, ML321T, ML521	ML390T, ML590	ML391T, ML591
Print Suppress Mode On	ASCII: ESC Q ETX Dec: 27 81 3 Hex: 1B 51 03	ASCII: ESC Q SYN Dec: 27 81 22 Hex: 1B 51 16	ASCII: ESC Q \$ Dec: 27 81 36 Hex: 1B 51 24	ASCII: ESC Q # Dec: 27 81 35 Hex: 1B 51 23
Print Suppress Mode Off	ASCII: DC1 Dec: 17 Hex: 11	ASCII: DC1 Dec: 17 Hex: 11	ASCII: DC1 Dec: 17 Hex: 11	ASCII: DC1 Dec: 17 Hex: 11

When the printer receives the command to begin Print Suppress mode, it ignores all data until it receives the DC1 code. This means that any data will be lost. The SEL light blinks when the printer is in the Print Suppress mode. These commands will only work if the Print Suppress Effective item in the printer menu is set to Yes (the factory default).

Print Suppress Mode On/Off Commands (E/ML)

- ✔ ML320 E/I, ML321 E/I
- ✔ ML320 Turbo, ML321Turbo
- ✔ ML590, ML591
- ✔ ML320 Std., ML321 Std.
- ✔ ML390 Turbo, ML391Turbo
- ✔ ML520, ML521

Function	ASCII	Dec	Hex
Print Suppress Mode On	DC3	19	13
Print Suppress Mode Off	DC1	17	11

When the printer receives the command to begin Print Suppress mode, it ignores all data until it receives the DC1 code. This means that any data will be lost. The SEL light blinks when the printer is in the Print Suppress mode. These commands will only work if the Print Suppress Effective item in the printer menu is set to Yes (the factory default).

Select Color Command (IBM/E)

✓ ML590, ML591

Function	ASCII	Dec	Hex
Select Color	ESC r n	27 114 n	1B 72 n

This command selects the color that will print when the printer has a color ribbon installed and the menu is set to any setting other than “Black Ribbon.”

Table 100: IBM/Epson ESC r Command — Color Selections for n Values

Value of n	Color
0	Black
1	Magenta
2	Cyan (blue)
3	Violet
4	Yellow
5	Orange
6	Green

Set Unit Command (Epson)

✓ ML390 Turbo, ML391 Turbo

Function	ASCII	Dec	Hex
Set Increment of Movement	ESC (U L _n H _n P _n	27 40 85 L _n H _n P _n	1B 28 55 L _n H _n P _n

This command is used to set the increment of movement used in conjunction with the following commands:

- ESC (c L_n H_n L_i H_i L_b H_b Set Page Format (see Chapter 9)
- ESC (C 2 0 L_p H_p Set Page Length in Defined Unit (see Chapter 9)
- ESC \ L_n H_n Set Relative Horizontal Dot Position (see Chapter 8)
- ESC (V L_n H_n L_p H_p Set Absolute Vertical Position (see Chapter 9)
- ESC (v L_n H_n L_p H_p Set Relative Vertical Position (see Chapter 9)

Parameters L_n and H_n

Parameters L_n and H_n are used to designate the quantity of data, as follows:

$$L_n + (H_n \times 256)$$

Parameter P_n

Parameter P_n sets the increment of movement. It can have any value from 0 to 255.

Table 101: Epson ESC (U Command — Increments of Movement for P_n Values

P _n	Increment
0 to 9	Unchanged
10 to 19	1/360"
20 to 29	11/80"
30 to 39	1/120"
40 to 49	1/90"
50 to 59	1/72"
60 to 69	1/60"
70 to 255	Unchanged

Software I-Prime Command (IBM/E/ML)

- ✓ ML320 Turbo, ML321Turbo ✓ ML520, ML521
- ✓ ML390 Turbo, ML391Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Software I-Prime	ESC } NUL	27 125 0	1B 7D 00

This command clears the print buffer and resets the printer to the default settings, regardless of the setting for the Reset Inhibit item in the printer menu.

If the Cut Sheet Feeder (CSF) is installed, this command will also eject any paper loaded into the printer from the CSF.

Stop Printing Command (IBM)

- ✓ ML390 Turbo, ML391Turbo ✓ ML590, ML591

Function	ASCII	Dec	Hex
Stop Printing (Deselect)	ESC j	27 106	1B 6A

This command deselects the printer so that it will stop printing. To resume printing, press the SEL switch, or—if "Auto Select" is set to "Yes" in the menu—reload paper.

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