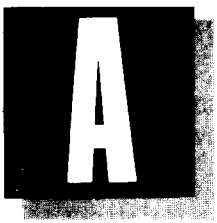
APPENDICES

APPENDIX



FUNCTION CODE REFERENCE

Appendix A contains an entire listing of the codes used for every function performed by your printer. Many of these codes appear throughout the manual, but there are a number of additional functions that are described only in this appendix. So if you'd like to learn about all the capabilities of your printer, you can find them here.

Each function is listed by name, followed by a short description. Since there are several different ways to access a function—through escape, control, decimal, and hexadecimal codes, and also through BASIC character strings—we have listed each of your possible choices. The codes are also cross-referenced to other related codes, and to the proper section of the manual. Here are a few tips on using the codes listed in Appendix A:

<ESC>	This symbol represents the escape function; for instructions on enabling this function, please consult your computer manual or software manual.
n or "*n*"	The "*n*" appears in the codes for user-selectable functions, such as horizontal tab settings. When you see "*n*", you may substitute a number or value within the parameters given in the function's description.
CHR$	The character string command, CHR$, is used to "capture" a code entered when you are programming in BASIC. For details, please see Section 6.

Always be sure to enter the code exactly as it appears in the listing. (If a letter is shown in uppercase, enter it in its uppercase form, and vice-versa.)

■ SELECT THE DRAFT-QUALITY (DQ) CHARACTER SET

This code switches the printer to the draft-quality character set. You can also access the DQ set by turning DIP switch 1-5 on.

CODE: <ESC> 5

HEX: 1B 35

DECIMAL: 27 53

BASIC: CHR$(27) CHR$(53)

REFERENCE: <ESC> 4, Section 4.

■ SELECT THE LETTER-QUALITY (LQ) CHARACTER SET

This command switches the printer to the LQ character set. (You may also set LQ as the power-on default by turning DIP switch 1-5 off. See Appendix D.)

CODE: <ESC> 4

HEX 1B 34

DECIMAL: 27 52

BASIC: CHR$(27) CHR$(52)

REFERENCE: <ESC> 5, Section 4.

■ *SELECT AN INTERNATIONAL CHARACTER SET*

This command selects one of eight international character sets determined by the value of "*n*", as shown below. (You can also select a particular International Character Set as a power-on default. To do this, please turn to Appendix D, "DIP Switches.")

CODE: <ESC> R "*n*"

HEX: 1B 52 "*n*"

DECIMAL: 27 82 "*n*"

BASIC: CHR$(27) CHR$(82) CHR$(*n*)

USA=0 France=1 Germany=2 England=3 Denmark=4
Sweden=5 Italy=6 Spain=7

■ *SET THE PROPORTIONAL SPACING*

In the letter-quality mode, this command causes all subsequent printing to be done in proportional spacing.

CODE: <ESC> p 1

HEX: 1B 70 01

DECIMAL: 27 112 1

BASIC: CHR$(27) CHR$(112) CHR$(1)

REFERENCE: <ESC> p 0, Section4

■ *CANCEL PROPORTIONAL SPACING*

This command cancels the proportional spacing and returns the print pitch to pica.

CODE: <ESC> p 0

HEX: 1B 70 00

DECIMAL: 27 112 0

BASIC: CHR$(27) CHR$(112) CHR$(0)

REFERENCE: <ESC> p 1, Section4

■ *SET THE PRINT PITCH TO PICA (10 CPI)*

In the draft mode, this command causes all subsequent printing to be done in pica type. This command also sets the maximum line length to 80 characters. You can select pica type as the power-on default by turning on DIP switch 1-6.

CODE: <ESC> P

HEX: 1B 50

DECIMAL: 27 80

BASIC: CHR$(27) CHR$(80)

REFERENCE: <ESC> M, Section 4.

■ *SET THE PRINT PITCH TO ELITE (12 CPI)*

In the draft mode, this command causes all subsequent printing to be done in elite type, and sets the maximum line length to 96 characters. You can select elite type as the power-on default by turning DIP switch 1-6 off.

CODE: <ESC> M

HEX: 1B 4D

DECIMAL: 27 77

BASIC: CHR$(27) CHR$(77)

REFERENCE: <ESC> P, Section 4.

■ *SET THE PRINT PITCH TO CONDENSED (16.7 CPI)*

In the draft mode, this command instructs the printer to print in the condensed pitch, and also sets the maximum line length to 132 characters.

CODE: <ESC> <SI>
<SI>

HEX: 1B 0F or 0F

DECIMAL: 27 15 or 15

BASIC: CHR$(27) CHR$(15) or CHR$(15)

REFERENCE: <ESC> P, <ESC> M, Section 4.

■ *SELECT EXPANDED PRINT*

This instruction causes all subsequent printing to be in expanded type. The size of the type is determined by the pitch in use at the time the command is sent:

PITCH	NORMAL	EXPANDED
Pica	10 cpi	5 cpi
Elite	12 cpi	6 cpi
Condensed	16.7 cpi	8.3 cpi

CODE: <ESC> W 1

HEX: 1B 57 01

DECIMAL: 27 87 1

BASIC: CHR$(27) CHR$(87) CHR$(1)

REFERENCE: <ESC> W 0, Section 4.

■ *1 LINE EXPANDED PRINT*

Another code for expanded type activates this function for one line only. Here are the codes:

CODE: <ESC> <SO>
<SO>

HEX: 1B 0E or 0E

DECIMAL: 27 14 or 14

BASIC: CHR$(27) CHR$(14) or CHR$(14)

REFERENCE: <ESC> W 1, <ESC> W 0.

■ *CANCEL EXPANDED PRINT*

Resets the print size to the pitch in use before expanded print began.

CODE: <ESC> W 0

HEX: 1B 57 00

DECIMAL: 27 87 0

BASIC: CHR$(27) CHR$(87) CHR$(0)

REFERENCE: <ESC> W 1, Section 4.

■ *SELECT DOUBLE-STRIKE PRINTING*

After this command is sent, all characters will be printed in the double-strike mode.

CODE: <ESC> G

HEX: 1B 47

DECIMAL: 27 71

BASIC: CHR$(27) CHR$(71)

REFERENCE: <ESC> H, Section 4.

■ *CANCEL DOUBLE-STRIKE PRINTING*

This command returns printer to normal printing, canceling the double-strike mode.

