MODEL 4810/4840
PROGRAMMER'S
MANUAL
GEK-89025A

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Introduction

Commands are sent to your printer in the form of control codes and escape sequences. These differ from normal data to be printed in that they give instructions to the printer on paper movement, style of print, size, density, and many other selectable features.

Certain protocols are needed so that the printer can recognize and act on these commands sent from the host.

Your shuttle matrix printer can emulate (become functionally similar to) ANSI Standard X3. 64-1979, Printronix P Series, IBM Proprinter III XL, Epson FX-286e, and Dataproducts type protocols. From this point on, these protocols may be referred to as ANSI, P Series, Proprinter, FX-286e, and Dataproducts emulations.

Each emulation has a set of control codes and/or escape sequences that will be explained in this manual. The ANSI, P Series, Proprinter, and FX-286e emulations will be discussed separately. The Dataproducts emulation is identical to the ANSI emulation with the exception of the EVFU load and command sequence protocol. The Dataproducts emulation is used exclusively with the Dataproducts parallel interface. When the Dataproducts emulation is selected, the Dataproducts interface is automatically selected. If the Dataproducts interface is not installed on your printer, neither the emulation nor the interface will be available in the menu.

Control Codes

Control codes are used to transmit information other than printable characters to the printer. They occupy the first 32 locations on the ASCII code chart and are represented by two or three letter abbreviations.

The control code LF (10 decimal, 0A hex), for instance, is almost universally interpreted as a line feed. However, the response of the printer to other control codes will depend on the emulation.

Escape Sequences

Remote selection of your printer's functions and features is achieved by using command strings (a combination of characters and parameters) preceded by an ESC (27 decimal, 1B hex) or CSI character (155 decimal 9B hex). Escape sequences associated with similar functions will vary from one emulation to the next.

The physical spaces in the escape sequences shown in this publication are only for clarification purposes and are not used in the actual string.

If a space is actually needed in the sequence, it will be shown as SP.

Escape Sequences (continued)

Examples are shown below of escape sequences as written in the text, shown with parameters filled in, and written in the BASIC programming language.

Tab Clear	ESC [p1 g ESC[3g LPRINT CHR$(27);"[3g"
Horizontal Tabs Set	ESC [p1;p. . . ; u ESC[648;1386;2808u LPRINT CHR$(27);"[648;1386;2808u"
Expand Characters	ESC [p1;p2 SP B ESC[200;200 B LPRINT CHR$(27);"[200;200 B"

CSI and OSC

A control sequence introducer (CSI) signals the beginning of an ANSI sequence using the ESC code and the left bracket [. CSI (9B hex) can be used instead of ESC [(1B 5B hex) when the printer is receiving and processing 8-bit data. ESC [will be used predominately in this manual for the examples.

An operating system command (OSC) signals the start of a download sequence using the ESC code and the right bracket]. OSC (9D hex) can be use instead of ESC] (1B 5D hex) when the printer is receiving and processing 8 bit data. ESC] will be used predominately in this manual for the examples.

Line Terminators

Some control codes and escape sequences act as line terminators. Line terminators cause all data received since the last terminator to be printed. Without a terminator, data will remain buffered.

Decipoints

Throughout this chapter you will find mention of decipoints as a unit of measure. A decipoint equals 1/720th of an inch and is used as a standard of measurement for parameters associated with set distances. A few examples are margins, tabs, and vertical paper moves. See Appendix D for the decipoint conversion tables.

Chapter 1 - ANSI Emulation

Product Line Compatibility

Two compatibility modes are available to make this printer function similar to other product lines. The 3000 and 4000 compatibility modes are strap-selectable and allow use of the non-ANSI commands found in the other products. With the straps OUT, the printer is in the native mode.

3000

With the 3000 compatibility mode enabled (printer option strap A16 IN), the following differences will be in effect.

- Parameters 5 (doublewide print) and 6 (proportional print) can be used in the select graphic rendition (SGR) command ESC[p1;. . ;pn m.
- Parameter 1 is recognized for the special print mode (GENSPM) command ESC[p1 t, to allow shift in and shift out control of expanded or oversized printing.

4000

With the 4000 compatibility mode enabled (printer option strap A33 IN), the following differences will be in effect.

- Vertical motion commands LF, VT, FF, VPA, VPR, and VFU cause a carriage return.
- Parameters 5 (doublewide print) and 6 (proportional print) can be used in the select graphic rendition (SGR) command ESC[p1;. . . ;pn m.
- Partial line up (PLU) and partial line down (PLD) act as superscript and subscript commands only. They can not be used consecutively to move the form.
- The reset to initial state (RIS) command ESC c causes a line feed.
- The additional sequence ESC[p1;p2 ! p can be used for VFU operation.

Differences within the 4000 Family

This printer processes incoming data a character at a time. Since the 4410/40 printers process data a line at a time, differences in operation between the printer families exist.

The following are known differences between the operation of the 4410/40 and the 4810/4840 printers.

This printer:

- does not perform an automatic CR/LF when entering or exiting dot graphics.
- has slightly different spacing when using proportional printing.
- will discard hex characters 7FH, A0H, and FFH except when printing character graphics, IBM character sets, 8-bit code pages, or bar code styles 93 and 128.
- will use either the top or bottom of expanded characters as a starting point for a received line feed after returning to normal printing. This is controlled through the control panel using the the baseline or default options in the Program Mode.
- will mix different sizes of expanded and oversize characters on the same line.
- does not mix line or column counts and decipoint positioning values. For example, horizontal tabs do not move when the cpi value is changed.
- will print data already processed if the vertical position is changed at the control panel (LF, FF).
- will position the paper one line below the previous line if a line feed is received while printing bar codes or oversize characters. If the backup strap (A10 or A14) is not used, the paper will be positioned one line below the bar code or oversize character.

ANSI control codes and escape sequences are assigned activity levels depending on which print mode is currently active. The following charts provide information on what to expect from the control codes and escape sequences in each printing mode.

ACTIVITY LEVELS

I - IGNORED No noticeable effect on printing will occur.

V - VALID These sequences will not affect the printing mode in progress, but will take effect when normal printing resumes.

A - ACTIVE This sequence will take effect immediately.

D - DATA These control codes are used as data.

NOTES

Note 1 If printer option strap A9 is IN, SO and SI will activate or deactivate this printing mode. SO and SI are VALID in bar codes and oversize --- ACTIVE in expanded.

Note 2 VALID during enhanced oversize --- ACTIVE during normal oversize.

Note 3 Discarded while in the native mode.

Note 4 Will cause an error symbol to print (XOX).

Control Code Activity Levels

Control Code	Line Terminator	Normal	Dot Graphics	Bar Codes	Oversize	POSTNET
BEL	No	A	A	D	A	Note 4
BS	Yes	A	I	I	I	Note 4
CR	Yes	A	A	I	A	Note 4
DC1	No	A	A	D	A	Note 4
DC3	No	A	A	D	A	Note 4
DEL	No	Note 3	Note 3	D	Note 3	Note 4
FF	Yes	A	A	I	A	Note 4
HT	No	A	A	A	A	A
LF	Yes	A	A	I	A	Note 4
SI	No	A	I	Note 1	Note 1	Note 4
SO	No	A	I	Note 1	Note 1	Note 4
VT	Yes	A	A	I	A	Note 4

Escape Sequence Activity Levels

Escape Sequence	Line Terminator	Normal	Dot Graphics	Bar Codes	Oversize	POSTNET
DCS (Graphics)	No	A	I	I	A	I
Font Load	No	A	I	I	A	I
GENBCS	No	A	A	A	A	I
GENFD	No	A	A	A	A	I
GENGRM	No	A	V	A	A	I
GENHTS	No	A	A	A	A	I
GENOSM	No	A	V	V	A	I
GENSLR	No	A	A	A	A	I
GENSNC	No	A	V	V	Note 2	I
GENSPM	No	A	V	A	A	A
GENTST	Yes	A	A	I	A	I
GENVFU	Yes	A	A	A	A	I
GENVTS	No	A	A	A	A	I
GSM	No	A	V	V	A	I
HPA	Yes	A	A	A	A	I
HPB	Yes	A	A	A	A	I
HPR	No	A	A	A	A	I
HTS	No	A	A	A	A	I
HVP	Yes	A	A	A	A	I
PLD	Yes	A	I	I	A	I
PLU	Yes	A	I	I	A	I
REP	No	A	A	I	A	I
RIS	No	A	A	A	A	I
RM	No	A	A	A	A	I
SGR	No	A	V	V	Note 2	I
SM	No	A	A	A	A	I
SPI	No	A	V	V	Note 2	I
ST	No	I	A	I	I	I
TBC	No	A	A	A	A	I
VFU Load	No	A	I	I	A	I
VPA	Yes	A	A	A	A	I
VPB	Yes	A	A	A	A	I
VPR	Yes	A	A	A	A	I
VTS	No	A	A	A	A	I

ANSI Control Codes

BEL — (Bell - 07H) Receipt of a BEL code causes the beeper to sound for approximately 1/2 second after any preceding printable data has been processed.

BS — (Back Space - 08H) Line terminator. The paper position remains unchanged and the print position is moved left one character space at the current cpi. If the print position is at the left margin, no action is taken.

CR — (Carriage Return - 0DH) Line terminator. The print position is reset to the left margin and the paper position is left unchanged. Printer option strap A3 (Appendix H) allows a CR code to be used to either edit or overprint.

CSI — (Control Sequence Introducer - 9BH) Signals the beginning of an ANSI control sequence. When 8-bit data is used, CSI (9BH) can be substituted for ESC [(1BH 5BH). Also see ESC.

DC1 — (Device Control 1 - 11H) **Parallel and Serial Interface:** Receipt of a DC1 code with the printer in local mode puts the printer online (SELECTS printer) and enables receipt of data.

Through software strap options, a serial interface protocol may be selected that transmits a DC1 code to the host to signal that the printer is ready to receive data.

DC3 — (Device Control 3 - 13H) **Parallel and Serial Interface:** Receipt of a DC3 code when online places the printer in local mode (DESELECTS printer) and causes it to ignore all data except a DC1.

Through software strap options, a serial interface protocol may be selected that transmits a DC3 code to the host to signal that the printer is not ready to receive data.

DEL — (Delete - 7FH) The DEL code is ignored except when printing dot graphics, 8-bit code pages, or non-ANSI fonts.

ESC — (Escape - 1BH) Signals the beginning of an escape sequence. Also terminates font, form, and VFU load operations. Also see CSI.

FF	(Form Feed - 0CH) Line terminator. The paper is advanced to the next top of form position. If the EVFU is enabled and programmed, paper will advance to the next stop in channel 1. Printer option strap A37 OUT (Appendix G) will cause the print position to be set at the left margin.
HT	(Horizontal Tab - 09H) Advances the print position to the next horizontal tab location. If no tabs are set, an HT code is either converted to a space or ignored, depending on printer option strap A30 (Appendix G).
LF	(Line Feed - 0AH) Line terminator. The paper is advanced to the next line. When printing horizontal dot graphics, the paper is advanced to the next dot row. When the LNM (line feed new line) mode (LNM) is in effect, the print position is set to the left margin.
SI	(Shift In - 0FH) Used to exit a Special Print Mode (GENSPM) when printer control strap A9 (Appendix G) is set.
SO	(Shift Out - 0EH) Used to enable a special print mode (GENSPM) when printer control strap A9 (Appendix G) is set.
VT	(Vertical Tab - 0BH) Line terminator. The paper is advanced to the next vertical tab stop. If no tabs are set, a VT code causes a line feed and, with printer option strap A36 IN (Appendix G), the print position is set to the left margin. When using the EVFU, paper advances to the next stop in channel 12.

ANSI Escape Sequences

Sequence	Meaning	Page
CSI or ESC [	Control Sequence Introducer	1-5
ESC [p1;p2 SP B	Modifies vertical (p1) and horizontal (p2) character size	1-16
ESC [p1;p2 SP G	Sets LPI (p1) and/or CPI (p2) in decipoints	1-17
ESC H	HTS - Set a tab at current print position	1-13
ESC J	VTS - Set a tab at current paper position	1-13
ESC K	Moves print line down 3/72 inch (subscript)	1-10
ESC L	Moves print line up 3/72 inch (superscript)	1-10
ESC P	Introduces dot graphics	1-25
ESC Q	Performs self-test	1-10
ESC [p1 a	HPR - Moves print position right p1 distance (relative)	1-11
ESC [p1 b	Dot graphics - repeat preceding character p1 times	1-25
ESC c	Resets printer to a known initial state	1-9
ESC [p1 d	VPA - Sets vertical position to p1 decipoints or lines	1-11
ESC [p1 e	VPR - Moves paper forward p1 decipoints	1-11
ESC [p1;p2 f	HVP - Moves paper and print position (absolute)	1-12
ESC [p1 g	Clears tabs - p1=3 for horizontal; p1=4 for vertical	1-13
ESC [p1;p...h	SM - Set mode (PUM, LNM, proportional, character mapping)	1-20
ESC [p1 j	HPB - Moves print position left by decipoints or columns	1-12
ESC [p1 k	VPB - Moves paper backward by decipoints or lines	1-12
ESC [p1;p...l	RM - Reset mode (PUM, LNM, proportional, character mapping)	1-21
ESC [p1;p... m	Selects font styles and enhancements	1-18
ESC [p1 ! p	EVFU vertical paper movement command	1-30
ESC [p1;p2;p3 q	Selects graphics horizontal and vertical dot densities	1-26
ESC [p1;p2;p3 r	Sets form length (p1), margins - top (p2), bottom (p3)	1-13
ESC [p1;p2 s	Sets margins - left (p1), right (p2) in decipoints or columns	1-14
ESC [p1 t	Selects bar codes p1=3, quit bar code p1=0	2-1
ESC [p1;p... u	Sets horizontal tabs (p1,etc.) in decipoints or columns	1-15

(continued)

ANSI Escape Sequences (continued)

Sequence	Meaning	Page
ESC [p1;p. . . v	Sets vertical tabs (p1,etc.) in decipoints or lines	1-16
ESC [p1 x	Selects international character sets	1-19
ESC [p1;. . . ;p10]	Selects bar code parameters	2-2
ESC [p1 SP]	Download Font Control - Checks printer for downloaded font	1-21
OSC or ESC]	Operating System Command - introduces sequence	vi
ESC]5	Permits downloading of font characters	1-21
ESC]!	Begins 12-channel EVFU table loading	1-27
ESC \	Exits special modes	1-10
ESC [p1 '	HPA - Moves print position (absolute) by decipoint/column	1-12
ESC [p1 |	Selects/rotates/deselects Oversize Characters	3-1

ANSI Escape Sequences

The ANSI escape sequences have been separated according to functionality. Special areas of interest such as graphics and the electronic vertical format unit (EVFU) have separate sections.

The sequences are separated as follows:

- Housekeeping
- Paper and Print Position Moves (vertical and horizontal postioning)
- Margins and Tabs
- Font Handling and Enhancements
- Graphics
- EVFU

Housekeeping

ESC c

RIS - Reset to Initial State. Resets the printer to either the standard state shown below or to the state stored in the customer save area of memory. The RIS sequence can be disabled by printer option strap A11.

RIS - Reset to Initial State

PARAMETER	STATE
Font Style	Gothic Draft
Character Size	1X Vertical, 1X Horizontal
Character Pitch	10 CPI
Country Selection	USA
Character Sets	GR = GL
Line Spacing	6 LPI
Partial Line Up	Reset
Partial Line Down	Reset
Bold Print	Inactive
Underline Mode	Inactive
Expanded Mode	Inactive
Proportional Mode	Reset
Position Unit Mode	To option setting
Line Feed New Line	To option setting
Horizontal Tab Table	Empty
Left Margin	None - Column 0
Right Margin	None - Maximum
Form Number	7
Page Size	7920 decipoints/ 66 lines/11 inches
Top Margin	None
Bottom Margin	None
Forms Position	Top of form = current position
Vertical Tab Table	Empty
Vertical Format Unit	Default
Graphics Density	60 H DPI, 72 V DPI, horizontal format
VFU Load in Progress	Exit (nothing saved)
Bar Code Mode	Inactive
Dot Graphics	Inactive
Font Load in Progress	Exit mode
Download Fonts	Retained if previously loaded

HEX 1B 63

BASIC CHR$(27);"c";

ESC Q

GENTST - This sequence causes the printer to execute the self-test routines. Buffered data up to and including the last line terminator will be printed. Nonterminated data is discarded.

(Serial Interface Only) Upon completion of the test routines, the printer will, if able, transmit the results of the test to the requesting device. See the User's Manual for a listing of error messages which can be transmitted.

HEX 1B 51

BASIC CHR$(27)"Q";

ESC \

ST - String Terminator. Used to terminate the loading of EVFU tables, download fonts, and dot graphics strings.

HEX 1B 5C or 9C

BASIC chr$(27);"\";

Paper and Print Position Moves

ESC K

PLD - Partial Line Down. Line terminator. The print line is moved down 3/72 inch for subscript printing. Also used to return to the original line following a partial line up (ESC L - superscript) sequence. See note below.

HEX 1B 4B

BASIC CHR(27)$;"K";

ESC L

PLU - Partial Line Up. Line terminator. The print line is moved up 3/72 inch for superscript printing. Also used to return to the original line following a partial line down (ESC K - subscript) sequence. See note.

HEX 1B 4C

BASIC CHR$(27);"L";

NOTE: In the native mode, these sequences can be used in succession to advance or reverse the paper to another line.

In the 4000 compatibility mode, they can be used in pairs to change from superscript directly to subscript or subscript directly to superscript, but can not be used to position the paper.

Also see the **SScript: ON/OFF** menu selection in the User's Manual.

ESC [p1 a

HPR - Horizontal Position Relative. Line terminator. Moves the print position to the right of the current position. The distance specified by the p1 parameter is in decipoints or columns depending on the state of PUM*. An HPR move exceeding the right margin sets the print position at the margin. If the p1 parameter is zero or missing, the command is ignored.

*See the Set Mode (SM) command for information on PUM.

HEX 1B 5B p1 61

BASIC CHR$(27)"[p1a";

ESC [p1 d

VPA - Vertical Position Absolute. Line terminator. Sets the vertical position to the value specified by p1, moving paper forward or backward to the new position. The distance specified by the p1 parameter is in decipoints or lines depending on the state of PUM*. This command can be used to print inside top and bottom margins. If the specified position is not within the current page, the command is ignored. If the parameter value is omitted, less than 5 decipoints or greater than 15,840 decipoints, it will result in the vertical position being set to the top of form position.

*See the Set Mode (SM) command for information on PUM.

HEX 1B 5B p1 64

BASIC CHR$(27);"[p1d";

ESC [p1 e

VPR - Vertical Position Relative. Line terminator. Increases the current vertical position by the value specified by p1. Decipoints are converted to provide the 1/144-inch moves shown in the table.

Decipoint Value	Movement in Inches
Missing or 0 - 4	No Movement
5 - 9	1/144 inch
10 - 14	2/144 inch
15 -19	3/144 inch
.	.
.	.
.	.
15,840 or greater	22 inches

HEX 1B 5B p1 65

BASIC CHR$(27);"[p1e";

ESC [p1;p2 f

HVP - Horizontal and Vertical Position. Line terminator. Sets the vertical (paper position) to the value of p1 and the print position to the p2 value. Values can be sent as decipoints or as line/column counts depending on the state of PUM*.

HVP can position printing inside margins. The vertical position can not exceed the form length and the horizontal position can not exceed 9504 decipoints (or the equivalent number of columns at the current CPI setting).

HEX 1B 5B p1 3B p2 66

BASIC CHR$(27)"[p1;p2f";

ESC [p1 j

HPB - Horizontal Position Backward. Line terminator. Moves the print position left of the current position by the distance specified in p1. Values can be sent as decipoints or as column counts depending on the state of PUM*. The print position is set to the left margin if the p1 value would exceed the margin. An HPB with a p1 value of zero is ignored.

HEX 1B 5B p1 6A

BASIC CHR$(27);"[p1j";

ESC [p1 k

VPB - Vertical Position Backwards. Line terminator. Moves the paper in reverse by the distance specified by p1. Values can be sent as decipoints or as a line count depending on the state of PUM*. The paper position is set to the top margin if the p1 value would exceed the margin. A VPB with a p1 value of 5 decipoints or less is ignored.

HEX 1B 5B p1 6B

BASIC CHR$(27);"[p1k";

ESC [p1 '

HPA - Horizontal Position Absolute. Line terminator. Moves the print position to the value specified in p1. Values can be sent as decipoints or as column counts depending on the state of PUM*. Position zero is column one. The print position is set to the right margin if the p1 value would exceed the margin. An HPB with a p1 value greater than 9504 is ignored.

HEX 1B 5B p1 60

BASIC CHR$(27);"[p1'";

*See the Set Mode (SM) command for information on PUM.

Margins and Tabs

ESC H

HTS - Horizontal Tab Set. Sets a tab at the current print position and updates any existing horizontal tab table. A total of 22 tabs can be set. If this number is exceeded, the leftmost 22 tabs will be retained.

HEX 1B 48

BASIC CHR$(27);"H";

ESC J

VTS - Vertical Tab Set. Sets a tab at the current paper position and updates any existing vertical tab table. A total of 12 tabs can be set. If this number is exceeded, the 12 tabs closest to the top margin will be retained.

HEX 1B 4A

BASIC CHR$(27);"J";

ESC [p1 g

TBC - Tab Clear. Clears horizontal or vertical tab stops based on the p1 value as follows:

p1 = 0 -Clear horizontal tab at current print position.
p1 = 1 -Clear vertical tab at current paper position.
p1 = 3 -Clear all horizontal tabs.
p1 = 4 -Clear all vertical tabs.

More than one parameter can be used. Example: To clear all horizontal and vertical tabs, send ESC [3;4g

HEX 1B 5B p1 67

BASIC CHR$(27);"[p1g";

ESC [p1;p2;p3 r

GENFD - Forms Definition. Establishes the form length (p1), the top margin (p2), and the bottom margin (p3) in decipoints or number of lines depending on the state of PUM*.

Default parameters are for an 11-inch (7920 decipoints) long form with a top and bottom margin of zero.

p1 = maximum allowable length is 22 inches (15,840 decipoints).
p2 = top of page to first print line.
p3 = bottom of page to last printable line.

*See the Set Mode (SM) command for information on PUM.

ESC [p1;p2;p3 r (continued)

Examples:

ESC [r	- default values of 11-inch form length, zero top and bottom margins
ESC [8280r	- 11.5-inch form length, default top and bottom margins of zero
ESC [;720r	- default length of 11 inches, top margin of 1 inch, default bottom margin of zero
ESC [;;7200r	- default length of 11 inches, default top margin of zero, and a 1-inch bottom margin
ESC [7920;360;7560r	- 11-inch form length, 1/2-inch top and bottom margins

HEX 1B 5B p1 p2 p3 72

BASIC CHR$(27);"[p1;p2;p3r";

ESC [p1;p2 s

GENSLR - Set Left/Right Margins.

NOTE: There is a physical left margin of .6 to 1.6 inch from the *edge* of the paper to the first printable column. This distance is adjustable by sliding all four tractors sideways. The margins set with this sequence begin at the first physical print position, *not* at the edge of the paper.

The p parameters are distances from the left edge of the printable area of the paper. Parameter p1 sets the left margin and p2 sets the right margin. An omitted parameter clears that margin. Invalid parameters will set the left margin to zero (column 1) and the left margin to 9504 decipoints (column 132 at 10 cpi).

A new left margin takes effect following any line terminator that normally calls for a print position set to the left. A new right margin takes effect when the print position reaches the new margin.

The parameter values can be sent in decipoints or column numbers depending on the state of PUM*.

Margin settings stored as decipoint values are enforced to the nearest 1/120, 1/140, 1/180, or 1/210 of an inch depending on the selected horizontal resolution. Character printing operates at 1/120 of an inch.

Margin settings stored as column locations will move whenever the cpi value is changed. The column location number is a printable column.

(continued)

ESC [p1;p2 s (continued)

For example, when using column numbers and operating at 10 cpi, the escape sequence ESC [11;122s will produce a 1-inch (10-column) left margin, with column 11 as the first printable position. The print line length is (11.2 inches / 112 columns). If the normal print area of 13.2 inches is available, the right margin is 1 inch. Note that the last column represented by p2 is the last print position and the right margin begins in the *next column*.

Left and right margin default values are column zero and the highest column number in use depending on the cpi setting (see below).

Left Margin = column 0	Right Margin
10 cpi	= Column 132
12 cpi	= Column 158
13.3 cpi	= Column 176
15 cpi	= Column 198
16.7 cpi	= Column 220

HEX 1B 5B p1 p2 73

BASIC CHR$(27);"[p1;p2s";

ESC [p1;p. . . ; u

GENHTS - Multiple Horizontal Tab Set. Sets up to 22 horizontal tabs. The p parameters are set in decipoints or columns depending on the state of PUM*. Appendix D contains a conversion table for column number to decipoint calculations.

If more than 22 tabs are set, the highest numbered tabs (farthest right) will be pushed out of the tab table.

Tabs set in front of the left margin, or beyond the right margin, are not usable. Moving the margins will make them active.

Example: To place tabs at columns 10, 20, and 40 at 10 cpi, send ESC [10;40;20u (tabs can be specified in any order).

HEX 1B 5B p1 3B p2 3B p. . . 3B 75

BASIC CHR$(27);"[p1;p2;p. . . ;u"

*See the Set Mode (SM) command for information on PUM.

ESC [p1;p. . . ; v

GENVTS - Multiple Vertical Tab Set. Sets up to 12 vertical tabs. The p parameters are set in decipoints or line numbers depending on the state of PUM*.

If more than 12 tabs are set, the 12 tabs nearest the top of form will be retained. If a tab is set in the top margin area, it will be stored but not active until the the margin is moved. If a tab is set beyond the bottom margin, attempting to move to that tab will advance the paper to the next top of form.

HEX 1B 5B p1 3B p2 3B p. . . 3B 76

BASIC CHR$(27);"[p1;p2;p. . . ;v"

*See the Set Mode (SM) command for information on PUM.

Font Handling and Enhancements

ESC [p1;p2 SP B

GSM - Graphic Size Modification. This sequence modifies the vertical (p1) and horizontal (p2) size of expanded and oversize characters. When using expanded characters, the currently selected font style is used. Oversize uses its own distinct font style.

Parameter values are percentages of the normal size character, so values over 100 are needed for expansion. Values are divided by 100 to obtain the expansion factor. Example: A parameter value of 526 would be divided by 100 to produce an expansion factor of 5 (5X expansion). Values less than 100 are treated as 1X expansion.

X1	0-199 (Default)	X4	400-499	X7	700-799
X2	200-299	X5	500-599	X8	800-UP
X3	300-399	X6	600-699		

Mixed sizes within a line can be top or bottom justified depending on the Program Mode menu option (see **VExOpt:Default** and **VExOpt:Baseline**).

The top of an expanded character is used as the starting point for vertical paper moves (line feed). The top or bottom of oversize characters can be used depending on the state of option strap A14.

When this sequence is received with a value of 200 or more, expanded printing will start, providing the printer is in the text mode (not bar codes, oversize, etc.), and the 3000 compatibility strap is OUT.

(continued)

ESC [p1;p2 SP B (continued)

Examples:

ESC [;200 B X1 Vertical expansion, X2 Horizontal expansion
ESC [200;200 B X2 Vertical expansion, X2 Horizontal expansion
ESC [800;400 B X8 Vertical expansion, X4 Horizontal expansion

During vertically expanded printing, blank lines (lines with no printed characters) are not expanded from the current lpi setting.

HEX 1B 5B p1 3B p2 20 42

BASIC CHR$(27);"[p1;p2 B";

ESC [p1;p2 SP G

SPI - Spacing Increment. This sequence is used to set line spacing (p1) and character spacing or pitch (p2). If the parameter is missing or zero, the spacing will remain unchanged.

In the native mode, p1 can range from 1 to 15840 decipoints (22 inches). The printable area (between the top and bottom margin) can not be exceeded. The range of p2 is dependent on the font and will be ignored if exceeded.

In the 4000 compatibility mode, vertical spacing (p1) and horizontal spacing (p2) must match the standard values shown in the charts below. Values other than the ones shown will be ignored.

LPI	p1 (decipoints)
3	240
4	180
6	120
8	90

CPI	p2 (decipoints)
10	72
12	60
13.3	54
15	48
16.7	43

HEX 1B 5B p1 3B p2 20 47

BASIC CHR$(27);"[p1;p2 G";

ESC [p1;p. . . m

SGR - Select Graphic Rendition. Font style and enhancements (bold and underline) are selected with this sequence. One font designator plus any number of enhancements can be entered in the escape sequence using the parameter values in the following table.

If the requested font is not installed, the default font is selected.

Parameter	Enhancement
0	Cancel all print enhancements
1	Bold (enhancement)
4	Underline (enhancement)
22	Cancel Bold
24	Cancel Underline

Parameter	Font
10	Default Font - Data Processing
11	Gothic Draft Font
12	Character Graphics
13	Gothic NLQ Font
14	Courier NLQ Font
15	High Speed Draft Font
16	OCR-A
17	OCR-B
18	Italic NLQ Font or Download A*
19	Correspondence or Download B*

*A download font (if loaded) overrides any other font.

Examples:

For Gothic NLQ font underlined send - ESC [4;13m

To cancel underlining and retain Gothic NLQ - send one of the following:

ESC [;13m ESC [0;13m ESC [0m ESC [24m

HEX 1B 5B p1 3B p. . . 6D

BASIC CHR$(27);"[p1;p. . . m";

ESC [p1 x

GENSNC - Select National Characters. Selects an international character set based on the value of p1. See chart below. When an international character set is selected, it is printed in the font style and enhancement mode currently in effect.

The default character set is USA (ISO Standard) and will be selected if parameter p1 is missing.

All values of p1 not shown in the chart are reserved.

Parameter p1 = Country (See Appendix F.)	
0 - USA (ISO Standard)	852 - Microsoft Code Page 852 Slavic
1 - German	853 - Microsoft Code Page 853
2 - French A	855 - Microsoft Code Page 855 Cyrillic
3 - French B	860 - Microsoft Code Page 860
4 - French Canadian	863 - Microsoft Code Page 863 French Canadian
5 - Dutch (Netherlands)	864 - Microsoft Code Page 864
6 - Italian	865 - Microsoft Code Page 865
7 - United Kingdom	866 - Microsoft Code Page 866 Russian
8 - Spanish	867 - Microsoft Code Page 867
9 - Danish/Norwegian A	8572 - USSR GOST (Russian)
10 - Danish/Norwegian B	8573 - Greek Code Page 437
11 - Danish/Norwegian C	8574 - DEC Multinational (LA-210)
12 - Danish/Norwegian D	8575 - Roman 8
13 - Swedish/Finnish A	8576 - Polish Mazowia
14 - Swedish/Finnish B	8577 - Turkish 8-bit Code Page
15 - Swedish/Finnish C	8578 - Greek Code Page 851
16 - Swedish/Finnish D	8591 - ISO 8859-1 Latin Alphabet #1
17 - Swiss	8592 - ISO 8859-2 Latin Alphabet #2
18 - (Ignored)	8593 - ISO 8859-3 Latin Alphabet #3
19 - Yugoslavian	8594 - ISO 8859-4 Latin Alphabet #4
20 - UK A (United Kingdom A)	8595 - ISO 8859-5 Latin/Cyrillic
21 - Turkish	8596 - ISO 8859-6 Latin/Arabic
22 - Greek	8597 - ISO 8859-7 Latin/Greek
437 - IBM PC USA MS Code Page 437	8598 - ISO 8859-8 Latin/Hebrew
850 - IBM PC Multilingual Code Page 850	8599 - ISO 8859-9 Latin Alphabet #5

Due to memory requirements, not all of the above character sets can reside in the printer at the same time.

See Appendix E for the actual characters contained in Set A and important additional information.

HEX 1B 5B p1 78

BASIC CHR$(27);"[p1x";

ESC [p1;. . . pn h

SM - Set Mode. Sets the mode or modes specified by the parameters listed below. Parameters preceded by the "greater than" sign (>) are privately defined modes and should be sent separately.

Parameter Number	Mode Mnemonic	Mode Function
0		Ignored
11	PUM	Position Unit Mode
20	LNM	Line Feed New Line Mode

PUM - Position Unit Mode. When using this mode, the printer interprets escape sequence parameters as decipoint values. With PUM off, parameters are read as line or column counts. This mode is used with HPA, HVP, VPA, VPR, GENHTS, GENVTS, GENFD, and GENSLR sequences.

When using PUM, left and right margins and vertical and horizontal tabs are converted to absolute decipoint values based on the current cpi and lpi. When PUM is reset, left and right margins and vertical and horizontal tabs are cleared.

Form length and top and bottom margins are not altered by lpi changes regardless of the state of PUM.

The default state of PUM is set using option strap A13.

LNM - Line Feed New Line Mode. When using this mode, a received line feed command causes a carriage return (new line). When LNM is reset, a line feed command only causes a vertical position move.

The default state of LNM is set using option strap A36 and must be followed by RIS, GENTST, self-test, or power-up to take effect.

The following parameters are privately defined modes.

Parameter Number	Mode Mnemonic	Mode Function
>1	GENPRM	Proportional Print Mode
>3	GENC1C	C1 Control Code Mode
>5	GENCS2	Character Set 2 Mode

GENPRM - Proportional Print Mode. This mode enables proportional printing. This mode does not apply to the oversize character feature. When reset (default), characters are spaced at the current cpi.

(continued)

ESC [p1;...pn h
(continued)

GENC1C - C1 Control Code Mode (PC Set 1). When set, it allows the use of C1 control codes. When reset, 80H - 9FH are ignored. See Appendix E for an explanation of how character sets are mapped. The default state is set using option strap A38.

GENSC2 - Character Set 2 Mode (PC Set 2). Selects character set 2 of any of the 8-bit international character sets. See PC Set 2 in Appendix E for an explanation of how character sets are mapped. The default state is set using option strap A39.

EXAMPLES: To set PUM, send ESC [11h. To set PUM and LNM, sent ESC [11;20h. To print proportional, send ESC [>1h.

HEX 1B 5B 3E 35 68

BASIC CHR$(27);"[p1h"; or CHR$(27);"[>p1h";

ESC [p1...pn l

RM - Reset Mode. Resets any modes turned on by the Set Mode command above. Parameters and syntax are the same.

ESC]5

Begin Font Load. (This sequence will not be honored if self-test determines that the download font option is not installed.)

Permits downloading of customer-defined font characters into printer nonvolatile memory from the host. Loading is terminated when an ESC \ sequence is received.

HEX 1B 5D 35

BASIC CHR$(27);"]5";

ESC [p1 SP }

GENDFC - Download Font Control. Using the serial interface, this command allows the host to see if at least one valid font is loaded (p1 = 2). The printer sends DCS 30H 30H ST if a font is loaded, DCS 44H 45H ST if no font is loaded.

It also provides the capability to erase the download font area (p1 = 1).

HEX 1B 5B p1 20 7DH

BASIC CHR$(27);"[p1 }";

Graphics

The ANSI emulation graphics mode provides both horizontal and vertical dot placement plotting methods. These methods enable the printing of ASCII characters in their binary code form. Since each character has a unique pattern of 1s and 0s (dots and voids) that make up its binary code, the correct placement of these binary forms enables you to form larger images on the paper.

For clarity in the text, a binary 1 (a printed dot) will be shown as an X and a binary 0 (empty dot position) will be shown as a 0.

In the graphics mode, only the low order six bits of a seven-bit character are used (bits 1-6). Looking at an ASCII code chart, the question mark character (?) is represented by the binary number 1111110 (bit 1 - bit 7). Since only the first 6 bits are used, a ? would print six dots on the paper. An asterisk (*) is represented by 010101 which would print the following:

Horizontal Graphics	Vertical Graphics
0X0X0X	0 X 0 X 0 X

Notice that in horizontal graphics that the character is printed on a single horizontal dot row. In vertical graphics, the character is printed six dots high, a character per dot column.

Using the question mark that prints all dots, a series of these characters in horizontal graphics produces a one-dot-high solid line across the paper. The same character in vertical graphics produces a six-dot-high band across the paper.

By repeating, omitting, and mixing characters across a page, images such as graphs, charts, and pictures can be produced.

Dot Patterns and Densities

The chart on the next page shows the dot patterns for each of the ASCII characters. Each character represents six dots (or dot positions) and their spacing is dependent on the density selected. At 60 dpi density, the dots are spaced 1/60 inch apart. At 120 dpi, each character represents six dots spaced 1/120 inch apart.

This chart shows the dot patterns for the ASCII characters needed to cover all dot/void combinations. Other valid characters (although they are repeat patterns of the characters in the chart) are 09H - 13H and 20H - 3EH.

Char	Value	Dots 123456	Char	Value	Dots 123456
@	40H	oooooo	`	60H	ooooox
A	41H	xooooo	a	61H	xoooox
B	42H	oxoooo	b	62H	oxooox
C	43H	xxoooo	c	63H	xxooox
D	44H	ooxooo	d	64H	ooxoox
E	45H	xoxooo	e	65H	xoxoox
F	46H	oxxooo	f	66H	oxxoox
G	47H	xxxooo	g	67H	xxxoox
H	48H	oooxoo	h	68H	oooxox
I	49H	xooxoo	i	69H	xooxox
J	4AH	oxoxoo	j	6AH	oxoxox
K	4BH	xxoxoo	k	6BH	xxoxox
L	4CH	ooxxoo	l	6CH	ooxxox
M	4DH	xoxxoo	m	6DH	xoxxox
N	4EH	oxxxoo	n	6EH	oxxxox
O	4FH	xxxxoo	o	6FH	xxxxox
P	50H	ooooxo	p	70H	ooooxx
Q	51H	xooooxo	q	71H	xooooxx
R	52H	oxooxo	r	72H	oxooxx
S	53H	xxooxo	s	73H	xxooxx
T	54H	ooxoxo	t	74H	ooxoxx
U	55H	xoxoxo	u	75H	xoxoxx
V	56H	oxxoxo	v	76H	oxxoxx
W	57H	xxxoxo	w	77H	xxxoxx
X	58H	oooxxo	x	78H	oooxxx
Y	59H	xooxxo	y	79H	xooxxx
Z	5AH	oxoxxo	z	7AH	oxoxxx
[	5BH	xxoxxo	{	7BH	xxoxxx
\	5CH	ooxxxo	¦	7CH	ooxxxx
]	5DH	xoxxxo	}	7DH	xoxxxx
^	5EH	oxxxxo	~	7EH	oxxxxx
_	5FH	xxxxxo	?	3FH	xxxxxx

NOTE:

x = dot,
o = no dot

Horizontal Format

Graphics data printed in horizontal format is comprised of a stream of bytes from left to right across each dot row.

This chart shows that byte 1 (or character 1) in row 1 will print its six bits from left to right in a single dot row. The next byte (byte 2) prints its six bits, representing a character, in the same dot row across the page.

Byte → / Row ↓	Byte 1	Byte 2	... Byte n
1	1 2 3 4 5 6	1 2 3 4 5 6	...1 2 3 4 5 6
2	1 2 3 4 5 6	1 2 3 4 5 6	...1 2 3 4 5 6
3	1 2 3 4 5 6	1 2 3 4 5 6	...1 2 3 4 5 6
.	. . . . . .	. . . . . .	....
.	. . . . . .	. . . . . .	....
.	. . . . . .	. . . . . .	....
6	1 2 3 4 5 6	1 2 3 4 5 6	...1 2 3 4 5 6

Vertical Format

In vertical format, each byte (or character) occupies six dot rows of one column. Each character is one-dot wide and six-dots high. The next character (byte 2) is printed beside the first moving from left to right across the page.

Byte →	1	2	3	... n
Row	bit	bit	bit	... bit
1	1	1	1	...1
2	2	2	2	...2
3	3	3	3	...3
4	4	4	4	...4
5	5	5	5	...5
6	6	6	6	...6

Other Graphics Considerations

- In horizontal format, an LF causes the paper to advance one or two dot rows based on the vertical dot density.

- In vertical format, the paper is advanced as the six dot rows are printed. Spacing is essentially 12 lpi for low density and 24 lpi for high density graphics.

- Escape sequences ending with the following characters are ignored in graphics mode:

K	L	P
Q	SP B	t
]	]5	]!

- Escape sequences ending with the following characters are valid while the printer is in graphics:

G	g	u
b	m	x
d	r	!p
e	s	

- Printer option strap A15 will effect positioning of the next line after exiting graphics.

Sequences

ESC P

DCS - Device Control String (or Dot Graphics). Enters dot graphics mode at the density and format previously selected by the ESC [p1;p2;p3 q sequence. Following this sequence, the printer prints discrete dots and leaves spaces based on the 1 s and 0 s in the low order six bits of each byte received, forming graphic dot rows from left to right. Exit from dot graphics mode is via
ESC \.

HEX 1B 5B 50

BASIC CHR$(27);"P";

ESC [p1 b

REP - Repeat text or dot graphics character. Repeats the single preceding character p1 times. If p1 is 0 or unspecified, it is set to 1. The maximum value for p1 is 32,767.

HEX 1B 5B p1 62

BASIC CHR$(27);"[p1b";

ESC [p1;p2;p3 q

GENGRM - Selects the graphics mode, format, and horizontal/vertical density for dot graphics.

Important: This sequence must be sent before entering the graphics mode with ESC P.

The first parameter selects the graphics mode, the second parameter selects the vertical spacing, and the third selects the horizontal dot spacing.

p1	Selects Graphics Format
0	Vertical Format @ 70H x 72V DPI*
1	Vertical Format @ 140H x 72V DPI
2	Vertical Format @ 140H x 144V DPI*
3	Ignored
4	Horizontal Format (plot mode)

*p2 and p3 are ignored in this mode.

p2	Selects Vertical Density
0 - 6	144 DPI
7	72 DPI

p3	Selects Horizontal Density
0 - 3	210 DPI - 462 Characters per Line
4	180 DPI - 396 Characters per Line
5	140 DPI - 308 Characters per Line
6 - 7	120 DPI - 264 Characters per Line
8 - 10	70 DPI - 154 Characters per Line
11	60 DPI - 132 Characters per Line

HEX1B 5B p1 p2 p3 70

BASIC CHR$(27);"[p1;p2;p3q";

Electronic Vertical Format Unit - EVFU

Downline vertical tab loading is accomplished through the EVFU. The EVFU allows loading a form table with a minimum form length of .33 inches (240 decipoints) and a maximum length of 22 inches (15,840 decipoints).

Since the maximum length is 22 inches, the number of lines is dependent on the lpi setting. 3 lpi = 66 lines, 4 lpi = 88 lines, 6 lpi = 132 lines, and 8 lpi = 176 lines. Exceeding the maximum causes a fault.

Downloading the EVFU

- The vertical format type must be set to **VtType:Emul VFU** through the control panel using the Program Mode.
- No paper instruction lead (PI) is required.
- When the printer has an EVFU table loaded, **VFU** will be displayed on the control panel.

ESC]!

Starts EVFU table loading sequence. Each line of the form requires an entry. Dummy values (filler codes - See Table of Channel Codes on page 5-30) are required in lines with no channel. Two bytes are required for each line of the form. Loading is terminated by the ESC \ sequence.

HEX 1B 5D 21

BASIC CHR$(27);"]!";

Loading the Table

The first table location is normally loaded with the channel 1 code. This is defined as the top of form (TOF) channel. The table may be left without channel 1, and a command to skip to channel 1 will cause a normal form feed as though there was no VFU.

Two bytes are loaded for each line of the form to be controlled. One or more channel numbers may be indicated in the two-byte code.

The format of two-byte channel control code is:

Bit Number	8	7	6	5	4	3	2	1
Channel Number	x	one	6	5	4	3	2	1
first byte	x	one	y	y	y	y	y	y

Bit Number	8	7	6	5	4	3	2	1
Channel Number	x	one	12	11	10	9	8	7
second byte	x	one	y	y	y	y	y	y

y: 0 = no stop in channel
1 = stop in channel
x: bit has no meaning

NOTE - To make characters acceptable, bit 7 must be set.

Each "channel control code" pair of bytes has the capability to indicate multiple channels since each channel indication has a unique bit position, which is either ON = 1 or OFF = 0.

TABLE OF CHANNEL CODES

	DECIMAL VALUE		BINARY VALUE		ASCI CHARACTER		REMARKS
BYTE:	1	2	1	2	1	2	
	64	64	1000000	1000000	@	@	Fillers; see Note
	65	64	1000001	1000000	A	@	Channel 1
	66	64	1000010	1000000	B	@	Channel 2
	68	64	1000100	1000000	D	@	Channel 3
	72	64	1001000	1000000	H	@	Channel 4
	80	64	1010000	1000000	P	@	Channel 5
	96	64	1100000	1000000	`	@	Channel 6
	64	65	1000000	1000001	@	A	Channel 7
	64	66	1000000	1000010	@	B	Channel 8
	64	68	1000000	1000100	@	D	Channel 9
	64	72	1000000	1001000	@	H	Channel 10
	64	80	1000000	1010000	@	P	Channel 11
	64	96	1000000	1100000	@	`	Channel 12

NOTE: Since LF is not recognized during EVFU loading, ***filler codes*** are used to tab the required number of vertical lines.

This is a sample program to load an EVFU table.

SAMPLE EVFU LOADING PROGRAM

```
PROGRAM INSTRUCTION                    REMARKS
1500 WIDTH "LPT1:", 255                Required by some BASIC languages to avoid auto LF at
                                         column 80
1510 LPRINT CHR$(27) "]!";             Enables EVFU loading.
1520 LPRINT CHR$(65)CHR$(64);          Resets TOF, Channel 1 See Table of Channel Codes
1530 FOR I=1 to 4
1531 LPRINT CHR$(64)CHR$(64);          4 filler lines
1532 NEXT I
1540 LPRINT CHR$(68)CHR$(64);          Selects Channel 3. See Table of Channel Codes
1550 FOR I=1 to 18
1551 LPRINT CHR$(64)CHR$(64);          18 filler lines
1552 NEXT I
1560 LPRINT CHR$(72)CHR$(64);          Selects channel 4. See Table of Channel Codes
1570 FOR I=1 to 31
1571 LPRINT CHR$(64)CHR$(64);          31 filler lines
1572 NEXT I
1580 LPRINT CHR$(80)CHR$(64);          Selects channel 5. See Table of Channel Codes
1590 FOR I=1 to 8
1591 LPRINT CHR$(64)CHR$(64);          8 filler lines
1592 NEXT I
1600 LPRINT CHR$(64)CHR$(66);          Selects channel 8. See Table of Channel Codes
1610 L PRINT CHR$(27)" \";             Exit EVFU loading.
1620 END
```

EVFU Default

The default EVFU will be generated based on the current forms length and lpi setting under the following conditions:

- When the printer is initialized.
- When either the forms definition or lpi setting is changed.
- When the start EVFU load escape sequence ESC]! is immediately followed by the end load sequence ESC \.
- When the emulation is changed from P Series or Dataproducts to ANSI.

The following chart shows how the default EVFU table is defined:

Channel	Description
1	Top Margin (first line)
2	Bottom Margin (last line)
3	Single Spacing
4	Double Spacing
5	Triple Spacing
6	Half Form
7	Quarter Form
8	Tenth Line
9	Bottom of Form (bottom margin)
10	Bottom of Form minus 1 line
11	Top of Form minus 1 line (last line this form)
12	Top of Form

Skip to Channel Command

ESC [p1;p2 ! p

GENVFU - VFU Channel Command. Commands vertical paper movement to the channel specified by the number formed by p1 and p2. Valid channel numbers are in the range 1-12.

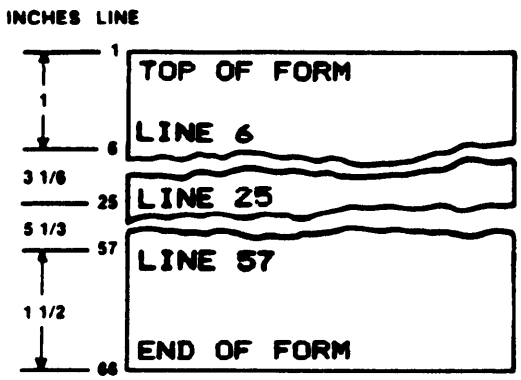
0;1 - selects channel 1
0;9 - selects channel 9
1;1 - selects channel 11

Channel 1 is always used for TOF; channel 12 is always used for vertical tab. If the channel number is greater than 12 then the program defaults to channel 1. If the table has not been loaded and a channel command is received, it is ignored.

The is sample program showing the use of the skip to channel command.

SAMPLE FORM PRINTOUT (Using previously loaded EVFU program)

PROGRAM INSTRUCTION	REMARKS
10 WIDTH "LPT1:", 255	Required by some BASIC languages to avoid auto LF at column 80
20 LPRINT CHR$(27)"[0;1!p";	Go to top fo form (channel 1)
30 LPRINT "TOP OF FORM";	Print indicated words
40 LPRINT CHR$(27)"[0;3!p";	Go to channel 3
50 LPRINT "LINE 6";	Print indicated words
60 LPRINT CHR$(27)"[0;4!p";	Go to channel 4
70 LPRINT "LINE 25";	Print indicated words
80 LPRINT CHR$(27)"[0;5!p";	Go to channel 5
90 LPRINT " LINE 57";	Print indicated words
100 LPRINT CHR$(27)"[0;8!p";	Go to channel 8
110 LPRINT "END OF FORM";	Print indicated words
120 END	



NOTE

Establish Top of Form locally before printing out forms. When executing the program, paper will slew to the top of next form before beginning printing.

Chapter 2 - Bar Codes

Introduction

Thirteen different styles of bar codes and POSTNET are available. Each style (except POSTNET) can be rotated 90, 180, or 270 degrees and printed with or without a human-readable line (HRL). The bar code symbol size and density are also adjustable.

NOTE: Control sequences given in the following text show the proper syntax needed from the host. The second line has examples of code written in the BASIC program language.

Entering and Exiting Bar Codes

Before the printer can print input data as bar code symbols, the bar code mode must be both selected and activated. There are two ways for this to be accomplished depending on the setting of printer option strap A9.

Printer control strap A9 is used to enable the SI (shift in) and SO (shift out) ASCII codes to activate and deactivate special mode functions. In this case, the special mode function is bar codes. With strap A9 IN, code SO will turn on or activate the bar code mode. SI will turn bar codes off.

Printer Control Strap A9 OUT

Enter the bar code mode of printing with the following control sequence sent by the host.

```
ESC[3t
LPRINT CHR$(27);"[3t";
```

Data sent after the above sequence is interpreted and printed as bar codes.

Exit the bar code mode using:

```
ESC[0t
LPRINT CHR$(27);"[0t";
```

Printer Control Strap A9 IN

ESC[3t
LPRINT CHR$(27);"[3t";
Selects the bar code special mode.

SO
LPRINT CHR$(14);
Activates bar codes and prints all received data as bar codes. (Only after it has been selected by ESC[3t above.)

SI
LPRINT CHR$(15);
Deactivates bar codes and allows printing of normal text.

ESC[0t
LPRINT CHR$(27);"[0t";
Deselects bar codes.

When an ESC[0t is received before the SI code, bar codes are both deactivated and deselected.

Setting Bar Code Parameters

Select the style, height, spacing, orientation, and print density for the bar code using the following escape sequence. The second line in the example (written in BASIC) shows the parameters that are the default values for the printer.

ESC[p1;p2;p3;p4;p5;p6;p7;p8;p9;p10|
LPRINT CHR$(27);"[4;9;1;2;6;2;6;2;0;0|";

p1 - Style

0 Interleaved 2 of 5	10 Codabar b/n
1 (Reserved for future use)	11 Codabar c/*
2 (Reserved for future use)	12 Codabar d/e
3 (Reserved for future use)	13 UPC-A
4 Code 3 of 9 (default)	14 UPC-E
5 EAN-8	15 Code 93
6 EAN-13	16 Code 128 (A,B,C)
7 Code 11	17 (Reserved for future use)
8 (Reserved for future use)	18 (Reserved for future use)
9 Codabar a/t	50 POSTNET (See Note)

NOTE: When using POSTNET, parameters p2 through p10 are invalid. If these parameters are changed, they will be retained in memory and will affect other styles if selected. See Appendix F for more information on POSTNET.