CODE: <ESC> H

HEX: 1B 48

DECIMAL: 27 72

BASIC: CHR$(27) CHR$(72)

REFERENCE: <ESC> G, Section 4.

■ *SELECT EMPHASIZED PRINTING*

This command causes all subsequent characters to be printed in the emphasized mode.

CODE: <ESC> E

HEX: 1B 45

DECIMAL: 27 69

BASIC: CHR$(27) CHR$(69)

REFERENCE: <ESC> F, Section 4.

■ *CANCEL EMPHASIZED PRINTING*

Returns normal printing, canceling the emphasized print mode.

CODE: <ESC> F

HEX: 1B 46

DECIMAL: 27 70

BASIC: CHR$(27) CHR$(70)

REFERENCE: <ESC> E, Section 4.

■ *SELECT UNDERLINING*

After this command is given, all characters will be underlined until this function is canceled.

CODE: <ESC> - 1

HEX: 1B 2D 01

DECIMAL: 27 45 1

BASIC: CHR$(27) CHR$(45) CHR$(1)

REFERENCE: <ESC> - 0, Section 4.

■ *CANCEL UNDERLINING*

After this code is sent, underlining will be canceled.

CODE: <ESC> - 0

HEX: 1B 2D 00

DECIMAL: 27 45 0

BASIC: CHR$(27) CHR$(45) CHR$(0)

REFERENCE: <ESC> - 1, Section 4.

■ *SELECT SUPERSCRIPTS*

With this command, all subsequent characters are printed as superscripts until this function is canceled.

CODE: <ESC> S 0

HEX: 1B 53 00

DECIMAL: 27 83 0

BASIC: CHR$(27) CHR$(83) CHR$(0)

REFERENCE: <ESC> S 1, <ESC> T, Section 5.

■ *SELECT SUBSCRIPTS*

This code causes all subsequent characters to be printed at the subscript level, until this function is canceled.

CODE: <ESC> S 1

HEX: 1B 53 01

DECIMAL: 27 83 1

BASIC: CHR$(27) CHR$(83) CHR$(1)

REFERENCE: <ESC> S 0, <ESC> T, Section 5.

■ *CANCEL SUPERSCRIPTS AND SUBSCRIPTS*

This command is used to cancel either super- or subscript printing.

CODE: <ESC> T

HEX: 1B 54

DECIMAL: 27 84

BASIC: CHR$(27) CHR$(84)

REFERENCE: <ESC> S 0, <ESC> S 1, Section 5.

FORMATTING CONTROLS

■ *SELECT UNIDIRECTIONAL PRINTING*

This command causes all subsequent lines to be printed in the unidirectional mode, until canceled. Unidirectional printing is useful in printing tables or charts, since it ensures that vertical columns of characters will be in alignment in the draft mode.

CODE: <ESC> U 1

HEX: 1B 55 01

DECIMAL: 27 85 1

BASIC: CHR$(27) CHR$(85) CHR$(1)

REFERENCE: <ESC> U 0, <ESC> <.

A similar command can be used to activate unidirectional printing for one line only. Here are the codes:

CODE: <ESC> <

HEX: 1B 3C

DECIMAL: 27 60

BASIC: CHR$(27) "<"

REFERENCE: <ESC> U 0, <ESC> U 1.

■ *CANCEL UNIDIRECTIONAL PRINTING*

This command cancels unidirectional printing, returning the printer to its standard bidirectional printing.

CODE: <ESC> U 0

HEX: 1B 55 00

DECIMAL: 27 85 0

BASIC: CHR$(27) CHR$(85) CHR$(0)

REFERENCE: <ESC> U 1.

■ *ADVANCE THE PAPER ONE LINE (LINE FEED)*

The actual distance advanced by the line feed is set either through DIP Switch 1-3 or through other line spacing methods outlined in Section 5.

CODE: <LF>

HEX: 0A

DECIMAL: 10

BASIC: CHR$(10)

REFERENCE: <ESC> 0, <ESC> 1, <ESC> 2, <ESC> a "*n*", <ESC> A "*n*", <ESC> 3 "*n*", <ESC> J "*n*", <ESC> j "*n*", Section 5.

■ *REVERSE THE PAPER ONE LINE (REVERSE LINE FEED)*

This command causes the printer to reverse the paper one line. The distance reversed by this instruction is set either through DIP switch 1-3 or through other line spacing methods outlined in Section 5.

CODE: <ESC> <LF>

HEX: 1B 0A

DECIMAL: 27 10

BASIC: CHR$(27) CHR$(10)

REFERENCE: <ESC> 0, <ESC> 1, <ESC> 2, <ESC> a "*n*", <ESC> A "*n*", <ESC> 3 "*n*", <ESC> J "*n*", <ESC> j "*n*", Section 5.

■ *CHANGE THE LINE SPACING TO 1/8 INCH*

This instructs your printer to print 8 lines per inch. (You can also select 1/8th inch line spacing by turning off DIP switch 1-3.)

CODE: <ESC> 0

HEX: 1B 30

DECIMAL: 27 48

BASIC: CHR$(27) CHR$(48)

REFERENCE: <ESC> 1, <ESC> 2, <ESC> a "*n*", <ESC> A "*n*", <ESC> 3 "*n*", <ESC> J "*n*", <ESC> j "*n*", Section 5.

■ *CHANGE THE LINE SPACING TO 1/10 INCH*

After this instruction is given, all subsequent line feeds will be set to 1/10th inch, or 10 lines per inch, as described in Section 5.

CODE: <ESC> 1

HEX: 1B 31

DECIMAL: 27 49

BASIC: CHR$(27) CHR$(49)

REFERENCE: <ESC> 0, <ESC> 2, <ESC> a "*n*", <ESC> A "*n*", <ESC> 3 "*n*", <ESC> J "*n*", <ESC> j "*n*", Section 5.

■ *CHANGE THE LINE SPACING TO 1/6 INCH*

This command returns the line spacing on the printer to 1/6th inch, which is the American standard. You can also select 1/6th inch line spacing as the power-on default by turning DIP switch 1-3 on.

CODE: <ESC> 2

HEX: 1B 32

DECIMAL: 27 50

BASIC: CHR$(27) CHR$(50)

REFERENCE: <ESC> 0, <ESC> 1, <ESC> A "*n*", <ESC> 3 "*n*", <ESC> J "*n*", <ESC> j "*n*", Section 5.

■ *CHANGE THE LINE SPACING TO n/60THS OF AN INCH*

This command allows you to select the line spacing you want, to *n*/60ths of an inch. You may choose a value for "*n*" between 0 and 255.

CODE: <ESC> A "*n*"

HEX: 1B 41 "*n*"

DECIMAL: 27 65 "*n*"

BASIC: CHR$(27) CHR$(65) CHR$(*n*)

REFERENCE: <ESC> 0, <ESC> 1, <ESC> 2, <ESC> a "*n*", <ESC> 3 "*n*", <ESC> J "*n*", <ESC> j "*n*", Section 5.

■ *CHANGE THE LINE SPACING TO n/120THS OF AN INCH*

This command allows you to select the line spacing you want, to *n*/120ths of an inch. You may choose a value for "*n*" between 0 and 255.

CODE: <ESC> 3 "*n*"

HEX: 1B 33 "*n*"

DECIMAL: 27 51 "*n*"

BASIC: CHR$(27) CHR$(51) CHR$(*n*)

REFERENCE: <ESC> 0, <ESC> 1, <ESC> 2, <ESC> a "*n*", <ESC> A "*n*", <ESC> J "*n*", <ESC> j "*n*", Section 5.

■ *SEND A ONE-TIME-ONLY LINE FEED OF n/120THS OF AN INCH*

This command causes the printer to advance the paper *n*/120ths of an inch, for the remainder of the line. It does not change the current value of the line spacing, and it does not cause a carriage return. You may substitute for "*n*" any number between 0 and 255.

CODE: <ESC> J "*n*"

HEX: 1B 4A "*n*"

DECIMAL: 27 74 "*n*"

BASIC: CHR$(27) CHR$(74) CHR$(*n*)

REFERENCE: <ESC> 0, <ESC> 1, <ESC> 2, <ESC> a "*n*", <ESC> A "*n*", <ESC> 3 "*n*", <ESC> j "*n*".

■ *SEND A ONE-TIME-ONLY REVERSE LINE FEED OF n/120THS OF AN INCH*

You can use this command to reverse the paper *n*/120ths of an inch. It does not change the current value of the line spacing, and it does not cause a carriage return. You may choose a value between 0 and 255.

CODE: <ESC> j "*n*"

HEX: 1B 6A "*n*"

DECIMAL: 27 106 "*n*"

BASIC: CHR$(27) CHR$(106) CHR$(*n*)

REFERENCE: <ESC> 0, <ESC> 1, <ESC> 2, <ESC> a "*n*", <ESC> A "*n*", <ESC> 3 "*n*", <ESC> J "*n*".

■ *ADVANCE PAPER TO TOP OF NEXT PAGE (FORM FEED)*

The length of a page selected by the form feed is set either through DIP switch 1-2 or through various codes listed below.

CODE: <FF>

HEX: 0C

DECIMAL: 12

BASIC: CHR$(12)

REFERENCE: <ESC> C "*n*", <ESC> C 0 "*n*"

■ *REVERSE PAPER TO TOP OF CURRENT PRINTING PAGE (REVERSE FORM FEED)*

This command causes the printer to reverse the paper to the top line of the page.

CODE: <ESC><FF>

HEX: 1B 0C

DECIMAL: 27 12

BASIC: CHR$(27) CHR$(12)

REFERENCE: <ESC> C "*n*", <ESC> C 0 "*n*".

■ *SET PAGE LENGTH TO "n" LINES*

This command sets the length of all subsequent pages to "*n*" lines. You may choose for "*n*" any whole number between 1 and 127.

CODE: <ESC> C "*n*"

HEX: 1B 43 "*n*"

DECIMAL: 27 67 "*n*"

BASIC: CHR$(27) CHR$(67) CHR$(*n*)

REFERENCE: <ESC> C 0 "*n*", Section 5.

■ *SET PAGE LENGTH TO "n" INCHES*

When you send this command, you set the length of all subsequent pages to "*n*" inches. You may choose for "*n*" any whole number value between 1 and 32. (You may also select a power-on default form length of 11 inches or 12 inches by setting DIP switch 1-2.)

CODE: <ESC> C 0 "*n*"

HEX: 1B 43 00 "*n*"

DECIMAL: 27 67 0 "*n*"

BASIC: CHR$(27) CHR$(67) CHR$(0) CHR$(*n*)

REFERENCE: <ESC> C "*n*", Section 5.

■ *SET TOP MARGIN*

This command allows you to redefine the top margin of the page. For "*n*", you may enter any number between 1 and 16.

CODE: <ESC> r "*n*"

HEX: 1B 72 "*n*"

DECIMAL: 27 114 "*n*"

BASIC: CHR$(27) CHR$(114) CHR$(*n*)

REFERENCE: <ESC> N "*n*", Section 5.

■ *SET THE BOTTOM MARGIN*

With this command, you set the bottom margin of the page to "*n*" lines. The printer automatically executes a form feed when the number of lines left on a page is equal to the "*n*" value you choose. You may enter for "*n*" any value between 1 and 127.

CODE: <ESC> N "*n*"

HEX: 1B 4E "*n*"

DECIMAL: 27 78 "*n*"

BASIC: CHR$(27) CHR$(78) CHR$(*n*)

REFERENCE: <ESC> O, Section 5.

■ *CANCEL TOP AND BOTTOM MARGINS*

This command cancels both the top margin set by <ESC> r "*n*" and the bottom margin set by <ESC> N "*n*".

CODE: <ESC> O

HEX: 1B 4F

DECIMAL: 27 79

BASIC: CHR$(27) CHR$(79)

REFERENCE: <ESC> r "*n*", <ESC> N "*n*", Section 5.

■ *SET VERTICAL TAB POSITIONS*

This command cancels all previous vertical tab positions and sets those defined at lines "*n1*","*n2*", etc. The maximum number of vertical tab positions you can set is 12. This instruction must be terminated with the "NUL" code, CHR$(0). Each vertical tab must be specified in ascending order.

CODE: <ESC> B "*n1*" "*n2*" ...0

HEX: 1B 42 "*n1*" "*n2*" ... 0

DECIMAL: 27 66 "*n1*" "*n2*" ... 0

BASIC: CHR$(27) CHR$(66) CHR$(*n1*) CHR$(*n2*) ... CHR$(0)

REFERENCE: <VT>, Section 5.