NOTE: The following dimensions are for bar codes printed at 0 and 180 degrees rotation. Bar codes printed at 90 or 270 degrees rotation will be compressed by a 6:5 ratio due to the difference in size of the horizontal and vertical grids.

p2 - Bar code height in 1/12-inch increments

Minimum 1 = 1/12 inch
Maximum 120 = 10 inches
Default 9 = 9/12 inch (3/4 inch)
Human-readable line is not included in height.

p3 - Human-readable line

0 = Do not print human-readable line
1 = Print human-readable line (default)

p4 - Narrow bar width, number x 1/120 inch

Default = 2 (2/120 inch, approximately .017 inch)
Range: 2, 4, 6, ... 126

p5*- Wide bar width, number x 1/120 inch

Default = 6 (6/120 inch, approximately .050 inch)
Range: 2, 4, 6, ... 254

p6 - Narrow space width, number x 1/120 inch

Default = 2 (2/120 inch, approximately .017 inch)
Range: 2, 4, 6, ... 126

p7*- Wide space width, number x 1/120 inch

Default = 6 (6/120 inch, approximately .050 inch)
Range: 2, 4, 6, ... 254

p8*- Intercharacter space width, number x 1/120 inch

Default = 2 (2/120 inch, approximately .017 inch)
Range: 2, 4, 6, ... 126

* Parameters p5, p7, and p8 are not programmable in some bar code styles since they are generated from other parameters.

p9 - Bar code rotation and human-readable line (HRL) font style (if used).

0 = No rotation - use currently selected font style, cpi, and lpi. This is the default setting.
1 = No rotation - use special HRL font.
2 = 90-degree rotation - use special HRL font.
3 = 180-degree rotation - use special HRL font.
4 = 270-degree rotation - use special HRL font.

p10 - Horizontal print density

0 = 60 dpi horizontal by 144 dpi vertical print density
1 = 120 dpi horizontal by 144 dpi vertical print density

Default for bar code styles 5, 6, 13, and 14 is 120 dpi.
Default for all other styles is 60 dpi.

Bar codes printed at 90 or 270 degrees rotation will print at the same speed (120 x 144) regardless of the selected horizontal density.

A missing parameter will leave the corresponding value unchanged.

Important: If no parameters have previously been entered, then the factory default values will be used. If previous values have been sent from the host, these values will prevail until changed by the host or the printer is reset using the initialization switch.

A zero parameter value for p2 - p8 will cause the default value to be selected.

Use semicolons as place holders when changing parameters.

LPRINT CHR$(27);"[;;;;;;;;;1]" Changes only parameter 10.
LPRINT CHR$(27);"[15;;0]" Changes only parameters 1 and 3.
LPRINT CHR$(27);"[16]" Changes only the style of the bar code.

If no changes are made to the parameters of the bar code, the printer will use the following factory-set values.

Default bar code characteristics

p1=4 Code 39
p2=9 3/4 inch height
p3=1 Human-readable line printed
p4=2 Narrow bar width 1/60 inch
p5=6 Wide bar width 1/20 inch
p6=2 Narrow space width 1/60 inch
p7=6 Wide space width 1/20 inch
p8=2 Intercharacter space width 1/60 inch
p9=0 No rotation, use currently selected font
p10=0 Horizontal print density 60 dpi

Human-Readable Line (HRL)

The human-readable line is printed 0. 10 inch below the bar code symbol. The height of the HRL and the 0. 10 inch space are not included in the bar code height parameter (p2).

A diamond symbol appearing in the human-readable line indicates one of the following conditions:

- Margin overrun. The data to be printed exceeds the available space remaining inside the programmed margins.
- The DEL character has been received while printing in a bar code style that permits the use of all 128 ASCII characters.
- An invalid character has been received. An example of this would be a letter "A" sent to the printer while printing a style 5 bar code. Style 5 (EAN-8) only accepts the digits 0-9.

Font Styles and Enhancements

Nonrotated bar codes can be printed with an HRL in any of the fonts available to the printer.

If enhancements are desired (e. g. , bold, underline, or expanded) the HRL must be printed using the normal text mode. Print the bar code symbol(s) without the HRL first. Exit the bar code mode and print the HRL using the normal text mode with enhancements.

Rotated bar codes use a special font for the human-readable line.

Spacing and Bar Code Editing Aids

There is a 0. 25-inch space called a quiet zone at the beginning and end of every bar code. As a result, the minimum distance between two horizontal bar codes will be 0. 50 inch.

Most bar code styles accept commas, spaces, and horizontal tabs as delimiters to separate bar codes. A comma will add no additional space between bar codes, so the separation will be the width of the quiet zone or 0. 50 inch. A space character will add 0. 10 inch to the quiet zone for a total of 0. 60-inch separation. A horizontal tab will add the appropriate number of empty spaces to go to the next tab.

Bar Code Readability Statement

The following information is provided to ensure that the best results are obtained from your printed bar codes.

Use bar code readers designed to operate in the visible light frequency range. Optional infrared-readable ribbon cartridges are available.

Use bar code readers designed to read medium- or low-density bar code symbols. Avoid readers with apertures less than 7 mils (. 007 inch or . 18mm).

Using bar code size parameters smaller than the default settings may produce unacceptable results.

Bar Code Program Examples

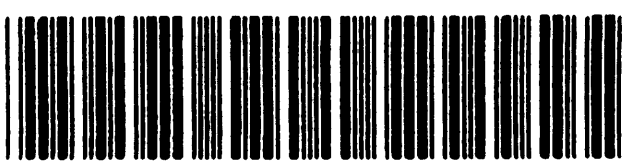
The following program examples are provided to help you become familiar with the bar code escape sequences. The programs are written in BASIC and printed using the LLIST command. All bar codes are actual size.

Test Program

This is the minimum code needed to print a bar code. Use it to test the printer's ability to print bar codes when more complicated programs are not producing results.

Line 10 turns on the bar code mode, line 20 contains the data to be printed as a bar code symbol, and line 30 turns off the bar code mode.

```
10 LPRINT CHR$(27); "[3t";
20 LPRINT "1234567890";
30 LPRINT CHR$(27); "[0t"
```



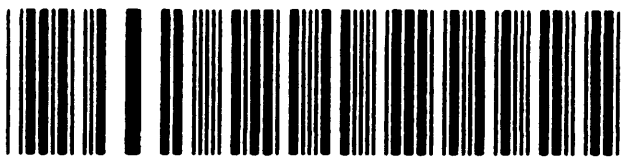
1234567890

Error Symbol

This example shows the error symbol in the HRL and the error pattern in the symbol. The error pattern causes the entire symbol to be rejected by the bar code reader.

The error was caused by the lowercase "a" being inserted into the data. The default style, Code 3 of 9, accepts only uppercase A-Z, the numbers 0-9, and the characters -. $/+%.

```
10 LPRINT CHR$(27); "[3t";
20 LPRINT "1a34567890";
30 LPRINT CHR$(27); "[0t"
```



1◊34567890

Changing Parameters

This example changes the style p1, height p2, and the HRL font p9 of the bar code. Notice that semicolons are used as place holders for the parameters not being changed.

Line 10 - change style to Code 128, change height to 1/4" (3/12"), and use the special HRL font.

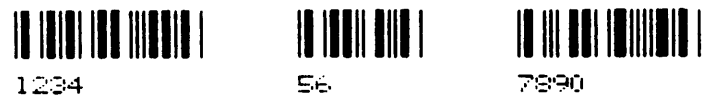
```
10 LPRINT CHR$(27); "[16;3;;;;;;;;1;)";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "1234567890";
40 LPRINT CHR$(27); "[0t"
```

1234567890

Commas and Spaces as Delimiters

When a comma delimiter is used to separate bar codes, no additional space is added to the quiet zones. Since the ending .25-inch quiet zone of one bar code symbol meets the beginning quiet zone of the next bar code, a total of .50 inch separates the two. Style 7 (line 5) is used for these examples since Code 11 uses both spaces and commas as delimiters.

```
10 LPRINT CHR$(27); "[7)";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "1234,56,7890";
40 LPRINT CHR$(27); "[0t"
```



When spaces are used as delimiters, an additional .1 inch of space is added to the quiet zones. Note that multiple spaces can be used.

```
10 LPRINT CHR$(27); "[3t";
20 LPRINT "1234        56  7890";
30 LPRINT CHR$(27); "[0t"
```

Horizontal Spacing

Use horizontal tabs for spacing bar code symbols across the page. Line 10 sets horizontal tabs at 1440 and 2880 decipoints (2 and 4 inches). The HT codes in lines 40 and 60 cause a jump to the next tab.

```
10 LPRINT CHR$(27); "[1440;2880;u";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "1234";
40 LPRINT CHR$(9);
50 LPRINT "5678";
60 LPRINT CHR$(9);
70 LPRINT "9012";
80 LPRINT CHR$(27); "[0t"
```

When no horizontal tabs are set, an HT code acts as a space, adding .1 inch to the separation. Total separation is .6 inch when the HT is added to the quiet zones.

Line 10 clears all previously set horizontal tabs for this example.

```
10 LPRINT CHR$(27); "[3g";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "1234";
40 LPRINT CHR$(9);
50 LPRINT "5678";
60 LPRINT CHR$(9);
70 LPRINT "9012";
80 LPRINT CHR$(27); "[0t"
```

Printer Control Strap A10

Printer control strap A10 is used for positioning the paper after printing a bar code. A10 IN sets the paper to the top of the bar code after printing; A10 OUT leaves the paper position as is after printing a bar code.

The state of A10 can be checked and changed using the configuration menu.

In the following examples, lines 10-30 print the bar code symbol and line 40 adds a line of text to be printed.

Examples 1 and 2 show the effect A10 has on the position of the text.

In example 3, the semicolon at the end of line 30 has been deleted to show that A10 only affects the same horizontal zone that the bar code occupies. The semicolon in BASIC is used to suppress a LF/CR after an LPRINT statement.

Important: A10 is only effective after exiting the bar code mode. As in the printout above, printing multiple bar codes without exiting (line 80 above) causes all the bar codes to be printed in the same horizontal area of the paper regardless of the condition of A10. Also, some form of printable data must be on the line before a paper move command (see line 40 in the examples); if not, the paper will not backup to the top of the bar code.

Bar Codes (continued)

EXAMPLE 1 - A10 OUT

```
10 LPRINT CHR$(27); "[3t";
20 LPRINT "1234567890";
30 LPRINT CHR$(27); "[0t";
40 LPRINT "A10-OUT"
```

1234567890 A10-OUT

EXAMPLE 2 - A10 IN

```
10 LPRINT CHR$(27); "[3t";
20 LPRINT "1234567890";
30 LPRINT CHR$(27); "[0t";
40 LPRINT "A10-IN"
```

A10-IN

1234567890

EXAMPLE 3 - A10 OUT with no suppression of LF/CR on line 30

```
10 LPRINT CHR$(27); "[3t";
20 LPRINT "1234567890";
30 LPRINT CHR$(27); "[0t"
40 LPRINT "A10-OUT"
```

1234567890
A10-OUT

Vertical Bar Codes

- Line 10 sets parameter p9 for 90-degree rotation using the special font for the HRL.
- Line 20 turns on the bar code mode.
- Line 30 is the data to be printed as a bar code symbol.
- Line 40 turns off the bar code mode.

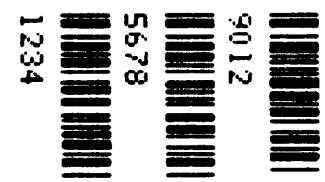
```
10 LPRINT CHR$(27); "[;;;;;;;;2)";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "12345";
40 LPRINT CHR$(27); "[0t"
```

Commas and spaces used as delimiters serve the same function as in horizontal bar codes. However, the quiet zones rotate with the symbol, leaving almost no horizontal separation between bar codes on the same line.

In the following examples, line 10 is used to print or inhibit the printing of the HRL (p3).

COMMAS - With HRL

```
10 LPRINT CHR$(27); "[;;1)";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "1234,5678,9012";
40 LPRINT CHR$(27); "[0t"
```



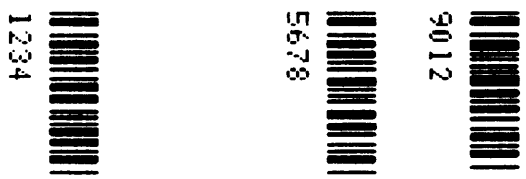
Bar Codes (continued)

COMMAS - Without HRL

```
10 LPRINT CHR$(27); "[;;0)";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "1234,5678,9012";
40 LPRINT CHR$(27); "[0t"
```

SPACES - With HRL

```
10 LPRINT CHR$(27); "[;;1)";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "1234          5678  9012";
40 LPRINT CHR$(27); "[0t"
```



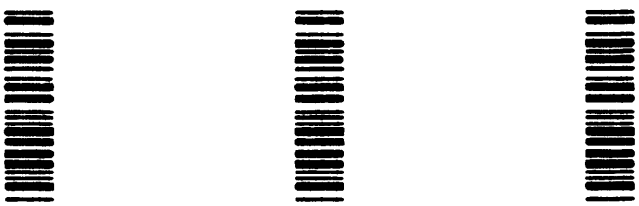
SPACES - Without HRL

```
10 LPRINT CHR$(27); "[;;0)";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "1234          5678  9012";
40 LPRINT CHR$(27); "[0t"
```

HORIZONTAL TABS

- Line 10 sets horizontal tab stops at 1080 and 2160 decipoints (1.5 and 3 inches).
- Lines 40 and 60 are HT codes that cause a jump to the next tab stop.
- Line 90 is a line of text to show positioning on the paper. The vertical separation between the bar code symbol and the text "A10 OUT" is the ending quiet zone.

```
10 LPRINT CHR$(27); "[1080;2160;u";
20 LPRINT CHR$(27); "[3t";
30 LPRINT "12345";
40 LPRINT CHR$(9);
50 LPRINT "12345";
60 LPRINT CHR$(9);
70 LPRINT "12345";
80 LPRINT CHR$(27); "[0t";
90 LPRINT "TEXT A-10 OUT"
```



TEXT A-10 OUT

Chapter 3 - Oversize Character Font

Introduction

The oversize font is composed of special block-style characters that can be expanded 156 times the size of standard fonts. This will produce letters up to 15.25-inches (388mm) high by 13-inches (330mm) wide. The minimum size (default setting) is two times the size of standard characters. Oversize characters can be rotated 90, 180, or 270 degrees.

Do not confuse oversize characters with expanded characters. The expanded character feature (standard in your printer) expands all existing fonts (except high speed) up to 8 times the normal size and are not rotatable.

The oversize character feature works with either the Dataproducts or ANSI protocol.

NOTE: Control sequences given in the following text show the proper syntax needed from the host. The second line has examples of code written in the BASIC program language.

The program examples are provided to help you become familiar with the oversize feature. The programs are written in BASIC and printed using the LLIST command. All characters are actual size.

Entering and Exiting Oversize

The following sequences are used to enter, rotate, and exit oversize printing:

ESC |0| Exit oversize printing.
ESC |1| Select oversize font with no rotation.
ESC |2| Select oversize font with 90-degree rotation.
ESC |3| Select oversize font with 180-degree rotation.
ESC |4| Select oversize font with 270-degree rotation.

LPRINT CHR$(27);"|0|"; or LPRINT CHR$(27);"|0";CHR$(124);

Once oversize has been turned on, it will remain on until an ESC |0| sequence is used to turned it off. It does not turn off due to line terminators (CR and LF).

NO ROTATION 90-DEGREE ROTATION 180-DEGREE ROTATION 270-DEGREE ROTATION

Oversize Character Font (continued)

Selecting Size

ESC [p1;p2 B is the sequence used to set the vertical (p1) and horizontal (p2) size of the oversize characters. A p1 value of 300 would increase the vertical size of the character 300% or 3 times.

The last two digits of each parameter are necessary to comply with the ANSI standard, but are ignored by the printer. Using the above example for p1, any three-digit number starting with 3 (300-399) will be interpreted as 3 times normal size. Likewise, 400-499 equals 4 times, 1200-1299 equals 12 times increase in size, and so on. The maximum size is 15600;15600 (156 times) and the minimum or default is 200;200 (2 times).

```
ESC[p1;p2 B
CHR$(27);"[300;300 B";
```

Since this same sequence is used to change size in the expanded mode, the parameters must be cleared to normal size, ESC[100;100 B, to prevent entering expanded mode when oversize is turned off. Oversize defaults to double-size, 200;200, (even when 100;100 is sent) so the 100;100 sequence must be sent ***after*** the oversize characters have been printed. See sample programs.

Size Parameters for Rotation

The p1 and p2 size parameters are always relative to a rotation angle of zero degrees. That is, the characters are expanded first and then rotated.

Spacing Between Characters

For nonrotated characters and characters rotated 180 degrees, the horizontal spacing between characters is 1/60 inch times the p2 parameter.

For characters rotated 90 or 270 degrees, the horizontal spacing between characters is 3/60 inch times the p1 parameter.

Vertical spacing is dependent on vertical paper move commands (LF, CR, VPR, etc.), the state of printer control strap B2 (34), and the character size and line spacing currently in effect.

Oversize Character Font (continued)

Sample Programs

EXAMPLE 1

The first example shows the code used to print oversize.

Line 10 sets the size to X3 vertical (V) and X3 horizontal (H).
Line 20 enters oversize printing with no rotation.
Line 30 is the data to be printed.
Line 40 exits oversize printing.
Line 50 returns the size parameters to X1 V - X1 H.

```
10 LPRINT CHR$(27); "[300;300 B";
20 LPRINT CHR$(27); "[1!";
30 LPRINT "ABCabc";
40 LPRINT CHR$(27); "[0!";
50 LPRINT CHR$(27); "[100;100 B"
```

EXAMPLE 2

The next two examples demonstrate the importance of setting the size parameters back to X1 V - X1 H after printing oversize. This is the same program used in Example 1 with an additional line added.

Line 60 prints 1234 in the currently selected font.

```
10 LPRINT CHR$(27); "[300;300 B";
20 LPRINT CHR$(27); "[1!";
30 LPRINT "ABCabc";
40 LPRINT CHR$(27); "[0!";
50 LPRINT CHR$(27); "[100;100 B"
60 LPRINT "1234"
```

1234

NOTE: In BASIC, LPRINT statements automatically generate an LF/CR at the end of the line unless suppressed by a semicolon. Since line 30 does not end with a semicolon, an LF/CR occurred at the lpi in effect (still in oversize). This accounts for the vertical distance between the ABCabc line and the 1234 line.

EXAMPLE 3

If line 50, which sets the size to X1 V and X1 H, is removed, the data printed in line 60 is now subject to the expanded mode of printing. Notice (below) that the 1234 printed line is expanded vertically by X3.

```
10 LPRINT CHR$(27); "[300;300 B";
20 LPRINT CHR$(27); "[1!";
30 LPRINT "ABCabc";
40 LPRINT CHR$(27); "[0!"
60 LPRINT "1234"
```

```
ABCabc
1234
```

Printer Control Strap A14

Printer control strap A14 is used for positioning the paper after printing oversize characters. A14 IN sets the paper to the top of the oversize character after printing; A14 OUT leaves the paper position as is after printing oversize.

The state of A14 can be checked and changed using the configuration menu.

In the following examples:

- Lines 10-30 print oversize characters at X3.
- Line 50 changes the oversize to X4 V by X6 H.
- Lines 70-80 prints oversize and exits.
- Line 90 returns the parameters to X1 to prevent expanded printing.
- Lines 100-110 prints normal text to show the effect strap A14 has on positioning.

Important: Line spacing was set back to normal (6 lpi) when normal text was selected in line 90. When A14 is IN and the paper position returns to the top of oversize, vertical moves (CR, LF, VPA, VPR) must be used to move the paper to prevent overprinting on the oversize characters.

EXAMPLE 4

Printer control strap A14 IN. The oversized characters and the first line of normal printing are aligned at the first print line. The second line of normal printing (Text Text Text. . .) started printing one line below "A14-IN" and overprints.

```
10 LPRINT CHR$(27); "[300;300 B";
20 LPRINT CHR$(27); "[1!";
30 LPRINT "ABC";
50 LPRINT CHR$(27); "[400;600 B";
70 LPRINT "ABC";
80 LPRINT CHR$(27); "[0!";
90 LPRINT CHR$(27); "[100;100 B";
100 LPRINT "A14-IN"
110 LPRINT "Text  Text  Text  Text  Text  Text  Text"
```

```
A14-IN
Text  Text  Text
```

EXAMPLE 5

Printer control strap A14 OUT. Paper position is not returned after printing oversize characters.

```
10 LPRINT CHR$(27); "[300;300 B";
20 LPRINT CHR$(27); "[1!";
30 LPRINT "ABC";
50 LPRINT CHR$(27); "[400;600 B";
70 LPRINT "ABC";
80 LPRINT CHR$(27); "[0!";
90 LPRINT CHR$(27); "[100;100 B";
100 LPRINT "A14-OUT"
110 LPRINT "Text  Text  Text  Text  Text  Text  Text"
```

```
                    A14-OUT
Text  Text  Text  Text  Text  Text  Text
```

Chapter 4 - Dataproducts Emulation

Introduction

The Dataproducts protocol is identical to the ANSI X3. 64 protocol, except for the EVFU load and command sequences. The Dataproducts protocol is used exclusively with the Dataproducts parallel interface. When the Dataproducts Emulation Mode is selected through the control panel menu, the Dataproducts interface is automatically selected. If the interface is not installed in the printer, the Dataproducts emulation and interface options will not be available on the menu.

Dataproducts Electronic Vertical Format Unit (EVFU)

- The PI lead must be in when using Dataproducts protocol.
- If VFU slew commands are used to reach the top of the next form, printer control strap A22 must be IN.
- If VFU slew zero commands are used, printer control strap A29 must be OUT since the command is converted to a CR.

The twelve channel table is loaded with two byte codes. Special start load and end load commands are used with this emulation.

LOAD COMMANDS (PI lead must be HIGH)

Start load command6CH selects 6 LPI
6DH selects 8 LPI
6EH selects current LPI setting

End load command 6FH

The format of two byte channel control code is:

Bit Number	8	7	6	5	4	3	2	1
Channel Number	x	x	6	5	4	3	2	1
first byte	x	x	y	y	y	y	y	y
Bit Number	8	7	6	5	4	3	2	1
Channel Number	x	x	12	11	10	9	8	7
second byte	x	x	y	y	y	y	y	y

y: 0 = no stop in channel
1 = stop in channel
x: bit has no meaning

Each "channel control code" pair of bytes has the capability to indicate multiple channels since each channel indication has a unique bit position which is either ON = 1 or OFF = 0.

TABLE OF CHANNEL CODES

BYTE	DECIMAL VALUE		BINARY VALUE		ASCI CHARACTER		REMARKS
	1	2	1	2	1	2	
	64	64	1000000	1000000	@	@	Fillers, see Note
	65	64	1000001	1000000	A	@	Channel 1
	66	64	1000010	1000000	B	@	Channel 2
	68	64	1000100	1000000	D	@	Channel 3
	72	64	1001000	1000000	H	@	Channel 4
	80	64	1010000	1000000	P	@	Channel 5
	96	64	1100000	1000000	`	@	Channel 6
	64	65	1000000	1000001	@	A	Channel 7
	64	66	1000000	1000010	@	B	Channel 8
	64	68	1000000	1000100	@	D	Channel 9
	64	72	1000000	1001000	@	H	Channel 10
	64	80	1000000	1010000	@	P	Channel 11
	64	96	1000000	1100000	@	`	Channel 12

NOTE: Since LF is not recognized during EVFU loading, ***filler codes*** are used to tab the required number of vertical lines.

Skip to Channel

The skip to channel command has the following format:

Bit Number	Function
P1 7 6 5 4 3 2 1 0	
1 X X X 0 C C C C	Skip to channel CCCC (X bits not used)

CCCC:

0000 = Channel 1	0110 = Channel 7
0001 = Channel 2	0111 = Channel 8
0010 = Channel 3	1000 = Channel 9
0011 = Channel 4	1001 = Channel 10
0100 = Channel 5	1010 = Channel 11
0101 = Channel 6	1011 = Channel 12

Slew "N" Lines

Bit Number	Function
P1 7 6 5 4 3 2 1 0	
1 X E E 1 N N N N	Advance paper the number of lines specified by NNNN or EENNNN.

Printer control strap B1 determines the slew range.

- B1 OUT = NNNN range 0 - 15
- B1 IN = EENNNN extended range 0 - 63

Chapter 5 - Printronix P Series Emulation

Introduction

This printer is plug compatible with the Printronix 150/300/600 family of line printers. It accepts and acts upon all control codes utilized by this family of printers in a manner that is as functionally equivalent as possible.

The following is a list of the control codes (and their functions) utilized by the Printronix printer. Any control codes not listed will be discarded.

When changing from the ANSI emulation to the P Series emulation, the ANSI vertical tab table does not transfer and the horizontal tab table set in the ANSI mode is not available. All menu parameters set before changing emulations will carry over except for these.

P Series Control Codes

ACK — (Line at 8 LPI - 06H) A received ACK anywhere on the line causes the entire line to be printed at 8 lpi. Since this code is momentary, it will not affect subsequent lines. Each line must receive an ACK code for the switch to 8 lpi.

BEL — (Bell Code - 07H) A BEL code received at the interface causes the beeper to sound for approximately 1 second.

BS — (Elongated Character Line - 08H) A BS code anywhere on the line causes that line to be printed at double height. Standard- and double-height characters can not be mixed on the same line.

CR — (Carriage Return . . Slew Zero or Edit Mode - 0DH) In the edit mode (printer option strap A3 OUT) a CR will left-justify the line in the buffer, *but **no printing will occur***. The line can then be modified by the next line of data received.

Printer option strap A3 IN invokes the 0 slew mode. In this mode, the line modification feature is deleted and a CR is treated in the same manner as in the ANSI protocol. Printer strap A28 IN converts a CR to a LF and strap A29 IN causes the printer to ignore received carriage returns.

DC1 — (Ready/Select - 11H) A received DC1 can be used to remotely select the printer in both serial and parallel interfaces.

A serial interface protocol can be selected to transmit a DC1 code to inform the host of a ready condition. See Appendix G - Serial Interface Straps.

DC3

(Busy/Select - 13H) A received DC3 can be used to remotely deselect the printer in both serial and parallel interfaces.

A serial interface protocol can be used to transmit a DC3 code to inform the host of a busy condition. See Appendix G - Serial Interface Straps.

DEL

(Delete - 7FH) The delete code causes a diamond to be printed in text mode. In graphics mode, the delete character is treated as data.

In the edit mode, a DEL following a CR erases (replace with a space) previously accepted (buffered, but not printed) characters.

Printer strap A30 IN causes the delete code to be ignored in both serial and parallel interfaces.

When in parallel interface, hardware strap H3 IN causes a DEL to interrupt the processor. See Appendix G - Hardware Straps.

DLE

(High Vertical Density Graphics - 10H) Graphics - A DLE code preceded by an ENQ code anywhere on the same line causes paper motion for that line to be 1/144 inch instead of the normal 1/72 inch. If not preceded by an ENQ code, the DLE is discarded. (See Printronix Mode Graphics Density Table.)

If there are no graphics commands (EOT or ENQ) in the line, the DLE code is treated as an EVFU channel command.

ENQ

(Normal Density Plot Line - 05H) An ENQ anywhere in the line causes the line to be treated as normal-density (60 dpi) plot mode graphics. An LF code causes the line to be printed as one dot row and the paper is advanced.

If there is a DLE anywhere in the line, the paper is advanced by 1/144 inch. Otherwise, the paper is advanced by 1/72 inch. (See Printronix Mode Graphics Density Table.)

EOT

(High Density Plot Line - 04H) An EOT is used to print at 120 dpi. This code anywhere in the line causes the line to be treated as high-density plot mode graphics. The line must be terminated with a CR (printer strap A29 must be OUT). The characters are treated as dot information and the CR at the end of the line *will not cause the paper to advance.* The code causes dots to be printed in the even-numbered dot column positions. A second line of the same data with the normal plot mode command (ENQ) is required to fill in the remainder of the dots and to advance the paper.

P Series Control Codes (continued)

ETX — (End of Transmission - 03H) The ETX code is used in the serial interface with the ACK code as part of an interface protocol. The ETX is received from the host at the end of a data block. The host then stops sending data until an ACK is received.

FF — (Form Feed - 0CH) A form feed causes the line to be printed and the paper advanced to the top of form.

HT — (Horizontal Tab - 09H) An HT is replaced by a space character.

LF — (Line Feed - 0AH) An LF causes the line to be printed and advances the paper to the next line. If the line is a plot mode line, the paper is advanced one dot row or not at all, depending on the density of the plot mode. See Printronix Mode Graphic Density Table.

RS — (Record Separator - 6EH) The RS character is used to signal the beginning of an EVFU load. Code 6EH is used if the PI (paper instruction) lead or bit is active or high. Code 1EH is used if the lead or bit is low inactive or low.

Printer option strap A5 must be IN to enable EVFU loading. Strap A6 must be IN if the PI lead or bit (data bit if serial) is to be used.

SI — (Shift In - 0FH) An SI code anywhere in the line causes the remainder of the line and all following lines to be printed in the last font selected.

SO — (Shift Out - 0EH) An SO code anywhere in the line causes the remainder of the line of the line and all subsequent lines (until an SI code is received) to be printed in the alternate font. The alternate font is selected with printer option straps A17-A20.

SP — (Space - 20H) The space code causes a blank in the character position represented by the code.

Following a carriage return in edit mode, space codes do not modify the contents of the print buffer. The SP is used as a skip code to pass over characters in the buffer.

When using the character graphics font, the character in the 20H position is printed instead of a blank.

UNDL — (Underline - 5FH) When using the parallel interface, hardware strap H7 IN causes a CR to be substituted for an underline character. See Appendix G - Hardware Straps.

Serial interface strap B5 IN causes a CR to be substituted for an underline character.

All software straps that apply to a CR will apply if either of these options are selected.

US — (Unit separator - 6FH) The US character is used to signal the end of an EVFU load sequence. Code 6FH is used if the PI (paper instruction) lead or bit is active or high. Code 1FH is used if the PI lead is inactive or low.

VT — (Vertical Tab - 0BH) A VT causes the line to be printed and paper advanced until the next tab position is reached.

P Series - Graphics

Graphics

The Printronix emulation graphics mode provides a horizontal dot placement plotting method. This method enables the printing of ASCII characters in their binary code form. Since each character has a unique pattern of 1's and 0's (dots and voids) that make up its binary code, the correct placement of these binary forms enables you to form larger images on the paper.

For clarity in the text, a binary 1 (a printed dot) will be shown as an X and a binary 0 (empty dot position) will be shown as a 0.

In the graphics mode, only the low order six bits of a seven- or eight-bit character are used (bits 1-6). Looking at an ASCII code chart, the question mark character (?) is represented by the binary number 1111110 (bit 1 - bit 7). Since only the first 6 bits are used, a ? would print six dots on the paper. An asterisk (*) is represented by 010101 which would print 0X0X0X0 across the page horizontally.

Using the question mark that prints all dots, a series of these characters produces a one dot high solid line across the paper. By repeating, omitting, and mixing characters across a page, images such as graphs, charts, and pictures can be produced.

Dot Patterns and Densities

The chart on the next page shows the dot patterns for each of the ASCII characters. Each character represents six dots (or dot positions) and their spacing is dependent on the density selected.

Graphics data printed in horizontal format is comprised of a stream of bytes from left to right across each dot row.

This chart shows that byte 1 (or character 1) in row 1 will print its six bits from left to right in a single dot row. The next byte (byte 2) prints its six bits, representing a character, in the same dot row across the page.

Byte → Row ↓	Byte 1	Byte 2	... Byte n
1	1 2 3 4 5 6	1 2 3 4 5 6	...1 2 3 4 5 6
2	1 2 3 4 5 6	1 2 3 4 5 6	...1 2 3 4 5 6
3	1 2 3 4 5 6	1 2 3 4 5 6	...1 2 3 4 5 6
.	. . . . . .	. . . . . .	....• . . . . .
.	. . . . . .	. . . . . .	....• . . . . .
.	. . . . . .	. . . . . .	....• . . . . .
6	1 2 3 4 5 6	1 2 3 4 5 6	...1 2 3 4 5 6

This chart shows the dot patterns for the ASCII characters needed to cover all dot/void combinations. Other valid characters (although they are repeat patterns of the characters in the chart) are 09H - 13H and 20H - 3EH.

Char	Value	Dots 123456	Char	Value	Dots 123456
@	40H	oooooo	`	60H	ooooox
A	41H	xooooo	a	61H	xoooox
B	42H	oxoooo	b	62H	oxooox
C	43H	xxoooo	c	63H	xxooox
D	44H	ooxooo	d	64H	ooxoox
E	45H	xoxooo	e	65H	xoxoox
F	46H	oxxooo	f	66H	oxxoox
G	47H	xxxooo	g	67H	xxxoox
H	48H	oooxoo	h	68H	oooxox
I	49H	xooxoo	i	69H	xooxox
J	4AH	oxoxoo	j	6AH	oxoxox
K	4BH	xxoxoo	k	6BH	xxoxox
L	4CH	ooxxoo	l	6CH	ooxxox
M	4DH	xoxxoo	m	6DH	xoxxox
N	4EH	oxxxoo	n	6EH	oxxxox
O	4FH	xxxxoo	o	6FH	xxxxox
P	50H	ooooxo	p	70H	oooxx
Q	51H	xooooxo	q	71H	xooooxx
R	52H	oxooxo	r	72H	oxooxx
S	53H	xxooxo	s	73H	xxooxx
T	54H	ooxoxo	t	74H	ooxoxx
U	55H	xoxoxo	u	75H	xoxoxx
V	56H	oxxoxo	v	76H	oxxoxx
W	57H	xxxoxo	w	77H	xxxoxx
X	58H	oooxxo	x	78H	oooxxx
Y	59H	xooxxo	y	79H	xooxxx
Z	5AH	oxoxxo	z	7AH	oxoxxx
[	5BH	xxoxxo	{	7BH	xxoxxx
\	5CH	ooxxxo	¦	7CH	ooxxxx
]	5DH	xoxxxo	}	7DH	xoxxxx
^	5EH	oxxxxo	~	7EH	oxxxxx
_	5FH	xxxxxo	?	3FH	xxxxxx

NOTE:

x = dot,

o = no dot

Each line to be printed as graphics must have one of the three graphic control codes (ENQ, EOT, DLE) in the line of data. The ENQ and EOT codes can be placed anywhere in the line of data. When used, the DLE code must always be placed *after* the ENQ code.

The following densities are available using the formats shown:

Density H	Density V	Line Format Required
60	72	ENQ, data, LF terminator
120	72	EOT, data, CR terminator ENQ, data, LF terminator
60	144	ENQ, DLE, data, LF terminator
120	144	EOT, data, CR terminator ENQ, DLE, data, LF terminator

The dot pattern for a particular character is the same regardless of density. The density difference is a shift to the right by 1/120 inch for high density.

NORMAL DENSITY GRAPHICS

At 60 DPI horizontal density, one line of characters is used for each dot row. The normal density plot mode character (ENQ) can appear anywhere in the line. The line must be terminated with an LF. At the end of graphics printing, send an empty data line containing only an LF.

HIGH DENSITY GRAPHICS

At 120 DPI horizontal density, each dot row requires two lines of characters. The first line contains the high density plot mode code (EOT) and must be terminated with a CR.

Important: Printer control straps A28 and A29 must be OUT.

The second line contains the normal density plot mode code (ENQ) and must be terminated with an LF.

At the end of graphics printing, send an empty data line containing only an LF for proper termination.

P Series - Electronic Vertical Format Unit

The electronic vertical format unit (EVFU) is used to download vertical tabs to the printer. It allows jumps to preselected lines on the form through vertical moves of the paper.

The maximum form length is 22 inches (176 lines at 8 lpi).

Using the EVFU

Using the EVFU is a two-step process. The first step is to load the channel control table with codes for the form being used. One byte must be loaded for each line of the form. A channel code can be inserted in the byte to indicate a stop (or vertical tab location).

The second step is to send a channel command to jump to a specified channel (location on the paper).

On the following pages are charts and sample programs showing the codes for loading the EVFU table and selecting channels for paper moves.

Points to Remember

- When a table is downloaded, **VFU** will be displayed.
- The vertical format type must be set to **VtType:Emul VFU** through the control panel using the Program Mode.
- Printer control strap A1 must be OUT for EVFU use.
- Printer control strap A5 must be IN to enable EVFU loading. If A5 is not IN when a start load RS code is received, the table will not be loaded and all control characters received before the end load US code will be interpreted as data.
- If the paper instruction (PI) lead is used, printer control strap A6 must be IN.
- When using serial interface with the PI lead (A6 above) enabled, interface strap B1 must be OUT to indicate that only seven bits are to be used as data. This leaves bit eight available as to act as the PI lead. In this configuration, bit eight cannot be used to select the alternate font or be used for parity checking. Interface strap B6 must also be IN to allow 8-bit data.

  If you select eight-bit data with B1 IN, the PI enable strap is ignored.
- Send the EVFU table at the start of a line to prevent a loss of data.

P Series - Electronic Vertical Format Unit (continued)

These charts contain the channel commands to load the EVFU table *and* for selecting a channel for vertical moves.

PI Lead Codes - Use with serial interface strap B1.

Data Lines									Channel number or Command		Decimal Number	ASCII
PI	7	6	5	4	3	2	1		Channel			
1	X	X	0	0	0	0	0		1	TOF	128	NUL
1	X	X	0	0	0	0	1		2		129	none
1	X	X	0	0	0	1	0		3		130	none
1	X	X	0	0	0	1	1		4		131	none
1	X	X	0	0	1	0	0		5		132	none
1	X	X	0	0	1	0	1		6		133	none
1	X	X	0	0	1	1	0		7		134	none
1	X	X	0	0	1	1	1		8		135	BEL
1	X	X	0	1	0	0	0		9		136	BS
1	X	X	0	1	0	0	1		10		137	HT
1	X	X	0	1	0	1	0		11		138	LF
1	X	X	0	1	0	1	1		12	VT	139	VT
1	X	X	0	1	1	0	0		13		140	FF
1	X	X	0	1	1	0	1		14		141	CR
1	1	1	0	1	1	1	0		Start Load		238	none
1	1	1	0	1	1	1	1		End Load		239	none

Codes not using the PI lead.

Data Lines								Channel number or Command		Decimal Number	ASCII
PI	7	6	5	4	3	2	1	Channel			
0	0	0	1	0	0	0	0	1	TOF	16	DLE
0	0	0	1	0	0	0	1	2		17	DC1
0	0	0	1	0	0	1	0	3		18	DC2
0	0	0	1	0	0	1	1	4		19	DC3
0	0	0	1	0	1	0	0	5		20	DC4
0	0	0	1	0	1	0	1	6		21	NAK
0	0	0	1	0	1	1	0	7		22	SYN
0	0	0	1	0	1	1	1	8		23	ETB
0	0	0	1	1	0	0	0	9		24	CAN
0	0	0	1	1	0	0	1	10		25	EM
0	0	0	1	1	0	1	0	11		26	SUB
0	0	0	1	1	0	1	1	12	VT	27	ESC
0	0	0	1	1	1	0	0	13		28	FS
0	0	0	1	1	1	0	1	14		29	GS
0	0	0	1	1	1	1	0	Start Load		30	RS
0	0	0	1	1	1	1	1	End Load		31	US

Example EVFU Loading Program:

- Using standard CENTRONICS parallel interface with 36-pin connector and P Series protocol.
- Using the channel code chart without the PI lead.

This program loads the EVFU table with channel stops at lines 6, 25, 57, and 66.

Set the printer control straps as follows:

- Strap A1 OUT to deactivate coded SELECT/DESELECT operation.
- Strap A5 IN to enable EVFU loading.

PROGRAM INSTRUCTION	REMARKS
1500 WIDTH "LPT1:", 255	Required by some BASIC languages to avoid auto LF at column 80
1510 LPRINT CHR$(30);	Selects SL channel.
1520 LPRINT CHR$(16);	Selects TOF, Channel 1.
1530 FOR I=1 to 4	
1531 LPRINT CHR$(17);	Selects Channel 2 for 4 filler lines
1532 NEXT I	
1540 LPRINT CHR$(18);	Selects Channel 3 (for line 6 printing)
1550 FOR I=1 to 18	
1551 LPRINT CHR$(17);	Selects Channel 2 for 18 filler lines
1552 NEXT I	
1560 LPRINT CHR$(19);	Selects Channel 4 (for line 25 printing)
1570 FOR I=1 to 31	
1571 LPRINT CHR$(17);	Selects Channel 2 for 31 filler lines
1572 NEXT I	
1580 LPRINT CHR$(20);	Selects Channel 5 (for line 57 printing)
1590 FOR I=1 to 8	
1591 LPRINT CHR$(17);	Selects Channel 2 for 8 filler lines
1592 NEXT I	
1600 LPRINT CHR$(21);	Selects Channel 6 (for line 66 printing)
1610 LPRINT CHR$(31);	Selects EL Channel
1620 END	

A start load RS code immediately followed by a stop load US code will clear the EVFU table.

```
10 LPRINT CHR$(30);
20 LPRINT CHR$(31);
```

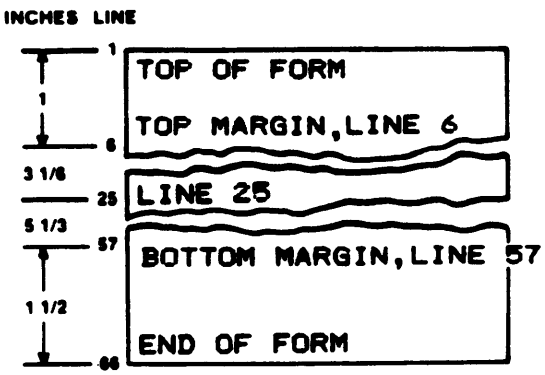
P Series - Electronic Vertical Format Unit (continued)

Example Form Printout (Using previously loaded EVFU table.)

NOTE: Establish top of form locally before printing. When running the program, paper will slew to the top of the next form before printing begins.

SAMPLE FORM PRINTOUT (Using previously loaded EVFU program)

PROGRAM INSTRUCTION	REMARKS
10 WIDTH "LPT1:", 255	Required by some BASIC languages to avoid auto LF at column 80
20 LPRINT CHR$(16);	Go to Top of Form (Channel 1)
25 LPRINT "TOP OF FORM";	Print indicated words
30 LPRINT CHR$(18);	Go to Channel 3
35 LPRINT "TOP MARGIN, LINE 6";	Print indicated words
40 LPRINT CHR$(19);	Go to Channel 4
45 LPRINT "LINE 25";	Print indicated words
50 LPRINT CHR$(20);	Go to Channel 5
55 LPRINT "BOTTOM MARGIN, LINE 57";	Print indicated words
60 LPRINT CHR$(21);	Go to Channel 6
65 LPRINT "END OF FORM";	Print indicated words
70 END	



Chapter 6 - Proprinter Emulation

Introduction

The IBM Proprinter III XL emulation is selected through the control panel. Printer option straps C1 - C16 (Appendix G) replace the applicable switches used on a Proprinter.

Although every effort has been made to make this printer functionally similar to the Proprinter, some differences do exist.

Differences

- Non-Proprinter fonts are available; however, proportional spacing line lengths may be different.
- Download fonts are not available.
- The Proprinter 20 cpi font is not available.
- Bidirectional and unidirectional printing do not apply on this printer.
- Double-width and double-height characters are slightly different.
- 240 dpi graphics are printed on a 120 dpi grid. Adjacent dots are OR'ed together. The aspect ratio of this printer (height vs. width of a graphic image) is identical to the Proprinter.

BEL

BELL sounds a momentary audible tone.

Decimal 7

Hex 07

BASIC CHR$(7);

BS

BACKSPACE moves the print position one character to the left. This code is normally used for overstriking a character. When the print positon is at the left margin, a received BS has no effect.

Decimal 8

Hex 08

BASIC CHR$(8);

CAN

CANCEL causes all printable data received since the last line terminator to be deleted. Print modes enabled since the last terminator (other than double-width printing initiated by the SO code) stay in effect. Example: If underlining was enabled during the line, it will still be active for the next line received. The cancel control code does not change the current print position.

Decimal 24

Hex 18

BASIC CHR$(24);

CR

CARRIAGE RETURN moves the current print position to the left margin. If auto LF on CR is set, either by printer strap C7 or by command (ESC 5), then a line feed will also be executed.

Decimal 13

Hex 0D

BASIC CHR$(13);

Proprinter Control Codes (continued)

DC1 (Device Code 1) SELECT PRINTER (PARALLEL INTERFACE ONLY) - DC1 sets the printer online after being deselected by an ESC Q.

Decimal 17

Hex 11

BASIC CHR$(17);

DC2 (Device Code 2) SETS 10 CPI PRINTING - DC2 sets the printer to 10 cpi (5 cpi if double-wide is enabled). Cancels condensed printing mode and 12 cpi printing.

Decimal 18

Hex 12

BASIC CHR$(18);

DC3 (Device Code 3) DESELECT PRINTER - When using a serial interface, DC3 (XOFF) is sent *to* the host to indicate the printer is not ready to accept data. When using a parallel interface, a received DC3 is treated as a NUL.

Decimal 19

Hex 13

BASIC CHR$(19);

DC4 (Device Code 4) CANCEL DOUBLE-WIDE PRINTING BY LINE - Cancels one-line double-wide print set by SO. Does not cancel continuous double-wide set by ESC W 1.

Decimal 20

Hex 14

BASIC CHR$(20);

ESC

ESCAPE introduces an escape sequence. ESC tells the printer that the following characters are to be interpreted as a printer command, not printable data. See the section on Proprinter escape sequences.

Decimal 27

Hex 1B

BASIC CHR$(27);

FF

FORM FEED advances the paper to the next top of form with the print position at the left. If a top margin is set, paper advances to the first print line below the margin.

Decimal 12

Hex 0C

BASIC CHR$(12);

HT

HORIZONTAL TAB advances the print position to the next horizontal tab stop. If there are no tab stops between the print position and the right margin, the HT is ignored.

Tab stops are set by the command ESC D. Default tabs are set every eight columns, beginning at column 9.

Decimal 9

Hex 09

BASIC CHR$(9);

LF

LINE FEED advances the paper one line by the current setting for line space. If the LF causes paper to exceed the form length, a form feed occurs. Acts as a line terminator.

Decimal 10

Hex 0A

BASIC CHR$(10);

NUL

NULL is ignored by the printer when received by itself. If received as part of a graphics data sequence, it is interpreted as a graphics space. Null is used by some escape sequences to end a series of parameters.

When used as a parameter of a sequence looking for an even or odd value, it is considered even. Example: ESC S NULL causes superscripting to occur.

Decimal 0

Hex 00

BASIC CHR$(0);

SI

SHIFT IN causes condensed printing. Sets the printer to 17. 1 cpi (8. 55 cpi if doublewide is enabled). Condensed printing remains in effect for subsequent lines until cancelled.

Decimal 15

Hex 0F

BASIC CHR$(15);

SO

SHIFT OUT causes double-wide printing for the current line only.

Decimal 14

Hex 0E

BASIC CHR$(14);

VT

VERTICAL TAB advances the paper to the next vertical tab setting and returns the print position to the left margin. A maximum of 64 vertical tabs are allowed per form. The vertical tabs are set using ESC B.

The paper is advanced one line if no tab is set beyond the current line.

Decimal 11

Hex 0B

BASIC CHR$(11);

Proprinter Escape Sequences

Sequence	Meaning	Page
ESC A n	Set text line spacing to n/72 inch	6-12
ESC B n1 n2..n64 0	Set vertical tabs by line numbers	6-12
ESC C n	Set form length in lines	6-12
ESC C 0 m	Set form length in inches	6-12
ESC D n1 n2..n28 0	Set horizontal tab stops in columns	6-13
ESC E	Select emphasized printing	6-13
ESC F	Cancel emphasized printing	6-13
ESC G	Select double-strike printing	6-13
ESC H	Cancel double-strike printing	6-13
ESC I n	Select print mode, 0 = DP, 2 = NLQ	6-14
ESC J n	Graphics variable line spacing n/216 inch	6-14
ESC K n1 n2, v1-vn	Normal density graphics (60 DPI)	6-19
ESC L n1 n2, v1-vn	Dual density graphics (120 DPI)	6-19
ESC N n	Skip perforation ON	6-14
ESC O	Skip perforation OFF	6-15
ESC P n	Proportional space mode	6-15
ESC Q n	Deselect printer	6-15
ESC R	Set all tabs to power on settings	6-15
ESC S n	Super/Sub script ON	6-16
ESC T	Super/Sub script OFF	6-16
ESC U n	Unidirectional print on/off	6-16
ESC W n	Double-wide print on/off	6-16
ESC X n m	Set horizontal margins	6-17
ESC Y n1 n2, v1-vn	Dual density graphics (full speed)	6-20
ESC Z n1 n2, v1-vn	High density graphics (reduced speed)	6-20
ESC 0	Set 1/8 line spacing	6-10
ESC 1	Set 7/72 line spacing	6-10
ESC 2	Start text line spacing	6-10
ESC 3 n	Set line spacing (n/216)	6-10

Proprinter Escape Sequences (continued)

Sequence	Meaning	Page
ESC 4	Set top of form	6-11
ESC 5 n	Automatic line feed on/off	6-11
ESC 6	Select character set 2	6-11
ESC 7	Select character set 1	6-11
ESC _ n	Continuous overscore on/off	6-8
ESC - n	Continuous underline on/off	6-8
ESC :	12 CPI printing	6-9
ESC ^	Print single character from chart	6-9
ESC \ n1 n2	Print continuously from chart	6-8
ESC [T n1 n2 m1..m5	Select International Character Sets	6-8

ESC - n

UNDERSCORE - When underscoring is enabled, all printable characters and all space characters, including leading space characters, are underlined. Leading white space preceding a horizontal tab stop is not underlined. Not recommended for use with line draw characters.

n = 1, underscoring is enabled
n = 0, underscoring is disabled

Decimal 27 45 n

Hex 1B 2D n

BASIC CHR$(27);CHR$(45);CHR$(n);

ESC _ n

OVERSCORE - When overscoring is enabled, all printable characters and all space characters, including leading space characters, are overscored. Leading white space preceding a horizontal tab stop is not overscored. Not recommended for use with line draw characters.

n = 1, enabled
n = 0, disabled

Decimal 27 95 n

Hex IB 5F n

BASIC CHR$(27);"_";CHR$(n);

ESC \ n1 n2

PRINT CONTINUOUSLY FROM ALL CHARACTER CHART - Allows printing all the 256 characters and symbols (even those normally used as control codes) in the all character chart. The total number of characters to be printed from the all character chart is specified by n1 and n2 according to the formula: n1 + (256 * n2).

Example: To print 400 characters from the chart send CHR$(27);"\";CHR$(144);CHR$(1);

Decimal 27 92 n n

Hex 1B 5C n n

BASIC CHR$(27);"\";CHR$(n1);CHR$(n2);

ESC ^

PRINT SINGLE CHARACTER FROM ALL CHARACTERS CHART
The next character received is printed from the all character chart.

Decimal 27 94

Hex 1B 5E

BASIC CHR$(27);"^";

ESC :

SET 12 CPI PRINTING - Sets the printer to 12 cpi (6 cpi if double-wide is enabled). DC2 resets to 10 cpi.

Decimal 27 58

Hex 1B 3A

ESC | T n1 n2 m1 m2 m3 m4 m5

SELECT CODE PAGE - Selects international character sets. The default is IBM PC Multilingual Set 2.

n1 = Always 5 (The number of m parameters used.)
n2 = Always 0

m1, m2, and m5 are always zero.

m3 = See chart below.
m4 = See chart below.

m3 m4 International Character Set

7E	21	DEC Multinational
7F	21	Roman 8
8F	21	ISO 8859-1 Latin Alphabet #1
93	21	ISO 8859-5 Latin/Cyrillic
B5	01	IBM PC Set 2 USA (Microsoft Code Page 437)
52	03	IBM PC Multilingual Set 2 (MS Code Page 850)
54	03	Microsoft Code Page 852 (Slavic)
57	03	Microsoft Code Page 855 (Cyrillic)
5F	03	Microsoft Code Page 863 (French Canadian)

(The examples below show the m3 and m4 values for selecting Roman 8.)

Decimal 27 91 84 5 0 0 0 127 33 0

Hex 1B 5B 54 05 00 00 00 7F 21 00

BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);CHR$(0);
CHR$(127);CHR$(33);CHR$(0);

ESC 0

SET 8 LINES PER INCH - Sets the line spacing to 1/8 of an inch (8 lpi).