■ *ADVANCE TO NEXT VERTICAL TAB POSITION*

This command causes to the paper to advance to the next vertical tab position or the top of the page, whichever comes first. The vertical tab positions are set automatically at power-on to lines 6, 12, 18, 24, 30, 36, 42, 48, 54, and 60.

CODE: <VT>

HEX: 0B

DECIMAL: 11

BASIC: CHR$(11)

REFERENCE: <ESC> B "*n1*" "*n2*" ... 0, <ESC> a "*n*", Section 5.

■ *ADVANCE THE PAPER "n" LINES*

This command causes the paper to advance "*n*" lines, but does not change any values of the vertical tab positions. You may choose any number between 1 and 255 for "*n*".

CODE: <ESC> a "*n*"

HEX: 1B 61 "*n*"

DECIMAL: 27 97 "*n*"

BASIC: CHR$(27) CHR$(97) CHR$(*n*)

REFERENCE: <ESC> B "*n1*" "*n2*" ... 0.

■ *SET VERTICAL FORM UNIT (VFU)*

The vertical form unit command can be used to help you print multipage forms. If each page of the form has different vertical tab positions, the tabs can be set in "channels". There are 7 channels which are numbered from 0 to 6, you can program the tab positions for up to 7 different pages of a form. In the example below the variable "*n*" is used to select which channel will be used. The variables "*m1*", "*m2*", "*m3*"... are used to define the vertical tab positions for a given channel. The command must be terminated with a nul code <0> to signify the end of data for that command. The maximum number of tab positions for a channel is 12.

CODE: <US> "*n*" "*m1*" "*m2*" ... 0

HEX: 1F "*n*" "*m1*" "*m2*" ... 00

DECIMAL: 31 "*n*" "*m1*" "*m2*" ... 0

BASIC: CHR$(31) CHR$(*n*) CHR$(*m1*) CHR$(*m2*) CHR$(0)

REFERENCE: <ESC> B "*n1*" "*n2*" ...0, <ESC> / *n*

■ *SELECT VERTICAL FORM UNIT (VFU) CHANNEL*

This command causes the printer to execute all subsequent vertical tabs in accordance with the format you specified for VFU channel "*n*".

CODE: <ESC> / "*n*"

HEX: 1B 2F "*n*"

DECIMAL: 27 47 "*n*"

BASIC: CHR$(27) CHR$(47) CHR$(*n*)

REFERENCE: <US> "*n*" "*m1*" "*m2*" ... 0
<ESC> B "*n1*" "*n2*" ...0

■ *CARRIAGE RETURN*

This command returns the print head to its "home" position at the left margin.

CODE: <CR>

HEX: 0D

DECIMAL: 13

BASIC: CHR$(13)

REFERENCE: Appendix D.

■ *SET THE LEFT MARGIN*

You can use this instruction to set the left printing margin of your page. This margin will be the "home" position of all subsequent carriage returns until it is canceled or changed. The power-on default for this position is 1. The value for "*n*" must be between 1 and 155. The maximum print position for pica type is 80 for elite, 96 and for condensed type, 132.

CODE: <ESC> l "*n*"

HEX: 1B 6C "*n*"

DECIMAL: 27 108 "*n*"

BASIC: CHR$(27) CHR$(108) CHR$(*n*)

REFERENCE: <ESC> Q "*n*", Section 5.

■ *SET THE RIGHT MARGIN*

Use this command to set the right printing margin on the page. Any attempt to print beyond your chosen right-hand margin will cause an automatic carriage return and line feed. Choose any value between 1 and 155.

CODE: <ESC> Q "*n*"

HEX: 1B 51 "*n*"

DECIMAL: 27 81 "*n*"

BASIC: CHR$(27) CHR$(81) CHR$(*n*)

REFERENCE: <ESC> l "*n*", Section 5.

■ *SET HORIZONTAL TAB POSITIONS*

With this command, you cancel all previously set horizontal tabs, and set new positions at lines "*n1*", "*n2*", etc. There are 255 available tab positions. Use 0 to terminate this command. Each horizontal tab must be between 1 and 255, and must be specified in ascending order.

CODE: <ESC> D "*n1*" "*n2*" ... 0

HEX: 1B 44 "*n1*" "*n2*" ... 00

DECIMAL: 27 68 "*n1*" "*n2*" ... 0

BASIC: CHR$(27) CHR$(68) CHR$(*n1*) CHR$(*n2*) ... CHR$(0)

REFERENCE: <ESC> b "*n*", <HT>, Section 5.

■ *ADVANCE TO NEXT HORIZONTAL TAB*

This command moves the print head to the next available horizontal tab position. Horizontal tabs are set at power-on to positions 9, 17, 25, 33, etc., to the maximum print position.

CODE: <HT>

HEX: 09

DECIMAL: 9

BASIC: CHR$(9)

REFERENCE: <ESC> D "*n1*" "*n2*" ... 0, Section 5.

■ *SKIP HORIZONTAL TAB POSITIONS*

Causes the print head to advance "*n*" print positions to the right. It does not, however, change the current values of the horizontal tabs. You may choose any number for "*n*" between 1 and 255.

CODE: <ESC> b "*n*"

HEX: 1B 62 "*n*"

DECIMAL: 27 98 "*n*"

BASIC: CHR$(27) CHR$(98) CHR$(*n*)

REFERENCE: <ESC> D "*n1*" "*n2*" ...0.

■ *MOVE THE PRINT HEAD BACK ONE POSITION (BACKSPACE)*

Shifts the print head one column to the left. This command can be used to overstrike characters.

CODE: <BS>

HEX: 08

DECIMAL: 8

BASIC: CHR$(8)

REFERENCE: Section 2.

■ *PRINT 8-BIT GRAPHICS*

This command selects the 8-bit graphics mode. Please see Appendix F for a detailed explanation of this mode.

CODE: <ESC> Y "*n1*" "*n2*" "*m1*" "*m2*" ... .

HEX: 1B 59 "*n1*" "*n2*" "*m1*" "*m2*" ... .

DECIMAL: 27 89 "*n1*" "*n2*" "*m1*" "*m2*" ... .

BASIC: CHR$(27) CHR$(89) CHR$(*n1*) CHR$(*n2*) CHR$(*m1*) CHR$(*m2*)... .

REFERENCE: Appendix F.

■ *PRINT 16-BIT GRAPHICS*

This command switches the printer into its 16-bit graphics mode. Please see Appendix F for more on the printer's graphics modes.

CODE: <ESC> I "*n1*" "*n2*" "*m1*" "*m2*" ... .

HEX: 1B 49 "*n1*" "*n2*" "*m1*" "*m2*" ... .

DECIMAL: 27 73 "*n1*" "*n2*" "*m1*" "*m2*" ... .

BASIC: CHR$(27) CHR$(73) CHR$(*n1*) CHR$(*n2*) CHR$(*m1*) CHR$(*m2*) ... .

REFERENCE: Appendix F.

■ *PRINT 24-BIT GRAPHICS*

With this command, you can print high-resolution 24-bit graphics. Please see Appendix F for details.

CODE: <ESC> V "*n1*" "*n2*" "*m1*" "*m2*" ... .

HEX: 1B 56 "*n1*" "*n2*" "*m1*" "*m2*" ... .

DECIMAL: 27 86 "*n1*" "*n2*" "*m1*" "*m2*" ... .

BASIC: CHR$(27) CHR$(86) CHR$(*n1*) CHR$(*n2*) CHR$(*m1*) CHR$(*m2*)...

REFERENCE: APPENDIX F.

■ *PRINT 8X3-BIT GRAPHICS*

This command enables the 8x3-bit graphics mode, which prints about three times as dense and three times as wide as simple 8-bit graphics. Please see Appendix F for details.

CODE: <ESC> K "*n1*" "*n2*" "*m1*" "*m2*" ... .

HEX: 1B 4B "*n1*" "*n2*" "*m1*" "*m2*" ... .

DECIMAL: 27 75 "*n1*" "*n2*" "*m1*" "*m2*" ... .

BASIC: CHR$(27) CHR$(75) CHR$(*n1*) CHR$(*n2*) CHR$(*m1*) CHR$(*m2*)...

REFERENCE: Appendix F.

■ *SELECT MASTER PRINT MODE*

With this command, you can select one of 16 unique print mode combinations shown in Table A-1, for the value of "*n*". (You may choose for "*n*" any number between 0 and 255.) This command precedes other commands (such as <ESC> G, etc.) which set the print mode.

CODE: <ESC>! "*n*"

HEX: 1B 21 "*n*"

DECIMAL: 27 33 "*n*"

BASIC: CHR$(27) CHR$(33) CHR$(*n*)

REFERENCE: <ESC><SO>, <ESC><SI>, <ESC> E, <ESC> F, <ESC> G, <ESC> H, <ESC> M, <ESC> P, <ESC> W 0, <ESC> W 1.

Table A-1. Options for the master print mode.

PITCH	NORMAL	EMPHASIZED	DOUBLE-STRIKE	DOUBLE-STRIKE & EMPHASIZED
Pica	0, 2, 64, 66, 128, 130, 192, 194	8, 10, 12, 14, 72, 74, 76, 78, 136, 138, 140, 142, 200, 202, 204, 206	16, 18, 80, 82,144, 146, 208, 210	24, 26, 28, 30, 88, 90, 92, 94, 152, 154, 156, 158, 216, 218, 220, 222
Elite	1, 3, 5, 7, 9, 11, 13, 15, 65, 67, 69, 71, 73, 75, 77, 79, 129, 131, 133, 135, 137, 139, 141, 143, 193, 195, 197, 199, 201, 203, 205, 207	Elite takes precedence over Emphasized.	17, 19, 21, 23, 25, 27, 29, 31, 81, 83, 85, 87, 89, 91, 93, 95,145, 147, 149,151, 153, 155,157, 159, 209,211, 213, 215,217, 219, 221,223	Elite takes precedence over Emphasized.
Condensed	4, 6, 68, 70, 132, 134, 196, 198	Emphasized takes precedence over condensed.	20, 22, 84, 86,148, 150, 212,214	Emphasized takes precedence over condensed.
Expanded Pica	32, 34, 96, 98, 160, 162, 224, 226	40, 42, 44, 46, 104, 106, 108, 110, 168, 170, 172, 174, 232, 234, 236, 238	48, 50, 112, 114,176, 178, 240, 242	56, 58, 60, 62, 120, 122, 124, 126, 184, 186, 188, 190, 248, 250, 252, 254
Expanded Elite	33, 35, 37, 39, 41, 43, 45, 47, 97, 99, 101, 103, 105, 107, 109, 111, 161, 163, 165, 167, 169, 171, 173, 175, 225, 227, 229, 231, 233, 235, 237, 239	Elite takes precedence over Emphasized.	49, 51, 53, 55, 57, 59, 61, 63, 113, 115,117, 119, 121,123, 125, 127,177, 179, 181,183, 185, 187,189, 191, 241,243, 245, 247,249, 251, 253,255	Elite takes precedence over Emphasized.
Expanded Condensed	36, 38, 100, 102, 164, 166, 228, 230	Emphasized takes precedence over condensed.	52, 54, 116, 118,180, 182, 244,246	Emphasized takes precedence over condensed.

■ *DEFINE MACRO INSTRUCTION*

This command cancels any existing macro instruction and replaces it with a new macro defined by you. Your maximum number of codes in this instruction is 16. The last character in each of the codes below is used to terminate the command.

CODE: <ESC> + ...<RS>

HEX: 1B 2B ... 1E

DECIMAL: 27 43 ... 30

BASIC: CHR$(27) CHR$(43) ... CHR$(30)

REFERENCE: <ESC> ?, Section 4.

■ *EXECUTE MACRO INSTRUCTION*

This command is used to execute your previously defined macro instruction.

CODE: <ESC> ?

HEX: 1B 3F

DECIMAL: 27 63

BASIC: CHR$(27) CHR$(63)

REFERENCE: <ESC> + ... <RS>, Section 4.

■ *SET THE VALUE OF THE 8TH DATA BIT TO LOGICAL 1*

This command allows users with a 7-bit interface to access those characters whose ASCII code is greater than 127.

CODE: <ESC> >

HEX: 1B 3E

DECIMAL: 27 62

BASIC: CHR$(27) CHR$(62)

REFERENCE: <ESC> #, <ESC> =.

■ *SET THE VALUE OF THE 8TH DATA BIT TO LOGICAL 0*

This command causes the printer to ignore the eighth data bit.

CODE: <ESC> =

HEX: 1B 3D

DECIMAL: 27 61

BASIC: CHR$(27) CHR$(61)

REFERENCE: <ESC> >, <ESC> #.