Decimal 27 48

Hex 1B 30

BASIC CHR$(27);"0";

ESC 1

SET 7/72 LPI LINE SPACING - Sets the line spacing to 7/72 of an inch (10.3 lpi).

Decimal 27 49

Hex 1B 31

BASIC CHR$(27);"1";

ESC 2

START TEXT LINE SPACING - Activates the line spacing stored by the last ESC A, or sets 6 lpi if no ESC A command has been received.

Decimal 27 50

Hex 1B 32

BASIC CHR$(27);"2";

ESC 3 n

SET GRAPHICS LINE SPACING - Sets the line spacing to n units of 1/216 inch. This allows for line spacing in .0046 inch increments to 1.18 inches (255/216). The value of n/216 is rounded up to the next 1/144 inch.

n = 1 through 255

Example: ESC 3 (27)\unul - Sets the line spacing to 1/8 inch, or 27/216.

Decimal 27 51 n

Hex 1B 33 ___

BASIC CHR$(27);"3";CHR$(n);

ESC 4

SET TOP OF FORM - Sets current paper position as top of form.

Decimal 27 52

Hex 1B 34

BASIC CHR$(27);"4";

ESC 5 n

AUTOMATIC LINE FEED - Printer automatically does a line feed after receiving a carriage return.

n = 0, disabled
n = 1, enabled

Decimal 27 53 n

Hex 1B 35 __

BASIC CHR$(27);"5";CHR$(n);

ESC 6

SELECT CHARACTER SET 2 - All characters (printable and control codes) received after this command are selected from character set 2. A reset, initialization, or ESC 7 resets to character set 1.

Decimal 27 54

Hex 1B 36

BASIC CHR$(27);"6";

ESC 7

SELECT CHARACTER SET 1 - All characters (printable and control codes) received after this command are selected from character set 1. Also, in this chapter, see ESC 6.

Decimal 27 55

Hex 1B 37

BASIC CHR$(27);"7";

ESC A n

STORES n/72 INCH LINE SPACING - The text line spacing is stored, although not set for use, to the value n in units of 1/72 inch. An ESC 2 must be sent to start this line spacing. Valid parameter values are 1 through 85.

Decimal 27 65 n

Hex 1B 41 ___

BASIC CHR$(27);"A";CHR$(n);

ESC B n1 n2...n64 0

SET VERTICAL TAB STOPS - This sequence sets up to 64 vertical tabs by line number. The tabs must be in ascending order and the sequence must end with a NUL. ESC B NUL clears all tab stops. These tabs are stored as absolute values, so they are not affected by changes in lpi settings. This command resets any previously set tab stops.

Variable n represents values 1 through 254.

Decimal 27 66 n1...n64 0

Hex 1B 42 ___ ... __ 00

BASIC CHR$(27);"B";CHR$(n1);... CHR$(nk);CHR$(0);

ESC C n

SET FORM LENGTH IN LINES - The value of n sets the form length in lines using the current line spacing setting. The maximum length is 22 inches (176 lines for 8 lpi, etc.). Top of form is set to the current form position. Once set, changing the line spacing has no effect on form length.

Decimal 27 67 n

Hex 1B 43 __

BASIC CHR$(27);"C";CHR$(n);

ESC C 0 n

SET FORM LENGTH IN INCHES - The value of n sets the form length from 1 to 22 inches. Top of form is set at the current vertical position. Once set, changing the line spacing has no effect on form length.

Decimal 27 67 0 n

Hex 1B 43 00 __

BASIC CHR$(27);"C";CHR$(0);CHR$(n);

ESC D n1...n28 0 — SETS HORIZONTAL TAB STOPS - Sets horizontal tab stops at the positions specified "n", expressed in columns at the current cpi. Once set, changing the cpi has no effect on the tab positions. ESC D NUL clears all tab stops. Tab stops must be specified in ascending order.

If more than 28 parameters are specified, the command is terminated.

Decimal 27 68 n1...n28 0

Hex 1B 44 ___...___ 0

BASIC CHR$(27);"D";CHR$(n1);...CHR$(n28);CHR$(0);

ESC E — START EMPHASIZED PRINT

Decimal 27 69

Hex 1B 45

BASIC CHR$(27);"E";

ESC F — STOP EMPHASIZED PRINT

Decimal 27 70

Hex 1B 46

BASIC CHR$(27);"F";

ESC G — START DOUBLE-STRIKE PRINT

Decimal 27 71

Hex 1B 47

BASIC CHR$(27);"G";

ESC H — STOP DOUBLE-STRIKE PRINT

Decimal 27 72

Hex 1B 48

BASIC CHR$(27);"H";

ESC I n

SELECT PRINT MODE

n = 0 selects Draft Resident, USA
n = 1 selects Draft 12 CPI (Fast) Resident, USA
n = 2 selects NLQ Resident, USA
n = 3 selects NLQ II (Courier) Resident, USA
n = 4 selects Draft Download, Multi/USA
n = 5 selects Draft 12 CPI (Fast) Download, Multi/USA
n = 6 selects NLQ Download, Multi/USA
n = 7 selects NLQ II (Courier) Download, USA
n = 8 selects Draft Download, USA
n = 9 selects Draft 12 CPI (Fast) Download, USA
n = 10 selects NLQ Download, USA
n = 11 selects Alternate NLQ II Resident (Italic), USA
n = 12 selects Draft Download, Multi/USA
n = 13 selects 12 CPI (Fast) Download, Multi/USA
n = 14 selects NLQ Download, Multi/USA
n = 15 selects Alternate NLQ II (Italic), Download, USA

Decimal 27 73 n

Hex 1B 49 __

BASIC CHR$(27);"I";CHR$(n);

ESC J n

VARIABLE LINE FEED - This command advances the paper a distance specified by the value of n in units of 1/216 inch. The value "n" can be a value from 0 to 255. The variable line feed is not stored, so there is no effect on line spacing values.

Decimal 27 74 n

Hex 1B 4A __

BASIC CHR$(27);"J";CHR$(n);

ESC N n

SET SKIP PERFORATION - Sets the perforation skipover to n lines. ESC N is reset when the form length is changed. Valid parameter values are 1 - 255.

The printer converts the number of lines (n) to inches using the current line spacing and saves the skip distance in inches. The skip perforation distance does not change when you change line spacing. Also, in this chapter see ESC O.

Decimal 27 78 n

Hex 1B 4E __

BASIC CHR$(27);"N";CHR$(n);

ESC O

CANCEL SKIP PERFORATION - Resets the skip perforation value to zero lines.

Decimal 27 79

Hex 1B 4F

BASIC CHR$(27);"O";

ESC P n

SELECT PROPORTIONAL SPACING

If n = odd number, proportional print enabled.

If n = even number, proportional print disabled.

Decimal 27 80 n

Hex 1B 50 __

BASIC CHR$(27);"P";CHR$(n)

ESC Q n

DESELECTS IBM PROPRINTER (PARALLEL INTERFACE ONLY) Stops printer from accepting data from the host. The host must reset the printer or select it using DC1. This sequence is intended for diagnostic purposes only. The variable (n) is 22.

Decimal 27 81 22

Hex 1B 51 16

BASIC CHR$(27);"Q";CHR$(22)

ESC R

SET ALL TABS TO POWER ON SETTINGS - Sets horizontal tabs every eight positions starting at column 9 and clears all vertical tabs.

Decimal 27 82

Hex 1B 52

BASIC CHR$(27);"R";

ESC S n

SET SUPERSCRIPT/SUBSRIPT ON - If "n" is 1, subscript (1/2 inch below the line) is selected; if it is 0, then superscript (1/2 inch above the line) is selected. Since these two attributes are mutually exclusive, an ESC S command overrides any previous ESC S setting. In this chapter, see ESC T.

n = 1, subscript
n = 0, superscript

Decimal 27 83 n

Hex 1B 53 __

BASIC CHR$(27);"S";CHR$(n);

ESC T

CANCEL SUPERSCRIPT/SUBSCRIPT - Returns to previous baseline position. Also, in this chapter see ESC S.

Decimal 27 89

Hex 1B 54

BASIC CHR$(27);"T";

ESC U n

SET UNIDIRECTIONAL PRINTING

n = 0, unidirectional printing is turned off
n = 1, unidirectional printing is turned on

Decimal 27 85

Hex 1B 55

BASIC CHR$(27);"U";CHR$(n);

ESC W n

SET DOUBLEWIDE PRINT ON/OFF - When enabled, printable characters are printed twice their current width. This sequence has precedence over the SO control code.

n = 1, doublewide is enabled
n = 0, doublewide is disabled

Decimal 27 87 n

Hex 1B 57 __

BASIC CHR$(27);"W";CHR$(n);

ESC X n m

SET HORIZONTAL MARGINS - This sequence sets the left (n) and right (m) margins. The interval is based on the current cpi setting. Variable (m) must be greater than (n), and the sequence must include both variables.

Decimal 27 88 n m

Hex 1B 5B __ __

BASIC CHR$(27);"X";CHR$(n);CHR$(m)

Proprinter Dot Graphics

Dot graphics allows you to print individual dots at any position on the page.

The Proprinter doesn't adjust the line feed increment automatically on entering graphics. If you want contiguous vertical graphics, then you must set the line feed increment to 8/72 inch before starting graphics and then reset it when you are finished.

An IBM graphics control sequence starts with an escape combination that sets the graphics density (ESC K,L,Y, or Z), followed by a 2-byte header that shows the number of subsequent bytes that are to be interpreted as graphics data. The format of the sequence is:

ESC (density) (n1) (n2) (data) . (data)

Since this control sequence has no terminator, you need to specify exactly in the header the number of bytes that you want to be interpreted as graphics. If there are fewer graphics data bytes than specified in the header, then the printer treats subsequent text and control codes as graphics. In that case, carriage returns and line feeds are often ingested as graphics data.

On the other hand, if there are more graphics data bytes than specified in the header, then the printer interprets excess bytes as text or control codes. This can also produce very interesting results.

The two bytes (n1, n2) specify the total number of image bytes that follow; n2 is the most significant byte.

The total number of image data bytes = n1 + (n2 * 256)

EXAMPLE: to print 5 inches of graphics at ESC K density, which is 60 dpi, then:

total bytes = 5 inches x 60 dpi = 300

n1 = total bytes modulo 256; in other words,
n1 = total bytes - (n2 * 256)
n1 = 300 - (1 * 256)
n1 = 44

n2 = integer (total bytes/256)
n2 = integer (300/256) = 1

The sequence sent to the printer (shown in BASIC) would look like:

```
CHR$(27);CHR$"K";CHR$(44);CHR$(1);CHR$(v1);. . . CHR$(v300);
```

where v1 through v300 are image data bytes.

Proprinter Dot Graphics (continued)

Each image data byte represents a vertical column of eight dots. The most significant bit of the byte controls the top dot of a column, and the least significant bit controls the bottom dot of that column. The first byte of data (v1) is the first column, (v2) is the second column, and so on. The illustration below shows byte values of various dot combinations.

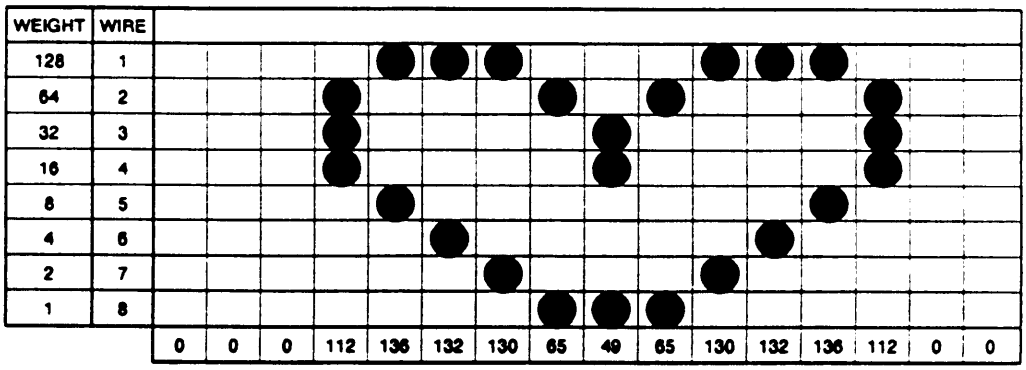


Image Byte Values

```
100 WIDTH "LPT1:",255
110 FOR N = 1 TO 4
115   LPRINT CHR$(27);"K";CHR$(80);CHR$(0);
120   FOR K = 1 TO 5
140     LPRINT CHR$(0);CHR$(0);CHR$(0);CHR$(112);
150     LPRINT CHR$(136);CHR$(132);CHR$(130);
160     LPRINT CHR$(65);CHR$(49);CHR$(65);
170     LPRINT CHR$(130);CHR$(132);CHR$(136);
180     LPRINT CHR$(112);CHR$(0);CHR$(0);
190   NEXT K
200 LPRINT
210 NEXT N
220 LPRINT"DONE"
230 END
```

ESC K n1 n2 v1...vn

NORMAL DENSITY GRAPHICS - Sets a density of 60 dpi horizontally and 72 dpi vertically.

Decimal 27 75 n1 n2 v1...vn

Hex 1B 4B ___ ___ ___ . ___

BASIC CHR$(27);"K";CHR$(n1);CHR$(n2);CHR$(v1);

ESC L n1 n2 v1...vn

LOW SPEED DOUBLE DENSITY GRAPHICS - Sets a density of 120 dpi horizontally and 72 dpi vertically.

Decimal 27 76 n1 n2 v1...vn

Hex 1B 4C ___ ___ ___ . ___

BASIC CHR$(27);"L";CHR$(n1);CHR$(n2);CHR$(v1)

ESC Y n1 n2 v1...vn

HIGH SPEED DOUBLE DENSITY GRAPHICS - Sets a density of 120 dpi horizontally and 72 dpi vertically. If horizontally adjacent dots are specified, then the second dot is not printed.

Decimal 27 89 n1 n2 v1...vn

Hex 1B 59 ___ ___ ___ . ___

BASIC CHR$(27);"Y";CHR$(n1);CHR$(n2);CHR$(v1)

ESC Z n1 n2 v1...vn

QUADRUPLE DENSITY GRAPHICS (REDUCED SPEED) - Sets a density of 240 dpi horizontally and 72 dpi vertically. If horizontally adjacent dots are specified, then the second dot is not printed.

Decimal 27 90 n1 n2 v1...vn

Hex 1B 5A ___ ___ ___ . ___

BASIC CHR$(27);"Z";CHR$(n1);CHR$(n2);CHR$(v1)

Chapter 7 - Epson FX-286e Emulation

Introduction

Conventions Used in this Chapter

- In contrast to ANSI, where an argument is expressed as an ASCII decimal integer, FX-286e control sequences take binary arguments. For example, the control sequence to set form length in lines is:

  ESC C (n)

The sequence to set a 66-line form, expressed in BASIC, would be:

```
LPRINT CHR$(27);"C";CHR$(66);
```

which could alternately be expressed as:

```
LPRINT CHR$(27);"CB";
```

- But when arguments 1 and 0 are used to turn something on and off, you can send the argument in either binary or ASCII. For example, you can turn underline on by sending:

  CHR$(27);CHR$(45);CHR$(1);

  or, you can send

  CHR$(27);CHR$(45);"1";

- The physical spaces in the escape sequences shown in this publication are only for clarification purposes and are not used in the actual string.

  If a space is actually needed in the sequence, it will be shown as SP.

Print Mode Combinations

The chart below shows those print modes that can be used together and those that cannot. When an FX-286e command is received to turn on two print modes that are incompatible, one of them will take precedence over the other one. This is indicated in the chart below by showing the letter of the higher precedence mode at the intersection of the two modes. For example, when combining the double-high and compressed modes (an impossible combination), the double-high mode, represented by the letter "D" at the intersection of the two modes, will take precedence and become the active print mode. Compatible print modes are represented by a plus (+) sign. Duplications are represented by a minus (-) sign.

PRINT MODE		N	C	E	Q	S	W	U	O	D	P	I
Normal	(N)	-	C	+	Q	+	+	+	+	+	+	I
Compressed*	(C)	C	-	+	C	+	+	+	+	D	P	+
Emphasize	(E)	+	+	-	+	+	+	+	+	+	+	+
NLQ	(Q)	Q	+	+	-	+	+	+	+	+	+	+
Super/Sub	(S)	+	+	+	S	-	+	+	+	D	+	+
Double Width	(W)	+	+	+	+	+	-	+	+	+	+	+
Underline	(U)	+	+	+	+	+	+	-	+	+	+	+
Double Strike	(O)	+	+	+	Q	+	+	+	-	+	+	+
Double High	(D)	+	D	+	+	D	+	+	+	-	+	+
Proportional	(P)	+	P	+	+	+	+	+	+	+	-	+
Italics	(I)	I	+	+	I	+	+	+	+	+	+	-

*Both 17.1 and 20 cpi use a special font that has dot densities of 120 dpi horizontal and 72 dpi vertical.

Software Printer Straps

STRAPPING OPTIONS A1-A40

These printer straps are pre-set whenever the FX-286e emulation is selected and return to their previous state upon exit from the FX-286e emulation. These straps are not accessible for change from the control panel program menu while the FX-286e emulation is active.

STRAPPING OPTIONS (C17-C32)

These straps apply to the FX-286e emulation only. They can be changed through the control panel Program Mode menu. See Appendix G for definitions of these strapping options.

Factory Default Strap Settings

Following a printer initialization (ISU) from the control panel, the printer is reset to its original configuration as it was shipped from the factory. The following are the factory default strap settings for the FX-286e emulation.

Strap	Function	State	Setting
C17	Condensed/Normal print	Normal	C17=0
C18	Slashed zero	Disabled	C18=0
C19	Code page or italics 7-bit	Italics	C19=0
C20	Print quality (draft/NLQ)	Draft	C20=0
C21	Form length	11-inch	C21=0
C22	Perforation skip	None	C22=0
C23	LF at CR	Disabled	C23=0
C24	Non-Descender (Q ; , _)	Enabled	C24=1
C25-C29	International Substitution	USA	C25-C29=0

The following characteristics are not controlled by straps. Their factory default settings are as follows:

- Character pitch is 10 cpi.
- Line pitch is 6 lpi.
- All font modifier attributes off (double-wide, double-high, emphasized, condensed, double-strike, italics, and proportional).
- Horizontal tabs set at every eight columns.
- All vertical tabs cleared and vertical tab channel zero is selected.
- Left margin set to the first horizontal print position and right margin set to 132 (at the default 10 cpi).
- Top of form is current vertical position.
- Top and bottom margins and top of form offset is 0.
- All internal buffers cleared.
- Code page is 437.
- The current horizontal position becomes the left margin.
- All interface signals are reset.
- Top of form is current print position.
- All other modes, such as graphics, are off or inactive.

Functional Differences

The following is a list of functional differences between this printer's emulation and the FX-286e printer.

- The maximum line length is 13.2 inches/132 columns at 10 cpi/792 graphics columns per line at 60 dpi
- Special enhanced print modes are not available when the "paper low" condition is reached.
- The number of characters that can be discarded by the CAN command is different due to a different buffer size.
- The delete code is discarded.
- The Auto Feed XT function (pin 14 on the parallel interface connector) is not implemented.
- Double-wide and double-high print characters appear to have wider dots due to offset printing.
- Adjacent dots can be printed when ESC Y or ESC Z graphics are selected. This provides a sharper image of higher density.
- All 12 dot rows will print when using 12-high characters in superscript or subscript.
- Superscript characters are not underlined in a different dot row.
- Even though the escape sequence and data to print nine-bit graphics is accepted, the data byte containing the ninth bit is discarded and only the top eight bits of data are printed.
- Thirteen different international character sets can be selected via software straps.
- Horizontal densities available are 60, 120, and 240 dpi. When 72 dpi is received, it is converted to 60 dpi. When densities of 80, 90, or 144 are received, they are converted to 120 dpi.
- The widths of the proportional characters are slightly different.
- The Courier NLQ font is used for "ROMAN".
- The Gothic font is used for "SANS SERIF".
- The italic font prints only in NLQ.
- The character graphics font prints only in draft.
- All condensed printing uses a special Gothic-enhanced font (120 dpi horizontal by 72 dpi vertical).

Additional Escape Sequences

The following escape sequences are supported by this emulation, but are not part of the FX-286e command set:

ESC (t	Assign a code page to one of four variables (0,1,2, or 3)
ESC [T	Assign a code page to variable "1"
ESC j (n)	Reverse n/216 paper move

Unsupported Escape Sequences

The following escape sequences from the FX-286e command set are not supported by this emulation and are therefore discarded:

ESC EM	Sheet feeder
ESC %	User-defined character set
ESC &	User-defined characters
ESC 8	Paper out sensor on
ESC 9	Paper out sensor off
ESC :	Copy ROM to RAM
ESC a	NLQ justification

FX-286e Control Codes

BEL — Bell (07H) - Sounds the beeper.

BS — Back Space (08H) - Flushes all print data and then moves the print position one character width to the left based on the current character spacing. If this code is received immediately after graphic printing, the print position of subsequent data is moved back to the point at which graphic printing started.

CAN — Cancel (18H) - Causes all printable data received since the last line terminator or escape sequence, whichever occurred later, to be deleted. Data on previous lines that has been auto-wrapped will not be deleted. This code is a line terminator. The current print position will be retained. Also, cancels the double width print mode initiated by the SO control code.

CR — Carriage Return (0DH) - Flushes all print data and positions the print position at the left margin for subsequent printable data to be printed. This code is a line terminator and will terminate the double width print mode initiated by a received SO code.

DC1 — Device Control 1 (11H) - Causes printing to resume after the printer has been deselected by a DC3 code. It will not resume printing if printer was halted by pressing the On Line key on the control panel.

DC2 — Device Control 2 (12H) - Cancel condensed mode. Ends the current print buffer and causes its contents to print. The condensed print mode is then canceled and printing resumes at 10 cpi (5 cpi double-wide) or 12 cpi (6 cpi double-wide) depending on which one was previously selected.

DC3 — Device Control 3 (13H) - **Serial Interface:** Deselect printer. The printer can be selected again by a DC1 command or by the online key. **Parallel Interface:** Treated the same as the NUL control code.

DC4 — Device Control 4 (14H) - Cancels double width printing initiated by a SO control code or ESC SO escape sequence and returns to the previously selected print compression (pica, compressed, or elite). Does not cancel double width printing selected by ESC W or ESC !.

DEL — Delete (7FH) - The delete character is discarded unless it is made printable via the ESC 6 code expansion sequence.

FX-286e Control Codes (continued)

ESC — Escape (1BH) - Introduces an escape sequence. It implies that subsequent code(s) will be interpreted by the printer as a printer command, not printable data.

FF — Form Feed (0CH) - Moves the print position to the top of the next form at the left margin. This code is a line terminator and will terminate the double width printing mode initiated by a received SO code. All print data is flushed before the form feed occurs.

HT — Horizontal Tab (09H) - If there are tabs set, this code ends the current print buffer and causes its contents to be printed. The horizontal print position moves right to the next horizontal tab stop position. Any tab that causes the current print position to exceed the right print limit, or right margin, will cause a line wrap to occur (CR,LF). Tab positions are absolute. If the character spacing changes, tab positions remain in the same absolute horizontal positions. If there is no tab set between the current print position and the print limit, the tab is ignored and the current print buffer is not affected.

LF — Line Feed (0AH) - Flushes all print data and then advances the paper up one line as determined by the current line spacing. The print position is moved to the left margin. This code is a line terminator and will terminate the double width printing mode initiated by a received SO code. If paper positioning causes the next line to exceed the form length, an automatic form feed will occur.

NUL — Null (00H) - Causes no action when received alone. It is used by some sequences to terminate the parameter list.

SI — Select In (0FH) - Select condensed print mode. Ends the current print buffer and causes its contents to be printed. This code then enables the condensed printing mode. Characters are condensed to 17.1 cpi for the pica pitch (10 cpi) and 20 cpi for the elite pitch (12 cpi). Both the 17.1 cpi and 20 cpi condensed mode produces printing with a 120 dpi horizontal resolution and a 72 dpi vertical resolution font.

Double-wide [by SO, ESC ! (n), or ESC W commands] together with 17.1 cpi produces printing at approximately 8.6 cpi. With 20 cpi, the resulting print will be approximately 10 cpi.

The condensed print mode can be selected but not activated while the proportional print mode is active.

SO

Shift Out (0EH) - Select double-wide printing by line. Ends the current print buffer and causes its contents to be printed. This code then starts double-wide printing for subsequent characters until a line terminator, DC4, ESC ! (n), or ESC W NUL command is received. Characters are elongated to twice their current width; that is, expanded to take up two character positions each. The tab positions are not changed.

If the double-wide print mode is already active by an ESC W or ESC ! (n) sequence, the SO code is ignored and the escape sequence takes control.

VT

Vertical Tab (0BH) - Ends the current print buffer and causes its contents to be printed. A CR function is always performed upon receipt of a VT code. The VT code then advances the paper vertically to the next vertical tab position in the channel selected by the ESC / sequence. If no channel has been selected, channel zero is used.

Following power-up or initialization, the eight vertical tab channels are in an initialized state (no tabs have been inserted into a specific channel nor has the tab erase command been received). If a VT code is received at this time, a vertical move equal to the current line spacing is performed. If the command to erase tabs is received (ESC B NUL or ESC bn NUL), received VT codes will produce no vertical motion but will cause a CR to occur.

A maximum of 16 vertical tab positions are allowed for each of the eight channels. If there are tabs in the currently selected table, but no tabs set beyond the current line, a vertical tab will cause paper to advance to the top margin of the next form.

When a vertical tab would cause the printer to exceed the current form length (minus any perforation skip distance) the vertical tab will act as a form feed.

Vertical tabs are converted to absolute positions when set. Future changes in line spacing will not change the position of the vertical tabs.

FX-286e Escape Sequences

Sequence	Meaning	Page
ESC SO	Select double-wide print mode	7-22
ESC SI	Select condensed print mode	7-15
ESC SP (n)	Set inter-character space	7-16
ESC ! (n)	Master print mode select	7-24
ESC #	Cancel MSB (most significant bit control)	7-30
ESC $ (n1)(n2)	Set absolute print position	7-19
ESC - (n)	Turn underlining ON/OFF	7-20
ESC / (n)	Select vertical tab channel	7-17
ESC 0	Select 1/8-inch line spacing	7-14
ESC 1	Select 7/72-inch line spacing	7-13
ESC l (n)	Set left margin	7-13
ESC 2	Select 1/6-inch line spacing	7-14
ESC 3 (n)	Select n/216-inch line spacing	7-14
ESC 4	Select italic print mode	7-23
ESC 5	Cancel italic print mode	7-23
ESC 6	Printable code area expansion	7-24
ESC 7	Cancel printable code area expansion	7-24
ESC <	Select unidirectional mode (1 line)	7-18
ESC =	Set most significant bit (MSB) to zero	7-30
ESC >	Set most significant bit (MSB) to one	7-30
ESC @	Initialize printer	7-30
ESC A (n)	Select n/72-inch line spacing	7-14
ESC B (n1)	Set vertical tab stops	7-16
ESC C (n)	Set page length in lines	7-12
ESC C NUL (n)	Set page length in inches	7-12
ESC D (n1)(n2)... NUL	Set horizontal tab stops	7-16
ESC E	Select emphasized mode	7-20

(continued)

FX-286e Escape Sequences (continued)

Sequence	Meaning	Page
ESC F	Cancel emphasized mode	7-21
ESC G	Select double-strike mode	7-21
ESC H	Cancel double-strike mode	7-21
ESC I (n)	Printable code area expansion	7-25
ESC J (n)	Single variable line feed	7-17
ESC K (n1)(n2) (v1). . . (vn)	Normal density graphics	7-33
ESC L (n1)(n2) (v1). . . (vn)	Low speed double density graphics	7-33
ESC M	Select elite pitch	7-15
ESC N (n)	Set skip-over perforation	7-12
ESC O	Cancel skip-over perforation	7-13
ESC P	Select pica pitch	7-15
ESC Q (n)	Set right margin	7-13
ESC R (n)	Select the international character set	7-27
ESC S (n)	Select superscript/subscript printing	7-21
ESC T	Cancel superscript/subscript printing	7-22
ESC U (n)	Turn unidirectional printing mode ON/OFF	7-18
ESC W (n)	Turn double-wide printing mode ON/OFF	7-22
ESC Y (n1)(n2) (v1). . . (vn)	High speed double density graphics	7-33
ESC Z (n1)(n2) (v1). . . (vn)	Quadruple density graphics	7-33
ESC \ (n1) (n2)	Set relative print position	7-19
ESC b (c)(n1) (n2). . . NUL	Set vertical tabs in channels 0-7	7-17
ESC k (n)	Select font style	7-25
ESC l (n)	Set left margin	7-13
ESC p (n)	Turn proportional mode ON/OFF	7-15

(continued)

FX-286e Escape Sequences (continued)

Sequence	Meaning	Page
ESC s (n)	Turn half-speed print mode ON/OFF	7-20
ESC t (n)	Select a code page	7-27
ESC w (n)	Turn double-high printing ON/OFF	7-23
ESC x (n)	Select NLQ or Draft printing	7-25
ESC (t 3 0 (m1) (m2)(m3)	Assign a code page to one of four variables (0,1,2, or 3)	7-28
ESC [T (n1)(n2) (m1). . . (m5)	Assign a code page to variable "1"	7-29
ESC * (m)(n1)(n2) (v1). . . (vn)	Select graphics mode	7-34
ESC ? (s)(n)	Reassign graphics mode	7-34
ESC ^ (m)(n1)(n2)	Select 9-pin graphics	7-34

FX-286e Escape Sequences

The FX-286e escape sequences have been separated according to functionality. Special areas of interest such as character spacing, print modes, and graphics have separate sections.

The sequences are separated as follows:

- Margins
- Line Spacing
- Character Spacing
- Tabs (Horizontal and Vertical)
- Paper Movement
- Print Position
- Print Modes
- Special Character Printing
- Miscellaneous Commands
- Dot Graphics

Margins

ESC C (n)

SET PAGE LENGTH IN LINES - Sets the forms length to n lines. The value for form length is stored in inches and will not change when line spacing is changed. This sequence resets the top of form value to the current line position and resets the perforation skip mode. This sequence takes precedence over the setting of printer strap C21. Form lengths of zero or greater than 22 inches are ignored and leave the existing form unchanged. The parameter limits are 1-255.

Decimal 27 67 __

Hex 1B 43 __

Basic CHR$(27);"C";CHR$(n);

ESC C NUL (n)

SET PAGE LENGTH IN INCHES - Sets the forms length from 1 to 22 inches depending on the value for the parameter n. This sequence resets the top of form value to the current line position and resets the perforation skip mode. This sequence takes precedence over the setting of printer strap C21. Form lengths of zero or greater than 22 inches will be ignored and leave the existing form unchanged. The parameter limits are 1-255.

Decimal 27 67 0 __

Hex 1B 43 00 __

Basic CHR$(27);"C";CHR$(0);CHR$(n);

ESC N (n)

SET SKIP-OVER-PERFORATION - Sets a bottom margin region to avoid printing on the perforation when using continuous forms. The parameter n determines the number of print lines to be included in the skip area. This is converted to an absolute distance in inches based on the current line spacing value. Subsequent line spacing changes will not change this setting. When form length is changed (by ESC C NUL n or ESC C n), the skip perforation is cleared. If the skip value exceeds the form's length, it is ignored. A parameter of zero leaves the previous setting unchanged.

Decimal 27 78 __

Hex 1B 4E __

Basic CHR$(27);"N";CHR$(n);

Margins (continued)

ESC O — CANCEL SKIP-OVER-PERFORATION - Resets the skip perforation value to zero.

Decimal 27 79

Hex 1B 4F

Basic CHR$(27);"O";

ESC l (n) — SET LEFT MARGIN - Sets the left margin to n columns in the current cpi. When proportional mode is in effect, the settings are treated as though they were set for pica. Before the new margin is set, all print data is flushed. The minimum space allowed between the left and right margin is the distance equal to the width of one double-wide pica character. This command clears any existing horizontal tabs and installs the defaults (every eight columns).

Decimal 27 108 __

Hex 1B 6C __

Basic CHR$(27);"l";CHR$(n);

ESC Q (n) — SET RIGHT MARGIN - Sets the right margin to n columns in the current pitch. When proportional is selected, the settings are the same as they would be for pica pitch. The minimum space between the left and right margin is the width of two pica characters. Note that before the right margin is set, this command sequence causes all print data to be flushed. Column numbering begins at zero.

If the right margin value is invalid (within the width of two pica characters of the left margin or exceeds the maximum columns), the current margin is unchanged.

This command clears any existing horizontal tabs and installs the defaults (every 8 columns based on the left margin).

Decimal 27 81 __

Hex 1B 51 __

Basic CHR$(27);"Q";CHR$(n);

Line Spacing

ESC 0

SELECT 1/8-INCH LINE SPACING - Sets the line spacing to 1/8 of an inch or 8 lpi.

Decimal 27 48

Hex 1B 30

Basic CHR$(27);"0";

ESC 1

SELECT 7/72-INCH LINE SPACING - Sets the line spacing to 7/72 of an inch.

Decimal 27 49

Hex 1B 31

Basic CHR$(27);"1";

ESC 2

SELECT 1/6-INCH LINE SPACING - Sets the line spacing to 1/6 of an inch.

Decimal 27 50

Hex 1B 32

Basic CHR$(27);"2";

ESC 3 (n)

SELECT n/216-INCH LINE SPACING - Sets the line spacing to n/216 of an inch. This permits line spacing from 0 inches (0/216) to 1.18 inches (255/216). This command is recommended with n=24 to set the proper line spacing when printing graphics.

Decimal 27 51 __

Hex 1B 33 __

Basic CHR$(27);"3";CHR$(n);

ESC A (n)

SELECT n/72-INCH LINE SPACING - Selects and activates n/72-inch line spacing.

Decimal 27 65 __

Hex 1B 41 __

Basic CHR$(27);"A";CHR$(n);

Character Spacing

ESC SI

SELECT CONDENSED PRINT MODE - Performs the same function as the SI control code.

Decimal 27 15

Hex 1B 0F

Basic CHR$(27);CHR$(15);

ESC M

SELECT ELITE PITCH - Selects elite pitch which is 12 cpi.

Decimal 27 77

Hex 1B 4D

Basic CHR$(27);"M";

ESC P

SELECT PICA PITCH - Selects pica pitch which is 10 cpi.

Decimal 27 80

Hex 1B 50

Basic CHR$(27);"P";

ESC p (n)

TURN PROPORTIONAL MODE ON/OFF - Turns the proportional print mode on or off according to the value of the parameter n as follows:

n	**effect**
1	proportional on
0	proportional off

This command overrides the condensed print mode.

Decimal 27 112 __

Hex 1B 70 __

Basic CHR$(27);"p";CHR$(n);

Character Spacing (continued)

ESC SP (n) SET INTERCHARACTER SPACE - Sets the amount of space added to each character in increments of 1/120 inch. This amount of space is added to the amount already allocated in the character's design. Parameter limits are 0-63 (decimal).

Decimal 27 32 __

Hex 1B 20 __

Basic CHR$(27);CHR$(32);CHR$(n);

Tabs

ESC B (n1)... (n16) NUL 0 SET VERTICAL TAB STOPS - Sets up to 16 vertical tabs in channel at the indicated line numbers in the current line spacing. The list of tab stops must be terminated by the NUL code. Any line that is not referenced in the list is cleared by this command. Therefore, the command sequence ESC B NUL will clear all vertical tab stops. The parameters n1, n2, ... must be in ascending order and the limits of the parameters are 1-255.

Vertical tabs are converted to absolute positions as they are set. Future changes in line spacing will not change the position of the tabs.

Decimal 27 66 __ __ ... 0

Hex 1B 42 __ __ ... 00

Basic CHR$(27);"B";CHR$(n1);CHR$(n2);... CHR$(0);

ESC D (n1)... (n32) NUL SET HORIZONTAL TAB STOPS - Sets up to 32 horizontal tab stops at the indicated column numbers. The list of tab stops must be terminated by the NUL code. Any column which is not referenced in the list is cleared by this command. Therefore, the command ESC D NUL will clear all horizontal tabs. The parameters must be in ascending order. If any tab is in descending order, the command is assumed to be terminated. If more than 32 tabs are sent to be set, all subsequent data is ignored until the NUL is decoded.

Decimal 27 68 __ __ ... 0

Hex 1B 44 __ __ ... 00

Basic CHR$(27);"D";CHR$(n1);CHR$(n2);... CHR$(0);

Tabs (continued)

ESC / (n) — SELECT VERTICAL TAB CHANNEL - Selects the vertical tab channel. All subsequent vertical tab commands (VT) will then use this channel.

Decimal 27 47 __

Hex 1B 2F __

Basic CHR$(27);"/";CHR$(n);

ESC b (c) (n1)(n2).. ... NUL — SET VERTICAL TABS IN CHANNELS 0 THROUGH 7 - Sets vertical tab stops in any one of 8 vertical tab channels numbered 0 through 7. This allows you to set up to 8 different groups of vertical tabs. The list of tab stops must be terminated by the NUL code. Any line that is not referenced in the list is cleared by this command. Therefore, the command sequence ESC b (c) NUL will clear all vertical tab stops within the channel c. The parameters n1, n2, ... must be in ascending order and the limits of the parameters are 1-255.

Vertical tabs are converted to absolute positions as they are set. Future changes in line spacing will not change the position of the tabs.

Decimal 27 98 __ __ __ ... 0

Hex 1B 62 __ __ __ ... 00

Basic CHR$(27);"b";CHR$(c);CHR$(n1);CHR$(n2).. CHR$(0);

Paper Movement

ESC J (n) — SINGLE VARIABLE LINE FEED - Causes the contents of the print buffer to print. The print position is then moved down the page the amount specified by the parameter in 1/216-inch increments. This sequence does not affect spacing of future line actions. The parameter values allow a vertical move from 0 (0/216) inches to 1.18 (255/216). If n is not an exact multiple of three (3/216 = 1/72 inch), the movement is approximate. The parameter n = 24 can be used to get the exact line spacing needed for the eight-bit graphics mode.

Zero is a valid parameter value which produces no vertical motion.

spacing	**n**
7 dots	21
8 dots	24
8 lpi	27
6 lpi (12 dots)	36

Paper Movement (continued)

ESC J (n) SINGLE VARIABLE LINE FEED (continued)

Decimal 27 74 __

Hex 1B 4A __

Basic CHR$(27);"J";CHR$(n);

Print Position

ESC < SELECT UNIDIRECTIONAL MODE (1 LINE) - Forces unidirectional print, from right to left, in the line in which this command is embedded. Unidirectional printing begins with the first character following receipt of this command and is canceled by a carriage return.

Decimal 27 60

Hex 1B 3C

Basic CHR$(27);"<";

ESC U (n) TURN UNIDIRECTIONAL PRINTING MODE ON/OFF - Causes the printer to print in only one direction (prints with the shuttle moving from right to left) or in both directions according to the value of parameter n as follows:

n	effect
1	unidirectional on
0	unidirectional off

When turning unidirectional printing off, the command should be the first character in the line to be printed bidirectionally.

Decimal 27 85 __

Hex 1B 55 __

Basic CHR$(27);"U";CHR$(n);

Print Position (continued)

ESC $ (n1)(n2) SET ABSOLUTE PRINT POSITION - Specifies the distance from the current left margin where subsequent characters are to be printed. If the position specified is beyond the right margin, this command sequence is ignored and the previous settings remain in effect. Argument units are 1/60 inch, expressed as n1 + (n2 x 256).

Example: To establish a position 6.3 inches from the left margin:

6.3 x 60 = 378 (total number of 1/60-inch increments)
378/256 = 1 with a remainder of 122
n1 = 122
n2 = 1

Expressed in BASIC this is:

CHR$(27);"$";CHR$(122);CHR$(1);

Decimal 27 36 __ __

Hex 1B 24 __ __

Basic CHR$(27);"$";CHR$(n1);CHR$(n2);

ESC \ (n1) (n2) SET RELATIVE PRINT POSITION - Sets the position where next printing will occur relative to the current print position. Parameters n1 and n2 are in 1/120-inch increments and are expressed as n1 + (n2 x 256). Parameter limits for n1 and n2 are 0-255.

Example 1: If you want to move 4 inches to the right, then:

4 x 120 = 480 (total number of 1/120-inch increments)
480/256 = 1 with a remainder of 224
n1 = 224
n2 = 1

Expressed in BASIC, this is:

CHR$(27);CHR$(92);CHR$(224);CHR$(1);

Example 2: If you want to move 4 inches to the left, then:

65,536 - 480 = 65,056
65,056/256 = 254 with a remainder of 32
n1 = 32
n2 = 254

Expressed in BASIC, this is:

CHR$(27);CHR$(92);CHR$(32);CHR$(254);

Decimal 27 92 __ __

Hex 1B 5C __ __

Basic CHR$(27);CHR$(92);CHR$(n1);CHR$(n2);

Print Position (continued)

ESC s (n) TURN HALF-SPEED PRINT MODE ON/OFF - Turns the half-speed print mode on or off according to the value of the parameter n below. Half speed printing is accomplished by only printing when the shuttle is moving from right to left.

n	effect
1	half-speed on
0	half-speed off

Decimal 27 115 __

Hex 1B 73 __

Basic CHR$(27);"s";CHR$(n);

Print Modes

ESC - (n) TURN UNDERLINING ON/OFF - Enables or disables automatic underlining depending on the parameter n as follows:

n	effect
1	enable underline
0	disable underline

The underline will be positioned on dot row 9 of draft characters and row 18 of NLQ characters. Block characters (ASCII 176-223, 244, and 245) will not be underlined.

Decimal 27 45 __

Hex 1B 2D __

Basic CHR$(27);CHR$(45);CHR$(n);

ESC E SELECT EMPHASIZED MODE - Causes subsequent printing to be emphasized. The print speed is half of the normal speed because the characters are printed twice. The second pass is offset about 1/120-inch for draft fonts and 1/240-inch for NLQ fonts.

Decimal 27 69

Hex 1B 45

Basic CHR$(27);"E";

Print Modes (continued)

ESC F — CANCEL EMPHASIZED MODE - Cancels the emphasized printing mode turned on by ESC E.

Decimal 27 70

Hex 1B 46

Basic CHR$(27);"F";

ESC G — SELECT DOUBLE-STRIKE MODE - Causes the contents of the print buffer to be printed and starts double strike printing when not in the NLQ mode. Each line of text is printed twice (direct overprint of each dot).

Decimal 27 71

Hex 1B 47

Basic CHR$(27);"G";

ESC H — CANCEL DOUBLE-STRIKE MODE - Cancels the double-strike printing mode turned on by ESC G.

Decimal 27 72

Hex 1B 48

Basic CHR$(27);"H";

ESC S (n) — SELECT SUPERSCRIPT/SUBSCRIPT PRINTING - This sequence ends the current print buffer and causes its contents to be printed. In each mode, the character is shortened to half height and then positioned in the upper (superscript) or lower (subscript) half of the print line. These print modes are mutually exclusive. Selects superscript or subscript printing according to the value of n as follows:

n	**effect**
1	enable subscript
0	enable superscript

Note: The superscript or subscript mode is not allowed when double-high print is selected. Either can be selected during double-high printing but they will not print until the double-high mode is canceled.

Print Modes (continued)

ESC S (n) — SELECT SUPERSCRIPT/SUBSCRIPT PRINTING (continued)

Decimal 27 83 __

Hex 1B 53 __

Basic CHR$(27);"S";CHR$(n);

ESC T — CANCEL SUPERSCRIPT/SUBSCRIPT PRINTING - Cancels the superscript or subscript printing mode. Characters are printed at their normal size and previous baseline positions.

Decimal 27 84

Hex 1B 54

Basic CHR$(27);"T";

ESC SO — SELECT DOUBLE-WIDE PRINTING (1 LINE) - Performs the same function as the SO control code.

Decimal 27 14
Hex 1B 0E

Basic CHR$(27);CHR$(14);

ESC W (n) — TURN DOUBLE-WIDE PRINTING MODE ON/OFF - Turns double-wide printing on or off according to the parameter n as follows:

n	effect
1	double-wide on
0	double-wide off

Note: If double-wide had been turned on previously by the SO control code, this mode is canceled and the ESC W sequence has control.

Decimal 27 87 __

Hex 1B 57 __

Basic CHR$(27);"W";CHR$(n);

Print Modes (continued)

ESC w (n) TURN DOUBLE-HIGH PRINTING ON/OFF - Turns double-high printing on or off according to the value of parameter n as follows:

n	effect
1	double-high on
0	double-high off

Superscript, subscript, and condensed modes are not valid in the double-high mode.

Decimal 27 119 __

Hex 1B 77 __

Basic CHR$(27);"w";CHR$(n);

ESC 4 SELECT ITALIC PRINT MODE - Causes characters to be printed from the Italic set. In the lower section of the character table (range 0-127 decimal), all printable characters will print in the italics mode. In the upper section of the character table (range 128-255), the characters to be printed will be determined by the table selected (either by the ESC t (n) sequence or printer strap C19). If italics has been selected for the upper section, they will be duplicates of the 7-bit italic characters in the lower table (0-127). If, however, an 8-bit code page is selected, the characters will be 128-255 from the specified code page printed in italics.

Decimal 27 52

Hex 1B 34

Basic CHR$(27);"4";

ESC 5 CANCEL ITALIC MODE - This command cancels the italic print mode set by the ESC 4 code.

Decimal 27 53

Hex 1B 35

Basic CHR$(27);"5";

Print Modes (continued)

ESC 6

PRINTABLE CODE AREA EXPANSION - This command enables the printing of codes 128-159 decimal as characters. If the upper section of the character table (range 128-255) has italics selected (ESC t or printer strap C19), the codes 128 through 159 will print from the international substitution characters. If, however, an 8-bit code page has been selected for the upper section of the table, characters will print from the selected code page.

Decimal 27 54

Hex 1B 36

Basic CHR$(27);"6";

ESC 7

CANCEL PRINTABLE CODE AREA EXPANSION - Causes codes 128-159 to be executed as control codes thereby cancelling any previous ESC 6 command.

Decimal 27 55

Hex 1B 37

Basic CHR$(27);"7";

ESC ! (n)

MASTER PRINT MODE SELECT - Selects any valid combination of the printing modes listed below. The parameter n is equal to the sum of the decimal values associated with each mode. Note that pica and elite are mutually exclusive and proportional overrides condensed. Also, pica and elite proportionals are the same. (See "Print Mode Combinations," see page 7-2.)

n	**decimal value**
Pica	0
Elite	1
Proportional	2
Condensed	4
Emphasized	8
Double-strike	16
Double-width	32
Italic	64
Underline	128

Decimal 27 33 __

Hex 1B 21 __

Basic CHR$(27);"!";CHR$(n);

Print Modes (continued)

ESC k (n) SELECT FONT STYLE - Selects the Roman (Courier) typeface if n is 0 and Sans Serif (Gothic) if n is 1. This command will not activate the selection, but sets the style to be activated by the ESC x (n) sequence. Refer to the "Functional Differences" section on page 7-4 for a description of typefaces used.

Decimal 27 107 __

Hex 1B 6B __

Basic CHR$(27);"k";CHR$(n);

ESC x (n) SELECT NLQ OR DRAFT PRINTING - Selects NLQ or draft printing. When selecting NLQ, the style will be the one that was last selected by the ESC k (n) sequence.

n	effect
1	NLQ
0	draft

Decimal 27 120 __

Hex 1B 78 __

Basic CHR$(27);"x";CHR$(n);

Special Character Printing

ESC I (n) PRINTABLE CODE AREA EXPANSION - If n is binary or ASCII one, some ASCII codes between 0-31 and some or all codes between 128-159 inclusive become printable as characters (if ESC 6 has been sent previous to this command, then all of the characters between 128 and 159 inclusive are printable). These characters come from the international character substitution set. Not all control codes between 0 and 31 inclusive can be made printable because if the ESC code became printable. For example, no more escape commands could be received. If the parameter n is binary or ASCII zero, these codes return to the nonprintable state.

Following is a chart showing an executed code between 0 and 31 and between 128 and 159 inclusive. If a control code can never be made into a printable character, the standard symbol for the code is printed instead of its ASCII number. To the right of these codes is the name of the character that is printed. Note that this chart assumes that an ESC 6 command has already been received and that the italics mode has been selected (via ESC t or printer strap C19) for the upper section of the table (range 128-255). Otherwise, control codes such as FF, CR, etc. would be executed in the region 128-159 inclusive instead of printing an international character.

Special Character Printing (continued)

ESC I (n) (continued)

This sequence causes some ASCII codes between 0-31 and some or all codes between 128-159 inclusive to become printable as characters when n is 1. When n is 0, these ASCII codes are nonprinting characters.

Executed ASCII Code

Decimal	(Hex)	Character Printed
0(0)	128(80)	grave a
1(1)	129(81)	grave e
2(2)	130(82)	grave u
3(3)	131(83)	grave o
4(4)	132(84)	grave i
5(5)	133(85)	angstrom
6(6)	134(86)	U. K. pound sign
BEL	135(87)	inverted !
BS	136(88)	inverted ?
HT	137(89)	tilde N
LF	138(8A)	tilde n
VT	139(8B)	int'l monetary sym.
FF	140(8C)	pesetas
CR	141(8D)	angstrom A
SO	142(8E)	angstrom a
SI	143(8F)	cedilla c
16(10)	144(90)	section mark
17(11)	145(91)	eszet
DC2	146(92)	AE diphthong
DC3	147(93)	ae diphthong
DC4	148(94)	slashed O (oh)
21(15)	149(95)	slashed o (oh)
22(16)	150(96)	umlaut accent
23(17)	151(97)	umlaut A
CAN	152(98)	umlaut O (oh)
25(19)	153(99)	umlaut U
26(1A)	154(9A)	umlaut a
ESC	155(9B)	umlaut o
28(1C)	156(9C)	umlaut u
29(1D)	157(9D)	acute E
30(1E)	158(9E)	acute e
31(1F)	159(9F)	yen sign

Decimal 27 73 _

Hex 1B 49 _

Basic CHR$(27);"I";CHR$(n);

Special Character Printing (continued)

ESC R (n) SELECTS THE INTERNATIONAL CHARACTER SET - Selects the international character substitution set for the ASCII codes between 35 and 126 decimal inclusive. Printer straps C25-C29 may also be used to select this character set. The following parameters define which substitution set is selected.

n	country
0	USA
1	France
2	Germany
3	UK
4	Denmark I
5	Sweden
6	Italy
7	Spain I
8	Japan
9	Norway
10	Denmark
11	Spain II
12	Latin America
13	Netherlands
14	Anglo-Universal
15	Spanish America
16	Portugal
17	Africa
18	Switzerland
19	Turkey
20	Greece
21	Yugoslavia

Decimal 27 82 __

Hex 1B 52 __

Basic CHR$(27);"R";CHR$(n);

ESC t (n) SELECT A CODE PAGE - Selects one of four variables which contains a specific code page selection. The four variables are loaded via the ESC (t and the ESC [T sequences. The four variables are identified as 0,1,2, and 3 (either binary or ASCII values). This command overrides the condition set by printer strap C19. Note that italics print can be selected by using the ESC 4 command even if the eight bit code page table has been selected. The four selection variables have the following defaults:

n	effect
0	no code page (italics 0-128 in upper table)
1	USA code page 437
2	no code page (italics 0-128 in upper table)
3	USA code page 437

Special Character Printing (continued)

ESC t (n) SELECT A CODE PAGE (continued)

Decimal 27 116 __

Hex 1B 74 __

Basic CHR$(27);"t";CHR$(n);

ESC (t (n1)(n2) (m1)(m2) (m3) ASSIGN A CODE PAGE TO ONE OF FOUR VARIABLES (0,1,2, or 3) - Assigns a specific code page to one of the four selection variables used by the ESC t (n) sequence (either the binary or ASCII value can be used for m1). Listed below are the values for m2 and m3 required to assign specific code pages to the select variable m1.

Note that this sequence is similar to the ESC [T . . . sequence except that fewer code page choices are available. Also, when using this command, assignments can be made to any of the four different select variables used by the ESC t (n) sequence.

m2	m3	character table
0	0	Italic (0-127)
1	0	Code page 437 (USA)
3	0	Code page 850 (multilingual)
4	0	Code page 851 (Greek)
5	0	Code page 853 (Turkish)
6	0	Code page 855 (Cyrillic)
7	0	Code page 860 (Portuguese)
8	0	Code page 863 (Canada-French)
9	0	Code page 865 (Norway)
10	0	Code page 852 (East Europe)
11	0	Code page 857 (Turkish)
13	0	Code page 864 (Arabic)
14	0	Code page 866 (Russian)
15	0	Code page 869 (Greek)
16	0	USSR GOST (Russian)
1	16	Code page 437 (Greek)

Some code pages might not be available in all font sets. If the sequence specifies a code page that is not currently installed, the sequence is ignored.