■ *ACCEPT THE VALUE OF THE 8TH DATA BIT AS IS*

This command cancels either setting of the 8th data bit, causing the printer to use the value of the eighth data bit that is sent from the computer.

CODE: <ESC> #

HEX: 1B 23

DECIMAL: 27 35

BASIC: CHR$(27) CHR$(35)

REFERENCE: <ESC> >, <ESC> =.

■ *DELETE THE LAST CHARACTER SENT*

This command deletes the last character received by the printer; it is ignored if the last character received has already been printed, or if the last character received was all or part of a function code.

CODE: <DEL>

HEX: 7F

DECIMAL: 127

BASIC: CHR$(127)

■ *SET PRINTER OFF-LINE*

This command causes the printer to set itself off-line, disregarding all subsequent characters and function codes (with the exception of <DC1>, which returns the printer to its on-line state). When the ON LINE lamp on the printer is off, the printer will not respond to <DC1>.

CODE: <DC3>

HEX: 13

DECIMAL: 19

BASIC: CHR$(19)

REFERENCE: <DC1>

■ *SET THE PRINTER ON-LINE*

This code resets the printer to an on-line state, allowing it to again receive and process characters and function codes. The ON LINE lamp must be lit for the printer to respond to this code.

CODE: <DC1>

HEX: 11

DECIMAL: 17

BASIC: CHR$(17)

REFERENCE: <DC3>.

■ *SOUND THE PRINTER BELL*

This command causes the printer tone to sound for approximately 1/4th second.

CODE: <BEL>

HEX: 07

DECIMAL: 7

BASIC: CHR$(7)

REFERENCE: <ESC> y 1, <ESC> y 0.

■ *DISABLE THE PRINTER BELL*

This command causes the printer to ignore the <BEL> code.

CODE: <ESC> y 0

HEX: 1B 79 00

DECIMAL: 27 121 0

BASIC: CHR$(27) CHR$(121) CHR$(0)

REFERENCE: <ESC> y 1, <BEL>

■ *ENABLE PRINTER BELL*

This command causes the printer to respond to the <BEL> code by sounding the printer tone.

CODE: <ESC> y 1

HEX: 1B 79 01

DECIMAL: 27 121 1

BASIC: CHR$(27) CHR$(121) CHR$(1)

REFERENCE: <ESC> y 0, <BEL>.

■ *DISABLE PAPER-OUT DETECTOR*

This command causes the printer to disregard the signal sent by the paper-out detector. The paper-out signal normally sounds the printer bell and stops printing until paper is inserted and the printer is reset.

CODE: <ESC> 8

HEX: 1B 38

DECIMAL: 27 56

BASIC: CHR$(27) CHR$(56)

REFERENCE: <ESC> 9.

■ *ENABLE PAPER-OUT DETECTOR*

This command restores the function of the paper-out detector.

CODE: <ESC> 9

HEX: 1B 39

DECIMAL: 27 57

BASIC: CHR$(27) CHR$(57)

REFERENCE: <ESC> 8.

■ *CANCEL TEXT IN PRINT BUFFER*

This command cancels all the data previously stored in the print buffer of your printer.

CODE: <CAN>

HEX: 18

DECIMAL: 24

BASIC: CHR$(24)

REFERENCE: <DEL>.

■ *INITIALIZE PRINTER*

This command is used to reinitialize the printer. The print buffer is cleared and the form length, character pitch, character set, line feed pitch, and international character set are all reset to the values defined by their respective DIP switches. The main difference between this code and simply turning the printer off is that download character RAM is preserved with this command.

CODE: <ESC> @

HEX: 1B 40

DECIMAL: 27 64

BASIC: CHR$(27) CHR$(64)

■ *SELECT INCREMENTAL MODE*

This command causes the printer to print each character as it is typed in. If the data is input at intervals of less than approximately 0.1 second, printout will be performed continuously. This is useful for completing forms, or whenever you need to print a character on command.

CODE: <ESC> i 1

HEX: 1B 69 01

DECIMAL: 27 105 1

BASIC: CHR$(27) CHR$(105) CHR$(1)

REFERENCE: <ESC> i 0.

■ *CANCEL INCREMENTAL MODE*

This command cancels incremental mode.

CODE: <ESC> i 0

HEX: 1B 69 00

DECIMAL: 27 105 0

BASIC: CHR$(27) CHR$(105) CHR$(0)

REFERENCE: <ESC> i 1.

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APPENDIX

INSTALLING THE PRINTER INTO YOUR WORD PROCESSING PACKAGE

In Section 1, we listed the basic information you will need to know when you install the printer into your word processing package. Now let's look at a typical installation for WordStar, one of the first—and still the most popular—word processors made for the personal computer. If you aren't planning to use WordStar as your word processor, you can still benefit by reading the following step-by-step description—it will take you through a typical "custom installation", giving you valuable information you can use with any word processor.

To get to the WordStar installation program, insert the disk into your computer as you normally do; at the A>, type the word WINSTALL. The installation program will appear, prompting you with a few preliminary questions (such as "Do you want to continue with this installation?"; answer these questions, and when you get to the query "Name of file to install", enter WS.COM and press the return key three times.

■ *THE INSTALLATION MENU*

The next menu to appear on your screen will be the WordStar Installation Menu, with several choices, including "Menu of Printers" and "Custom Installation of Printers." As we said, you may want to look at the menu of printers and experiment with any of the dot matrix printers listed.

However, you'll get your best results by using WordStar's "Custom Installation of Printers." This choice requires some detailed information about your printer, which you'll find in the following pages. When you choose "Custom Installation of Printers," you are immediately given a submenu called the Printer Installation Menu. The

Printer Installation Menu contains a separate entry for each category of information you will provide concerning the printer.

From this menu your choice is "Automatic Installation for Specialty Printers," which will lead you through each individual category under the heading "All printers"; in addition, it will lead you through the categories for "Specialty printers only".

Printer Name

Your first category is an easy one—the optional "Printer Name." If this is your first installation of WordStar, there will be a blank space next to the words "Current name is:". Press C to change this status, and type in your printer's name.