Decimal 27 40 116 3 0 __ __ __

Hex 1B 28 74 3 0 __ __ __

Basic CHR$(27);"(t";CHR$(3);CHR$(0);CHR$(m1);CHR$(m2);CHR$(m3);

Special Character Printing (continued)

ESC [T (n1) (n2)(m1) . . . (m5)

ASSIGN A CODE PAGE TO VARIABLE "1" - Assigns a code page to the 1 variable used by the ESC t (n) sequence. Note that this sequence is very similar to the ESC (t . . . sequence except that variable 1 is the only variable that can accept a code page assignment. Also, more code page choices are available by using this sequence rather than the ESC (t . . . sequence.

If a code page is selected that is not supported by the current font set, or an invalid parameter is received, the sequence will be discarded and the multilingual code page will remain unchanged. Some code pages might not be available in a specific set of firmware. If the sequence specifies a code page that is not currently installed, the sequence is ignored.

Parameters n1, n2, and m1 through m3 are discarded by the emulation; however, they must appear in the sequence and represent some value (or zero).

The following table lists the parameters required to select the different code pages.

m4	m3	code page
00	00	No change from current setting
01	B5	Code page 437 (USA)
03	52	Code page 850 (multilingual)
03	53	Code page 851 (Greek)
03	54	Code page 852
03	55	Code page 853 (Turkish)
03	57	Code page 855 (Cyrillic)
03	59	Code page 857
03	5C	Code page 860 (Portuguese)
03	5F	Code page 863 (Canada-French)
03	60	Code page 864 (Arabic)
03	61	Code page 865 (Norway)
03	62	Code page 866 (Russian)
03	63	Code page 867
03	65	Code page 869
21	7C	USSR GOST (Russian)
21	7D	Code page 437 (Greek)
21	7E	DEC multinational (LA-210)
21	7F	Roman 8
21	80	Mazowia (Polish)
21	81	Turkey
21	82	Greece
21	8F	ISO 8859-1 Western Europe
21	90	ISO 8859-2 Eastern Europe
21	91	ISO 8859-3 Southern Europe
21	92	ISO 8859-4 Northern Europe
21	93	ISO 8859-5 Cyrillic
21	94	ISO 8859-6 Arabic
21	95	ISO 8859-7 Greek
21	96	ISO 8859-8 Hebrew
21	97	ISO 8859-9 Southern Europe 2

Special Character Printing (continued)

ESC [T (n1) (n2)(m1) . . . (m5) — ASSIGN A CODE PAGE TO VARIABLE "1" (continued)

Decimal 27 91 84 __ __ . . . __

Hex 1B 5B 54 __ __ . . . __

Basic CHR$(27);"[T";CHR$(n1);CHR$(n2);CHR$(m1);. . . ;CHR$(m5)

Miscellaneous Commands

ESC # — CANCEL MSB (MOST SIGNIFICANT BIT) CONTROL - Cancels the "most significant bit control" set by either ESC = or ESC >.

Decimal 27 35

Hex 1B 23

Basic CHR$(27);"#";

ESC = — SET MOST SIGNIFICANT BIT (MSB) TO ZERO - Sets the most significant bit of all incoming data to zero. This command has no effect on graphics or user-defined characters.

Decimal 27 61

Hex 1B 3D

Basic CHR$(27);"=";

ESC > — SET MOST SIGNIFICANT BIT (MSB) TO ONE - Sets the most significant bit of all incoming data to one. This command has no effect on graphics or user-defined characters.

Decimal 27 62

Hex 1B 3E

Basic CHR$(27);">";

ESC @ — INITIALIZE PRINTER - Flushes all data in the print buffer preceding the command and then initializes the printer. Does not change straps, pitch, or print quality.

Decimal 27 64

Hex 1B 40

Basic CHR$(27);"@";

FX-286e Dot Graphics

Dot graphics allows you to print individual dots at any position on the page, and thus to print pictures as well as text. While in graphics, emphasized, doublestrike, expanded, underlined, subscript, and superscript remain as set, but are inactive.

The FX-286e printer doesn't adjust the line feed increment automatically on entering graphics. If you want contiguous vertical graphics, then you must set the line feed increment to 8/72 inch before starting graphics and then reset it when you are finished. See page 7-14.

An FX-286e graphics control sequence starts with an escape combination that sets the graphics density (ESC K,L,Y, or Z), followed by a 2-byte header that shows the number of subsequent bytes that are to be interpreted as graphics data. The format of the sequence is:

ESC (density) (n1) (n2) (data) . . . (data)

Since this control sequence has no terminator, you need to specify exactly in the header the number of bytes that you want to be interpreted as graphics. If there are fewer graphics data bytes than specified in the header, then the printer treats subsequent text and control codes as graphics. In that case, carriage returns and line feeds are often ingested as graphics data.

On the other hand, if there are more graphics data bytes than specified in the header, then the printer interprets excess bytes as text or control codes. This can also produce very interesting results.

Specifying Graphics Line Length

The two bytes (n1, n2) specify the total number of image bytes that follow; n2 is the most significant byte.

total number of image data bytes = n1 + (n2 x 256)

For example, if you want to print 5 inches of graphics at ESC K density, which is 60 dpi, then:

total number of bytes = 5 inches x 60 dpi = 300

300/256 = 1 with a remainder of 44
n1 = 44
n2 = 1

The sequence sent to the printer (shown in BASIC) would look like:

CHR$(27);CHR$"K";CHR$(44);CHR$(1);CHR$(v1);. . . CHR$(v300);

where v1 through v300 are image data bytes.

Image Data Bytes

The FX-286e printer supports both 8-pin and 9-pin vertical formats. Since this emulation supports only 8-pin graphics, 9-pin graphics will not be explained or illustrated here. When 9-pin graphics are sent to this printer, the byte containing the 9th-bit is discarded.

Each image data byte represents a vertical column of eight dots. The most significant of the eight bits controls the top pin of a column, and the least significant bit controls the bottom pin of that column. The first byte of data (v1) is the second column, and so on. The illustration below shows byte values of various dot combinations.

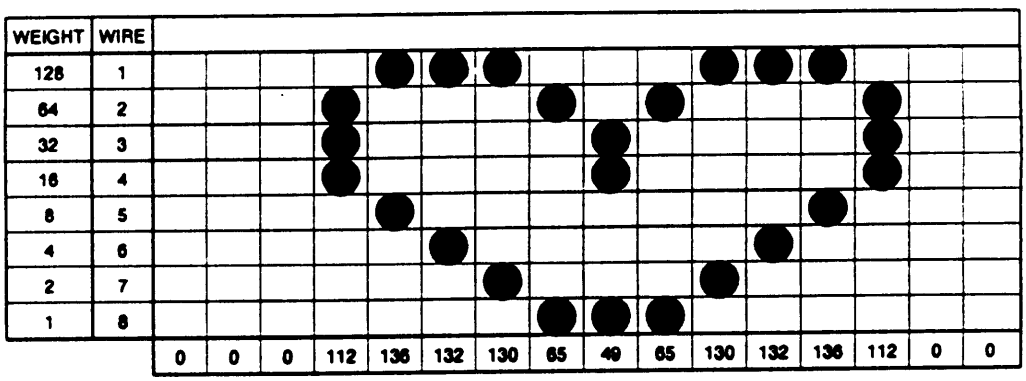


Image Byte Values

Graphics Programming Example

```
100 WIDTH "LPT1:",255
110 FOR N = 1 TO 4
115   LPRINT CHR$(27);"K";CHR$(80);CHR$(0);
120   FOR K = 1 TO 5
140      LPRINT CHR$(0);CHR$(0);CHR$(0);CHR$(112);
150      LPRINT CHR$(136);CHR$(132);CHR$(130);
160      LPRINT CHR$(65);CHR$(49);CHR$(65);
170      LPRINT CHR$(130);CHR$(132);CHR$(136);
180      LPRINT CHR$(112);CHR$(0);CHR$(0);
190   NEXT K
200 LPRINT
210 NEXT N
220 LPRINT"DONE"
230 END
```

FX-286e Dot Graphics (continued)

AE51

DONE

Printed Results of Sample Program

FX-286e Dot Graphics Control Sequences

ESC K (n1)(n2) (v1). . . (vn)

NORMAL DENSITY GRAPHICS - Sets a density of 60 dpi horizontally and 72 dpi vertically.

Decimal 27 75 (n1) (n2) (v1). . . (vn)

Hex 1B 4B ___ ___ ___ . . . ___

Basic CHR$(27);"K";CHR$(n1);CHR$(n2);CHR$(v1);. . .

ESC L (n1)(n2) (v1). . . (vn)

LOW SPEED DOUBLE DENSITY GRAPHICS - Sets a density of 120 dpi horizontally and 72 dpi vertically. If horizontally adjacent dots are sent, they will be printed.

Decimal 27 76 (n1) (n2) (v1). . . (vn)

Hex 1B 4C ___ ___ ___ . . . ___

Basic CHR$(27);"L";CHR$(n1);CHR$(n2);CHR$(v1). . .

ESC Y (n1)(n2) (v1). . . (vn)

HIGH SPEED DOUBLE DENSITY GRAPHICS - Sets a density of 120 dpi horizontally and 72 dpi vertically. If horizontally adjacent dots are sent, they will be printed.

Decimal 27 89 (n1) (n2) (v1). . . (vn)

Hex 1B 59 ___ ___ ___ . . . ___

Basic CHR$(27);"Y";CHR$(n1);CHR$(n2);CHR$(v1). . .

ESC Z (n1)(n2) (v1). . . (vn)

QUADRUPLE DENSITY GRAPHICS (REDUCED SPEED) - Sets a density of 240 dpi horizontally and 72 dpi vertically. If horizontally adjacent dots are sent, they will be printed.

Decimal 27 90 (n1) (n2) (v1). . . (vn)

Hex 1B 5A ___ ___ ___ . . . ___

Basic CHR$(27);"Z";CHR$(n1);CHR$(n2);CHR$(v1). . .

ESC * (m) (n1)(n2) (v1). . . (vn)

SELECT GRAPHICS MODE - Selects graphics mode m (see table below) for n1 + (n2 x 256) columns. The variables n1 and n2 represent the number of data bytes to be sent that will be interpreted as graphics. If the number of graphics columns to be printed causes printing to exceed the right margin, all data beyond that margin will be ignored.

m	graphics mode	dpi
0	single density	60
1	double-density	120
2	high-speed double-density	120
3	quadruple density	240
4	CRT I	120
5	Plotter (1:1)	60
6	CRT II	120
7	double-density plotter	120

Decimal 27 42 __ __ __ __ · · · __

Hex 1B 2A __ __ __ __ · · · __

Basic CHR$(27);"*";CHR$(m);CHR$(n1);CHR$(n2);. . .

ESC ? (s)(n)

REASSIGN GRAPHICS MODE - Reassigns the dot density to the graphics mode specified by ESC K, ESC L, ESC Y or ESC Z.

s = K, L, Y, or Z
n = dot density (see values below)

n	dpi horizontal	dpi vertical
0	60	72
1	120	72
2	120	72
3	240	72
4	80 (120)	72
5	72 (60)	72
6	90 (120)	72
7	144 (120)	72

Note: The emulation converts the values corresponding to n4 through n7 to the ones shown in parenthesis.

Example:

Normally, when the printer receives the ESC L command, the dot density is 120 dpih x 72 dpiv. By using this command, you can reassign that density to 60 dpih x 72 dpiv by sending the following: CHR$(27);"?";"L";CHR$(0);

ESC ? (s)(n) REASSIGN GRAPHICS MODE (continued)

After the command is sent, the ESC L command then causes the horizontal density to be 60 dpi instead of 120 dpi.

Decimal 27 63 __ __

Hex 1B 3F __ __

Basic CHR$(27);"?";CHR$(s);CHR$(n);

ESC ^ (m) (n1)(n2) SELECT 9-PIN GRAPHICS - Turns on the 9-bit graphics mode for n1 + (n2 x 256) columns. The variable m determines the density as follows:

Note: This emulation does not support the 9-bit operation. The byte containing the 9th bit is discarded and only the top eight bits are used.

m	**effect**
1	double density
0	single density

Decimal 27 94 __ __ __

Hex 1B 5E __ __ __

Basic CHR$(27);"^";CHR$(m);CHR$(n1);CHR$(n2);

Appendix A. Using the Hex Dump

A printout of hexadecimal data is useful primarily to application programmers or service representatives as a debugging or troubleshooting tool.

With the printer **Offline**, enable the hex dump mode of printing by pressing:

- 3 - (Function Mode)
- 1 - (Previous Option) until **FCT:Hex Dump OFF** is displayed
- 4 - (Enter) to switch the display to **FCT:Hex Dump ON**
- 2 - (Quit)
- 0 - (Online) to place the printer online.

Hex dump causes data received from the host to be printed out in ASCII form. A sample is shown below.

```
30 31 32 33 34 35 36 37 38 39 41 42 43 44 45 46   0123456789ABCDEF
0D 0A 54 48 45 20 54 57 4F 20 44 4F 54 53 20 59   ..THE TWO DOTS Y
4F 55 20 4A 55 53 54 20 53 41 57 20 57 45 52 45   OU JUST SAW WERE
20 41 20 52 45 53 55 4C 54 20 4F 46 20 41 20 43    A RESULT OF A C
41 52 52 49 41 47 20 52 45 54 55 52 4E 20 41 4E   ARRIAG RETURN AN
44 20 4C 49 4E 45 20 46 45 45 44 2E 0D 0A 41 4C   D LINE FEED...AL
4C 20 43 4F 4E 54 52 4F 4C 20 43 48 41 52 41 43   L CONTROL CHARAC
54 45 52 53 20 41 52 45 20 52 45 50 52 45 53 45   TERS ARE REPRESE
4E 54 45 44 20 42 59 20 44 4F 54 53 20 54 48 49   NTED BY DOTS THI
53 20 44 4F 54 20 1B 20 49 53 20 41 4E 20 45 53   S DOT . IS AN ES
43 41 50 45 20 43 4F 44 45 2E 0D 0A 41 20 44 4F   CAPE CODE...A DO
54 20 54 4F 20 54 48 45 20 52 49 47 48 54 20 4F   T TO THE RIGHT O
46 20 41 20 48 45 58 20 43 4F 44 45 20 4D 45 41   F A HEX CODE MEA
4E 53 20 54 48 41 54 20 54 48 45 20 50 49 20 4C   NS THAT THE PI L
45 41 44 20 57 41 53 20 53 45 54 20 41 54 20 54   EAD WAS SET AT T
48 41 54 20 54 49 4D 45 2E 0D 0A 53 45 45 20 54   HAT TIME...SEE T
48 45 20 44 4F 54 53 20.20.20.20.49 4E 20 54 48   HE DOTS    IN TH
45 20 48 45 58 20 44 55 4D 50 2E 0D 0A            E HEX DUMP...
```

The hexadecimal printout is shown on the left side and the equivalent plain text is shown on the same line at the right. Exceptions: ASCII control code characters below hexadecimal 20 are printed out as periods on the right side. An SP or hexadecimal 20 causes a blank space in the equivalent print position.

By examining the printout, you can see what data was actually sent to the printer.

EXAMPLE: If your program was supposed to send an ESC K (or 1B 4B hex) to the printer but you did not get the expected result, a hex dump could reveal that an ESC k (1B 6B hex) was actually sent.

Make sure the hex dump mode of printing is switched off when data transmission has ended and the hex mode is no longer needed.

Appendix B. USASCII Code Chart

AG86

b_7 →					0	0	0	0	1	1	1	1
b_6 →					0	0	1	1	0	0	1	1
b_5 →					0	1	0	1	0	1	0	1
Bits	b_4	b_3	b_2	b_1	COLUMN → / ROW ↓	0	1	2	3	4	5	6	7
	0	0	0	0	0	NUL	DLE	SP	0	@	P	`	p
	0	0	0	1	1	SOH	DC1	'	1	A	Q	a	q
	0	0	1	0	2	STX	DC2	"	2	B	R	b	r
	0	0	1	1	3	ETX	DC3	#	3	C	S	c	s
	0	1	0	0	4	EOT	DC4	$	4	D	T	d	t
	0	1	0	1	5	ENQ	NAK	%	5	E	U	e	u
	0	1	1	0	6	ACK	SYN	&	6	F	V	f	v
	0	1	1	1	7	BEL	ETB	'	7	G	W	g	w
	1	0	0	0	8	BS	CAN	(	8	H	X	h	x
	1	0	0	1	9	HT	EM	)	9	I	Y	i	y
	1	0	1	0	10 (A)	LF	SUB	*	:	J	Z	j	z
	1	0	1	1	11 (B)	VT	ESC	+	;	K	[	k	{
	1	1	0	0	12 (C)	FF	FS	,	<	L	\	l	¦
	1	1	0	1	13 (D)	CR	GS	-	=	M	]	m	}
	1	1	1	0	14 (E)	SO	RS	.	>	N	↑	n	~
	1	1	1	1	15 (F)	SI	US	/	?	O	_	o	DEL

Figure B-1. USASCII Code Chart

This ASCII code chart provides the means to determine both the decimal value and the hexadecimal value of a 128 character map. There are eight columns of characters (numbered 0-7), with 16 characters in each column. Reading across from left to right, the characters appear in rows.

How to Find the Decimal Value of a Character

1. Determine the character's row and column position.
2. Use the following formula:

   (column X 16) + row = decimal value

Examples:

Capital G is located at column 4, row 7.

(4 X 16) + 7 = 71

The question mark is located at column 3, row 15.

(3 X 16) + 15 = 63

Hexadecimal Value

The hexadecimal numbering system uses 16 single digits per place value. Decimal numbers 10-16 are represented by the letters (digits) A-F since they are single digits. Use the numbers 0-9 and A-F in the ROW column of the chart.

Finding a Hexadecimal Value on the Chart

Find the hexadecimal value of a character by locating the character on the chart and determining the column and row of its position.

Using the lowercase n as an example, n is located at column 6 row E. This is expressed as 6EH. The H signifies that 6E is a hexadecimal number.

An uppercase L would be 4CH, a lowercase d would be 64H, and an FF (form feed control code) would be expressed as 0CH.

Appendix C. USASCII Code Table

Decimal	Hexa-decimal	ASCII	Character Graphics
0	00	NUL	
1	01	SOH	
2	02	STX	
3	03	ETX	
4	04	EOT	
5	05	ENQ	
6	06	ACK	
7	07	BEL	
8	08	BS	
9	09	HT	
10	0A	LF	
11	0B	VT	
12	0C	FF	
13	0D	CR	
14	0E	SO	
15	0F	SI	
16	10	DLE	
17	11	DC1	
18	12	DC2	
19	13	DC3	
20	14	DC4	
21	15	NAK	
22	16	SYN	
23	17	ETB	
24	18	CAN	
25	19	EM	
26	1A	SUB	
27	1B	ESC	
28	1C	FS	
29	1D	GS	
30	1E	RS	
31	1F	US	
32	20	SP	á
33	21	!	í
34	22	"	ó
35	23	#	ú
36	24	$	ñ
37	25	%	Ñ
38	26	&	ª
39	27	'	º
40	28	(	¿
41	29	)	⌐
42	2A	*	¬
43	2B	+	½

Figure C-1. USASCII Code Table (Part 1 of 3)

Decimal	Hexa-decimal	ASCII	Character Graphics
44	2C	,	½
45	2D	-	¡
46	2E	.	«
47	2F	/	»
48	30	0	░
49	31	1	▒
50	32	2	▓
51	33	3	│
52	34	4	┤
53	35	5	╡
54	36	6	╢
55	37	7	╖
56	38	8	╕
57	39	9	╣
58	3A	:	║
59	3B	;	╗
60	3C	<	╝
61	3D	=	╜
62	3E	>	╛
63	3F	?	┐
64	40	@	└
65	41	A	┴

Decimal	Hexa-decimal	ASCII	Character Graphics
66	42	B	┬
67	43	C	├
68	44	D	─
69	45	E	┼
70	46	F	╞
71	47	G	╟
72	48	H	╚
73	49	I	╔
74	4A	J	╩
75	4B	K	╦
76	4C	L	╠
77	4D	M	═
78	4E	N	╬
79	4F	O	╧
80	50	P	╨
81	51	Q	╤
82	52	R	╥
83	53	S	╙
84	54	T	╘
85	55	U	╒
86	56	V	╓
87	57	W	╫

Figure C-1. USASCII Code Table (Part 2 of 3)

Decimal	Hexa-decimal	ASCII	Character Graphics
88	58	X	╪
89	59	Y	┘
90	5A	Z	┌
91	5B	[	▉
92	5C	\	■
93	5D	]	▌
94	5E	^	▌
95	5F	_	■
96	60	`	∝
97	61	a	β
98	62	b	Γ
99	63	c	π
100	64	d	Σ
101	65	e	σ
102	66	f	μ
103	67	g	τ
104	68	h	Φ
105	69	i	θ
106	6A	j	Ω
107	6B	k	δ
108	6C	l	∞
109	6D	m	ϕ

Decimal	Hexa-decimal	ASCII	Character Graphics
110	6E	n	∈
111	6F	o	∩
112	70	p	≡
113	71	q	±
114	72	r	≥
115	73	s	≤
116	74	t	⌠
117	75	u	⌡
118	76	v	÷
119	77	w	≈
120	78	x	°
121	79	y	•
122	7A	z	-
123	7B	{	√
124	7C	¦	η
125	7D	}	²
126	7E	~	■
127	7F	DEL	SP

Figure C-1. USASCII Code Table (Part 3 of 3)

Appendix D. Conversion Tables

Equivalent Columns Conversion Table

For use with Table of Decipoints for Column vs. CPI Values

INCHES		CPI				
		10	12	13.3	15	16.7
1/16	0.0625	1	1	1	1	1
1/8	0.125	1	2	2	2	2
3/16	0.1875	2	2	2	3	3
1/4	0.250	3	3	3	4	4
5/16	0.3125	3	4	4	5	5
3/8	0.375	4	5	5	6	6
7/16	0.4375	4	5	6	7	7
1/2	0.500	5	6	7	8	8
9/16	0.5625	6	7	7	8	9
5/8	0.625	6	8	8	9	10
11/16	0.6875	7	8	9	10	11
3/4	0.750	8	9	10	11	13
13/16	0.8125	8	10	11	12	14
7/8	0.875	9	11	12	13	15
15/16	0.9375	9	11	12	14	16
1		10	12	13	15	17
1		20	24	27	30	33
3		30	36	40	45	50
4		40	48	53	60	67
5		50	60	67	75	84
6		60	72	80	90	100
7		70	84	93	105	117
8		80	96	106	120	134
9		90	108	120	135	150
10		100	120	133	150	167

Example:

A 4 9/16-inch left margin is desired while printing at 13. 3 CPI. In the 13. 3 CPI column, add the column value in the 9/16 inch line (7) to the column value in the 4 inch line (53). The column count for the new left margin is 7 + 53 = 60.

Using the Table of Decipoints for Column vs. CPI Values, find line 60 and read across to the 13. 3 CPI column. The decipoint value is 3240 for the left margin. Note that the first print column is the one following the left margin or column 61.

Table of Decipoints for Column vs. CPI Values

The decipoint values in the following chart represent the beginning of the range of each column value. For example, the range of the decipoint value for margin column 2 at 13.3 CPI is 108 - 161. Any number within this range will acheive the same results.

This table may also be used for setting horizontal tabs as well as margins. Remember that the first print column after tabbing is the next column to the right.

MARGIN	CPI				
COLUMN*	10	12	13.3	15	16.7
0	0	0	0	0	0
1	72	60	54	48	43
2	144	120	108	96	86
3	216	180	162	144	129
4	288	240	216	192	172
5	360	300	270	240	215
6	432	360	324	288	258
7	504	420	378	336	301
8	576	480	432	384	344
9	648	540	486	432	387
10	720	600	540	480	430
11	792	660	594	528	473
12	864	720	648	576	516
13	936	780	702	624	559
14	1008	840	756	672	602
15	1080	900	810	720	645
16	1152	960	864	768	688
17	1224	1020	918	816	731
18	1296	1080	972	864	774
19	1368	1140	1026	912	817
20	1440	1200	1080	960	860
21	1512	1260	1134	1008	903
22	1584	1320	1188	1056	946
23	1656	1380	1242	1104	989
24	1728	1440	1296	1152	1032
25	1800	1500	1350	1200	1075
26	1872	1560	1404	1248	1118
27	1944	1620	1458	1296	1161
28	2016	1680	1512	1344	1204
29	2088	1740	1566	1392	1247
30	2160	1800	1620	1440	1290

*First print column = margin + 1.

Table of Decipoints for Column vs. CPI Values
(continued)

MARGIN COLUMN*	CPI				
	10	12	13.3	15	16.7
31	2232	1860	1674	1488	1333
32	2304	1920	1728	1536	1376
33	2376	1980	1782	1584	1419
34	2448	2040	1836	1632	1462
35	2520	2100	1890	1680	1505
36	2592	2160	1944	1728	1548
37	2664	2220	1998	1776	1591
38	2736	2280	2052	1824	1634
39	2808	2340	2106	1872	1677
40	2880	2400	2160	1920	1720
41	2952	2460	2214	1968	1763
42	3024	2520	2268	2016	1806
43	3096	2580	2322	2064	1849
44	3168	2640	2376	2112	1892
45	3240	2700	2430	2160	1935
46	3312	2760	2484	2208	1978
47	3384	2820	2538	2256	2021
48	3456	2880	2592	2304	2064
49	3528	2940	2646	2352	2107
50	3600	3000	2700	2400	2150
51	3672	3060	2754	2448	2193
52	3744	3120	2808	2496	2236
53	3816	3180	2862	2544	2279
54	3888	3240	2916	2592	2322
55	3960	3300	2970	2640	2365
56	4032	3360	3024	2688	2408
57	4104	3420	3078	2736	2451
58	4176	3480	3132	2784	2494
59	4248	3540	3186	2832	2537
60	4320	3600	3240	2880	2580
61	4392	3660	3294	2928	2623
62	4464	3720	3348	2976	2666
63	4536	3780	3402	3024	2709
64	4608	3840	3456	3072	2752
65	4680	3900	3510	3120	2795
66	4752	3960	3564	3168	2838
67	4824	4020	3618	3216	2881
68	4896	4080	2672	3264	2924
69	4968	4140	3726	3312	2967
70	5040	4200	3780	3360	3010
71	5112	4260	3834	3408	3053
72	5184	4320	3888	3456	3096
73	5256	4380	3942	3504	3139
74	5328	4440	3996	3552	3182
75	5400	4500	4050	3600	3225

*First print column = margin column + 1.

Table of Decipoints for Column vs. CPI Values
(continued)

MARGIN COLUMN*	CPI				
	10	12	13.3	15	16.7
76	5472	4560	4104	3648	3268
77	5544	4620	4158	3696	3311
78	5616	4680	4212	3744	3354
79	5688	4740	4266	3792	3397
80	5760	4800	4320	3840	3440
81	5832	4860	4374	3888	3483
82	5904	4920	4428	3936	3526
83	5976	4980	4482	3984	3569
84	6048	5040	4536	4032	3612
85	6120	5100	4590	4080	3655
86	6192	5160	4644	4128	3698
87	6264	5220	4698	4176	3741
88	6336	5280	4752	4224	3184
89	6408	5340	4806	4272	3827
90	6480	5400	4860	4320	3870
91	6552	5460	4914	4368	3913
92	6624	5520	4968	4416	3956
93	6696	5580	5022	4464	3999
94	6768	5640	5076	4512	4042
95	6840	5700	5130	4560	4085
96	6912	5760	5184	4608	4128
97	6984	5820	5238	4656	4171
98	7056	5880	5292	4704	4214
99	7128	5940	5346	4752	4257
100	7200	6000	5400	4800	4300
101	7272	6060	5454	4848	4343
102	7344	6120	5508	4896	4386
103	7416	6180	5562	4944	4429
104	7488	6240	5616	4992	4472
105	7560	6300	5670	5040	4515
106	7632	6360	5724	5088	4558
107	7704	6420	5778	5136	4601
108	7776	6480	5832	5184	4644
109	7848	6540	5886	5232	4687
110	7920	6600	5940	5280	4730
111	7992	6660	5994	5328	4773
112	8064	6720	6048	5376	4816
113	8136	6780	6102	5424	4859
114	8208	6840	6156	5472	4902
115	8280	6900	6210	5520	4945
116	8352	6960	6264	5568	4988
117	8424	7020	6318	5616	5031
118	8496	7080	6372	5664	5074
119	8568	7140	6426	5712	5117
120	8640	7200	6480	5760	5160

*First print column = margin column + 1.

Table of Decipoints for Column vs. CPI Values
(continued)

MARGIN COLUMN*	CPI				
	10	12	13.3	15	16.7
121	8712	7260	6534	5808	5203
122	8784	7320	6588	5856	5246
123	8856	7380	6642	5904	5289
124	8928	7440	6696	5952	5332
125	9000	7500	6750	6000	5375
126	9072	7560	6804	6048	5418
127	9144	7620	6858	6096	5461
128	9216	7680	6912	6144	5504
129	9288	7740	6966	6192	5547
130	9360	7800	7020	6240	5590
131	9432	7860	7074	6288	5633
132	9504	7920	7128	6336	5676
133	—	7980	7182	6384	5719
134		8040	7236	6432	5762
135		8100	7290	6480	5805
136		8160	7344	6528	5848
137		8220	7398	6576	5891
138		8280	7452	6624	5934
139		8340	7506	6672	5977
140		8400	7560	6720	6020
141		8460	7614	6768	6063
142		8520	7668	6816	6106
143		8580	7722	6864	6149
144		8640	7776	6912	6192
145		8700	7830	6960	6235
146		8760	7884	7008	6278
147		8820	7938	7056	6321
148		8880	7992	7104	6364
149		8940	8046	7152	6407
150		9000	8100	7200	6450
151		9060	8154	7248	6493
152		9120	8208	7296	6536
153		9180	8262	7344	6579
154		9240	8316	7392	6622
155		9300	8370	7440	6665
156		9360	8424	7488	6708
157		9420	8478	7536	6751
158		9480	8532	7584	6794
159		—	8586	7632	6837
160			8640	7680	6880
161			8694	7728	6923
162			8748	7776	6966
163			8802	7824	7009
164			8856	7872	7052

*First print column = margin column + 1.

Table of Decipoints for Column vs. CPI Values
(continued)

MARGIN COLUMN*	CPI				
	10	12	13.3	15	16.7
165			8910	7920	7095
166			8964	7968	7138
167			9018	8016	7181
168			9072	8064	7224
169			9126	8112	7267
170			9180	8160	7310
171			9234	8208	7353
172			9288	8256	7396
173			9342	8304	7439
174			9396	8352	7482
175			9450	8400	7525
176			9504	8448	7568
177			—	8496	7611
178				8544	7654
179				8592	7697
180				8640	7740

MARGIN COLUMN*	CPI	
	15	16.7
181	8688	7783
182	8736	7826
183	8784	7869
184	8832	7912
185	8880	7955
186	8928	7998
187	8976	8041
188	9024	8084
189	9072	8127
190	9120	8170
191	9168	8213
192	9216	8256
193	9264	8299
194	9312	8342
195	9360	8385
196	9408	8428
197	9456	8471
198	9504	8514
199	—	8551
200		8600

MARGIN COLUMN*	CPI	
	15	16.7
201		8643
202		8686
203		8729
204		8772
205		8815
206		8858
207		8901
208		8944
209		8987
210		9030
211		9073
212		9116
213		9159
214		9202
215		9245
216		9288
217		9331
218		9374
219		9417
220		9460

*First print column = margin column + 1.

Appendix E. International Character Sets

Introduction

International character sets can be selected at the control panel using the Font:Country menu while in the Program Mode or by sending escape sequences. In the table below, the p1 value is used in the ANSI escape sequence ESC[p1x.

This printer is equipped with the following 50 international character sets:

Character Set Name	p1 Value	Character Set Name	p1 Value
USA (ISO)	0	IBM PC Multilingual Set, (MS Code Page 850)	850
German (ISO)	1	Microsoft Code Page 852 (East Europe)	852
French A (ISO)	2	Microsoft Code Page 853 (Turkey)	853
French B	3	Microsoft Code Page 855 (Cyrillic)	855
French Canadian	4	Microsoft Code Page 860 (Portugal)	860
Dutch (Netherlands)	5	Microsoft Code Page 863 (French Canadian)	863
Italian	6	Microsoft Code Page 864 (Arabic)	864
United Kingdom (ISO)	7	Microsoft Code Page 865 (Norway)	865
Spanish	8	Microsoft Code Page 866 (Russian)	866
Danish/Norwegian A	9	Microsoft Code Page 867 (Turkey)	867
Danish/Norwegian B	10	Greek Code Page 437	8573
Danish/Norwegian C	11	DEC Multinational (LA-210)	8574
Danish/Norwegian D	12	HP Roman 8	8575
Swedish/Finnish A	13	Polish Mazowia	8576
Swedish/Finnish B	14	Turkish 8-bit Code Page	8577
Swedish/Finnish C	15	Greek Code Page 851	8578
Swedish/Finnish D	16	ISO 8859-1 Latin Alphabet #1	8591
Swiss	17	ISO 8859-2 Latin Alphabet #2	8592
Slovenia/Croatia	19	ISO 8859-3 Latin Alphabet #3	8593
United Kingdom A	20	ISO 8859-4 Latin Alphabet #4	8594
Turkish	21	ISO 8859-5 Latin/Cyrillic	8595
Greek	22	ISO 8859-6 Latin/Arabic	8596
Italian (ISO)	23	ISO 8859-7 Latin/Greek	8597
Spanish (ISO)	24	ISO 8859-8 Latin/Hebrew	8598
IBM PC Set, USA (Code Page 437)	437	ISO 8859-9 Latin/Alphabet #5	8599

The ability to select the characters within these sets depends on whether the printer is receiving 7- or 8-bit data and on how the printer straps are set.

The following pages include an explanation of how character sets are mapped, what the characters within each set look like, and the escape sequence syntax needed for selection.

The numbers at the top and left side of the following charts represent the hex values for each character. A question mark"?" would be printed by sending a hex value of 3F (see Appendix B).

7-Bit Data Characters

The shaded area of the chart below shows the locations that may be accessed with 7-bit data. These locations contain printable characters and control codes.

These locations are available when:

- 7-bit data is sent from the host.
- parallel interface strap A8 is OUT and the parallel interface is being used.
- serial interface strap B6 is OUT and the serial interface is being used.

NOTE: The character at location 15 hex only prints under certain conditions. See the explanation of PC Set 2 when using 8-bit data later in this appendix.

HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	NUL	DLE		0	@	P	`	p								
1	SOH	DC1	!	1	A	Q	a	q								
2	STX	DC2	"	2	B	R	b	r								
3	ETX	DC3	#	3	C	S	c	s								
4	EOT	DC4	$	4	D	T	d	t								
5	ENQ	NAK	%	5	E	U	e	u								
6	ACK	SYN	&	6	F	V	f	v								
7	BEL	ETB	'	7	G	W	g	w								
8	BS	CAN	(	8	H	X	h	x								
9	HT	EM	)	9	I	Y	i	y								
A	LF	SUB	*	:	J	Z	j	z								
B	VT	ESC	+	;	K	[	k	{								
C	FF	FS	,	<	L	\	l	|							
D	CR	GS	-	=	M	]	m	}								
E	SO	RS	.	>	N	^	n	~								
F	SI	US	/	?	O	_	o									

Using the Alternate Font

The alternate font feature allows the printer to switch back and forward between the currently set font *style* and an alternate font *style* using the 8th data bit sent by the host. Even though the 8th bit is sent by the host, only the characters in a 7-bit map are used. (See the shaded area in the 7-bit character map on page F-2.)

NOTE: Interface straps (A8 for parallel and B6 for serial) must be IN to accept the 8th bit.

Sending the 8th bit high to the printer when control strap A32 is OUT causes the printer to map a duplicate set of the characters in locations 20H-7FH into locations A0H-FFH. The font style of this duplicate set depends on the settings of control straps A17-A20.

EXAMPLE:

The chart below shows the 7-bit character set mapped in locations 00H-7FH and the alternate font mapped to locations A0H-FFH. The characters are the same but the style was changed to italic by setting straps A17-A20 to 1000.

If the host sends 68H to the printer with strap B3 OUT, the letter h in the currently selected font style is printed. Sending E8H (68H with the 8th bit high) prints the letter *h* in italic.

HEX	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P		p				0	@	P		p
1				1	A	Q						1	A	Q	a	q
2				2	B	R						2	B	R	b	r
3				3	C	S						3	C	S	c	s
4				4	D	T		t				4	D	T	d	t
5				5	E	U		u				5	E	U	e	u
6			&	6	F	V		v			&	6	F	V	f	v
7				7	G	W		w				7	G	W	g	w
8				8	H	X						8	H	X	h	x
9				9								9				
A					J	Z		z					J	Z	j	z
B					K								K		k	
C					L								L		l	
D					M	]							M		m	
E					N								N		n	
F			/	?	O	_	o				/	?	O		o	

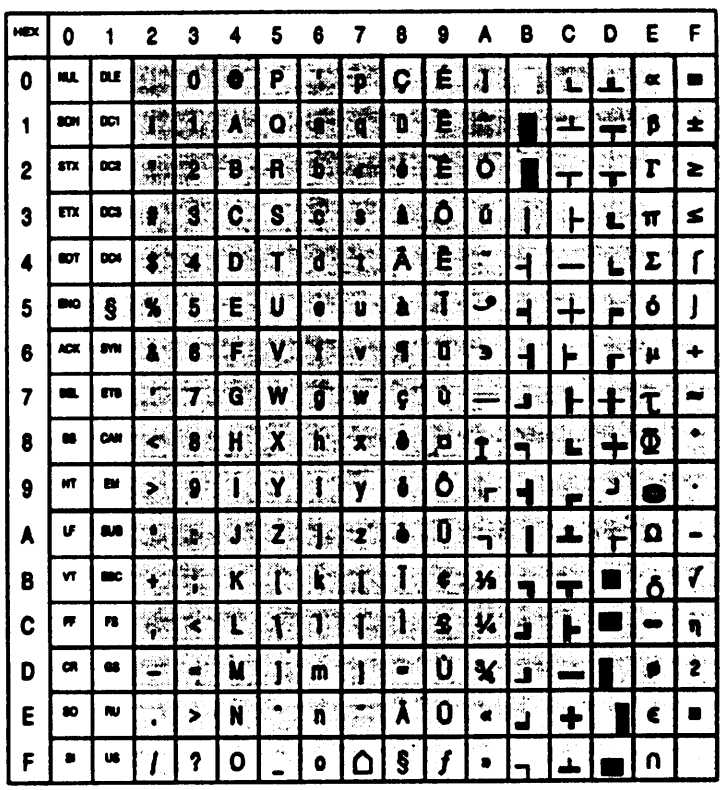
8-Bit Data Characters

When sending 8-bit data to the printer, more options for selection of characters are made available.

The chart below shows all the locations that can be addressed with 8-bit data. The shaded area of the chart shows the locations of the printable characters. The unshaded locations are the control codes.

These locations are available when:

- 8-bit data is sent from the host.
- parallel interface strap A8 is IN and the parallel interface is being used.
- serial interface strap B6 is IN and the serial interface is being used.
- set private mode PC Set 2 is in effect (more on the private mode follows).



8-Bit Data Characters (Continued)

Reset Private Mode PC Set 1

The escape sequence ESC [>5l is used to set the printer for PC Set 1 character mapping. PC Set 1 printing maps the printable characters to locations 20H-7EH and A0H-FFH.

Control Code Mapping

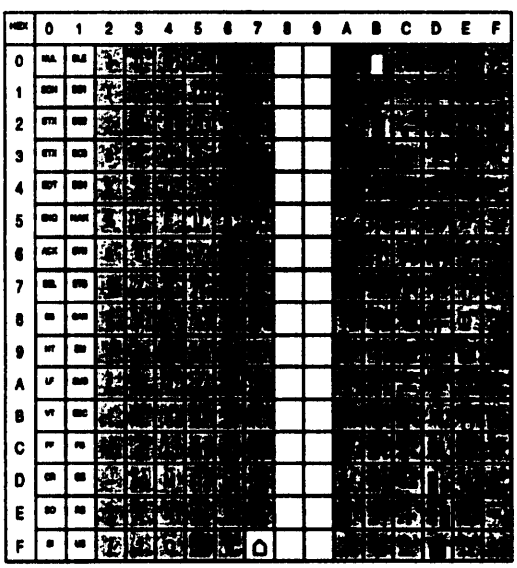
When Reset Private Mode - C1 Control Code Mode is selected (ESC[>3l), locations 80H-9FH are mapped as NULs. Control codes must be addressed at locations 00H-1FH. See chart below.

When Set Private Mode - C1 Control Code Mode is selected (ESC[>3h), the 8-bit set of usable control codes are mapped to locations 80H-9FH. See chart below.

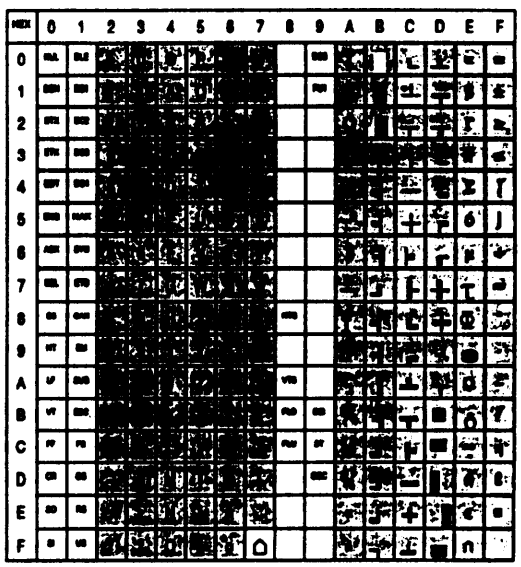
Control code PU1 (private use one), A0H, is defined as GENTST. GENTST causes the printer to run self-test the same as if an ESC Q were sent.

NOTE: Set Private Mode - PC Set 2 (ESC[>5h) overrides Set - C1 Control Code Mode (ESC[>3h) and Reset - C1 Control Code Mode (ESC[>3l).

PC Set 1
C1 Control Code Modes



Reset Private Mode



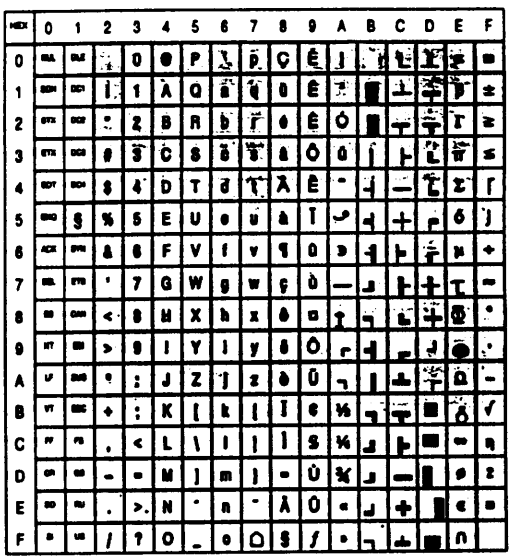
Set Private Mode

8-Bit Data Characters (Continued)

Set Private Mode PC Set 2

The escape sequence ESC [>5h is used to set the printer for PC Set 2 character mapping. PC Set 2 printing maps the printable characters to locations 20H-7EH, 80H-FFH, and 15H as shown below.

Location 7FH will only print if a character is present in that particular set and allowed by the emulation.



Default Conditions

When the printer is first powered-up or initialized, the IBM PC Set, USA Code Page 437 character set is selected. This is an 8-bit character set with characters mapped into locations A0H-FFH.

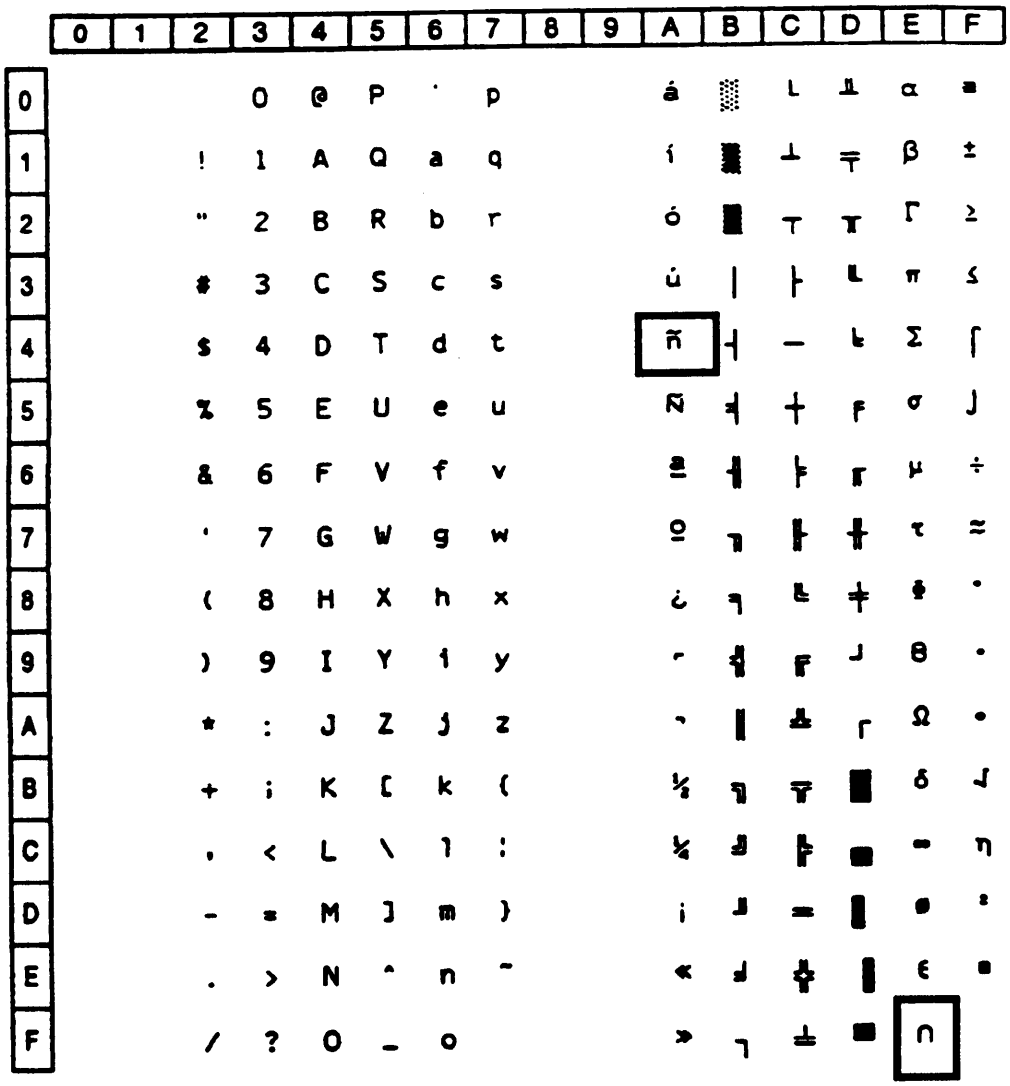
The Private Modes: Set - C1 Control Code Mode (ESC[>3h) and Reset - PC Set 2 (ESC[>5l) will also be in effect and will map the usable 8-bit control codes into locations 80H-9FH.

When a 7-bit character set (p1 value of 0-24 in ESC[p1x) is selected, the 7-bit set only replaces the characters in locations 20H-7FH. The Code Page 437 characters A0H-FFH will still print if 8-bit data is sent from the host and control strap A32 is IN.

Newly selected 7-bit character sets (p1 = 0-24) will always retain the A0H-FFH characters from the last 8-bit character set selected.

Newly selected 8-bit character sets will always clear the 20H-7FH characters from the previously selected 7-bit character set.

USA (ISO Standard)

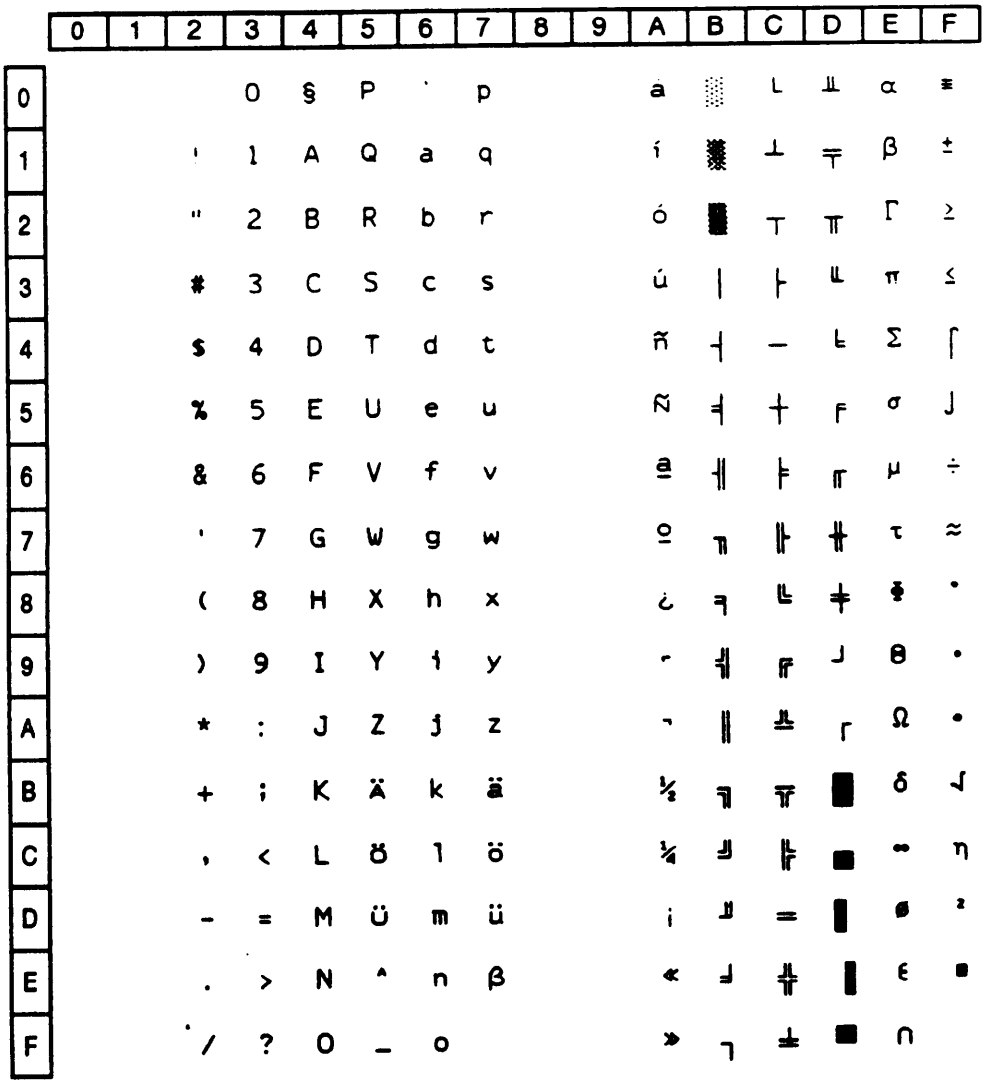


International Character Set Parameter 0.

ANSI Emulation: HEX 1B 5B 30 78
BASIC CHR$(27);"[0x";

Indicates which symbols are replaced by the Euro symbol and the location.

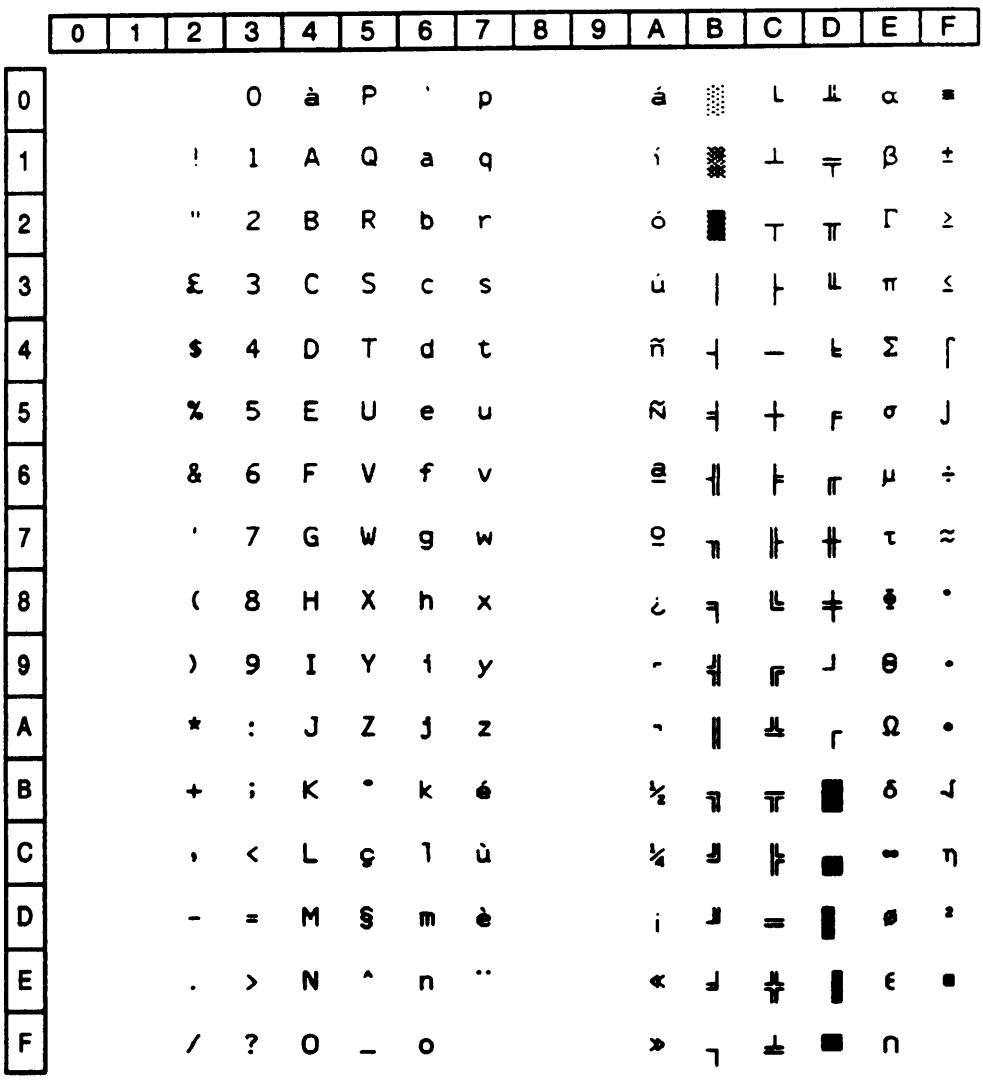
German (ISO)



International Character Set Parameter 1.

ANSI Emulation: HEX 1B 5B 31 78
BASIC CHR$(27);"[1x";

French A (ISO)

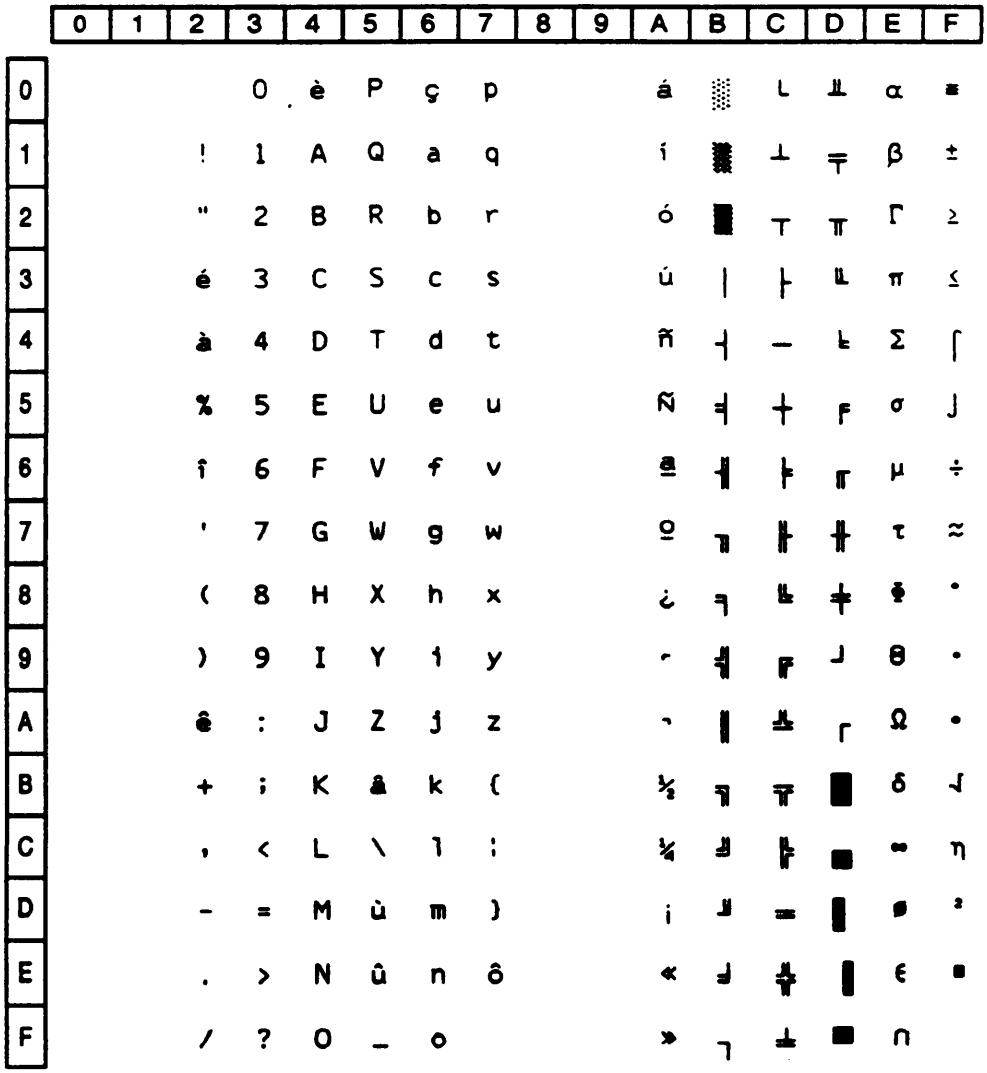


	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	à	P	`	p			á	▒	└	╨	α	■
1			!	1	A	Q	a	q			í	▓	┴	╤	β	±
2			"	2	B	R	b	r			ó	▉	┬	╥	Γ	≥
3			£	3	C	S	c	s			ú	▏	├	╙	π	≤
4			$	4	D	T	d	t			ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u			Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v			ª	╢	╞	╓	µ	÷
7			'	7	G	W	g	w			º	╖	╟	╫	τ	≈
8			(	8	H	X	h	x			¿	╕	╚	╪	Φ	°
9			)	9	I	Y	i	y			⌐	╣	╔	┘	Θ	∙
A			*	:	J	Z	j	z			¬	║	╩	┌	Ω	•
B			+	;	K	[	k	é			½	╗	╦	▉	δ	√
C			,	<	L	ç	l	ù			¼	╝	╠	▄	∞	η
D			-	=	M	§	m	è			¡	╜	═	▌	ø	²
E			.	>	N	^	n	¨			«	╛	╬	▐	ε	■
F			/	?	O	_	o				»	┐	╧	▀	∩	

International Character Set Parameter 2.

ANSI Emulation: HEX 1B 5B 32 78
BASIC CHR$(27);"[2x";

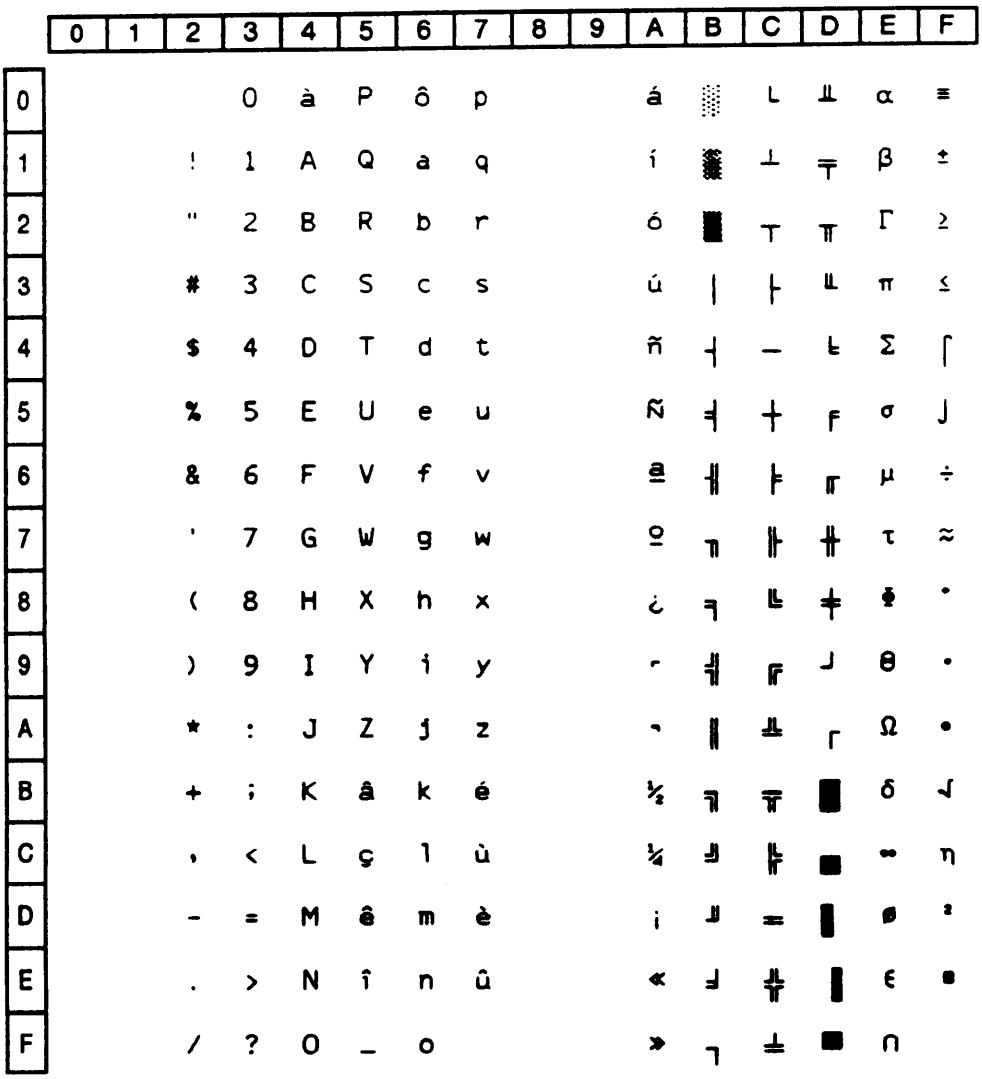
French B



International Character Set Parameter 3.

ANSI Emulation: HEX 1B 5B 33 78
BASIC CHR$(27);"[3x";

French Canadian

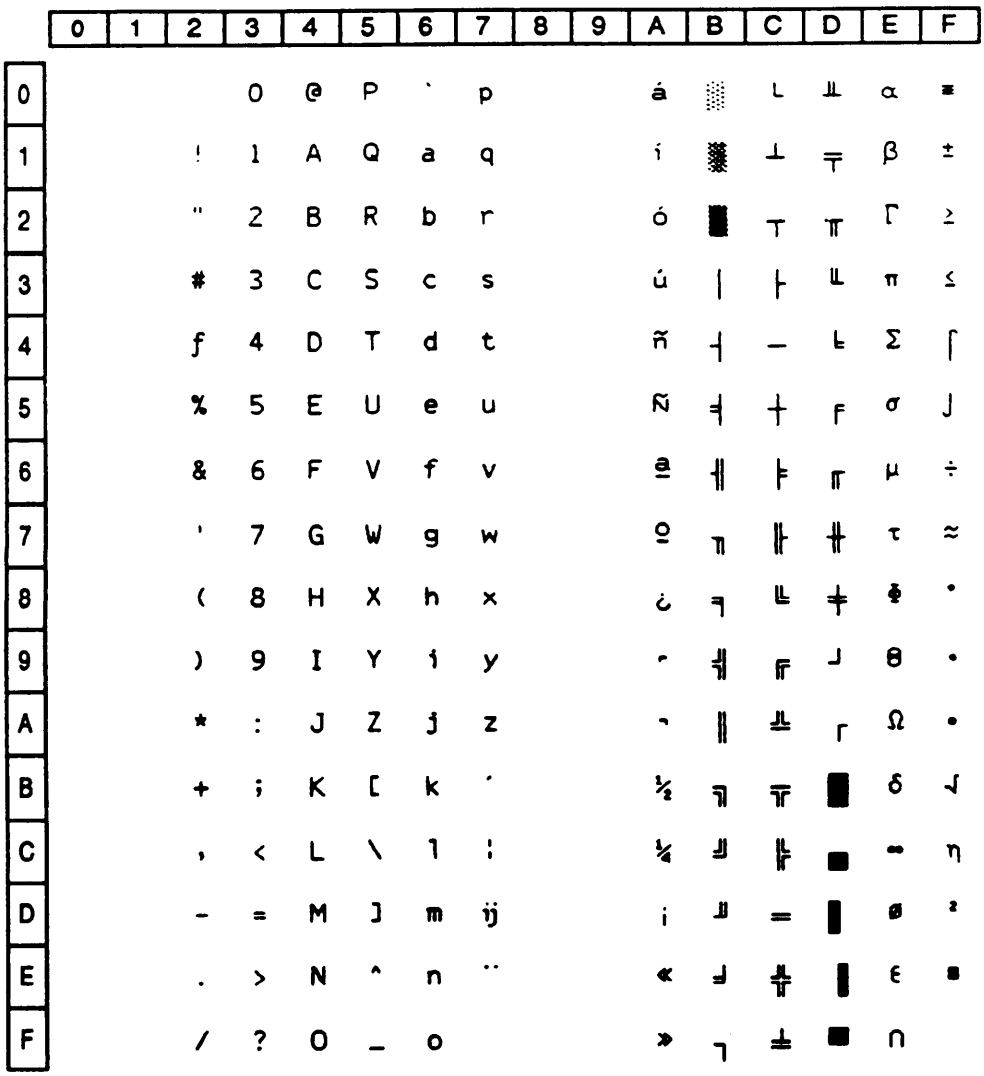


	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	à	P	ô	p			á	▒	└	╨	α	≡
1			!	1	A	Q	a	q			í	▓	┴	╤	β	±
2			"	2	B	R	b	r			ó	■	┬	╥	Γ	≥
3			#	3	C	S	c	s			ú	│	├	╙	π	≤
4			$	4	D	T	d	t			ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u			Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v			ª	╢	╞	╓	µ	÷
7			'	7	G	W	g	w			º	╖	╟	╫	τ	≈
8			(	8	H	X	h	x			¿	╕	╚	╪	Φ	°
9			)	9	I	Y	i	y			⌐	╣	╔	┘	Θ	∙
A			*	:	J	Z	j	z			¬	║	╩	┌	Ω	·
B			+	;	K	â	k	é			½	╗	╦	█	δ	√
C			,	<	L	ç	l	ù			¼	╝	╠	▄	∞	n
D			-	=	M	ê	m	è			¡	╜	═	▌	ø	²
E			.	>	N	î	n	û			«	╛	╬	▐	ε	■
F			/	?	O	_	o				»	┐	╧	▀	∩	

International Character Set Parameter 4.

ANSI Emulation: HEX 1B 5B 34 78
BASIC CHR$(27);"[4x";

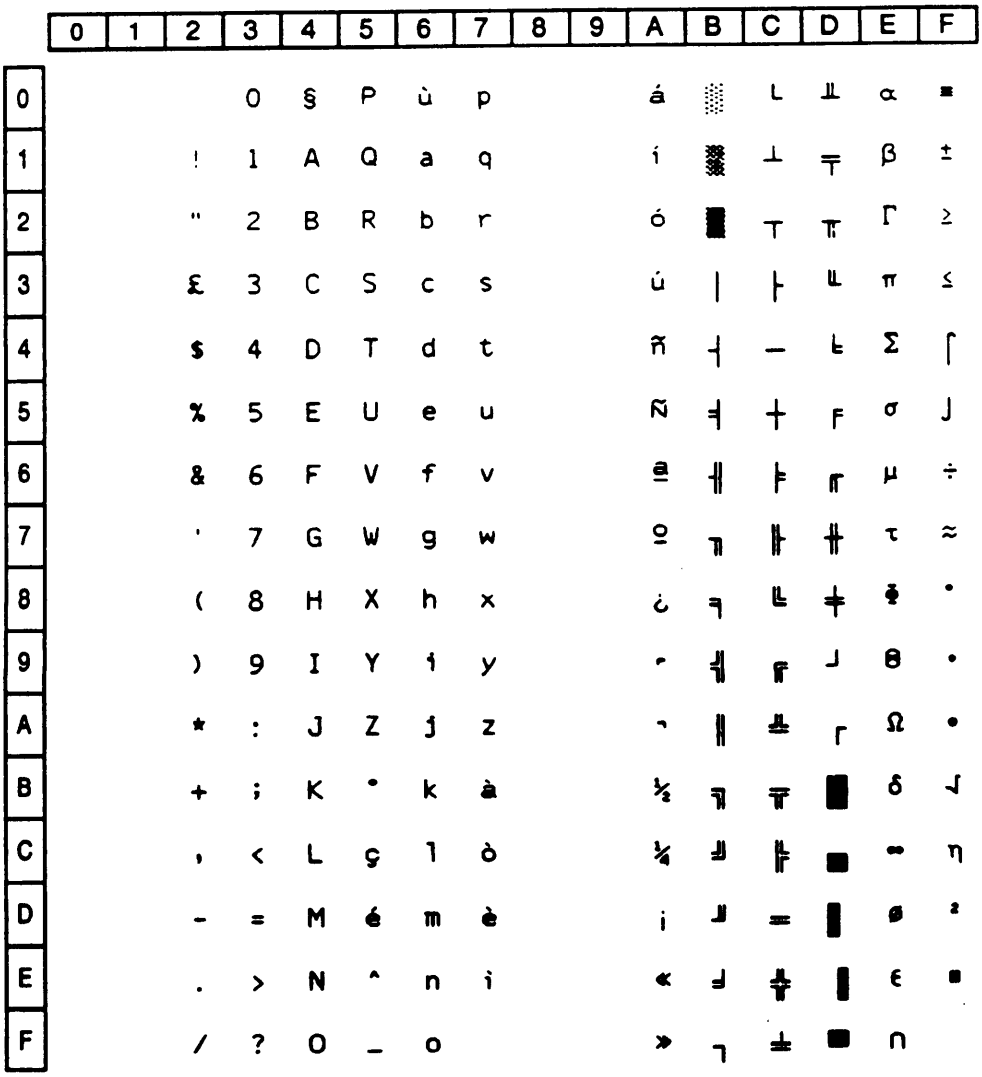
Dutch (Netherlands)



International Character Set Parameter 5.

ANSI Emulation: HEX 1B 5B 35 78
BASIC CHR$(27);"[5x";

Italian

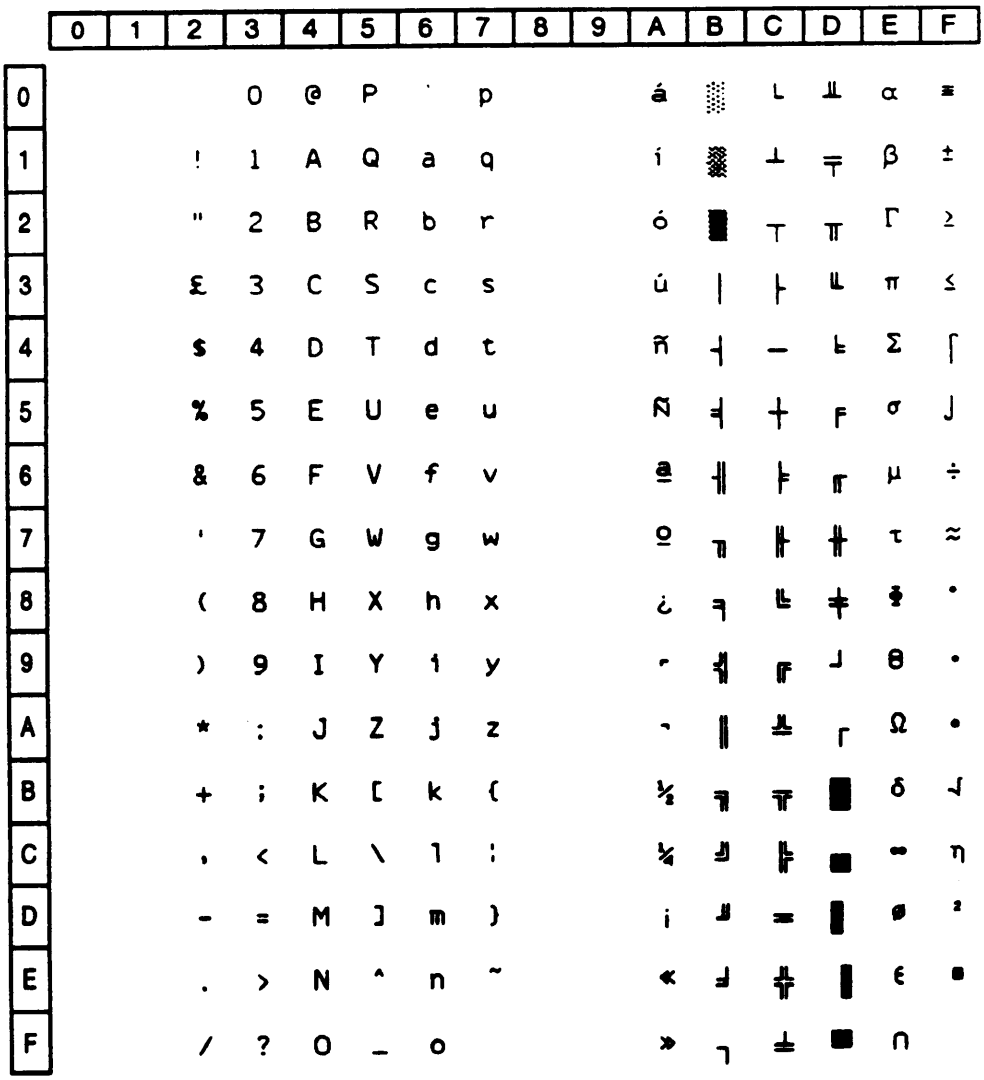


	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	§	P	ù	p			á	▒	└	╨	α	≡
1			!	1	A	Q	a	q			í	▓	┴	╤	β	±
2			"	2	B	R	b	r			ó	▉	┬	╥	Γ	≥
3			£	3	C	S	c	s			ú	▏	├	╙	π	≤
4			$	4	D	T	d	t			ñ	┤	─	╘	Σ	⌠
5			%	5	E	U	e	u			Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v			ª	╢	╞	╓	µ	÷
7			'	7	G	W	g	w			º	╖	╟	╫	τ	≈
8			(	8	H	X	h	x			¿	╕	╚	╪	Φ	°
9			)	9	I	Y	i	y			⌐	╣	╔	┘	Θ	∙
A			*	:	J	Z	j	z			¬	║	╩	┌	Ω	·
B			+	;	K	[	k	à			½	╗	╦	▉	δ	√
C			,	<	L	ç	l	ò			¼	╝	╠	▄	∞	η
D			-	=	M	é	m	è			¡	╜	═	▌	ø	²
E			.	>	N	^	n	ì			«	╛	╬	▐	ε	■
F			/	?	O	_	o				»	┐	╧	▀	∩	

International Character Set Parameter 6.

ANSI Emulation: HEX 1B 5B 36 78
BASIC CHR$(27);"[6x";

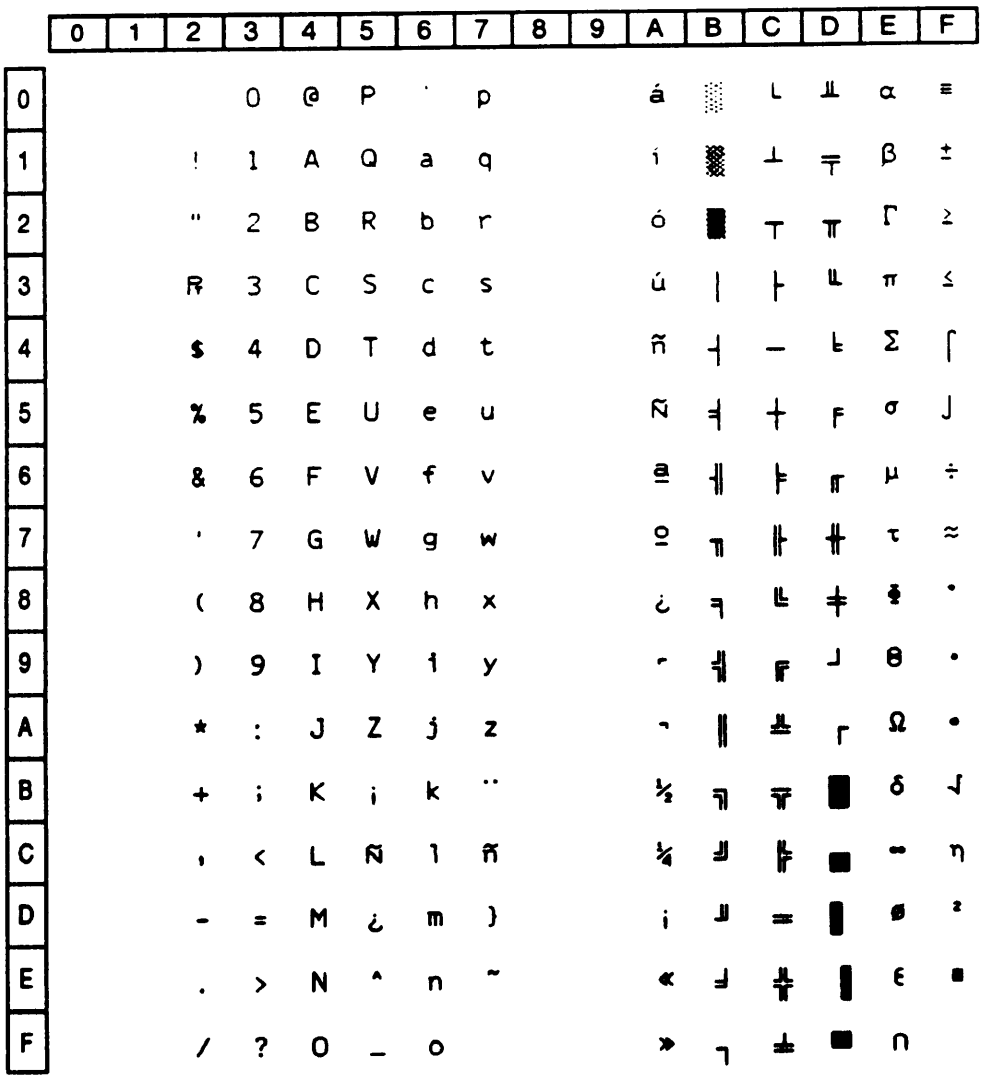
United Kingdom (ISO)



International Character Set Parameter 7.

ANSI Emulation: HEX 1B 5B 37 78
BASIC CHR$(27);"[7x";

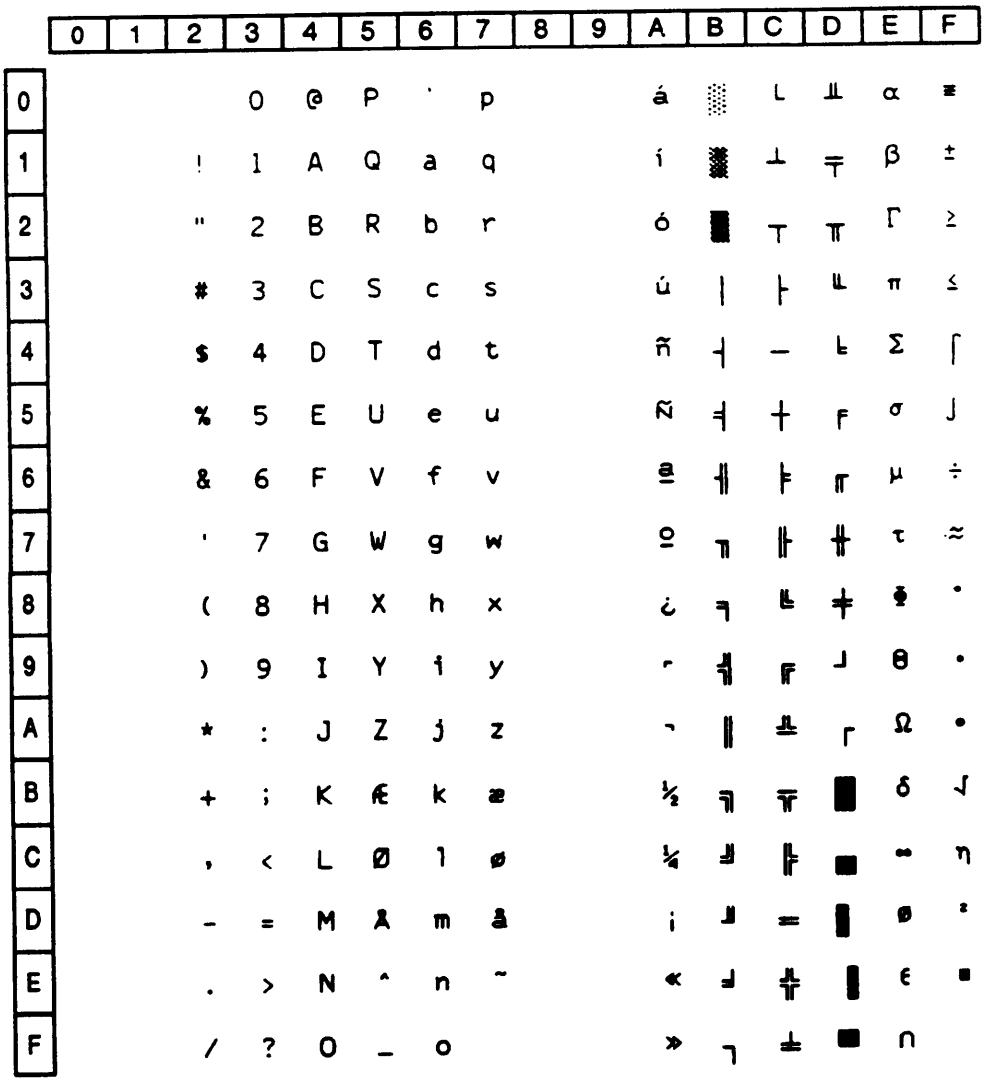
Spanish



International Character Set Parameter 8.

ANSI Emulation: HEX 1B 5B 38 78
BASIC CHR$(27);"[8x";

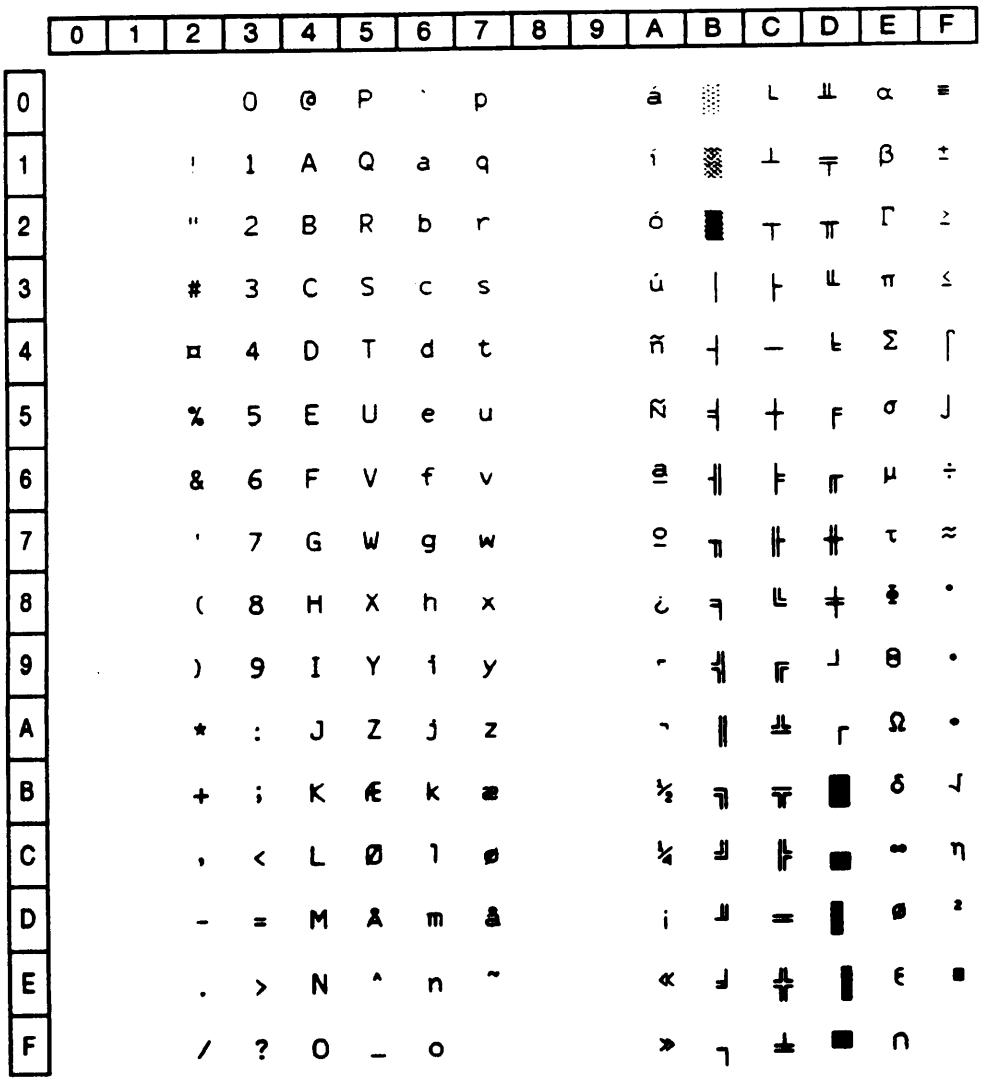
Danish/Norwegian A



International Character Set Parameter 9.

ANSI Emulation: HEX 1B 5B 39 78
BASIC CHR$(27);"[9x";

Danish/Norwegian B



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6			&	6	F	V	f	v			ª	╢	╞	╓	µ	÷
7			'	7	G	W	g	w			º	╖	╟	╫	τ	≈
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9			)	9	I	Y	i	y			⌐	╣	╔	┘	Θ	∙
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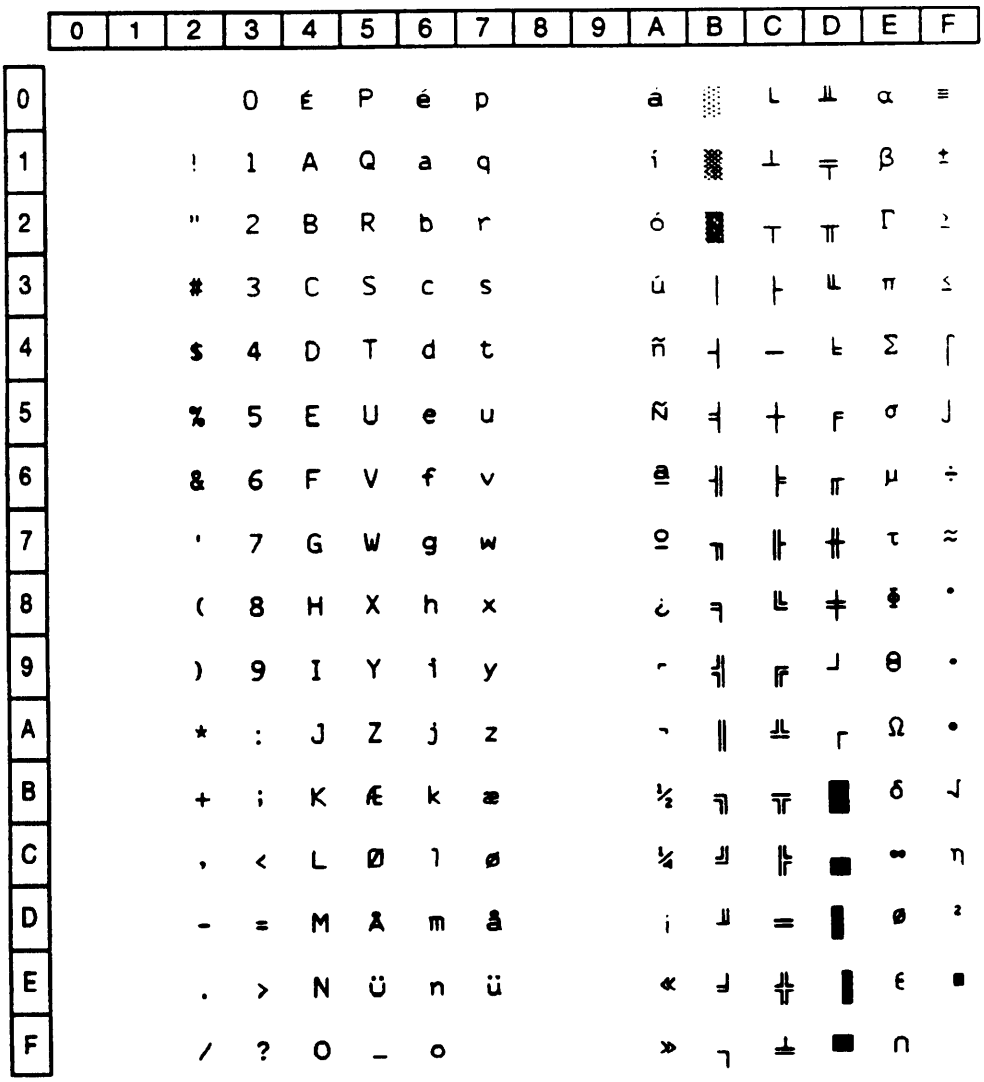
International Character Set Parameter 10.

ANSI Emulation: HEX 1B 5B 31 30 78
BASIC CHR$(27);"[10x";

Danish/Norwegian C



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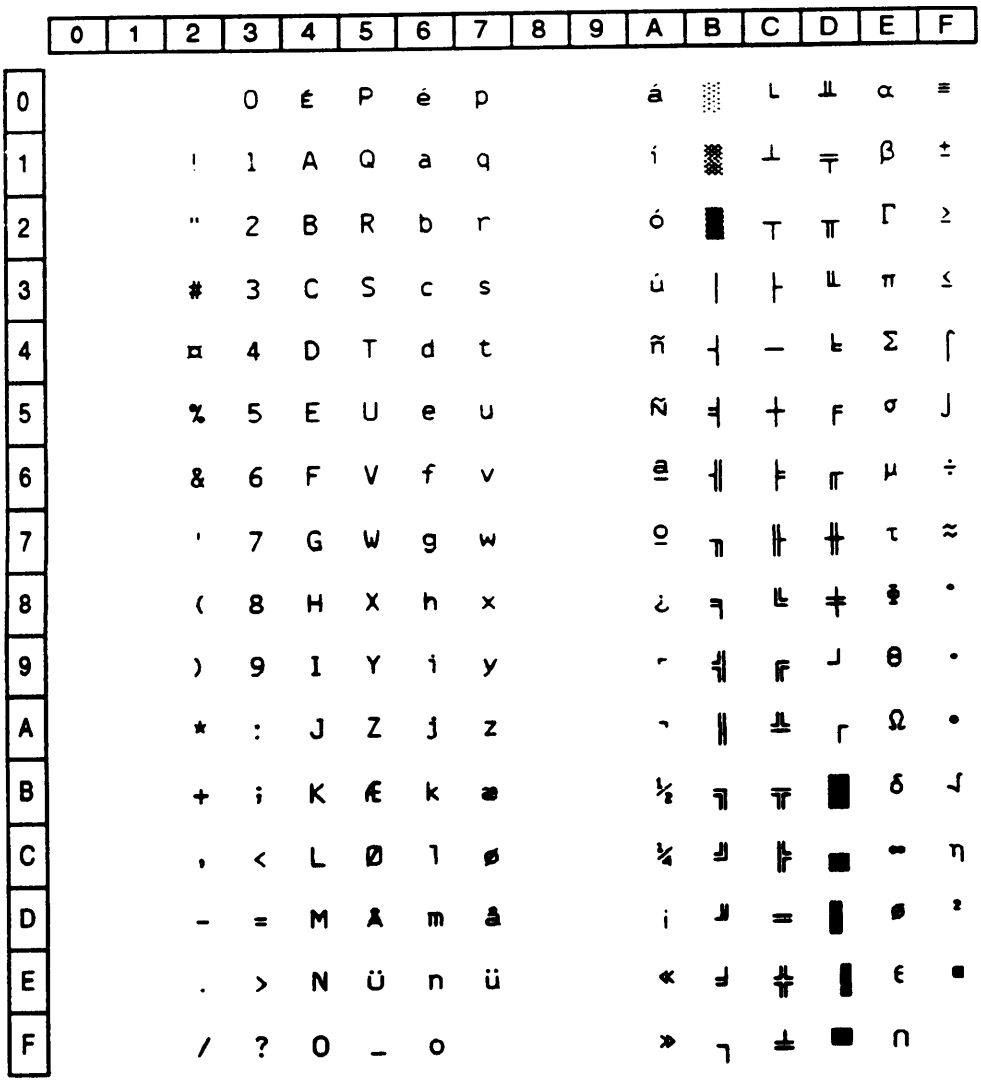
International Character Set Parameter 11.

ANSI Emulation: HEX 1B 5B 31 31 78
BASIC CHR$(27);"[11x";

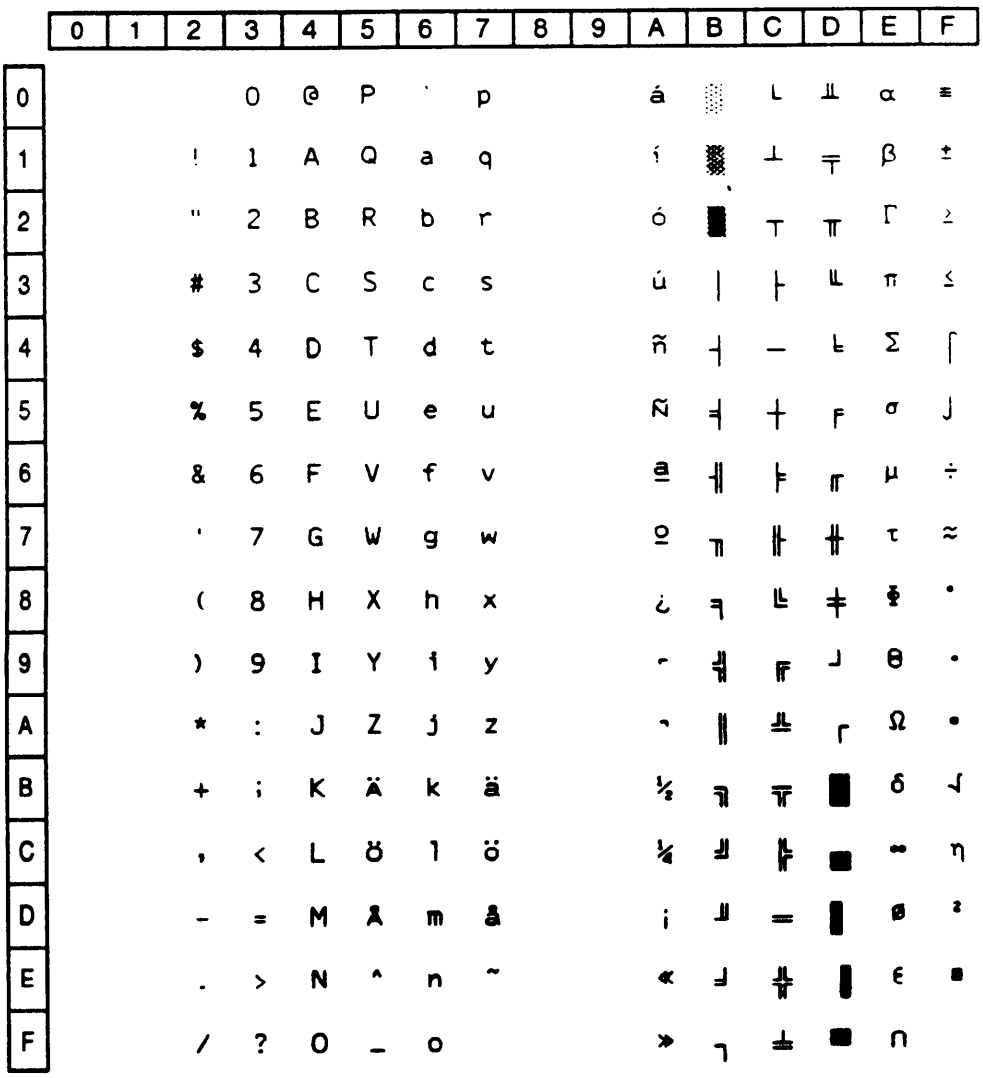
Danish/Norwegian D



International Character Set Parameter 12.

ANSI Emulation: HEX 1B 5B 31 32 78
BASIC CHR$(27);"[12x";

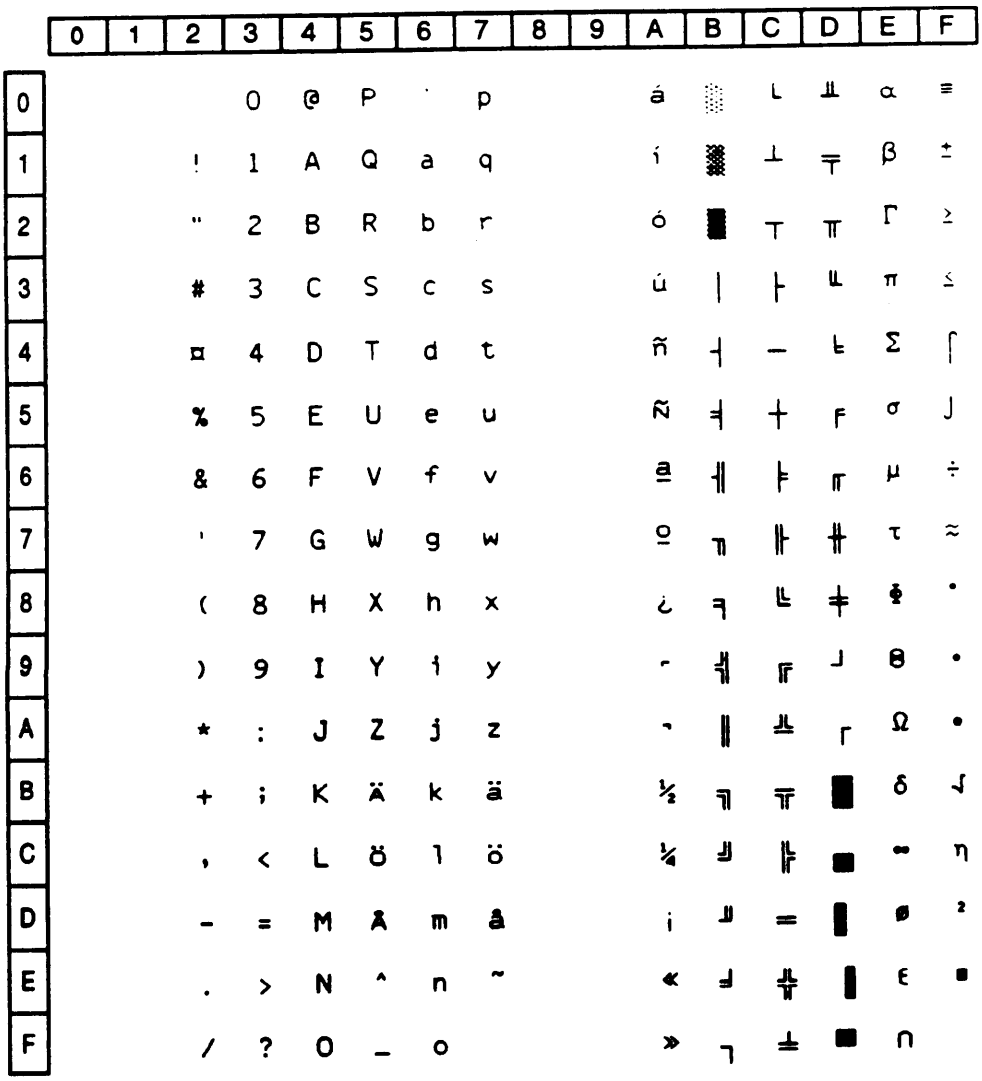
Swedish/Finnish A



International Character Set Parameter 13.

ANSI Emulation: HEX 1B 5B 31 33 78
BASIC CHR$(27);"[13x";

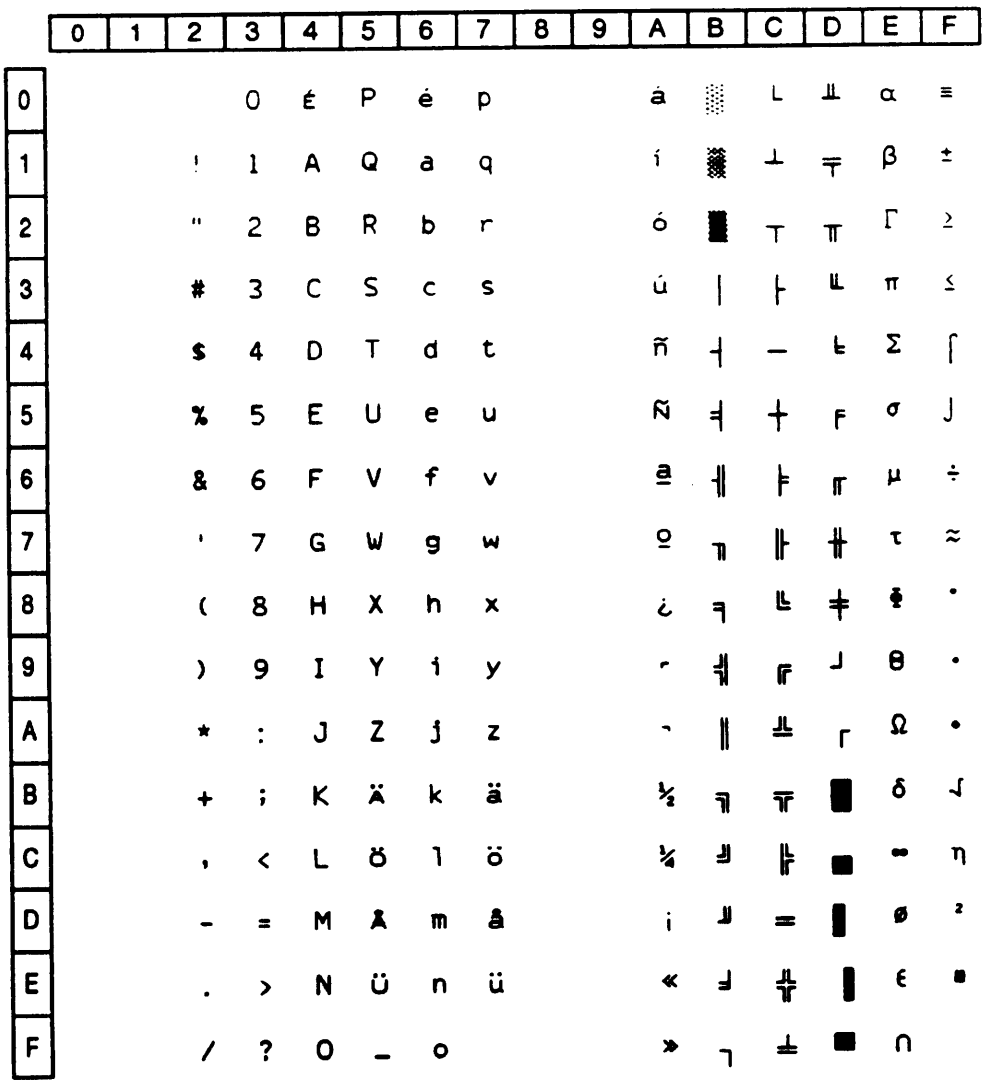
Swedish/Finnish B



International Character Set Parameter 14.