Printer Initialization

This important category tells WordStar the exact code sequence needed to communicate with your printer. The sequence is "currently empty," so press C to change this status; then enter the following hexadecimal numbers in the exact order shown here (press the return key when you see the word <return>):

```
0D   <return>
1B   <return>
40   <return>
1B   <return>
34   <return>
1B   <return>
1E   <return>
09   <return>
1B   <return>
1F   <return>
0D   <return>
00   <return>
00   <return>
00   <return>
00   <return>
00   <return> <return>
```

When you're finished entering the initialization code, press Y or <return> to confirm your choices.

Printer De-initialization

You will automatically advance to this category when you have finished entering the information concerning printer initialization. No de-initialization code is needed for your printer, so just press <return> to advance to the next category.

Overprinting

The "Overprinting" category will want to know how your printer backspaces. Press C and, from a list of three choices, choose "backspacing standard printer"; then press Y or <return> to confirm your choice.

Next you will be prompted to enter the "backspacing code sequence." Press C, then type in "8h", and finish by pressing the return key.

Boldfacing

Your next category, "Boldfacing", informs you directly of the correct number of strikes for boldface printing: 2. So, press C, 2, and <return>.

Communications protocol

If you are using the parallel interface, no protocol is necessary for this printer. (For the code sequences used in the various serial interface protocols, please see Appendix H.)

Printer driver

If you have chosen "Primary list device" as your printer driver, then the correct codes for that device will already be entered in this category, and no further input is necessary on your part. Press <return> to exit this category.

Ribbon selection

This category also does not apply to your printer , so please press <return> to exit.

Vertical motion and Horizontal motion

When you chose "Automatic Installation for Specialty Printers," the installation program automatically entered the necessary codes for these two categories. No further input is necessary, so just press <return> to pass through them unchanged.

Print modes

This category asks for the code sequences of the backward and forward print modes. You should also pass through these sequences unchanged.

Print phantom characters

This category does not apply to your printer , so press <return> to pass through it. You will be returned to the Printer Installation Menu, and may now enter the special features of the printer that you'll want to use on a regular basis: emphasized, expanded, and underlined printing, or any of the other features you've learned about in this book.

■ *USER FUNCTIONS*

Once you have entered them, you'll be able to call up each of these features from the WordStar Print Menu, under the heading "User Patches."

You can enter these features into WordStar by choosing the option "User-defined functions" from the Printer Installation Menu; "User function #1" will appear on your screen.

WordStar allows you four separate "user functions," each of which represents a feature of the printer (and requires a specific code). Now, remember that most printer features need both a code to turn them on and a code to turn them off. So, you will need two user functions for, say, expanded print. Using expanded print as a typical feature you might want to install, let's proceed with user function #1. (Before we do, however, please note that function #1 is given the designation "^PQ"; when you are word processing in WordStar, you can call up this function simply by typing in ^PQ.)

Begin by pressing C to change the status of user function #1. WINSTALL will present you with an explanation of how to enter three different kinds of codes: "ASCII", decimal and hexadecimal. In this particular installation program, the method described for entering "ASCII" codes can be used to enter both escape codes and control codes: for each character in the code sequence,

- press ":",
- enter the character itself, and
- press <return>.

The code sequence to activate expanded print is <ESC> W 1; to enter this code in WordStar, type in:

:<ESC> <return>
:W <return>
:1 <return> <return>

WordStar will next read back to you the hexadecimal form of this code: 1B 57h 1h 0h (the lowercase "h" denotes hexadecimal numerals, and the "0h" means that the fourth space remains empty). You can check the hexadecimal code displayed on your screen with the hexadecimal code for expanded print in Appendix A of this manual. If they match, you'll know that you have entered the code correctly. Press Y or <return> to confirm your choice.

You will next be presented with WordStar user function #2. Here you'll want to enter the code to cancel expanded print. You can enter the code to cancel expanded print, <ESC> W 0, using the same method you employed for user function #1. At a later time, when you are word processing with WordStar, you can access this function by entering ^PW.

You can program user functions #3 and #4 the same way you did for #1 and #2, employing any other feature that you wish to use.

By following these procedures, you'll have successfully completed the WordStar installation program, and will have up to four special features of the printer at your command.

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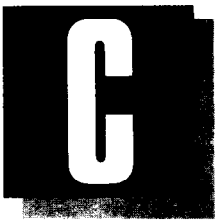
APPENDIX



ASCII CODE CONVERSION CHART

STANDARD ASCII CODES

DECIMAL	HEXADECIMAL	BINARY	CONTROL CHARACTER	CHARACTER
0	00	0000 0000	CTRL-@	<NUL>
1	01	0000 0001	CTRL-A	
2	02	0000 0010	CTRL-B	
3	03	0000 0011	CTRL-C	
4	04	0000 0100	CTRL-D	
5	05	0000 0101	CTRL-E	
6	06	0000 0110	CTRL-F	
7	07	0000 0111	CTRL-G	<BEL>
8	08	0000 1000	CTRL-H	<BS>
9	09	0000 1001	CTRL-I	<HT>
10	0A	0000 1010	CTRL-J	<LF>
11	0B	0000 1011	CTRL-K	<VT>
12	0C	0000 1100	CTRL-L	<FF>
13	0D	0000 1101	CTRL-M	<CR>
14	0E	0000 1110	CTRL-N	<SO>
15	0F	0000 1111	CTRL-O	<SI>
16	10	0001 0000	CTRL-P	
17	11	0001 0001	CTRL-Q	<DC1>
18	12	0001 0010	CTRL-R	<DC2>
19	13	0001 0011	CTRL-S	<DC3>
20	14	0001 0100	CTRL-T	<DC4>
21	15	0001 0101	CTRL-U	
22	16	0001 0110	CTRL-V	
23	17	0001 0111	CTRL-W	
24	18	0001 1000	CTRL-X	<CAN>
25	19	0001 1001	CTRL-Y	
26	1A	0001 1010	CTRL-Z	