ANSI Emulation: HEX 1B 5B 31 34 78
BASIC CHR$(27);"[14x";

Swedish/Finnish C



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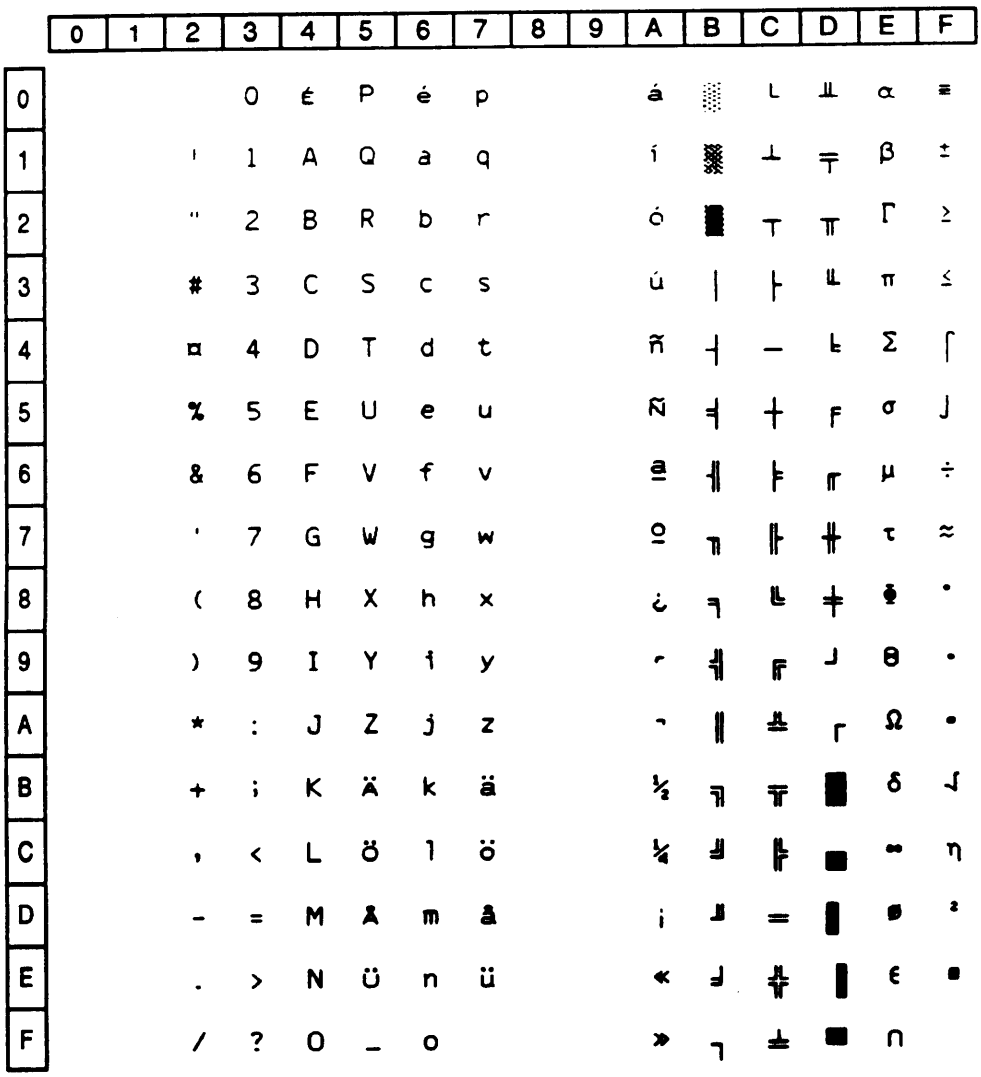
International Character Set Parameter 15.

ANSI Emulation: HEX 1B 5B 31 35 78
BASIC CHR$(27);"[15x";

Swedish/Finnish D



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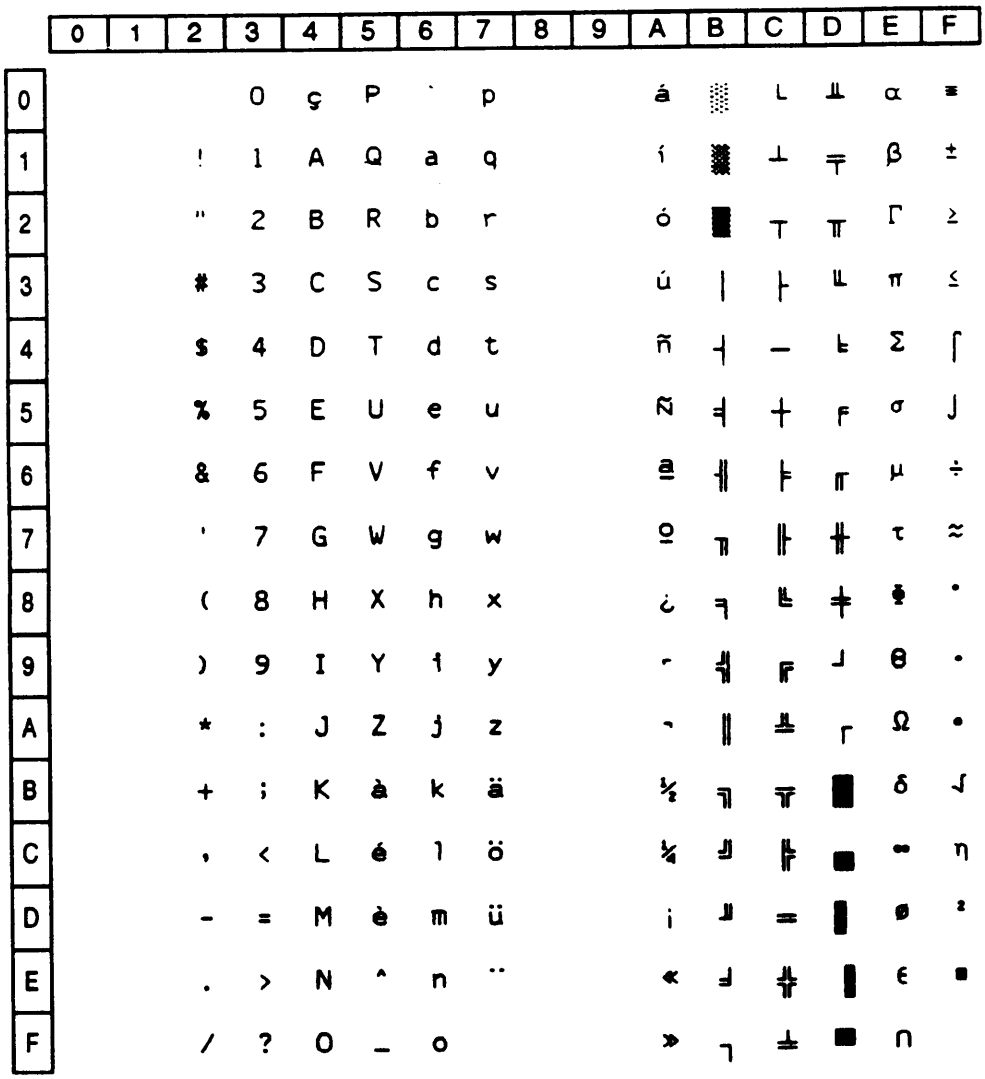
International Character Set Parameter 16.

ANSI Emulation: HEX 1B 5B 31 36 78
BASIC CHR$(27);"16x";

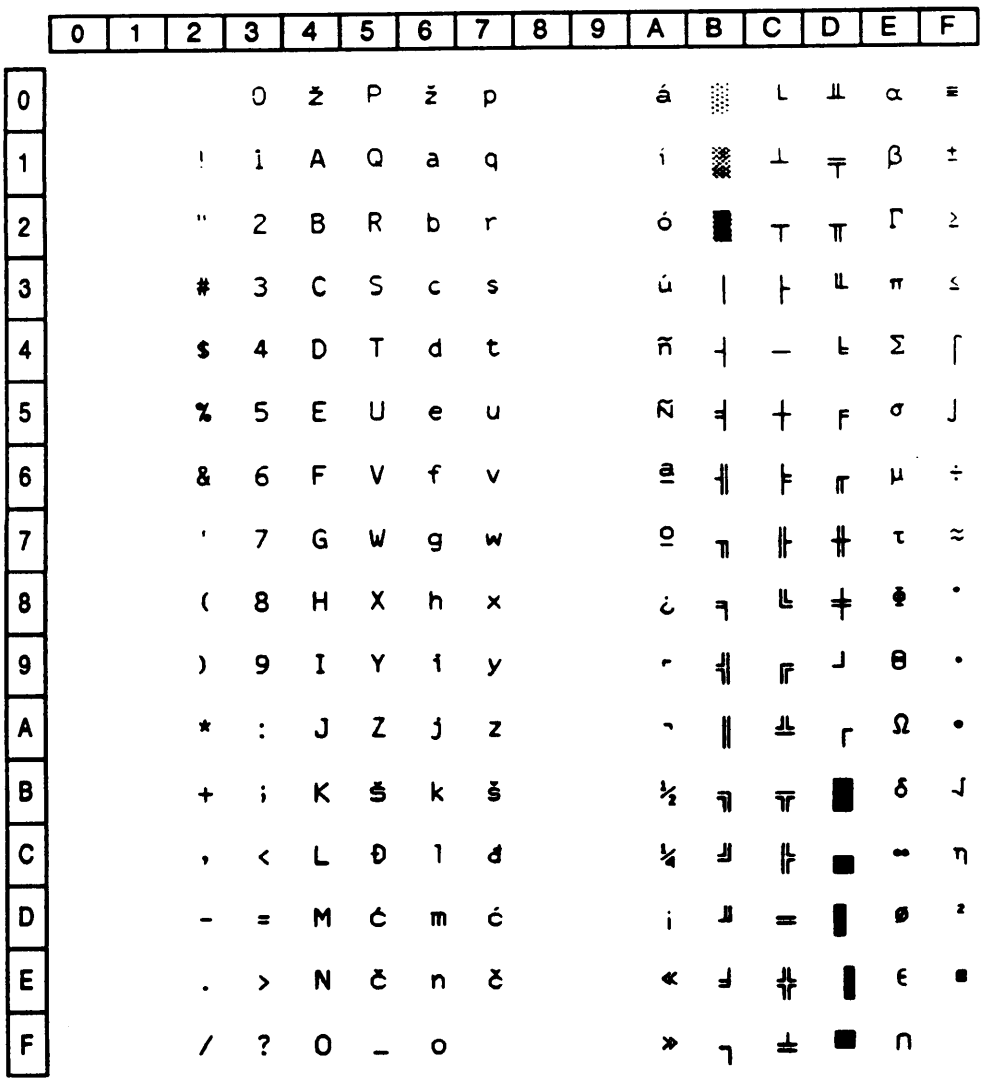
Swiss



International Character Set Parameter 17.

ANSI Emulation: HEX 1B 5B 31 37 78
BASIC CHR$(27);"[17x";

Slovenia/Croatia



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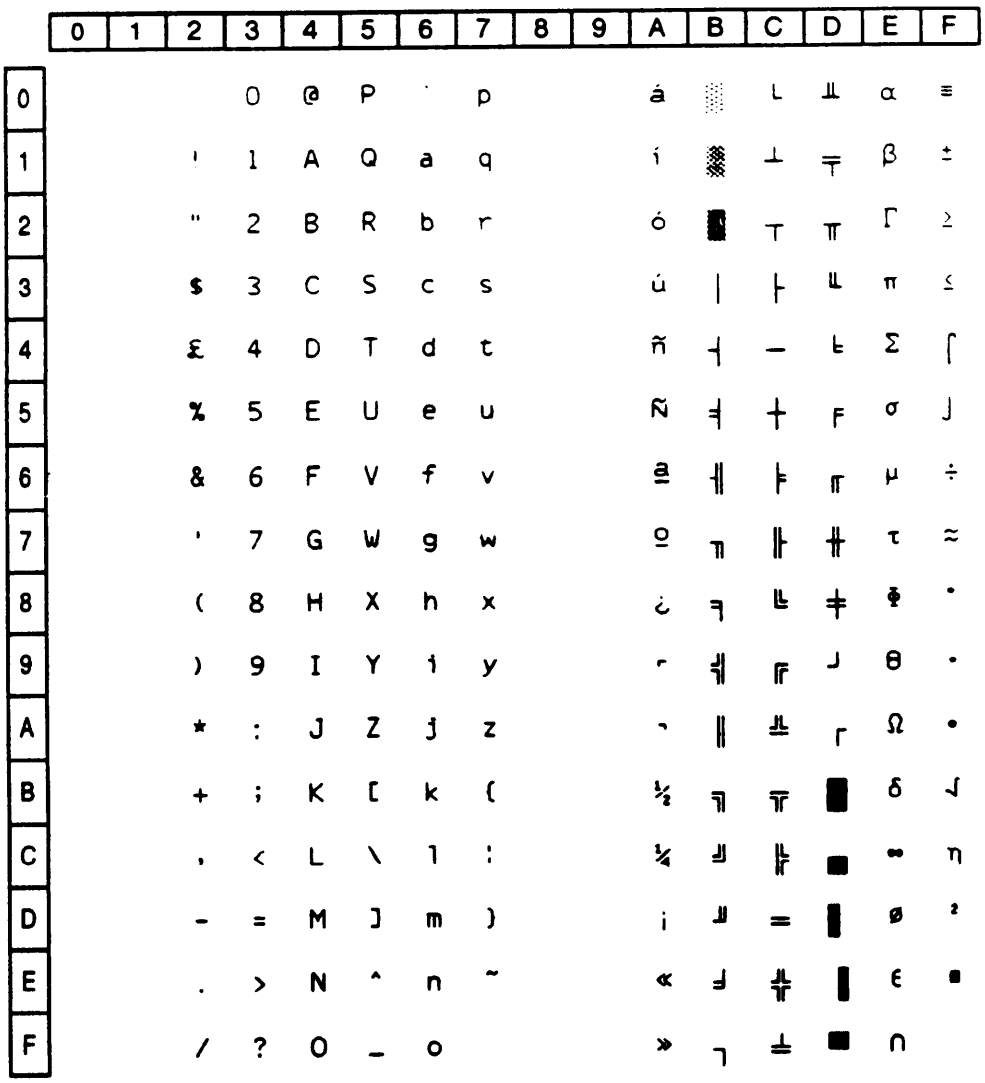
International Character Set Parameter 19.

ANSI Emulation: HEX 1B 5B 31 39 78
BASIC CHR$(27);"[19x";

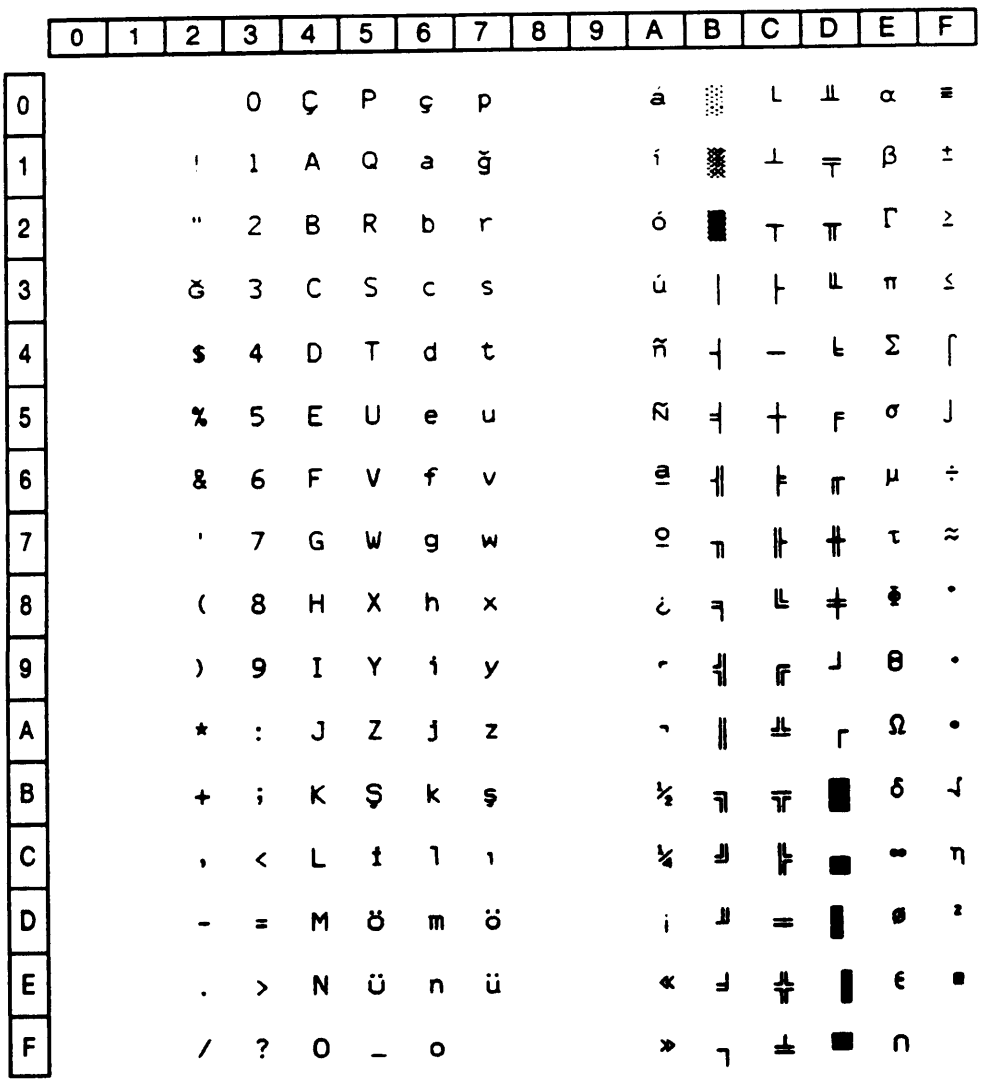
United Kingdom A



International Character Set Parameter 20.

ANSI Emulation: HEX 1B 5B 32 30 78
BASIC CHR$(27);"[20x";

Turkish



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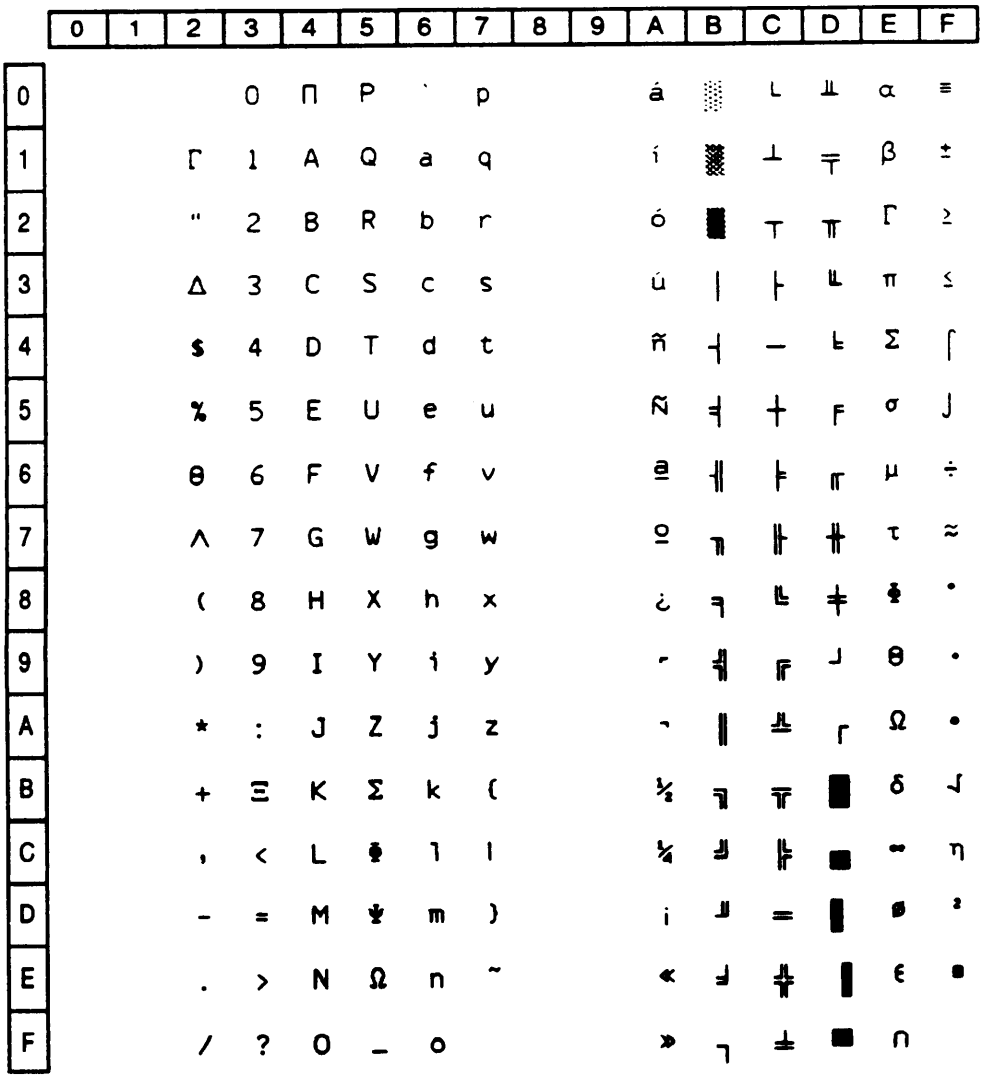
International Character Set Parameter 21.

ANSI Emulation: HEX 1B 5B 32 31 78
BASIC CHR$(27);"[21x";

Greek



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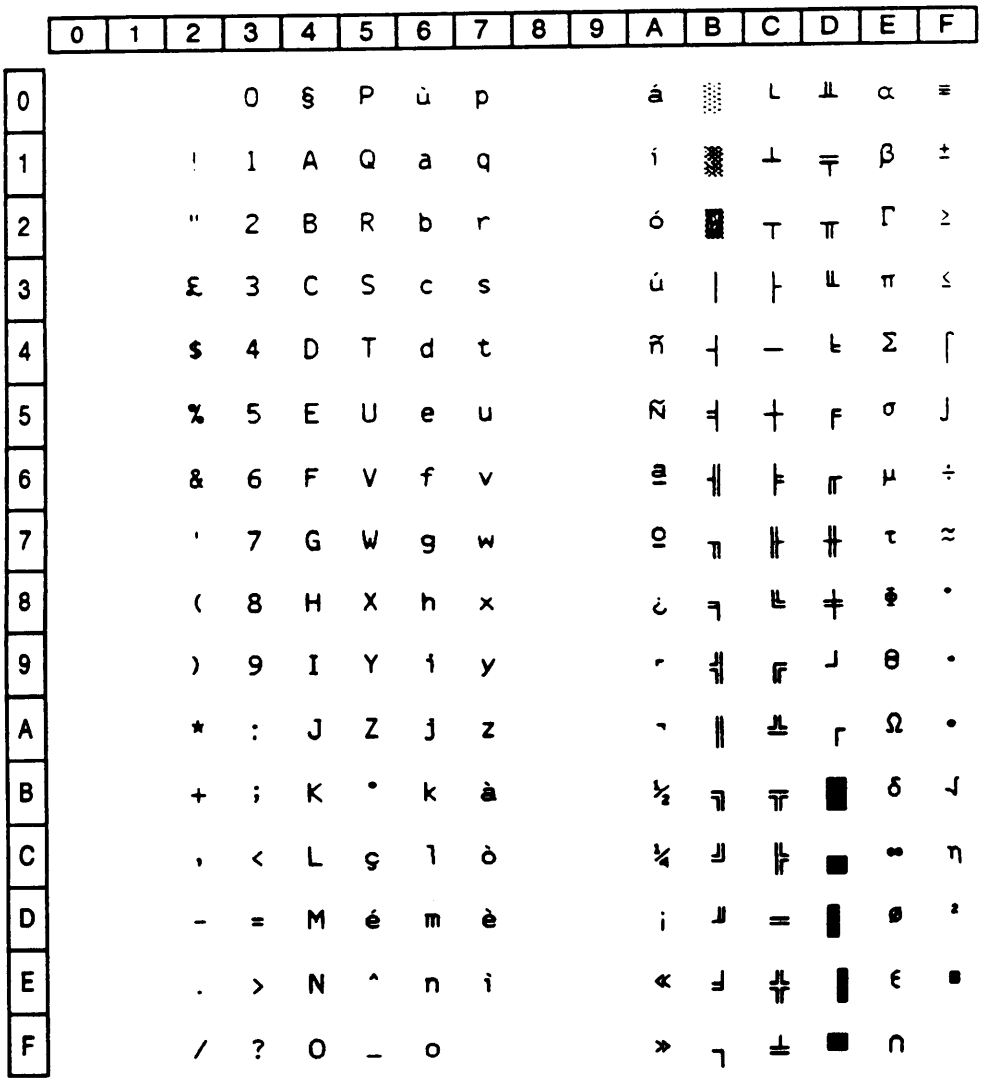
International Character Set Parameter 22.

ANSI Emulation: HEX 1B 5B 32 32 78
BASIC CHR$(27);"[22x";

Italian (ISO)



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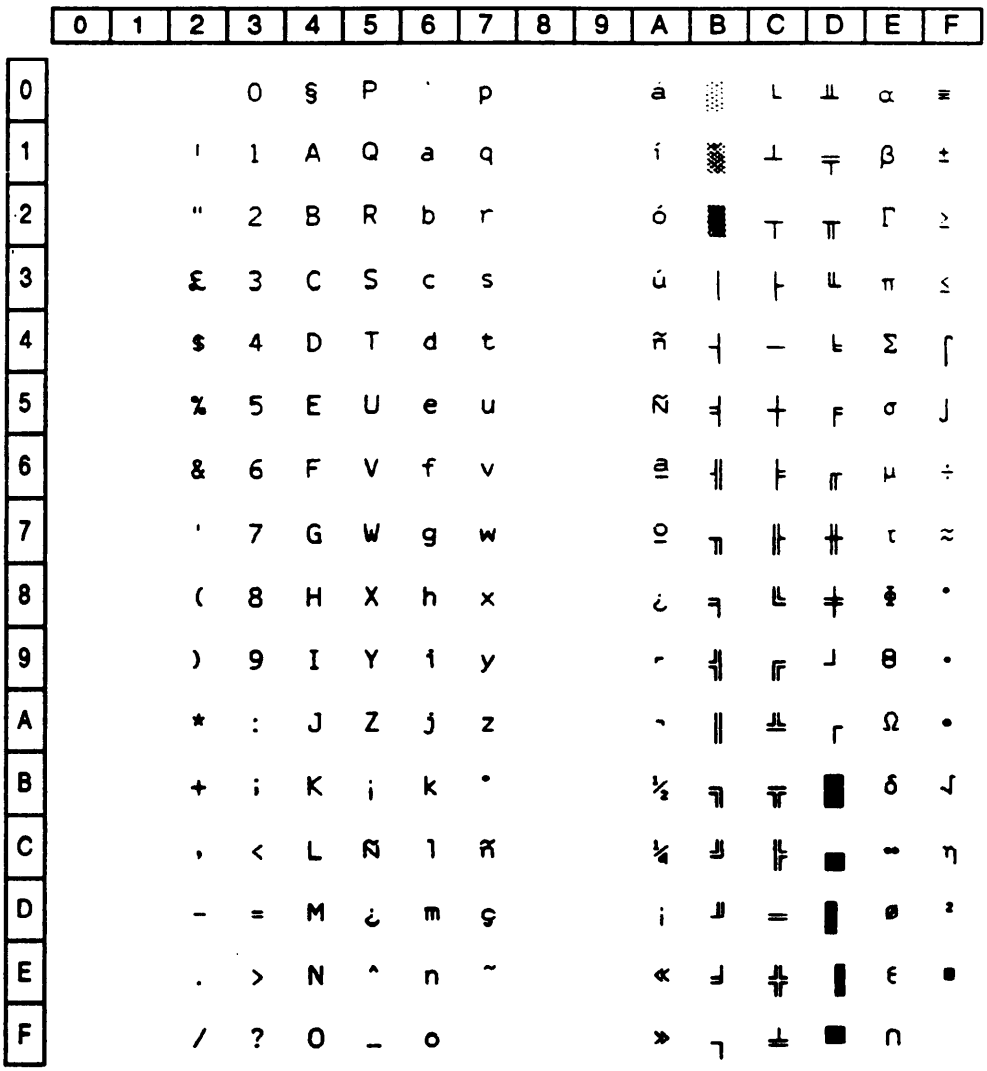
International Character Set Parameter 23.

ANSI Emulation: HEX 1B 5B 32 33 78
BASIC CHR$(27);"[23x";

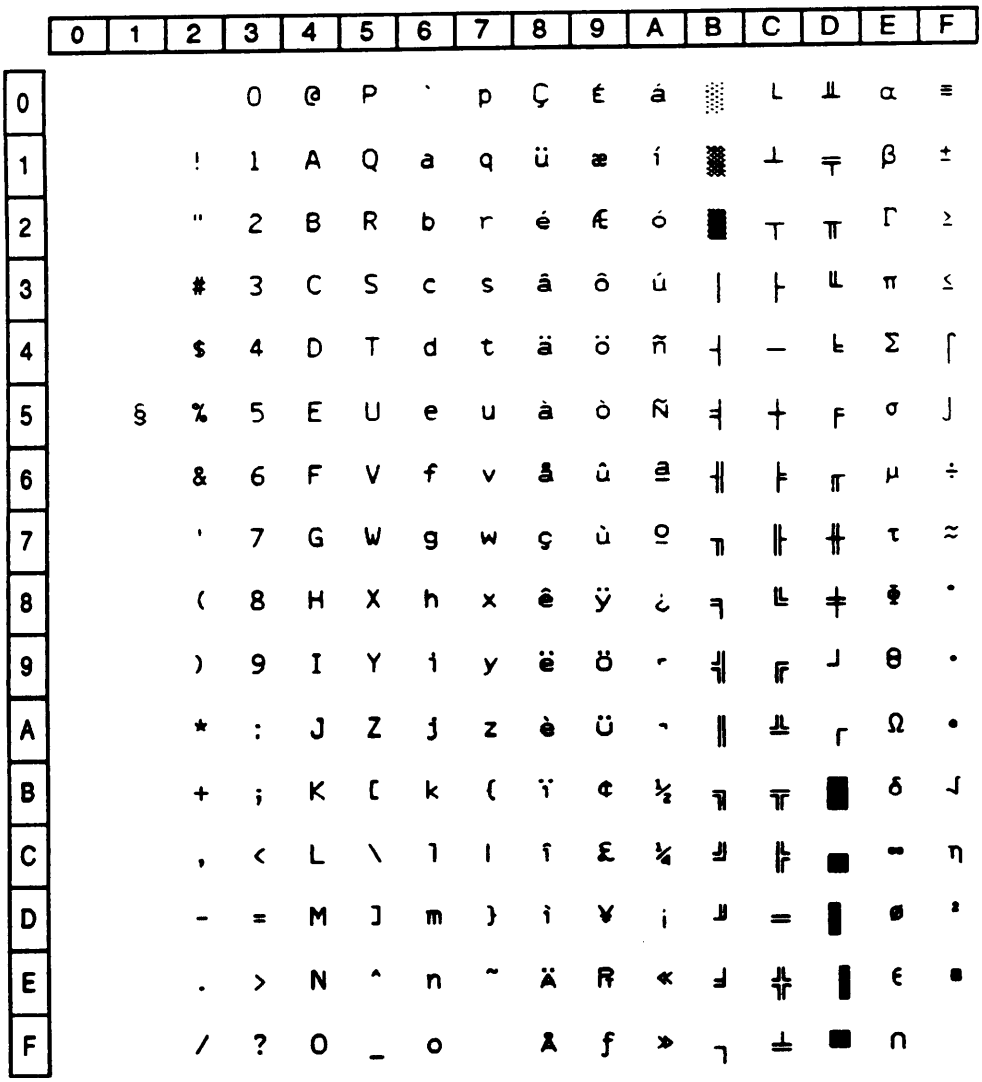
Spanish (ISO)



International Character Set Parameter 24.

ANSI Emulation: HEX 1B 5B 32 34 78
BASIC CHR$(27);"[24x";

IBM PC Set, USA (Microsoft Code Page 437)

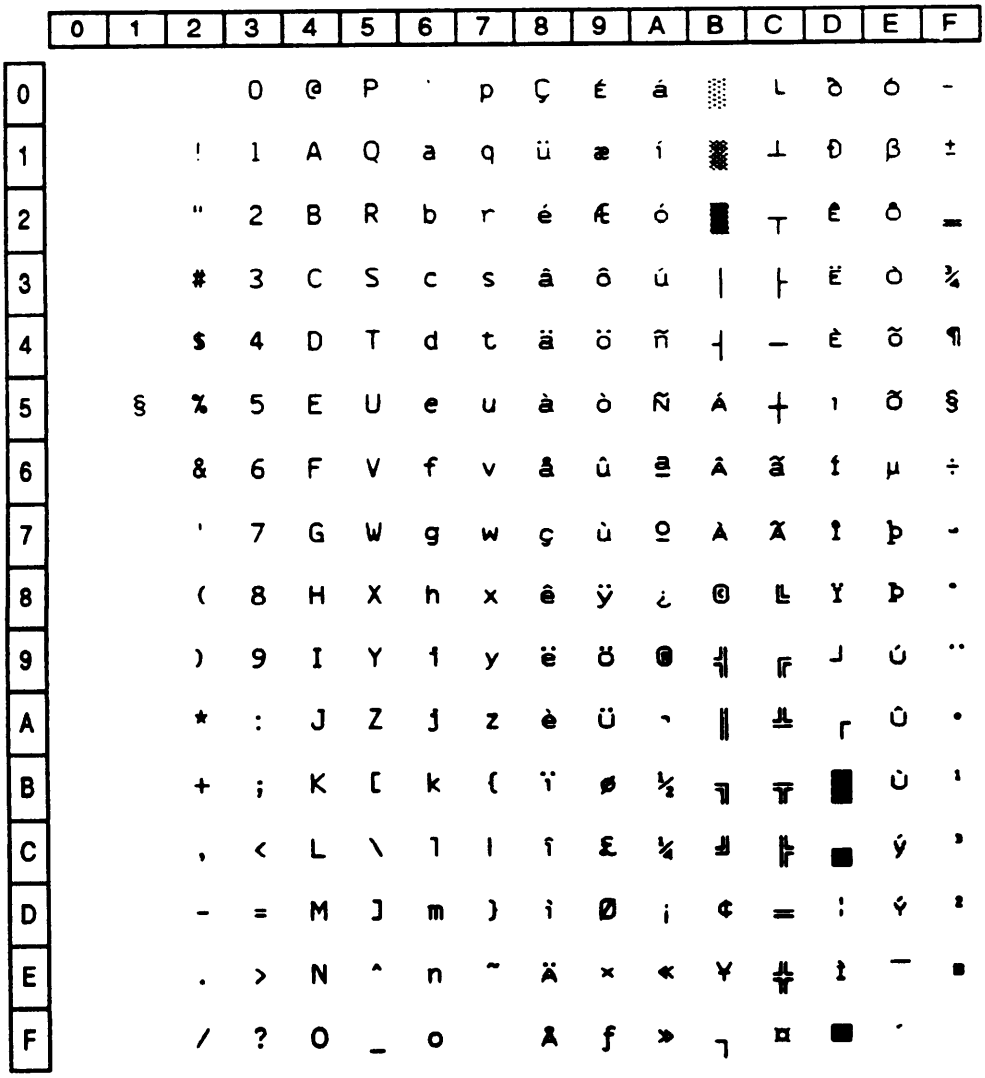


International Character Set Parameter 437.

ANSI Emulation: HEX 1B 5B 34 33 37 78
BASIC CHR$(27);"[437x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 B5 01 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(181);CHR$(1);CHR$(0);

IBM PC Multilingual Set (Microsoft Code Page 850)



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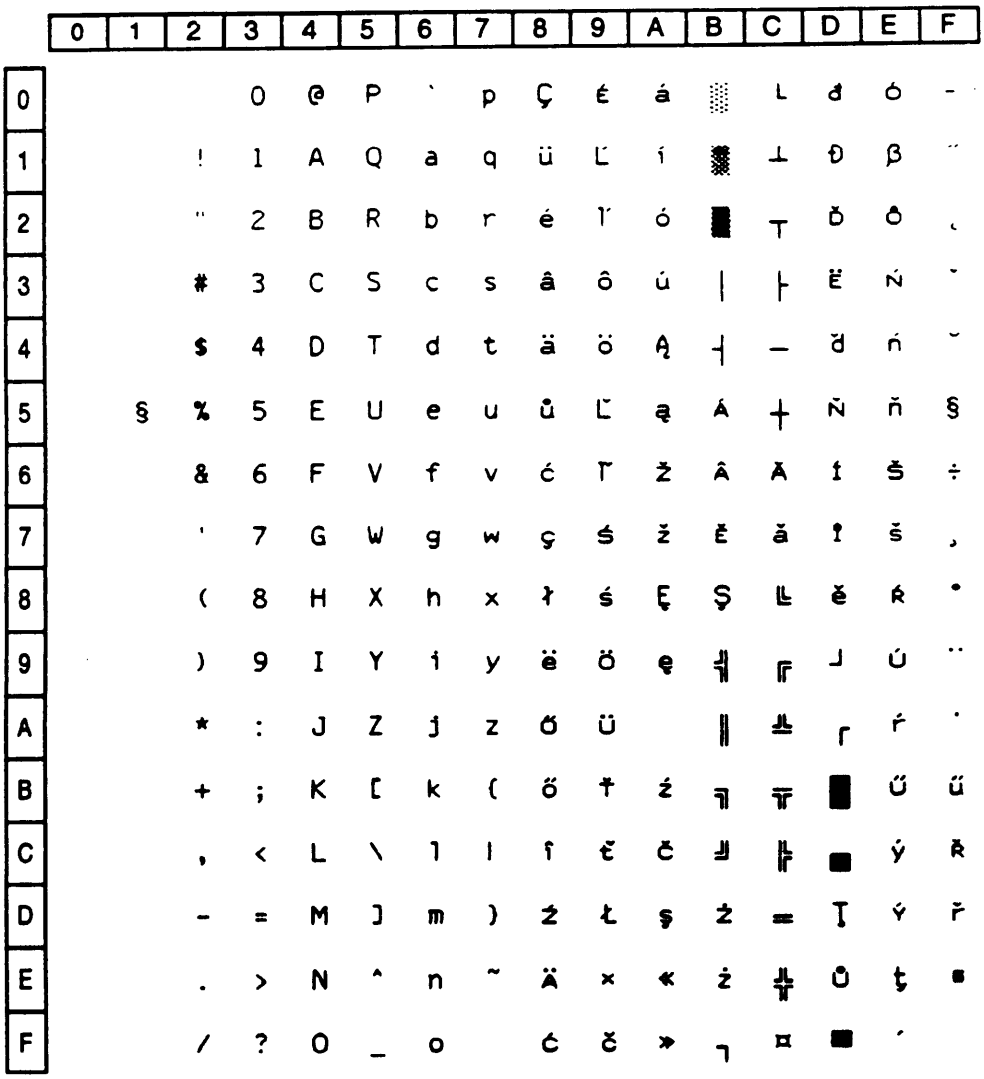
International Character Set Parameter 850.

ANSI Emulation: HEX 1B 5B 38 35 30 78
BASIC CHR$(27);"[850x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 52 03 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(82);CHR$(3);CHR$(0);

Microsoft Code Page 852 (East European)



	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	á	▒	└	đ	Ó	-
1			!	1	A	Q	a	q	ü	Ĺ	í	▓	┴	Đ	ß	˝
2			"	2	B	R	b	r	é	ĺ	ó	▉	┬	Ď	Ô	˛
3			#	3	C	S	c	s	â	ô	ú	┤	├	Ë	Ń	ˇ
4			$	4	D	T	d	t	ä	ö	Ą	┤	─	ď	ń	˘
5		§	%	5	E	U	e	u	ů	Ľ	ą	Á	┼	Ň	ň	§
6			&	6	F	V	f	v	ć	ľ	Ž	Â	Ă	Í	Š	÷
7			'	7	G	W	g	w	ç	ś	ž	Ě	ă	˙	š	¸
8			(	8	H	X	h	x	ł	ś	Ę	Ş	╚	ě	Ř	°
9			)	9	I	Y	i	y	ë	Ö	ę	╣	╔	╩	Ú	¨
A			*	:	J	Z	j	z	ő	Ü		║	╩	┌	ŕ	·
B			+	;	K	[	k	{	ő	ť	ź	╗	╦	▉	Ű	ű
C			,	<	L	\	l	|	î	č	č	╝	╠	▄	ý	Ř
D			-	=	M	]	m	}	ź	Ł	ş	ż	═	ţ	Ý	ř
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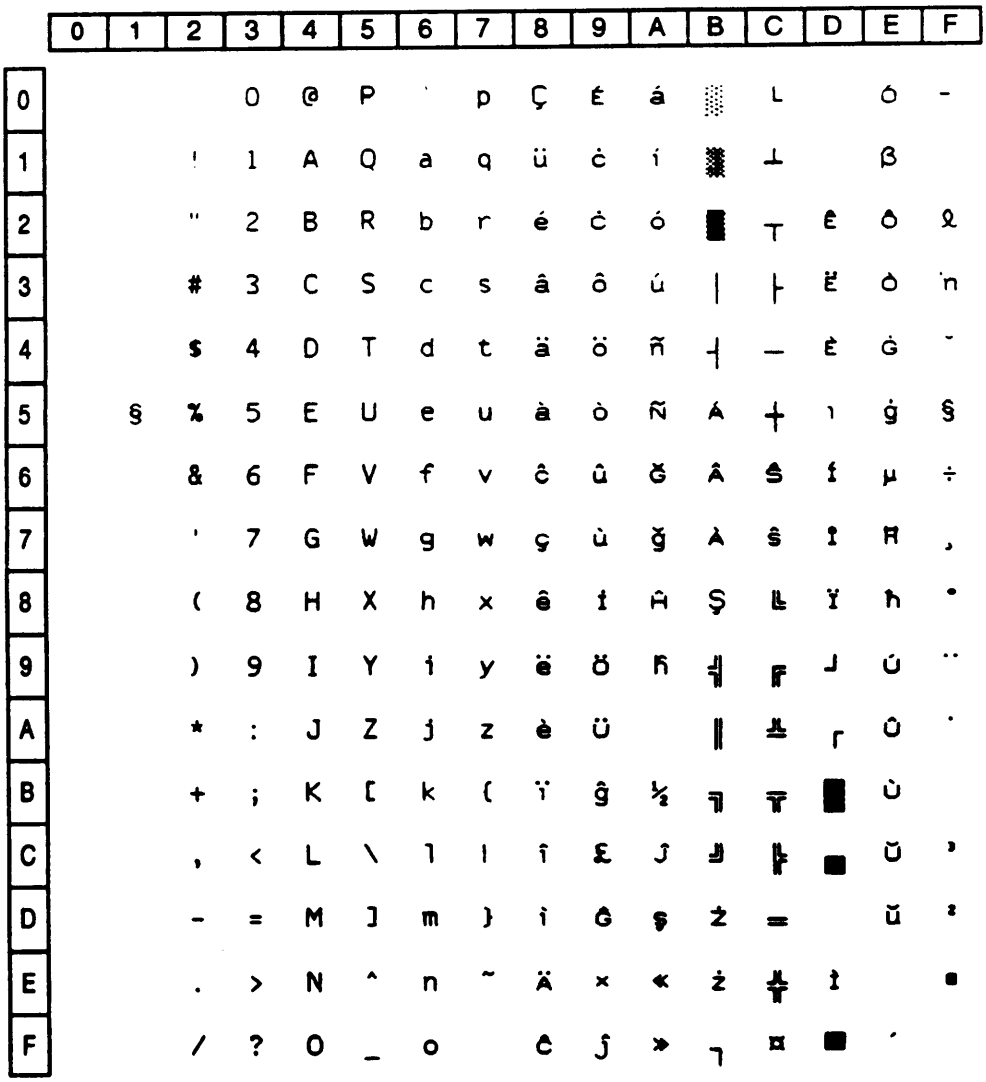
F			/	?	O	_	o		ć	č	»	┐	¤	▉	´	

International Character Set Parameter 852.

ANSI Emulation: HEX 1B 5B 38 35 32 78
BASIC CHR$(27);"[852x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 54 03 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(84);CHR$(3);CHR$(0);

Microsoft Code Page 853 (Turkey)

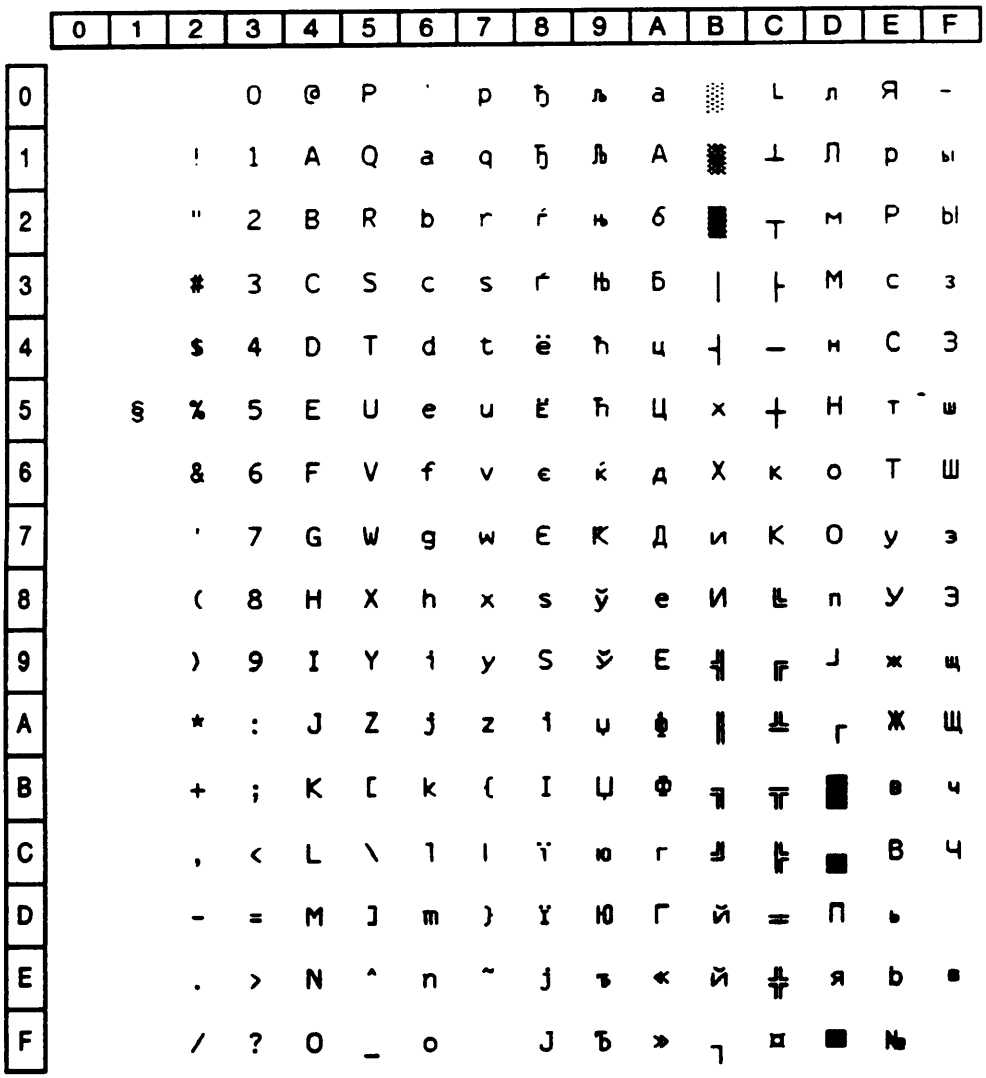


International Character Set Parameter 853.

ANSI Emulation: HEX 1B 5B 38 35 33 78
BASIC CHR$(27);"[853x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 55 03 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(85);CHR$(3);CHR$(0);

Microsoft Code Page 855 (Cyrillic)

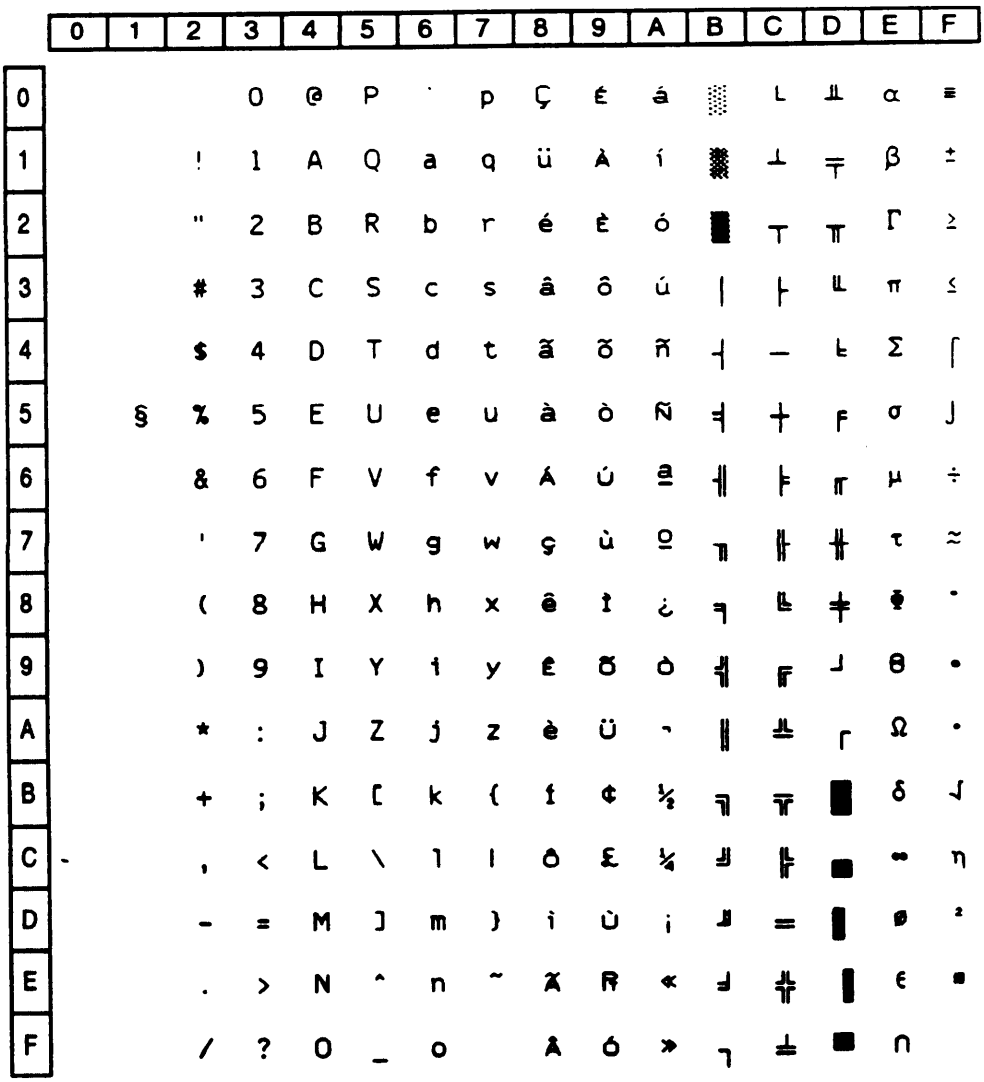


International Character Set Parameter 855.

ANSI Emulation: HEX 1B 5B 38 35 35 78
BASIC CHR$(27);"[855x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 57 03 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(87);CHR$(3);CHR$(0);

Microsoft Code Page 860 (Portugal)

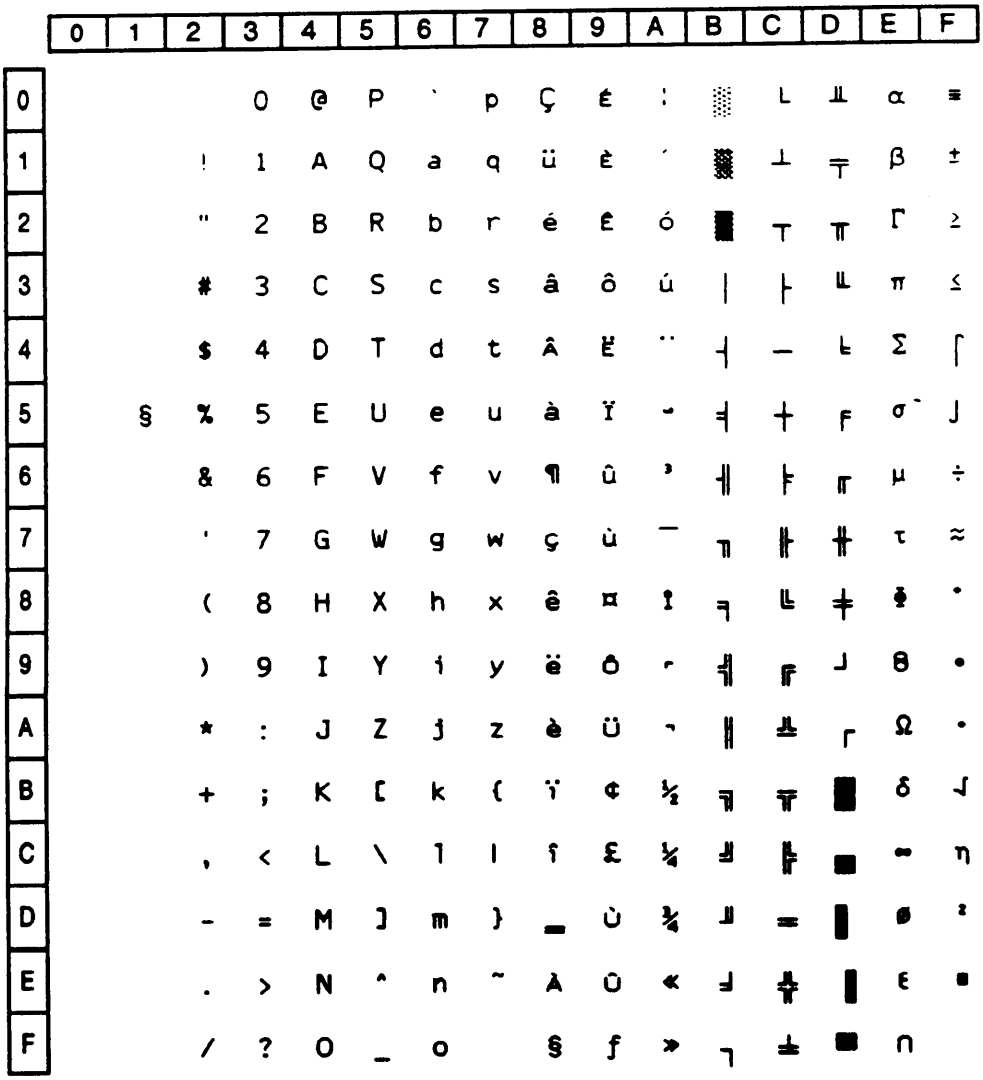


International Character Set Parameter 860.

ANSI Emulation: HEX 1B 5B 38 36 30 78
BASIC CHR$(27);"[860x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 5C 03 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(92);CHR$(3);CHR$(0);

Microsoft Code Page 863 (French Canadian)

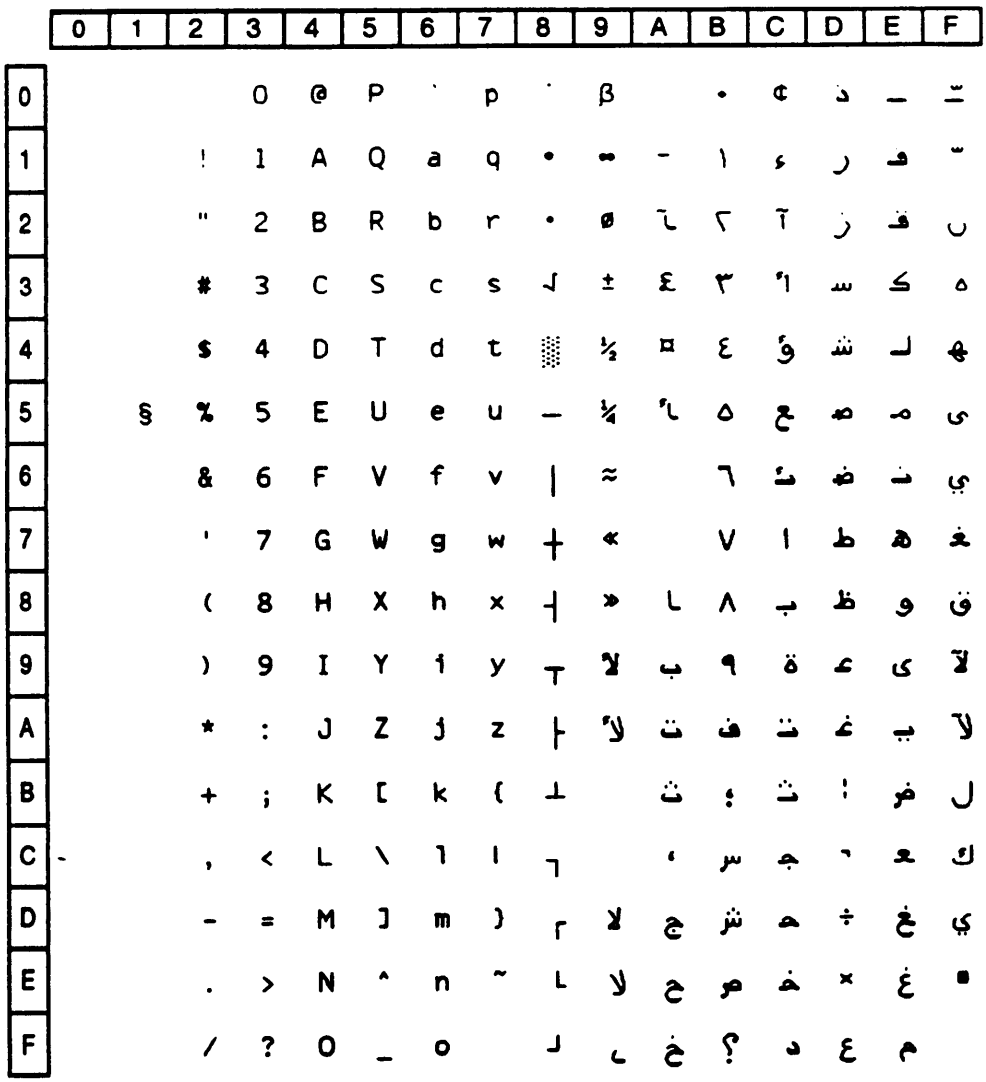


International Character Set Parameter 863.

ANSI Emulation: HEX 1B 5B 38 36 33 78
BASIC CHR$(27);"[863x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 5F 03 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(95);CHR$(3);CHR$(0);

Microsoft Code Page 864 (Arabic)



	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	`	β		•	¢	د	ـ	ّ
1			!	1	A	Q	a	q	•	▬	-	١	ء	ر	ف	ّ
2			"	2	B	R	b	r	•	ø	ـٰ	٢	آ	ز	ق	ن
3			#	3	C	S	c	s	√	±	٤	٣	أ	س	ك	ه
4			$	4	D	T	d	t	▒	½	¤	٤	ؤ	ش	ل	ه
5		§	%	5	E	U	e	u	—	¼	أ	٥	ع	ص	م	ى
6			&	6	F	V	f	v	|	≈		٦	ئ	ض	ن	ي
7			'	7	G	W	g	w	┼	«		V	ا	ط	ه	غ
8			(	8	H	X	h	x	┤	»	ـا	٨	ب	ظ	و	ق
9			)	9	I	Y	i	y	┬	لا	ب	٩	ة	ع	ى	لآ
A			*	:	J	Z	j	z	├	لأ	ت	ف	ث	غ	ب	لأ
B			+	;	K	[	k	{	┴		ث	؛	ت	!	ظ	ل
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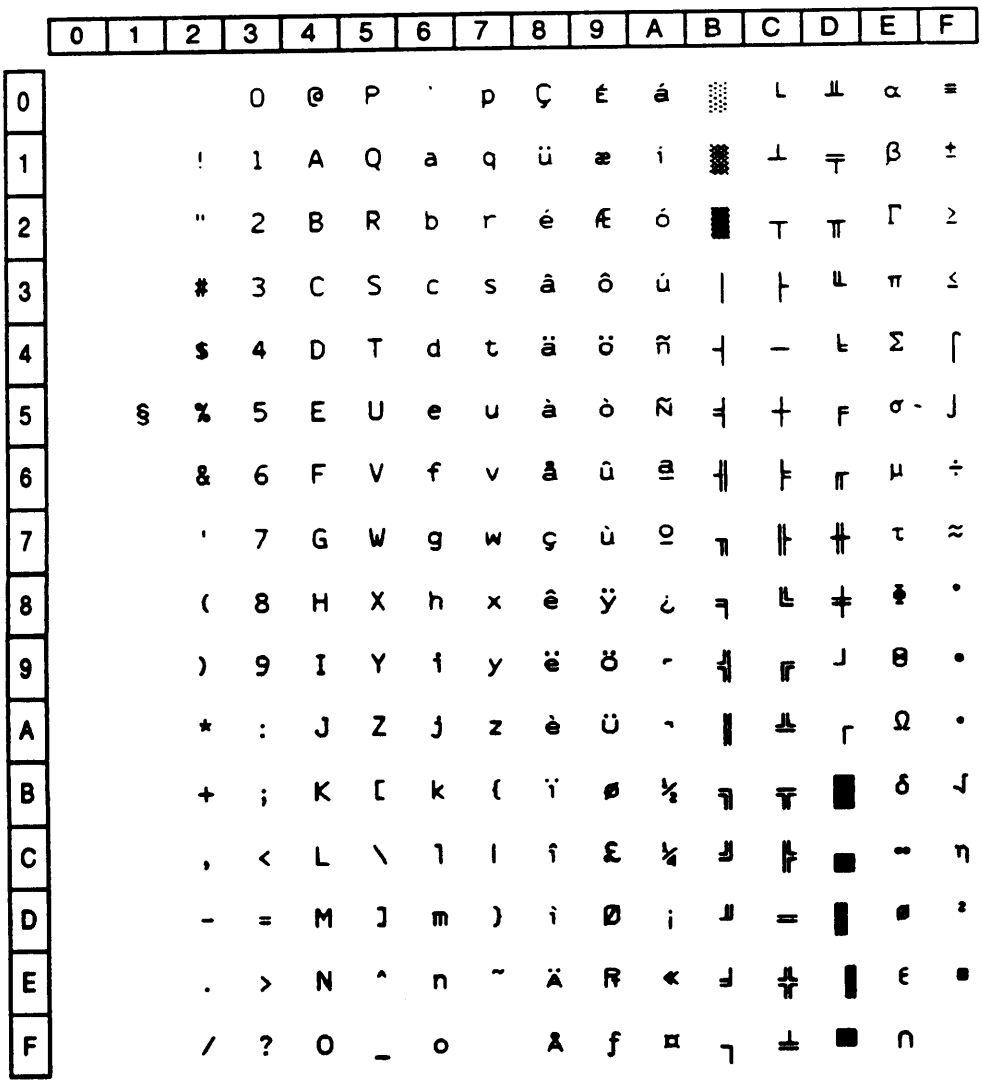
D			-	=	M	]	m	}	┌	لا	ج	ش	ح	÷	غ	ي
E			.	>	N	^	n	~	└	لا	ح	ص	خ	×	غ	■
F			/	?	O	_	o		┘	ے	خ	؟	د	ع	م	

International Character Set Parameter 864.

ANSI Emulation: HEX 1B 5B 38 36 34 78
BASIC CHR$(27);"[864x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 60 03 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(96);CHR$(3);CHR$(0);

Microsoft Code Page 865 (Norway)



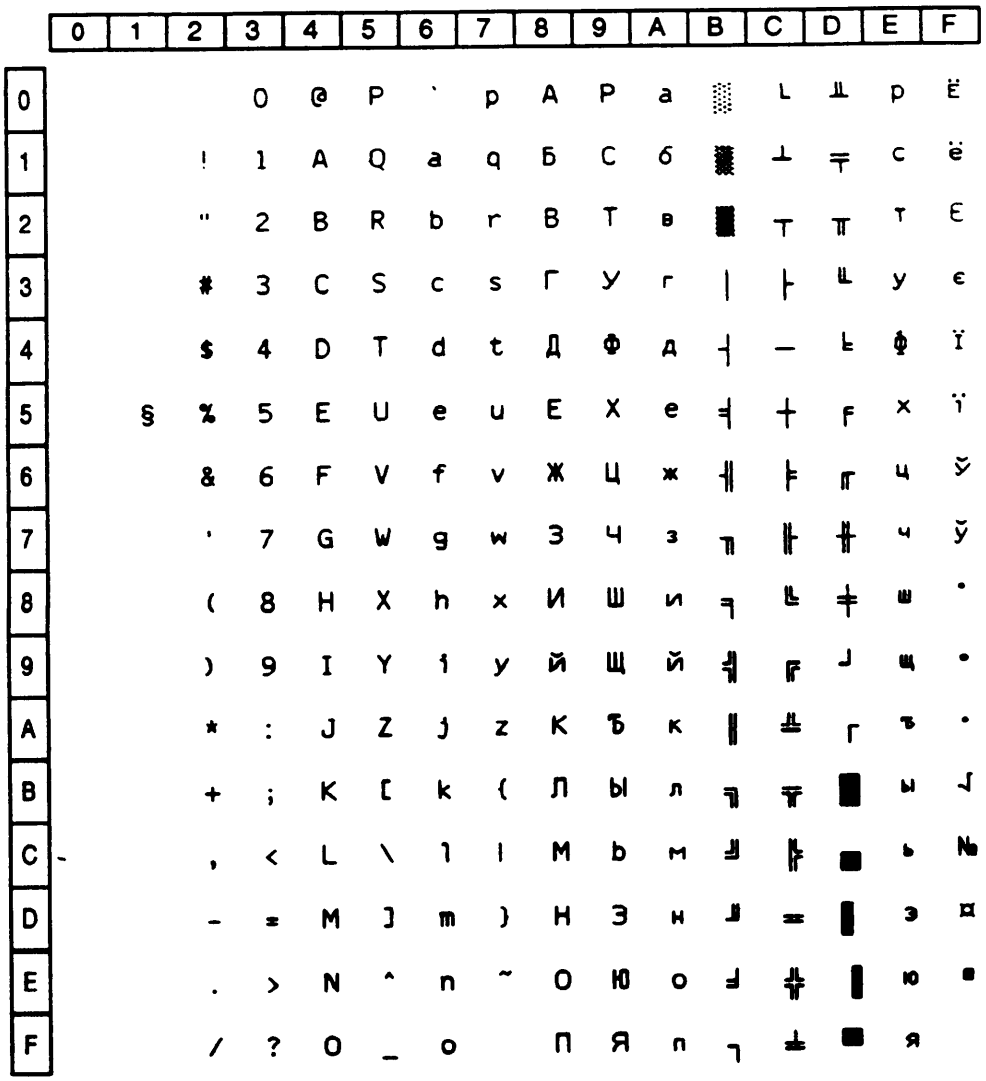
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É	á	▒	└	╨	α	≡
1			!	1	A	Q	a	q	ü	æ	í	▓	┴	╤	β	±
2			"	2	B	R	b	r	é	Æ	ó	▉	┬	╥	Γ	≥
3			#	3	C	S	c	s	â	ô	ú	|	├	╙	π	≤
4			$	4	D	T	d	t	ä	ö	ñ	┤	─	╘	Σ	⌠
5		§	%	5	E	U	e	u	à	ò	Ñ	╡	┼	╒	σ	⌡
6			&	6	F	V	f	v	å	û	ª	╢	╞	╓	µ	÷
7			'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8			(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9			)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	Θ	∙
A			*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	·
B			+	;	K	[	k	{	ï	ø	½	╗	╦	▄	δ	√
C			,	<	L	\	l	|	î	£	¼	╝	╠	▀	∞	n
D			-	=	M	]	m	}	ì	Ø	¡	╜	═	▌	∅	²
E			.	>	N	^	n	~	Ä	₧	«	╛	╬	▐	∈	■
F			/	?	O	_	o		Å	ƒ	¤	┐	╧	▀	∩	

International Character Set Parameter 865.

ANSI Emulation: HEX 1B 5B 38 36 35 78
BASIC CHR$(27);"[865x";mm

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 61 03 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(97);CHR$(3);CHR$(0);

Microsoft Code Page 866 (Russian)

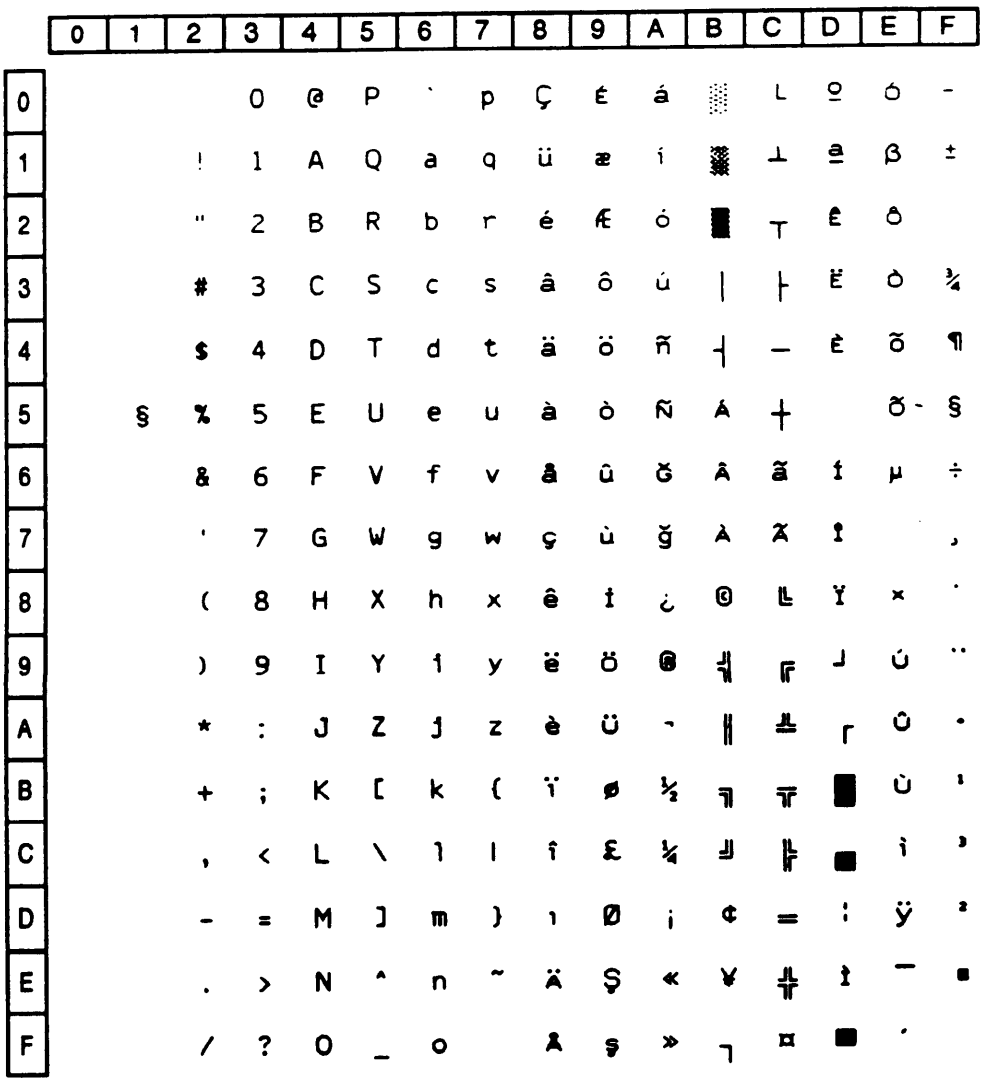


International Character Set Parameter 866.

ANSI Emulation: HEX 1B 5B 38 36 36 78
BASIC CHR$(27);"[866x";mm

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 62 03 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(98);CHR$(3);CHR$(0);

Microsoft Code Page 867 (Turkish)

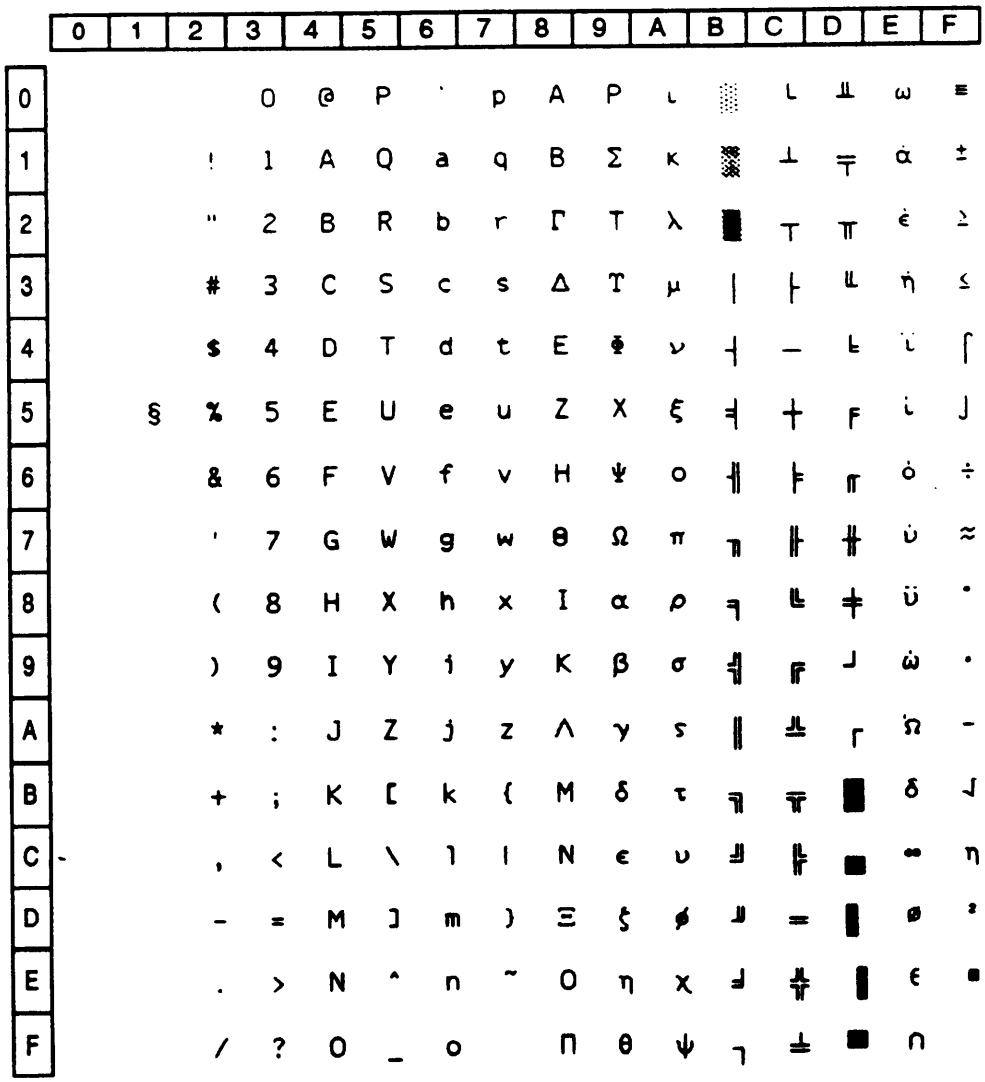


International Character Set Parameter 867.

ANSI Emulation: HEX 1B 5B 38 36 37 78
BASIC CHR$(27);"[867x";mm

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 63 03 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(99);CHR$(3);CHR$(0);

Greek Code Page 437



International Character Set Parameter 8573.

ANSI Emulation: HEX 1B 5B 38 35 37 34 78
BASIC CHR$(27);"[8573x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 7D 21 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(125);CHR$(33);CHR$(0);

DEC Multinational (LA–210)

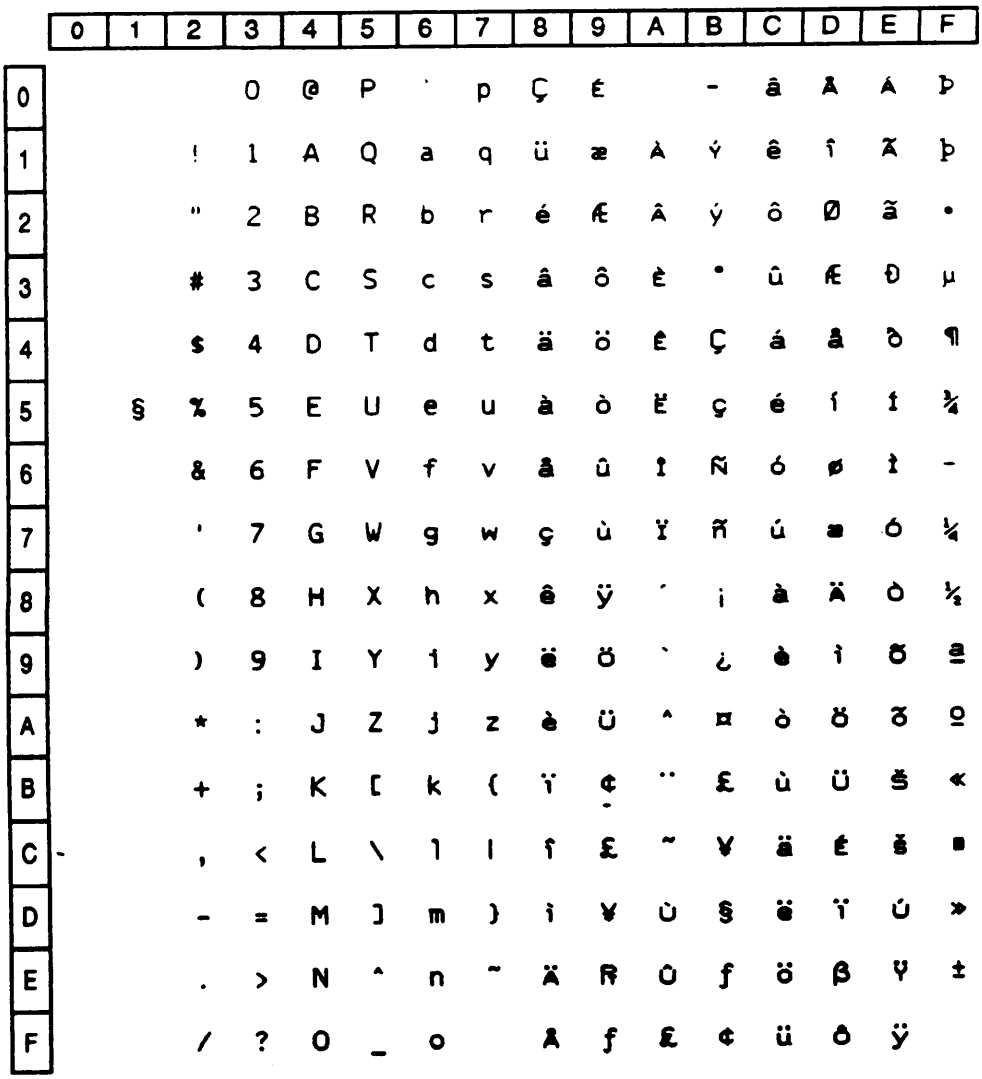
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É		°	À	Ş	à	ş
1			!	1	A	Q	a	q	ü	æ	¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r	é	Æ	¢	²	Â	Ò	â	ò
3			#	3	C	S	c	s	â	ô	£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t	ä	ö	Ş	Ş	Ä	Ô	ä	ô
5		§	%	5	E	U	e	u	à	ò	¥	µ	Å	Õ	å	õ
6			&	6	F	V	f	v	å	û	Ş	¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w	ç	ù	§	•	Ç	Œ	ç	œ
8			(	8	H	X	h	x	ê	ÿ	¤	Ş	È	Ø	è	ø
9			)	9	I	Y	i	y	ë	Ö	©	¹	É	Ù	é	ù
A			*	:	J	Z	j	z	è	Ü	ª	º	Ê	Ú	ê	ú
B			+	;	K	[	k	{	ï	¢	«	»	Ë	Û	ë	û
C			,	<	L	\	l	|	î	£	Ş	¼	Ì	Ü	ì	ü
D			-	=	M	]	m	}	ì	¥	Ş	½	Í	Ÿ	í	ÿ
E			.	>	N	^	n	~	Ä	Ŕ	Ş	Ş	Î	Ş	î	Ş
F			/	?	O	_	o		Å	ƒ	Ş	¿	Ï	ß	ï	

International Character Set Parameter 8574.

ANSI Emulation: HEX 1B 5B 38 35 37 34 78
BASIC CHR$(27);"[8574x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 7E 21 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(126);CHR$(33);CHR$(0);

Roman 8

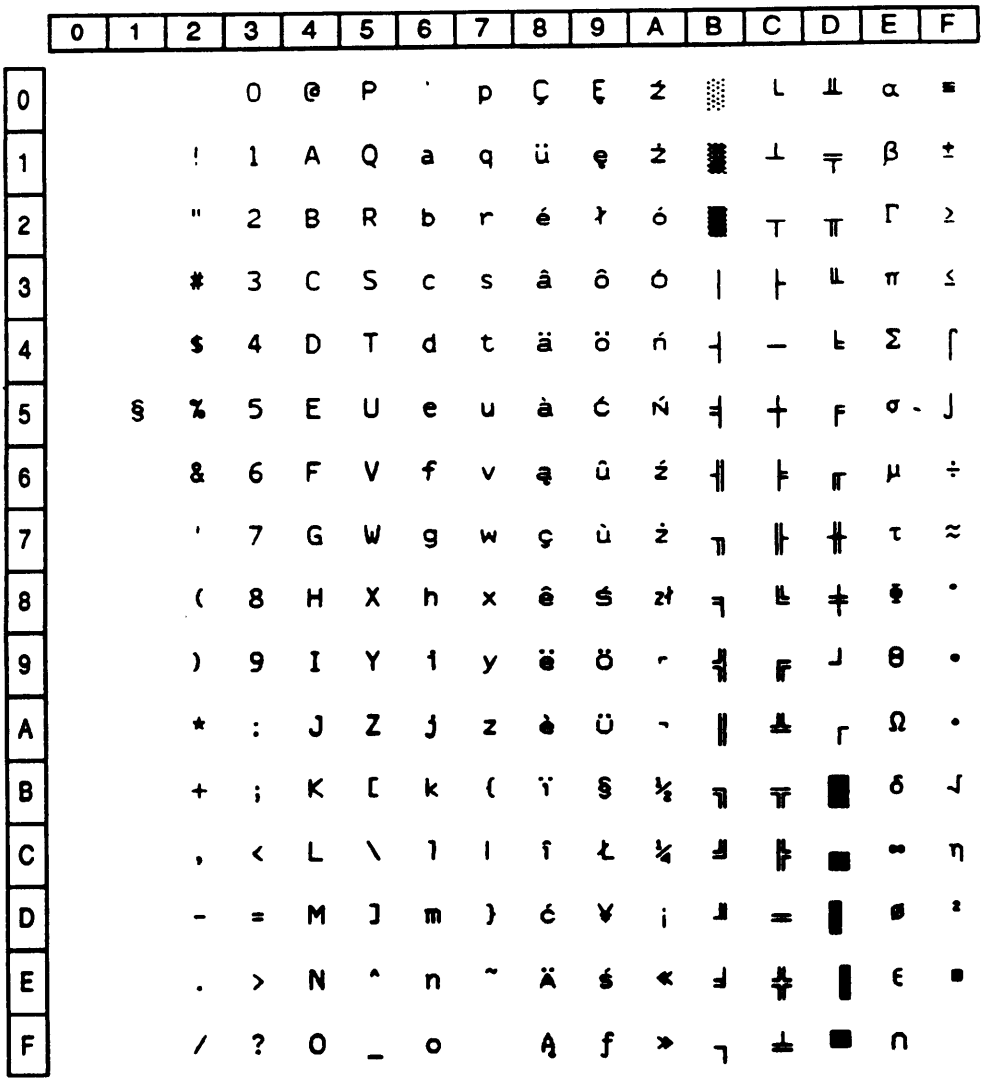


International Character Set Parameter 8575.

ANSI Emulation: HEX 1B 5B 38 35 37 35 78
BASIC CHR$(27);"[8575x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 7F 21 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(127);CHR$(33);CHR$(0);

Polish Mazowia

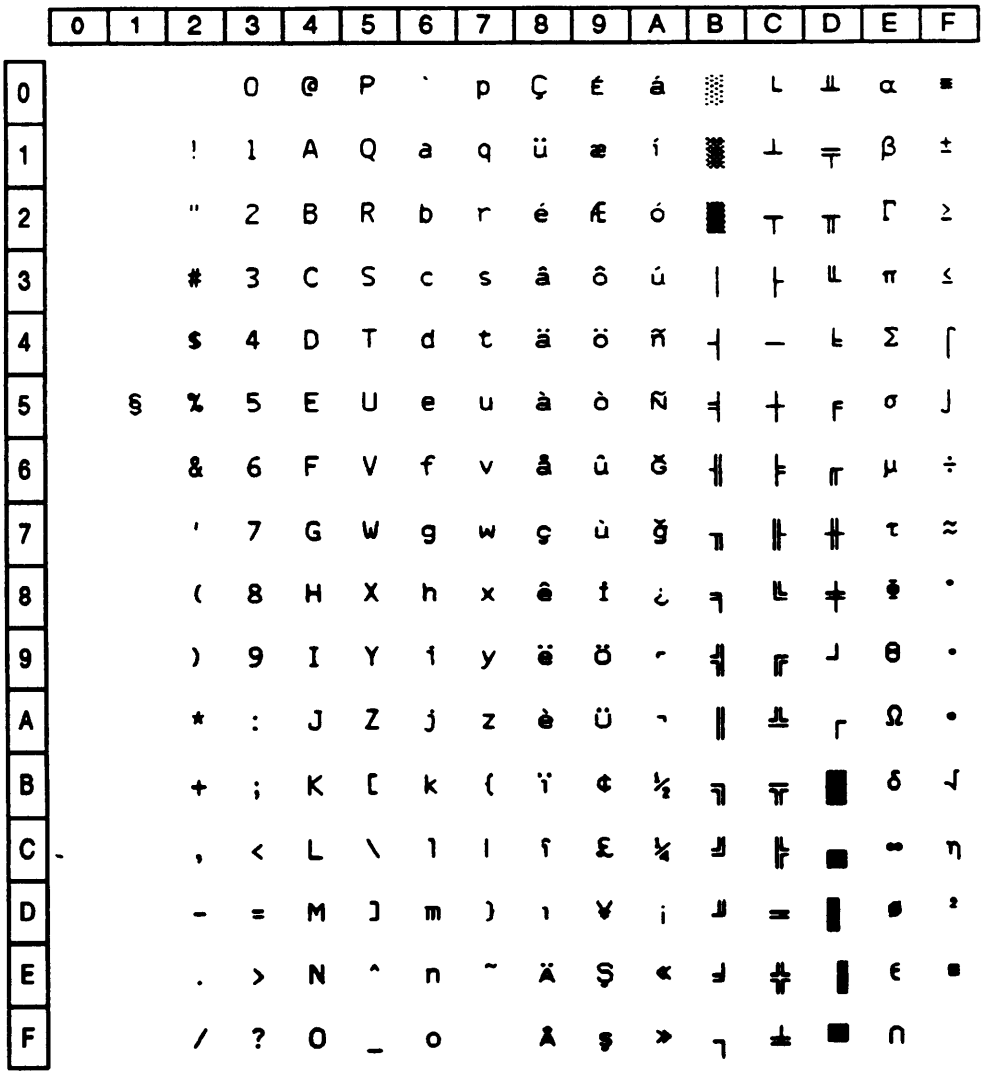


International Character Set Parameter 8576.

ANSI Emulation: HEX 1B 5B 38 35 37 36 78
BASIC CHR$(27);"[8576x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 80 21 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(128);CHR$(33);CHR$(0);

Turkish 8–bit Code Page

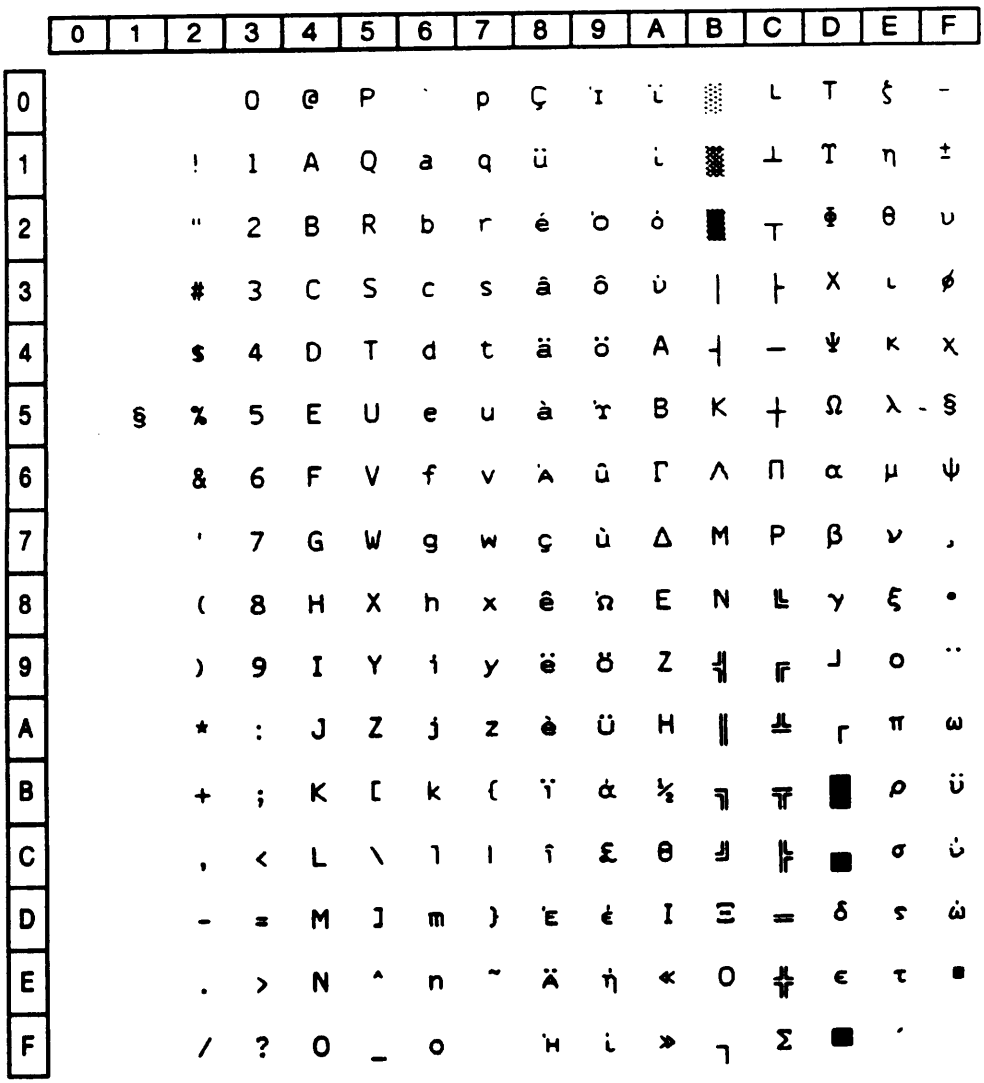


International Character Set Parameter 8577.

ANSI Emulation: HEX 1B 5B 38 35 37 37 78
BASIC CHR$(27);"[8577x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 81 21 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(129);CHR$(33);CHR$(0);

Greek Code Page 851



International Character Set Parameter 8578.

ANSI Emulation: HEX 1B 5B 38 35 37 38 78
BASIC CHR$(27);"[8578x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 82 21 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(130);CHR$(33);CHR$(0);

ISO 8859–1 Latin Alphabet #1

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É		°	À	Ð	à	ð
1			!	1	A	Q	a	q	ü	æ	¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r	é	Æ	¢	²	Â	Ò	â	ò
3			#	3	C	S	c	s	â	ô	£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t	ä	ö	¤	´	Ä	Ô	ä	ô
5		§	%	5	E	U	e	u	à	ò	¥	µ	Å	Õ	å	õ
6			&	6	F	V	f	v	å	û	¦	¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w	ç	ù	§	·	Ç	×	ç	÷
8			(	8	H	X	h	x	ê	ÿ	¨	¸	È	Ø	è	ø
9			)	9	I	Y	i	y	ë	Ö	©	¹	É	Ù	é	ù
A			*	:	J	Z	j	z	è	Ü	ª	º	Ê	Ú	ê	ú
B			+	;	K	[	k	{	ï	¢	«	»	Ë	Û	ë	û
C			,	<	L	\	l	|	î	£	¬	¼	Ì	Ü	ì	ü
D			-	=	M	]	m	}	ì	¥	-	½	Í	Ý	í	ý
E			.	>	N	^	n	~	Ä	Ŕ	®	¾	Î	Þ	î	þ
F			/	?	O	_	o		Å	ƒ	¯	¿	Ï	ß	ï	ÿ

International Character Set Parameter 8591.

ANSI Emulation: HEX 1B 5B 38 35 39 31 78
BASIC CHR$(27);"[8591x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 8F 21 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(143);CHR$(33);CHR$(0);

ISO 8859–2 Latin Alphabet #2

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É		°	Ŕ	Đ	ŕ	đ
1			!	1	A	Q	a	q	ü	æ	Ą	ą	Á	Ń	á	ń
2			"	2	B	R	b	r	é	Æ	˘	˛	Â	Ň	â	ň
3			#	3	C	S	c	s	â	ô	Ł	ł	Ă	Ó	ă	ó
4			$	4	D	T	d	t	ä	ö	¤	´	Ä	Ô	ä	ô
5		§	%	5	E	U	e	u	à	ò	Ľ	ľ	Ĺ	Ő	ĺ	ő
6			&	6	F	V	f	v	å	û	Ś	ś	Ć	Ö	ć	ö
7			'	7	G	W	g	w	ç	ù	§	¸	Ç	×	ç	÷
8			(	8	H	X	h	x	ê	ÿ	¨	ą	Č	Ř	č	ř
9			)	9	I	Y	i	y	ë	Ö	Š	š	É	Ů	é	ů
A			*	:	J	Z	j	z	è	Ü	Ş	ş	Ę	Ú	ę	ú
B			+	;	K	[	k	{	ï	¢	Ť	ť	Ë	Ű	ë	ű
C			,	<	L	\	l	|	î	£	Ź	ź	Ě	Ü	ě	ü
D			-	=	M	]	m	}	ì	¥	-	˝	Í	Ý	í	ý
E			.	>	N	^	n	~	Ä	Ř	Ž	ž	Î	Ţ	î	ţ
F			/	?	O	_	o		Å	ß	ż	ż	ð	β	đ	˙

International Character Set Parameter 8592.

ANSI Emulation: HEX 1B 5B 38 35 39 32 78
BASIC CHR$(27);"[8592x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 90 21 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(144);CHR$(33);CHR$(0);

ISO 8859–3 Latin Alphabet #3

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É		°	À		à	
1			!	1	A	Q	a	q	ü	æ	Ħ	ħ	Á	Ñ	á	ñ
2			"	2	B	R	b	r	é	Æ	˘	²	Â	Ò	â	ò
3			#	3	C	S	c	s	â	ô	£	³		Ó		ó
4			$	4	D	T	d	t	ä	ö	¤	´	Ä	Ô	ä	ô
5		§	%	5	E	U	e	u	à	ò		µ	Ċ	Ġ	ċ	ġ
6			&	6	F	V	f	v	å	û	Ĥ	ĥ	Ć	Ö	ĉ	ö
7			'	7	G	W	g	w	ç	ù	§	·	Ç	×	ç	÷
8			(	8	H	X	h	x	ê	ÿ	¨	¸	È	Ĝ	è	ĝ
9			)	9	I	Y	i	y	ë	Ö	ı	¹	É	Ù	é	ù
A			*	:	J	Z	j	z	è	Ü	Ş	ş	Ê	Ú	ê	ú
B			+	;	K	[	k	{	ï	¢	Ğ	ğ	Ë	Û	ë	û
C			,	<	L	\	l	|	î	£	J	ĵ	Ì	Ü	ì	ü
D			-	=	M	]	m	}	ì	¥	-	½	Í	Ŭ	í	ŭ
E			.	>	N	^	n	~	Ä	Ŗ			Î	Ŝ	î	ŝ
F			/	?	O	_	o		Å	ƒ	Ż	ż	Ï	ß	ï	˙

International Character Set Parameter 8593.

ANSI Emulation: HEX 1B 5B 38 35 39 33 78
BASIC CHR$(27);"[8593x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 91 21 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(145);CHR$(33);CHR$(0);

ISO 8859–4 Latin Alphabet #4

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É		°	Ā	Đ	ā	đ
1			!	1	A	Q	a	q	ü	æ	Ą	ą	Á	Ņ	á	ņ
2			"	2	B	R	b	r	é	Æ	ĸ	˛	Â	Ō	â	ō
3			#	3	C	S	c	s	â	ô	Ŗ	ŗ	Ã	Ķ	ã	ķ
4			$	4	D	T	d	t	ä	ö	¤	´	Ä	Ô	ä	ô
5		§	%	5	E	U	e	u	à	ò	Ĩ	ĩ	Å	Õ	å	õ
6			&	6	F	V	f	v	å	û	Ļ	ļ	Æ	Ö	æ	ö
7			'	7	G	W	g	w	ç	ù	§	ˇ	Į	×	į	÷
8			(	8	H	X	h	x	ê	ÿ	¨	¸	Č	Ø	č	ø
9			)	9	I	Y	i	y	ë	Ö	Š	š	É	Ų	é	ų
A			*	:	J	Z	j	z	è	Ü	Ē	ē	Ę	Ú	ę	ú
B			+	;	K	[	k	{	ï	¢	Ģ	ģ	Ë	Û	ë	û
C			,	<	L	\	l	|	î	£	Ŧ	ŧ	Ė	Ü	ė	ü
D			-	=	M	]	m	}	ì	¥	-	Ŋ	Í	Ũ	í	ũ
E			.	>	N	^	n	~	Ä	Ŗ	Ž	ž	Ī	Ū	î	ū
F			/	?	O	_	o		Å	ƒ	¯	ŋ	Ī	ß	ī	˙

International Character Set Parameter 8594.

ANSI Emulation: HEX 1B 5B 38 35 39 34 78
BASIC CHR$(27);"[8594x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 92 21 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(146);CHR$(33);CHR$(0);

ISO 8859–5 Latin/Cyrillic

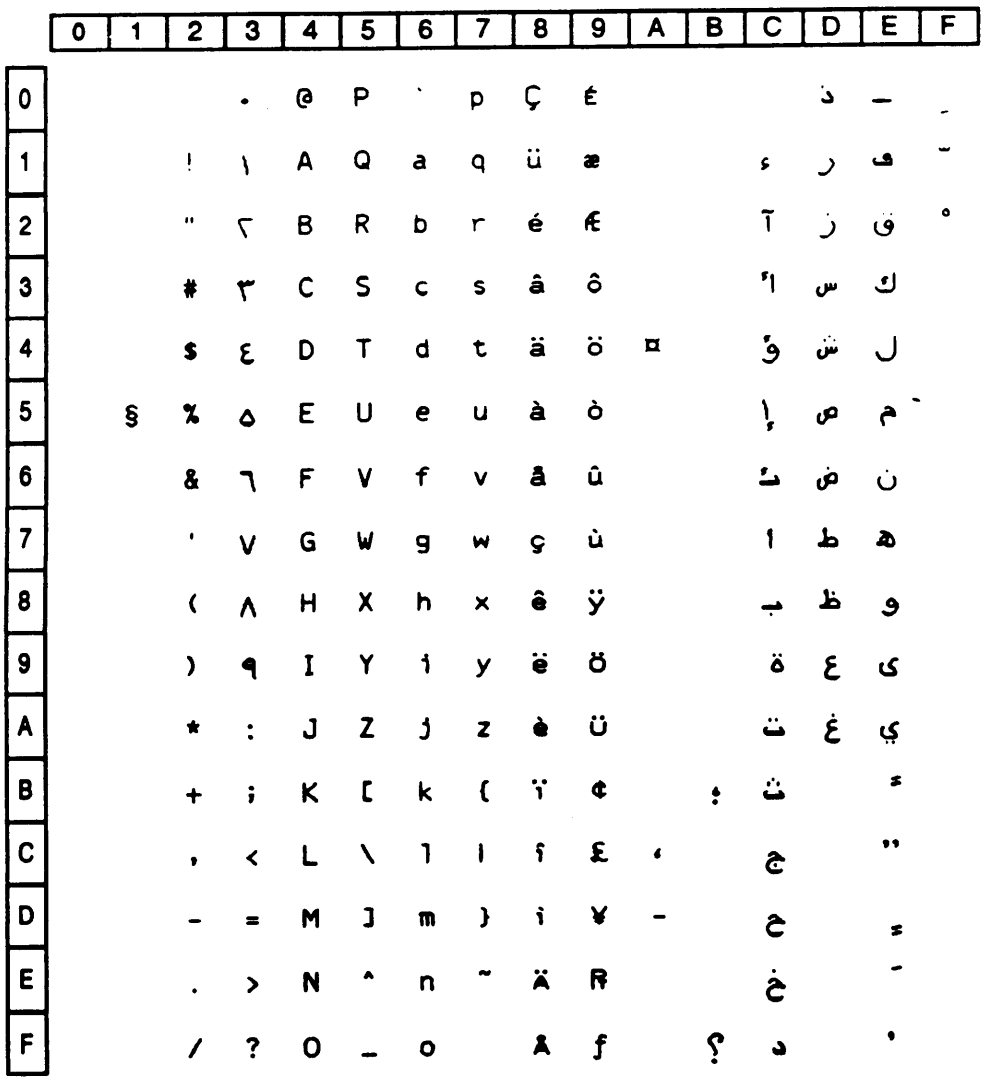
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	Ѐ		А	Р	а	р	№
1			!	1	A	Q	a	q	ü	æ	Ё	Б	С	б	с	ё
2			"	2	B	R	b	r	é	Ѓ	ђ	В	Т	в	т	ђ
3			#	3	C	S	c	s	â	ô	ѓ	Г	У	г	у	ѓ
4			$	4	D	T	d	t	ä	ö	Є	Д	Ф	д	ф	є
5		§	%	5	E	U	e	u	à	ò	S	Е	Х	е	х	s
6			&	6	F	V	f	v	å	û	I	Ж	Ц	ж	ц	і
7			'	7	G	W	g	w	ç	ù	Ї	З	Ч	з	ч	ї
8			(	8	H	X	h	x	ê	ÿ	J	И	Ш	и	ш	j
9			)	9	I	Y	i	y	ë	Ö	Љ	Й	Щ	й	щ	љ
A			*	:	J	Z	j	z	è	Ü	Њ	К	Ъ	к	ъ	њ
B			+	;	K	[	k	{	ï	¢	Ћ	Л	Ы	л	ы	ћ
C			,	<	L	\	l	|	î	£	ќ	М	Ь	м	ь	ќ
D			-	=	M	]	m	}	ì	¥	-	Н	Э	н	э	
E			.	>	N	^	n	~	Ä	Ў	ў	О	Ю	о	ю	ў
F			/	?	O	_	o		Å	ƒ	Џ	П	Я	п	я	џ

International Character Set Parameter 8595.

ANSI Emulation: HEX 1B 5B 38 35 39 35 78
BASIC CHR$(27);"[8595x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 93 21 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(147);CHR$(33);CHR$(0);

ISO 8859–6 Latin/Arabic



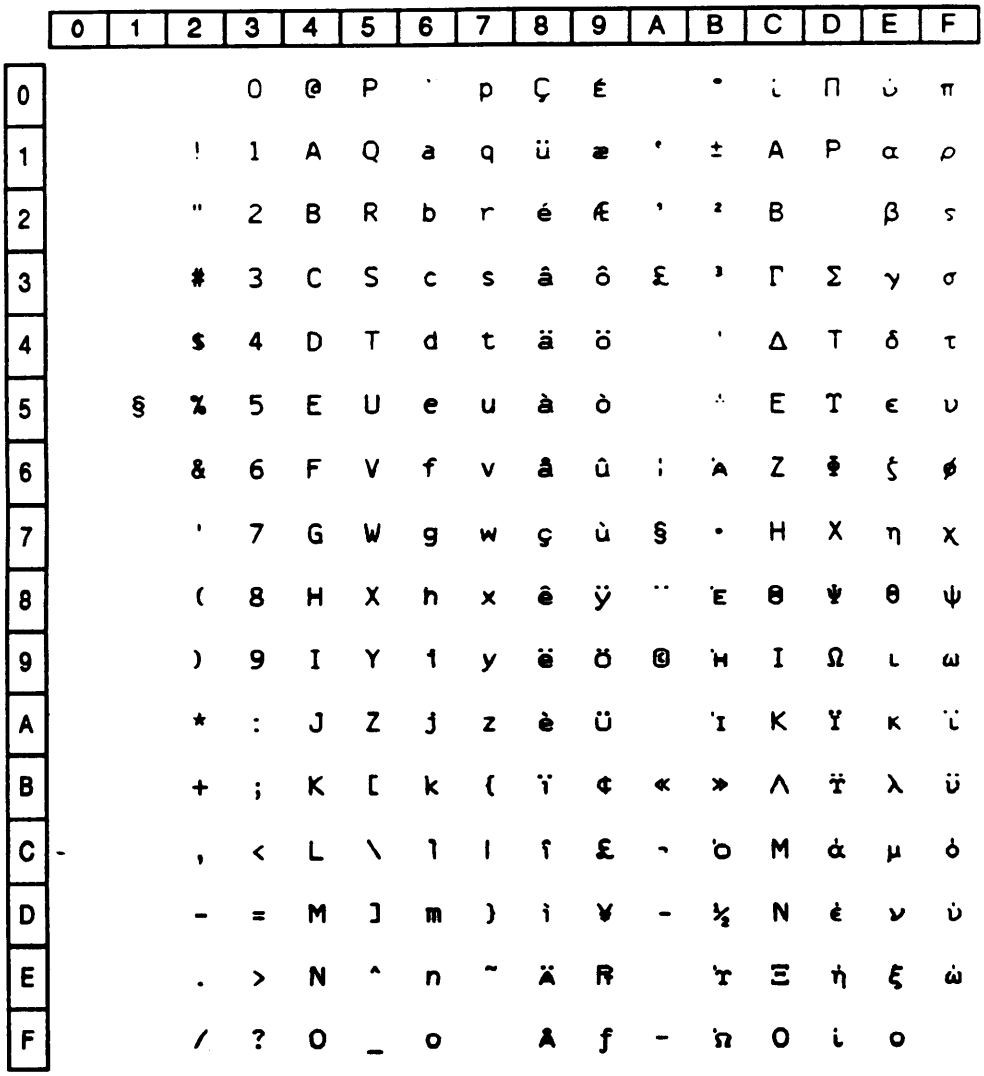
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				•	@	P	`	p	Ç	É				ذ	ـ	_
1			!	١	A	Q	a	q	ü	æ			ء	ر	ف	ّ
2			"	٢	B	R	b	r	é	Æ			آ	ز	ق	°
3			#	٣	C	S	c	s	â	ô			أ	س	ك	
4			$	٤	D	T	d	t	ä	ö	¤		ؤ	ش	ل	
5		§	%	٥	E	U	e	u	à	ò			إ	ص	م	ٌ
6			&	٦	F	V	f	v	å	û			ئ	ض	ن	
7			'	٧	G	W	g	w	ç	ù			ا	ط	ه	
8			(	٨	H	X	h	x	ê	ÿ			ب	ظ	و	
9			)	٩	I	Y	i	y	ë	Ö			ة	ع	ى	
A			*	:	J	Z	j	z	è	Ü			ت	غ	ي	
B			+	;	K	[	k	{	ï	¢		؛	ث		ً	
C			,	<	L	\	l	|	î	£	،		ج		ٌ	
D			-	=	M	]	m	}	ì	¥	-		ح		ٍ	
E			.	>	N	^	n	~	Ä	R			خ		ْ	
F			/	?	O	_	o		Å	ƒ		؟	د		ّ	

International Character Set Parameter 8596.

ANSI Emulation: HEX 1B 5B 38 35 39 36 78
BASIC CHR$(27);"[8596x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 94 21 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(148);CHR$(33);CHR$(0);

ISO 8859–7 Latin/Greek



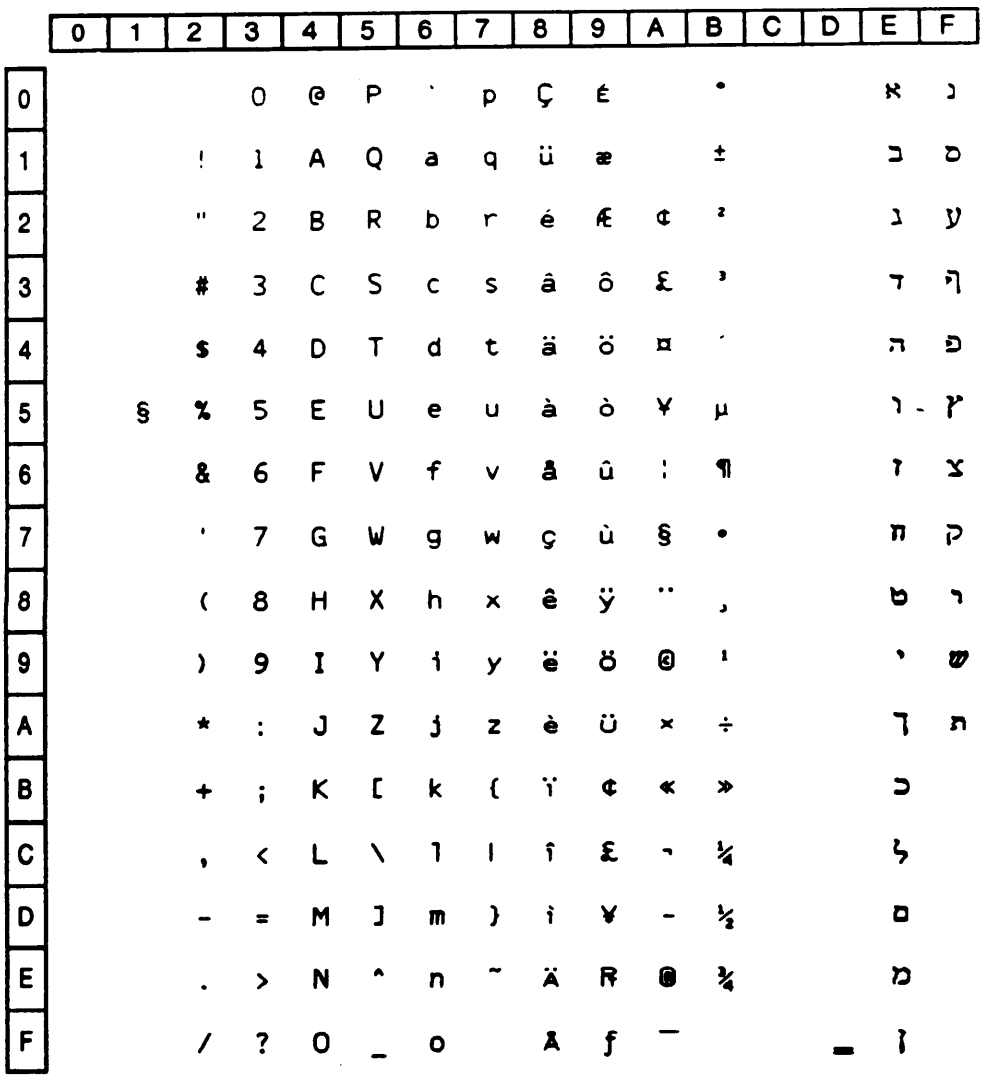
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É		°	ΐ	Π	ΰ	π
1			!	1	A	Q	a	q	ü	æ	‘	±	A	P	α	ρ
2			"	2	B	R	b	r	é	Æ	’	²	B		β	ς
3			#	3	C	S	c	s	â	ô	£	³	Γ	Σ	γ	σ
4			$	4	D	T	d	t	ä	ö		΄	Δ	T	δ	τ
5		§	%	5	E	U	e	u	à	ò		Α	E	Τ	ε	υ
6			&	6	F	V	f	v	å	û	;	Ά	Z	Φ	ζ	φ
7			'	7	G	W	g	w	ç	ù	§	·	H	X	η	χ
8			(	8	H	X	h	x	ê	ÿ	¨	Έ	Θ	Ψ	θ	ψ
9			)	9	I	Y	i	y	ë	Ö	©	Η	I	Ω	ι	ω
A			*	:	J	Z	j	z	è	Ü		Ί	K	Ϋ	κ	ΐ
B			+	;	K	[	k	{	ï	¢	«	»	Λ	Ϊ	λ	ΰ
C			,	<	L	\	l	|	î	£	¬	Ό	M	ά	μ	ό
D			-	=	M	]	m	}	ì	¥	-	½	N	έ	ν	ύ
E			.	>	N	^	n	~	Ä	₧		Υ	Ξ	ή	ξ	ώ
F			/	?	O	_	o		Å	ƒ	-	Ώ	O	ί	ο	

International Character Set Parameter 8597.

ANSI Emulation: HEX 1B 5B 38 35 39 37 78
BASIC CHR$(27);"[8597x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 95 21 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(149);CHR$(33);CHR$(0);

ISO 8859–8 Latin/Hebrew



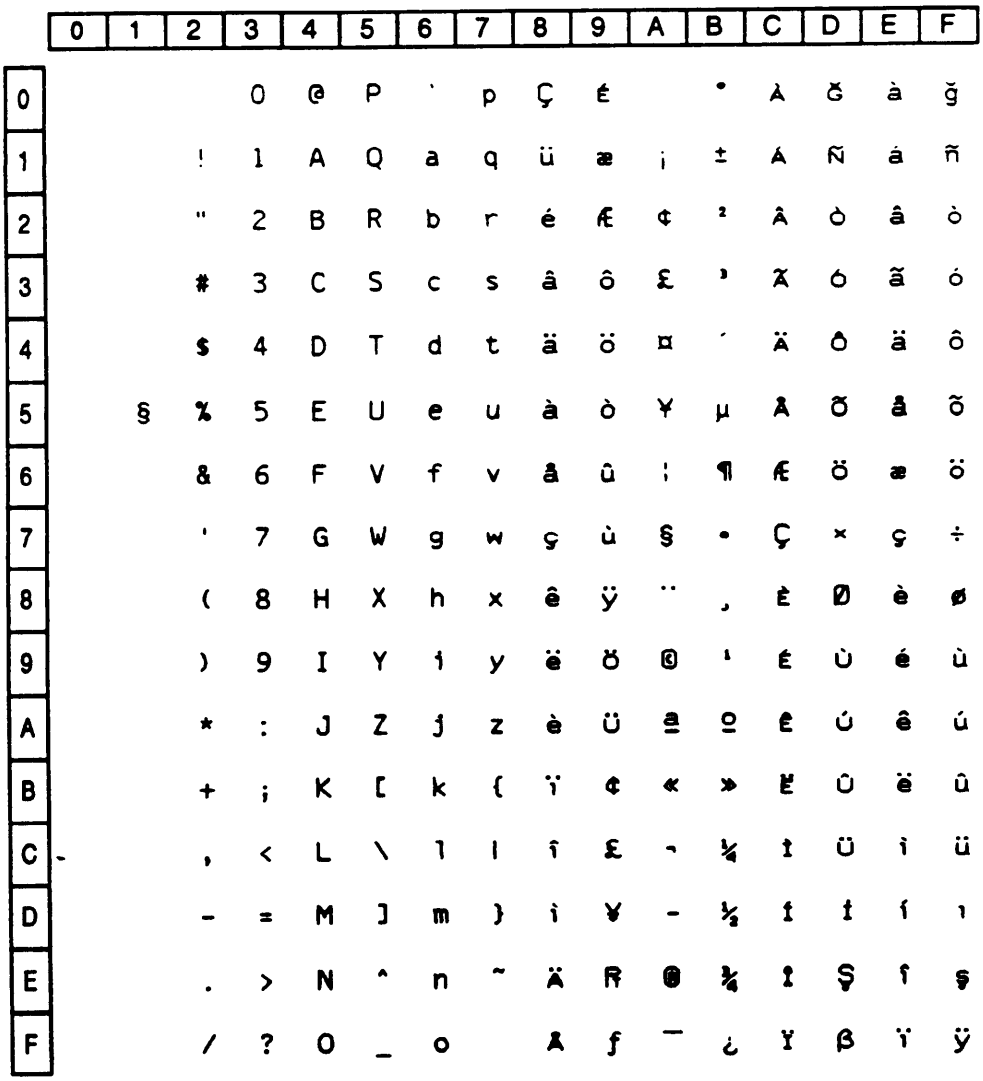
	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É		°			א	נ
1			!	1	A	Q	a	q	ü	æ		±			ב	ס
2			"	2	B	R	b	r	é	Æ	¢	²			ג	ע
3			#	3	C	S	c	s	â	ô	£	³			ד	ף
4			$	4	D	T	d	t	ä	ö	¤	´			ה	פ
5		§	%	5	E	U	e	u	à	ò	¥	µ			ו	ץ
6			&	6	F	V	f	v	å	û	¦	¶			ז	צ
7			'	7	G	W	g	w	ç	ù	§	·			ח	ק
8			(	8	H	X	h	x	ê	ÿ	¨	¸			ט	ר
9			)	9	I	Y	i	y	ë	Ö	©	¹			י	ש
A			*	:	J	Z	j	z	è	Ü	×	÷			ך	ת
B			+	;	K	[	k	{	ï	¢	«	»			כ	
C			,	<	L	\	l	|	î	£	¬	¼			ל	
D			-	=	M	]	m	}	ì	¥	-	½			ם	
E			.	>	N	^	n	~	Ä	R	®	¾			מ	
F			/	?	O	_	o		Å	ƒ	¯			▬	ן	

International Character Set Parameter 8598.

ANSI Emulation: HEX 1B 5B 38 35 39 38 78
BASIC CHR$(27);"[8598x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 96 21 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(150);CHR$(33);CHR$(0);

ISO 8859–9 Latin Alphabet #5



	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0				0	@	P	`	p	Ç	É		°	À	Ğ	à	ğ
1			!	1	A	Q	a	q	ü	æ	¡	±	Á	Ñ	á	ñ
2			"	2	B	R	b	r	é	Æ	¢	²	Â	Ò	â	ò
3			#	3	C	S	c	s	â	ô	£	³	Ã	Ó	ã	ó
4			$	4	D	T	d	t	ä	ö	¤	´	Ä	Ô	ä	ô
5		§	%	5	E	U	e	u	à	ò	¥	µ	Å	Õ	å	õ
6			&	6	F	V	f	v	å	û	¦	¶	Æ	Ö	æ	ö
7			'	7	G	W	g	w	ç	ù	§	·	Ç	×	ç	÷
8			(	8	H	X	h	x	ê	ÿ	¨	¸	È	Ø	è	ø
9			)	9	I	Y	i	y	ë	Ö	©	¹	É	Ù	é	ù
A			*	:	J	Z	j	z	è	Ü	ª	º	Ê	Ú	ê	ú
B			+	;	K	[	k	{	ï	¢	«	»	Ë	Û	ë	û
C			,	<	L	\	l	|	î	£	¬	¼	Ì	Ü	ì	ü
D			-	=	M	]	m	}	ì	¥	-	½	Í	Ì	í	ı
E			.	>	N	^	n	~	Ä	Ŧ	®	¾	Î	Ş	î	ş
F			/	?	O	_	o		Å	ƒ	¯	¿	Ï	ß	ï	ÿ

International Character Set Parameter 8599.

ANSI Emulation: HEX 1B 5B 38 35 39 39 78
BASIC CHR$(27);"[8599x";

Proprinter Emulation: HEX 1B 5B 54 05 00 00 00 97 21 00
BASIC CHR$(27);"[T";CHR$(5);CHR$(0);CHR$(0);
CHR$(0);CHR$(151);CHR$(33);CHR$(0);

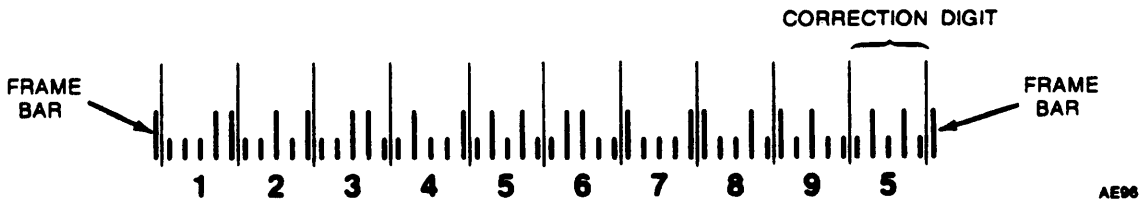
Appendix F. POSTNET Bar Codes

The POSTNET bar code feature is used to encode and print Zip Code® and Zip+4® as a bar code on mailing material. If the option is installed in and recognized by the printer, POSTNET will be listed on the configuration menu.

A POSTNET code consists of a starting frame bar, the five ZIP Code numbers, four Zip+4 numbers (if used), a correction digit, and an ending frame bar.

Each number has two tall bars (binary ones) and three short bars (binary zeros) for a total of five bars per digit. The placement of the two binary 1s within the field of five bars determines the number represented.

74210	74210
0 = 11000	5 = 01010
1 = 00011	6 = 01100
2 = 00101	7 = 10001
3 = 00110	8 = 10010
4 = 01001	9 = 10100



Correction Digit

The correction digit may or may not be sent by the host system. If not supplied by the host, the printer will calculate the digit and print the code. If sent, the printer will check the validity of the correction digit and, if correct, print the code. An invalid correction digit sent from the host causes an error symbol (XOX) to be printed in place of the correction digit. See below.

The correction digit is a number added to the sum of all the ZIP or ZIP+4 digits so that the total can be divided evenly by 10.

ZIP 22980

2+2+9+8+0 = 21	Correction digit equals 9.
21+9 = 30	30 ÷ 10 = 3 with no remainder.

ZIP+4 22980-1999

2+2+9+8+0+1+9+9+9 = 49	Correction digit equals 1.
49+1 = 50	50 ÷ 10 = 5 with no remainder.

Entering and Exiting POSTNET Bar Codes

NOTE: Control sequences given in the following text show the proper syntax needed from the host. The second line has examples of code written in the BASIC program language.

POSTNET symbols are selected and printed using the same escape sequences used for other bar code styles.

Selecting POSTNET Style Bar Codes

The following sequence selects the style of bar code to be printed. In this case POSTNET is chosen:

```
ESC [50;p2;p3;p4;p5;p6;p7;p8;p9;p10]
LPRINT CHR$(27);"[50;9;1;2;6;2;6;2;0;0]"
```

or simply:

```
ESC [50]
LPRINT CHR$(27);"[50]"
```

Parameters p2 - p10 do not affect POSTNET, but if they are sent, they will be stored and used if another bar code style is selected. POSTNET symbols can neither be rotated nor have their size or density modified.

Before the printer can print input data as POSTNET bar code symbols, the bar code mode must be both selected and activated. There are two ways for this to be accomplished depending on the setting of printer option strap A9.

Printer control strap A9 is used to enable the SI (shift in) and SO (shift out) ASCII codes to activate and deactivate special mode functions. In this case, the special mode function is bar codes. With strap A9 IN, code SO will turn on or activate the bar code mode. SI will turn bar codes off.

Printer Control Strap A9 OUT

Enter the POSTNET bar code mode of printing with the following control sequence sent by the host:

```
ESC[3t
LPRINT CHR$(27);"[3t";
```

Data sent after the above sequence is interpreted and printed as POSTNET bar code symbols.

Exit POSTNET bar code mode using:

```
ESC[0t
LPRINT CHR$(27);"[0t";
```

Printer Control Strap A9 IN

ESC[3t
LPRINT CHR$(27);"[3t";
Selects the bar code special mode.

SO
LPRINT CHR$(14);
Activates POSTNET bar codes and prints received data as POSTNET symbols (only after it has been selected by ESC[3t above).

SI
LPRINT CHR$(15);
Deactivates bar codes and allows printing of normal text. (POSTNET is still selected but not active.)

ESC[0t
LPRINT CHR$(27);"[0t";
Deselects bar codes.

When an ESC[0t is received before the SI code, bar codes are both deactivated and deselected.

Valid Characters

Only certain characters are valid as data within the POSTNET bar code escape sequence. Any other character causes the error symbol (X0X) to be printed instead. Valid characters are the numerals 0-9. The dash (-) will be ignored if it is found in character position six or greater to allow processing of ZIP+4 data (22980-1999).

Characters acting as delimiters (space, comma, and horizontal tab) are allowed to separate and add space between consecutive POSTNET symbols.

Delimiters (Spacing between codes)

Printer Option Strap A40 OUT puts a 0.2-inch space called a quiet zone at the beginning and end of every POSTNET bar code. As a result, the minimum distance between two symbols on the same line will be 0.4-inch. No quiet zone is provided with A40 IN.

Delimiters are used to separate and add space between POSTNET codes without exiting bar code printing.

A **comma** will add no additional space between symbols. With strap A40 OUT, the distance between two symbols will be the quiet zone (0.4 inch).

A **space** character will add 0.1 inch of space between symbols. If strap A40 is out, one space character and the quiet zone will equal a total of 0.5 inch.

A **horizontal tab** will add the appropriate number of empty spaces to go to the next tab before starting the symbol. Horizontal tabs in POSTNET are based on 10 columns, or text characters, per inch (10 CPI).

Incorrect Number of Digits

If less than five digits for a ZIP Code or nine for a ZIP+4 are received, the symbol will be printed with the missing digits replaced by error symbols.

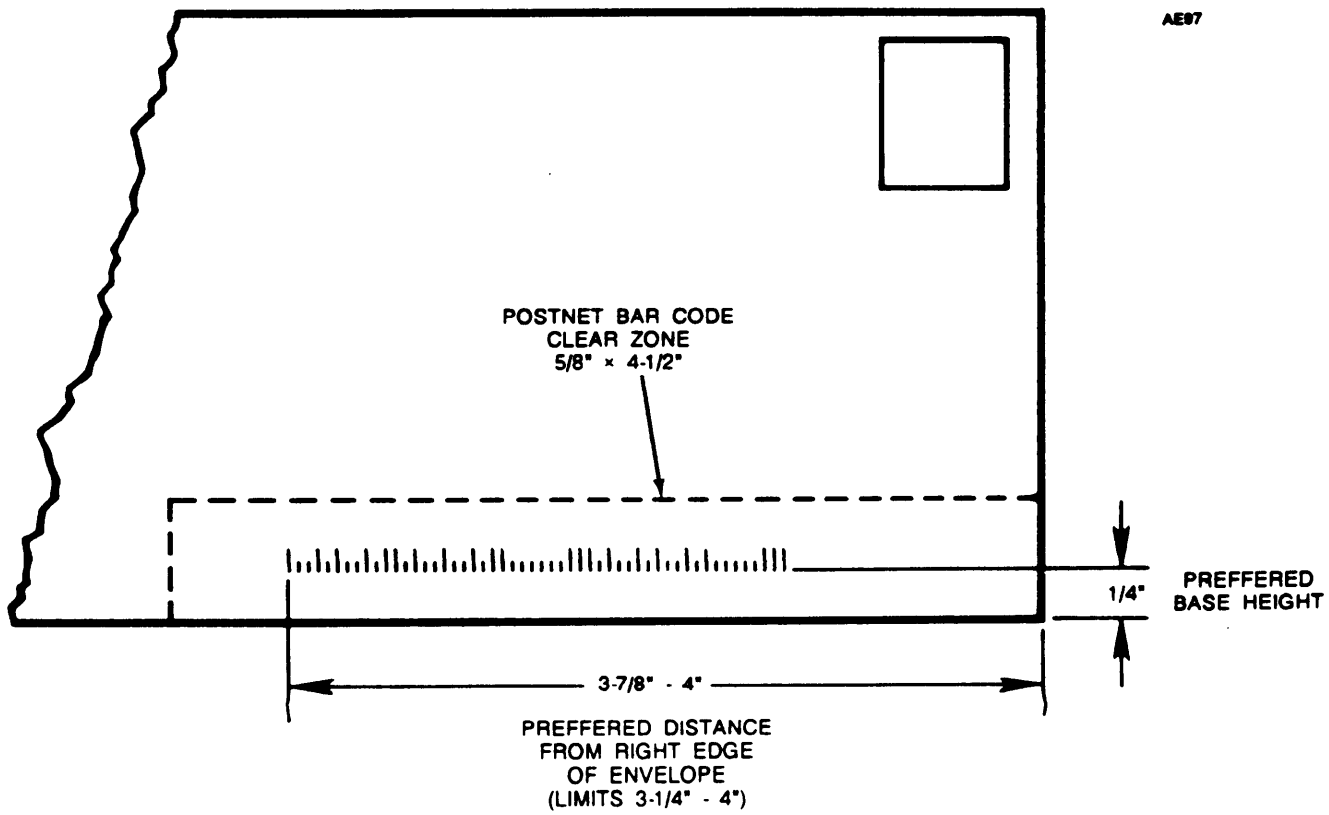
If more than six digits (ZIP and correction digit) are received, the data will be treated as a ZIP+4 or ZIP+6 code. If less digits than a ZIP+4 or ZIP+6 are received, error symbols will be printed to fill the symbol.
Note: *The U. S. Postal Service may implement ZIP+6 at a later date.*

When more digits are received than are required for a valid symbol, the symbol will be terminated, printed, and a new symbol started.

Positioning

NOTE: *When POSTNET was first implemented, tight restrictions applied to the location of the code on the mailing piece. As this system develops, newer equipment, like wide area scanners, will be used to change the location requirements. The information below is accurate at the time of its writing; however, changes are expected. Be sure to consult your local U. S. Postal Service Center for the latest information available.*

The POSTNET code must be positioned at the lower right area of the envelope with the starting frame bar 3-7/8 to 4 inches from the right side of the mailing piece and 1/4 inch from the bottom. Consult U. S. Postal Publication 25, *A Guide to Business Mail Preparation*, for information on POSTNET requirements.



Restrictions

- Printer option strap A10, paper position reset to top of bar code after printing, is ignored while using POSTNET.
- If the symbol exceeds the right margin, the symbol is cut off at the margin.
- POSTNET codes cannot be used on the same line as the high speed font.
- Exit the bar code mode before sending other control codes or escape sequences.

Adjusting for Application Program Spacing

Programs used to print multiple labels side by side may encounter difficulty placing the POSTNET codes correctly. This is caused by the program printing and spacing to the next label using the currently selected CPI setting (10 CPI for example) with the POSTNET bar code being printed at the equivalent of 4 CPI.

Each character within a POSTNET code (start frame, ZIP digits, correction digit, and stop frame) uses . 25-inch regardless of the current CPI setting for the text. The size is constant to allow readability by the optical scanners.

ZIP = F12345CF = 8 × . 25 = 2 inches

ZIP+4 = F123456789CF = 12 × . 25 = 3 inches

The program knows how many characters it sent to be printed and calculates how much space to add to go to the next label. A ZIP code with five numbers appears to only use . 5 inch at 10 CPI to the program, but it actually uses 2 inches.

Using the comma delimiter inside the POSTNET sequence may work with some programs to cancel out the added length. The comma adds no space between POSTNET codes but will be counted by the program as a printed character.

Some applications programs, upon seeing consecutive space characters, will allow positioning by the data sent instead of calculating and adding spaces on its own.

The formulas on the next page may help when using commas and spaces to adjust the POSTNET code.

POSTNET Bar Codes (continued)

COMMAS = (CPI ÷ 4) × (ZIP Code + 3) minus ZIP Code = number of commas.

CPI = the CPI currently selected for text.
ZIP CODE = number of ZIP Code characters furnished by the host (don't count dash if sent).

If CPI equals 10, then ZIP = 15 commas, ZIP+4 = 21 commas, and ZIP+6 = 24 commas.
NOTE: Subtract ONE comma if a dash was sent by the host for ZIP+ codes.

EXAMPLES:

For each label with the program doing the spacing send:

<ESC[3t> <22980,.....,> <ESC[0t> 15 commas

<ESC[3t> <229801999,.....,> <ESC[0t> 21 commas

<ESC[3t> <22980-1999,.....,> <ESC[0t> 20 commas

SPACES = (Distance from the start of one label to the start of the next label minus the length of the ZIP Code) × 10

(Distance 3.5" - ZIP+4 or 3") = .5" × 10 = 5 spaces at 10 CPI

EXAMPLES:

When you send the spacing for multiple labels, use commas to compensate for CPI differences and spaces within the sequence for locating the POSTNET code.

<ESC[3t> <229801999,..... 229801999,.....,> <ESC[0t>

The combination and placement of the commas and spaces allow you to position the code within a label as shown below.

<ESC[3t> <229801999,..... > <ESC[0t> - Positions code at left side of label.

<ESC[3t> < 229801999,.....,> <ESC[0t> - Positions code at right side of label.

Appendix G. Description of Strapping Options

This appendix explains the firmware strap settings, which are changed using the control panel pushbuttons.

- Save any strap setting changes using the **Setup:Store** feature to prevent losing them when power is removed or when the printer is initialized.
- Straps that change a default condition may not be recognized until a self-test is performed. Cycle the printer power or press the TEST/CLEAR pushbutton.

Parallel Interface Software Straps

With the parallel interface selected and the printer offline, select the parallel interface straps by pressing:

- 4 - (Program Mode)
- 0 - (Next Option) until **PRG:Interface Op** is displayed
- 4 - (Enter)
- 0 - (Next Option) until **IFOp:ParallelSet** is displayed
- 4 - 4 - 4 (Enter) until **IStrap:A1 OUT** is displayed

Use the NEXT OPTION or PREVIOUS OPTION pushbuttons until the desired strap is displayed and use the ENTER pushbutton to change the strap's setting.

Strap definitions for parallel interface are different from those for serial interface.

Strap Number	Meaning if IN	Meaning if OUT
A1 - A3	Reserved for future use.	
A4	No Prime on Select (Online).	Prime on Select.
A5**	No Fault on Paper Out or Deselect.	Fault on Paper Out or Deselect.
A6	Enable TOF/BOF leads.*	Disable TOF/BOF leads.*
A7	Include PI lead in parity.*	Do not include PI lead in parity.*
A8	Pass 8-bit data - Option Strap A32 determines 8th bit usage.	Bit 8 equals 0.
A9	Include bit 8 in parity.*	Do not include bit 8 in parity.*
A10	Character with parity error replaced by space.*	Character with parity error unchanged.*
A11	Enable parity checking.*	Disable parity checking.*
A12	Paper moving lead reflects paper out status.*	Paper moving lead does not reflect paper out status (lead is unused).*

*Dataproducts Interface Only
**To completely disable the BUSY lead, A5, H19, H20, H21, and H22 must be IN

A13-A40 Reserved for future use.

Parallel Interface Hardware Straps

The ASIC (application specific integrated circuit) technology used in this printer allows the hardware portion of the interface to be configured using the control panel pushbuttons.

In the following chart, the column labeled SMPI is a cross-reference to other shuttle matrix printers using non-ASIC interface boards.

C = Factory default setting for CENTRONICS interface. Automatically selected when the parallel interface and any emulation except Dataproducts is selected.

D = Factory default setting for Dataproducts interface. Automatically selected when the Dataproducts emulation is selected.

Selecting the **HWstraps:Default** option in the menu will set all 48 straps to the default settings depending on which emulation is in effect. Straps can also be changed individually.

Changing Hardware Strap Settings

With the parallel interface selected and the printer offline, select the parallel interface hardware straps by pressing:

- 4 - (Program Mode)
- 0 - (Next Option) until **PRG:Interface Op** is displayed
- 4 - (Enter)
- 0 - (Next Option) until **IFOp:ParallelSet** is displayed
- 4 - (Enter) to select **ParOp:Straps**
- 0 - (Next Option) until **ParOp:HWstraps** is displayed
- 4 - (Enter) to select

Press 4 - (Enter) for the default settings or press

- 0 - (Next Option) until **HWstraps:Set H** is displayed
- 4 - (Enter) to select **HWstrap:H1 OUT**

Use the NEXT OPTION or PREVIOUS OPTION pushbuttons until the desired strap is displayed, and use the ENTER pushbutton to change the strap's setting.

Parallel Interface Hardware (HW) Strap Table

HWstrap	Default	State	SMPI	Function
H1	C,D	IN OUT	J16 J15	Interface lead PRIME high causes printer buffer clear. Interface lead PRIME low causes printer buffer clear.
H2	C,D	IN OUT	J13 J14	Enable the interrupt on all control codes. Interrupt disabled on all control codes except LF, VT, FF, CR, DC1, and DC3. Note straps H11 - H16.
H3	C,D	IN OUT	J12 J11	DEL decoded does not cause an interrupt. DEL decoded causes an interrupt.
H4	C,D	IN OUT	J10 J9	DEL decoded does not cause printer PRIME. DEL decoded causes printer PRIME.
H5	C,D	IN OUT	J8 J7	PERR reset by $\overline{\text{IOW8}}$ ($\overline{\text{EOL}}$, CR, LF, VT, FF) or $\overline{\text{PRMSET}}$. PERR reset by the leading edge of the next data strobe or by $\overline{\text{IOW8}}$ or by $\overline{\text{PRMSET}}$
H6	Reserved for future use.			
H7	C,D	IN OUT	J4 J3	Underline character treated as CR. Underline character printed.
H8	C,D	IN OUT	J2 J1	Latched interface lead PI causes an interrupt. Latched interface lead PI does not cause an interrupt.
H9	C,D	IN OUT	J36 J35	Interface lead ACK does not reflect ONLINE/LOCAL status. Interface strap A5 must also be IN. Interface lead ACK reflects ONLINE/LOCAL status.
H10	C,D	IN OUT	J34 J33	Selectable character conversion to space enabled. See H41 - H48. Selectable character conversion to space disabled.
H11	C,D	IN OUT	J32 J31	CR not decoded. CR decoded to generate an interrupt.
H12	C,D	IN OUT	J30 J29	FF not decoded. FF decoded to generate an interrupt.
H13	C,D	IN OUT	J28 J27	LF not decoded. LF decoded to generate an interrupt.
H14	C,D	IN OUT	J26 J25	VT not decoded. VT decoded to generate an interrupt.
H15	C,D	IN OUT	J24 J23	DC3 not decoded. DC3 decoded to generate an interrupt.
H16	C,D	IN OUT	J22 J21	DC1 not decoded. DC1 decoded to generate an interrupt.
H17	D C	IN OUT	J52 J51	Interface lead BUSY does not reflect ACK. Interface lead BUSY reflects ACK.
H18	C,D	IN OUT	J50 J49	Interface lead BUSY/DEMAND toggles with each character. Interface lead BUSY/DEMAND doesn't toggle with each character.
H19**	C,D	IN OUT	J48 J47	Does not allow software to control the BUSY lead. Allows software to control the BUSY lead.
H20**	C,D	IN OUT	J46 J45	Interface lead BUSY does not reflect ONLINE/LOCAL status. Interface lead BUSY reflects ONLINE/LOCAL status.
H21**	D C	IN OUT	J44 J43	Interface lead BUSY does not reflect FAULT. Interface lead BUSY reflects FAULT.

Parallel Interface Hardware Straps (continued)

HWstrap	Default	State	SMPI	Function
H22**	D	IN	J42	Interface lead BUSY does not reflect PAPER OUT.
	C	OUT	J41	Interface lead BUSY reflects PAPER OUT.
H23		IN	J40	Interface lead ACK does not reflect PAPER OUT.
	C,D	OUT	J39	Interface lead ACK reflects PAPER OUT.
H24		IN	J38	Interface lead ACK does not reflect FAULT.
	C,D	OUT	J37	Interface lead ACK reflects FAULT.
H25	C,D	IN	J71	Interface leads DATA 0-7, VFURDY, PAPMVG, PARERR, TOF, BOF, and PARBIT are active high.
		OUT	J72	Interface leads DATA 0-7, PAPMVG, PARERR, TOF, BOF, and PARBIT are active low. VFURDY active only when DP VFU loaded.
H26	C	IN	J68	Interface lead BUSY is active high.
	D	OUT	J67	Interface lead BUSY is active low.
H27	C,D	IN	J66	Interface lead PI active high.
		OUT	J65	Interface lead PI active low.
H28	D	IN	J64	Interface lead PI enabled.
	C	OUT	J63	Interface lead PI disabled.
H29	D	IN	J59	Interface lead STB is active high.
	C	OUT	J60	Interface lead STB is active low.
H30	C,D	IN	J58	Interface lead SELECT is active high.
		OUT	J57	Interface lead SELECT is active low.
H31	C,D	IN	J55	Interface lead PAPER OUT is active high.
		OUT	J56	Interface lead PAPER OUT is active low.
H32		IN	J54	Interface lead FAULT is active high.
	C,D	OUT	J53	Interface lead FAULT is active low.
H33	C	IN	N/A	Disable demand delay.
	D	OUT	N/A	Enable demand delay.
H34 - H35	Used together to set ACK delay from strobe.		H34 / H35 / Delay: OUT / OUT / None (D); OUT / IN / 1 µsec.; IN / OUT / 2 µsec.; IN / IN / 3 µsec. (C)	
H36 - H37	Used together to set ACK pulse width.		H36 / H37 / Pulse Width: OUT / OUT / None (D); OUT / IN / 1 µsec.; IN / OUT / 2 µsec.; IN / IN / 3 µsec. (C)	NOTE: The pulse width will be 1 µsec. if H34 and H35 are out while using CENTRONICS interface.
H38		IN	J76	Interface lead IDENT1 low.
	C,D	OUT	J75	Interface lead IDENT1 high.
H39		IN	J78	Interface lead IDENT0 low.
	C,D	OUT	J77	Interface lead IDENT0 high.
H40		IN	J80	Interface lead PAPMVG reflects VFURDY.
	C,D	OUT	J79	Interface lead PAPMVG reflects PAPMVG.
H41 - H48	Used with strap H10 to select space character substitution. H41 corresponds to bit 1 of the character code. (See ASCII Chart.) All are OUT as the factory default. Example: Setting H41 - H44 (for bits 1 - 4) and H46 (bit 6) IN would cause a space to be printed when a slash (/) character is received. A8 must be IN if H41 is set.			

**To completely disable the BUSY lead, A5, H19, H20, H21, and H22 must be IN

Serial Interface Straps

Changing Serial Interface Strap Settings

With the serial interface selected and the printer offline, select the serial interface straps by pressing:

- 4 - (Program Mode)
- 0 - (Next Option) until **PRG:Interface Op** is displayed
- 4 - (Enter)
- 0 - (Next Option) until **IFOp:Serial Set** is displayed
- 4 - (Enter)
- 0 - (Next Option) until **SerOp:Straps** is displayed
- 4 - (Enter)
- For Set A - Press 4 - (Enter) to display **IStrap:A1 OUT**
- For Set B - Press 0 - (Next Option) to display **SerStrp:Set B**, and then press 4 to select

Use the NEXT OPTION or PREVIOUS OPTION pushbuttons until the desired strap is displayed, and use the ENTER pushbutton to change the strap's setting.

READY/BUSY CONTROL STRAPS

Strap Number	Meaning if IN	Meaning if OUT
A1 - A3	Reserved for future use.	
A4	Ready/Busy via SCA.	SCA does not reflect Ready/Busy.
A5	Ready/Busy via DC1/DC3.	DC1/DC3 does not reflect Ready/Busy.
A6	Reserved for future use.	
A7	Ready/Busy via CD.	CD does not reflect Ready/Busy.
A8	Ready/Busy via CA.	CA does not reflect Ready/Busy.

FAULT CONTROL STRAPS

Strap Number	Meaning if IN	Meaning if OUT
A9 - A11	Reserved for future use.	
A12	FAULT via SCA.	SCA does not reflect FAULT.
A13	FAULT via DC1/DC3.	DC1/DC3 does not reflect FAULT.
A14	Reserved for future use.	
A15	FAULT via CD.	CD does not reflect FAULT.
A16	FAULT via CA.	CA does not reflect FAULT.

Serial Interface Straps (continued)

SELECT STATE CONTROL

Strap Number	Meaning if IN	Meaning if OUT
A17 - A19	Reserved for future use.	
A20	SELECT state via SCA.	SCA does not reflect SELECT.
A21	SELECT state via DC1/DC3.	DC1/DC3 does not reflect SELECT.
A22	Reserved for future use.	
A23	SELECT state via CD.	CD does not reflect SELECT.
A24	SELECT state via CA.	CA does not reflect SELECT.
A25	ETX/ACK protocol enabled with immediate ACK.	ETX/ACK protocol disabled (depending on strap A26).
A26	ETX/ACK protocol enabled with ACK on buffer pass. Overrides strap A25.	ETX/ACK protocol disabled (depending on strap A25).
A27	SCA active low.	SCA active high.
A28	CD active low.	CD active high.
A29	Disable parity check.	Enable parity check.
A30	2 stop bits.	1 stop bit.
A31	Inhibit transmitting to host.	Do not inhibit transmitting.
A32	CA active low.	CA active high.

Strap Number	Meaning if IN	Meaning if OUT
B1	8-bit data; No PI lead function. See Note 1.	7-bit data; Bit 8 = PI lead.
B2	Parity bit not present.	Parity bit present.
B3	Reserved for future use.	
B4	CC false inhibits transmitting.	CC does not inhibit transmitting.
B5	Underline character = CR.	Underline character = Underline character.
B6	8-bit character.	7-bit character.
B7	Accept data offline - send XOFF when buffer almost full - see B8.	Do not accept data while offline.
B8	Accept data offline - send XOFF every 10th character - overrides B7.	Do not accept data while offline.

Straps A33-A40 and B9-B40 are reserved for special applications.

Note 1 - Serial interface strap B1 and printer control strap A32 determine 8th bit usage.

Hardware jumpers on the TTLB board serve the following functions.

J5 IN (J6 OUT) - Transmit always enabled regardless of CB lead state.
J6 IN (J5 OUT) - Host CB lead function determined by J3 and J4.

J7 IN (J8 OUT) - CB lead pulled true but is still controlled by host.
J8 IN (J7 OUT) - CB lead is controlled only by host.

Printer Control Straps

There are three sets of printer option straps: Set A, B, and C.

Set C is only available when the Proprinter or FX-286 emulation is selected. Set A is only available when using an emulation other than Proprinter or FX-286. Only the applicable sets are displayed for the emulation in effect.

Select the emulation first to make the appropriate strap sets available.

Changing Printer Option Strap Settings

With the printer offline, select the option straps by pressing:

- 4 - (Program Mode)
- 0 or 1 - (Next or Previous Option) until **PRG:Printer Opts** is displayed
- 4 - (Enter) The display shows **PStrap:** followed by either **Set A** or **Set B** depending on which emulation is selected

Pressing 4 - (Enter) selects the set showing on the display

Pressing 0 - (Next Option) and then 4 - (Enter) selects the next set

Use the NEXT OPTION or PREVIOUS OPTION pushbuttons until the desired strap number is displayed, and use the ENTER pushbutton to change the strap's setting.

Options A1 through A8 apply to Printronix emulation only.

Strap Number	Meaning if IN	Meaning if OUT
A1	Coded select/deselect active.	Coded select/deselect ignored.
A2	Reserved for future use.	
A3	CR causes overprint.	CR invokes edit mode.
A4	Restrict LPI to 8.	Allow all LPI selections.
A5	Enable VFU load.	Disable VFU load.
A6	Requires PI lead for VFU load.	Allow VFU load without PI lead.
A7	Reserved for future use.	
A8	Reserved for future use.	

Printer Control Straps (continued)

Options A9 - A16 apply to the ANSI and Dataproducts emulations only.

Strap Number	Meaning if IN	Meaning if OUT
A9	SI/SO will select/deselect bar codes and oversize.	SI/SO is ignored.
A10	Paper position is set to top of bar code after printing.	Paper position is left at end of bar code after printing.
A11	Disable ESC c (reset) sequence.	Enable ESC c sequence.
A12	Enable staggered bar codes.	Enable low density bar codes.
A13	Position Unit Mode (PUM) set - Absolute decipoint mode.	PUM reset - row/column mode.
A14	Paper position reset to top of oversize after printing.	Paper position left at end of oversize after printing.
A15	LF after dot graphics puts paper on next LPI grid.	LF after dot graphics moves one LPI increment.
A16	3000 Compatibility Mode.	ANSI Mode.

Options A17 - A40 apply to all emulations except Proprinter and FX-286.

Strap Number	Meaning if IN	Meaning if OUT
A17-A20	4-bit binary value selecting alternate font. See chart on following page.	
A21	CPI reset on font change.	CPI preserved after font change.
A22	Truncate PI slews at top of form.	No truncation of PI slews.
A23	No descenders in NLQ.	Descenders used in NLQ.
A24	Power-up interface online.	Power-up interface in local.
A25	Slashed zero character.	Normal zero character.
A26	Enable LF and FF pushbuttons online.	Disable LF and FF pushbuttons online.
A27	Wraparound at right margin.	Truncate at right margin.
A28	CR converted to LF control code.	CR works as CR.
A29	Ignore received CR control code.	Observe received CR.
A30	Ignore HT if table empty.	HT is space if table empty.
A31	No descenders in draft.	Descenders used.
A32	8th bit selects 256 character font.	8th bit selects alternate font.
A33	4410/40 Compatibility Mode.	4810/4840 Native Mode.
A34	Make 12 CPI font from 10 CPI.	Make 12 CPI font from 13.3 CPI.
A35	Make 15 CPI font from 16.7 CPI.	Make 15 CPI font from 13.3 CPI.
A36	LNM reset by default, LF = LF. See Note 1.	LNM set by default, LF = CR, LF. See Note 1.
A37	No CR on vertical position command.	CR for vertical position command except LF.
A38	GENC1C reset bt default, C1 control codes ignored. See Notes 1&2.	GENC1C set by default, C1 control codes recognized. See Notes 1&2.
A39	GENCS2 reset by default - codes 20H-7EH and A0H-FFH are printable. See Notes 1&2.	GENSC2 set by default - codes 15H, 20H-7EH, and 80H-FFH are printable. See Notes 1&2.
A40	Reduced POSTNET bar code quiet zone and 24 bars per inch. Use 12 cpi for calculating spacing.	Normal POSTNET bar code quiet zone and 20 bars per inch. Use 10 cpi for calculating spacing.

Printer Control Straps (continued)

Notes for A36, A38, and A39:

Note 1: A change in the default state of LNM, GENC1C, and/or GENCS2 will not be effective until followed by an RIS, GENTST, self-test, or a power-up sequence.

Note 2: GENCS2 overrides GENC1C.

4-BIT BINARY VALUE FOR SELECTING ALTERNATE FONT

Strap Option				Font Table Entry	SGR Parameter	Default Font
A17	A18	A19	A20			
OUT	OUT	OUT	OUT	0	10	Gothic Draft
OUT	OUT	OUT	IN	1	11	Gothic Draft
OUT	OUT	IN	OUT	2	12	Character Graphics
OUT	OUT	IN	IN	3	13	Gothic NLQ
OUT	IN	OUT	OUT	4	14	Courier NLQ
OUT	IN	OUT	IN	5	15	High Speed
OUT	IN	IN	OUT	6	16	OCR-A
OUT	IN	IN	IN	7	17	OCR-B
IN	OUT	OUT	OUT	8	18	Italics NLQ
IN	OUT	OUT	IN	9	19	Correspondence

See Appendix E for an explanation of character mapping.

Options B1 through B8 apply to the Dataproducts VFU only.

Strap Number	Meaning if IN	Meaning if OUT
B1	Extended line counter mode: PI slew range = 0 through 63.	Normal line counter mode: PI slew range = 1 through 15.
B2	Default is 8 LPI.	Default is 6 LPI.
B3	Control codes disabled (ASCII codes 00H-1FH).	Control codes enabled.
B4	Form control codes disabled (ASCII codes 10H-13H; LF, VT, FF, CR)	Form control codes enabled.
B5-B8	Reserved for future use.	

Printer Control Straps (continued)

Options B9 through B40 apply to all emulations.

Strap Number	Meaning if IN	Meaning if OUT
B9	Set top of form uses reverse paper motion	Set top of form uses forward paper motion.
B10-15	Reserved for future use.	
B16	Paper low is paper out. See B17&B18.	Paper low is not a fault.
B17	Deselect on paper low if B16 is IN.	Do not deselect on paper low.
B18	Automatic Low Paper Printing to the end of the last sheet. Overrides straps B16 & B17.	Stop printing at paper low.
B19	Stored form programming disabled.	Stored form programming enabled.
B20	Paper tear-off feature enabled if strap A26 is IN.	Paper tear-off feature disabled.
B21	Paper tear-off feature does full paper retraction.	Paper tear-off feature does calculated paper retraction.
B22	Enable micro adjustment of paper with the double arrow key.	Disable micro adjustment function.
B23	Automatic View feature enabled.	Automatic View feature disabled.
B24-B27	Reserved for future use.	
B28	Euro character is enabled.	Euro character is disabled.
B29	Euro character is enabled. (For Windows)	Euro character is disabled. (For Windows)
B30-B35	Reserved for future use.	
B36	Paper tear-off distance set for top exit.	Paper tear-off distance set for rear exit.
B37	Paper jam does not report Fault.	Paper jam reports Fault.
B38	Ribbon jam detector does not report ribbon fault.	Ribbon jam detector reports ribbon fault.
B39	Reverse paper motion is permitted during low paper printing.	Reverse paper motion is not permitted during low paper printing.
B40	Perform complete parallel and serial interface self-test diagnostics. B40 switches to OUT when test is completed successfully.	Test only for installation of parallel and serial interface.

Options C1 through C16 apply to the Proprinter emulation only.

Strap Number	Meaning if IN	Meaning if OUT
C1	Slashed zero enabled.	Slashed zero disabled.
C2	Line length equals 8 inches.	Line length equals 13.2 inches.
C3	Condensed printing at 12 CPI yields 12 CPI.	Condensed printing at 12 CPI yields 20 CPI.
C4	Code paper = Multilingual at initialization.	Code page = USA at initialization.
C5	Character set 2 selected.	Character set 1 selected.
C6	Default form length is 12 inches.	Default form length is 11 inches.
C7	Carriage return = CR plus LF	Carriage return = CR without LF.
C8	Carriage return for LF, VT, and ESC J.	No carriage return for LF, VT, and ESC J.
C9	NLQ II and alternate NLQ II can use Multilingual Code Page 850.	NLQ II and alternate NLQ II can only use USA Code Page 437.
C10-C16	Reserved for future use.	

Printer Control Straps (continued)

Options C17 through C40 apply to the FX286 emulation only.

Strap Number	Meaning if IN	Meaning if OUT
C17	Condensed printing enabled.	Condensed printing disabled.
C18	Slashed zero enabled.	Slashed zero disabled.
C19	Codes 128-255 are character graphics.	Codes 128-255 are Italic characters.
C20	Default print quality is NLQ.	Default print quality is Data Processing.
C21	Default form length is 12 inches.	Default form length is 11 inches.
C22	Enable 1 inch perforation skip.	No perforation skip.
C23	Carriage return = CR plus LF.	Carriage return = CR without LF.
C24	No descenders in draft or NLQ.	Descenders used in draft and NLQ.
C25-C29	5-bit binary value selecting the default international character set. See the chart on the following page.	
C30-C40	Reserved for future use.	

5-BIT BINARY VALUE FOR SELECTING FX286 INTERNATIONAL CHARACTER SETS

C25	C26	C27	C28	C29	Character Set
OUT	OUT	OUT	OUT	OUT	USA
OUT	OUT	OUT	OUT	IN	French
OUT	OUT	OUT	IN	OUT	German
OUT	OUT	OUT	IN	IN	United Kingdom
OUT	OUT	IN	OUT	OUT	Danish I
OUT	OUT	IN	OUT	IN	Swedish
OUT	OUT	IN	IN	OUT	Italian
OUT	OUT	IN	IN	IN	Spanish
OUT	IN	OUT	OUT	OUT	Japan
OUT	IN	OUT	OUT	IN	Norway
OUT	IN	OUT	IN	OUT	Danish II
OUT	IN	OUT	IN	IN	Spanish II
OUT	IN	IN	OUT	OUT	Latin America
OUT	IN	IN	OUT	IN	Netherlands
OUT	IN	IN	IN	OUT	Anglo-Universal
OUT	IN	IN	IN	IN	Spanish American
IN	OUT	OUT	OUT	OUT	Portugal
IN	OUT	OUT	OUT	IN	Africa
IN	OUT	OUT	IN	OUT	Switzerland
IN	OUT	OUT	IN	IN	Turkey
IN	OUT	IN	OUT	OUT	Greece
IN	OUT	IN	OUT	IN	Yugoslavia

NOTE: All other combinations are ignored.

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