STANDARD ASCII CODES

DECIMAL	HEXADECIMAL	BINARY	CHARACTER
27	1B	0001 1011	<ESC>
28	1C	0001 1100	
29	1D	0001 1101	
30	1E	0001 1110	<RS>
31	1F	0001 1111	<US>
32	20	0010 0000	SP
33	21	0010 0001	!
34	22	0010 0010	"
35	23	0010 0011	#
36	24	0010 0100	$
37	25	0010 0101	%
38	26	0010 0110	&
39	27	0010 0111	'
40	28	0010 1000	(
41	29	0010 1001	)
42	2A	0010 1010	*
43	2B	0010 1011	+
44	2C	0010 1100	,
45	2D	0010 1101	-
46	2E	0010 1110	.
47	2F	0010 1111	/
48	30	0011 0000	0
49	31	0011 0001	1
50	32	0011 0010	2
51	33	0011 0011	3
52	34	0011 0100	4
53	35	0011 0101	5
54	36	0011 0110	6
55	37	0011 0111	7
56	38	0011 1000	8
57	39	0011 1001	9
58	3A	0011 1010	:
59	3B	0011 1011	;
60	3C	0011 1100	<
61	3D	0011 1101	=
62	3E	0011 1110	>
63	3F	0011 1111	?
64	40	0100 0000	@
65	41	0100 0001	A
66	42	0100 0010	B
67	43	0100 0011	C
68	44	0100 0100	D
69	45	0100 0101	E
70	46	0100 0110	F

STANDARD ASCII CODES

DECIMAL	HEXADECIMAL	BINARY	CHARACTER
71	47	0100 0111	G
72	48	0100 1000	H
73	49	0100 1001	I
74	4A	0100 1010	J
75	4B	0100 1011	K
76	4C	0100 1100	L
77	4D	0100 1101	M
78	4E	0100 1110	N
79	4F	0100 1111	O
80	50	0101 0000	P
81	51	0101 0001	Q
82	52	0101 0010	R
83	53	0101 0011	S
84	54	0101 0100	T
85	55	0101 0101	U
86	56	0101 0110	V
87	57	0101 0111	W
88	58	0101 1000	X
89	59	0101 1001	Y
90	5A	0101 1010	Z
91	5B	0101 1011	[
92	5C	0101 1100	\
93	5D	0101 1101	]
94	5E	0101 1110	^
95	5F	0101 1111	_
96	60	0110 0000	`
97	61	0110 0001	a
98	62	0110 0010	b
99	63	0110 0011	c
100	64	0110 0100	d
101	65	0110 0101	e
102	66	0110 0110	f
103	67	0110 0111	g
104	68	0110 1000	h
105	69	0110 1001	i
106	6A	0110 1010	j
107	6B	0110 1011	k
108	6C	0110 1100	l
109	6D	0110 1101	m
110	6E	0110 1110	n
111	6F	0110 1111	o
112	70	0111 0000	p
113	71	0111 0001	q
114	72	0111 0010	r

STANDARD ASCII CODES

DECIMAL	HEXADECIMAL	BINARY	CHARACTER
115	73	0111 0011	s
116	74	0111 0100	t
117	75	0111 0101	u
118	76	0111 0110	v
119	77	0111 0111	w
120	78	0111 1000	x
121	79	0111 1001	y
122	7A	0111 1010	z
123	7B	0111 1011	{
124	7C	0111 1100	|
125	7D	0111 1101	}
126	7E	0111 1110	~
127	7F	0111 1111	<DEL>
128	80	1000 0000	
129	81	1000 0001	
130	82	1000 0010	
131	83	1000 0011	
132	84	1000 0100	
133	85	1000 0101	
134	86	1000 0110	
135	87	1000 0111	<BEL>
136	88	1000 1000	<BS>
137	89	1000 1001	<HT>
138	8A	1000 1010	<LF>
139	8B	1000 1011	<VT>
140	8C	1000 1100	<FF>
141	8D	1000 1101	<CR>
142	8E	1000 1110	<SO>
143	8F	1000 1111	<SI>
144	90	1001 0000	
145	91	1001 0001	<DC1>
146	92	1001 0010	<DC2>
147	93	1001 0011	<DC3>
148	94	1001 0100	<DC4>
149	95	1001 0101	
150	96	1001 0110	
151	97	1001 0111	
152	98	1001 1000	<CAN>
153	99	1001 1001	
154	9A	1001 1010	
155	9B	1001 1011	<ESC>
156	9C	1001 1100	
157	9D	1001 1101	
158	9E	1001 1110	<RS>

STANDARD ASCII CODES

DECIMAL	HEXADECIMAL	BINARY	CHARACTER
159	9F	1001 1111	<US>
160	A0	1010 0000	
161	A1	1010 0001	
162	A2	1010 0010	
163	A3	1010 0011	
164	A4	1010 0100	
165	A5	1010 0101	
166	A6	1010 0110	
167	A7	1010 0111	
168	A8	1010 1000	
169	A9	1010 1001	
170	AA	1010 1010	
171	AB	1010 1011	
172	AC	1010 1100	
173	AD	1010 1101	
174	AE	1010 1110	
175	AF	1010 1111	
176	B0	1011 0000	
177	B1	1011 0001	
178	B2	1011 0010	
179	B3	1011 0011	
180	B4	1011 0100	
181	B5	1011 0101	
182	B6	1011 0110	
183	B7	1011 0111	
184	B8	1011 1000	
185	B9	1011 1001	
186	BA	1011 1010	
187	BB	1011 1011	
188	BC	1011 1100	
189	BD	1011 1101	
190	BE	1011 1110	
191	BF	1011 1111	
192	C0	1100 0000	
193	C1	1100 0001	
194	C2	1100 0010	
195	C3	1100 0011	
196	C4	1100 0100	
197	C5	1100 0101	
198	C6	1100 0110	

STANDARD ASCII CODES

DECIMAL	HEXADECIMAL	BINARY	CHARACTER
199	C7	1100 0111	
200	C8	1100 1000	
201	C9	1100 1001	
202	CA	1100 1010	
203	CB	1100 1011	
204	CC	1100 1100	
205	CD	1100 1101	
206	CE	1100 1110	
207	CF	1100 1111	
208	D0	1101 0000	
209	D1	1101 0001	
210	D2	1101 0010	
211	D3	1101 0011	
212	D4	1101 0100	
213	D5	1101 0101	
214	D6	1101 0110	
215	D7	1101 0111	
216	D8	1101 1000	
217	D9	1101 1001	
218	DA	1101 1010	
219	DB	1101 1011	
220	DC	1101 1100	
221	DD	1101 1101	
222	DE	1101 1110	
223	DF	1101 1111	
224	E0	1110 0000	
225	E1	1110 0001	
226	E2	1110 0010	
227	E3	1110 0011	
228	E4	1110 0100	
229	E5	1110 0101	
230	E6	1110 0110	
231	E7	1110 0111	
232	E8	1110 1000	
233	E9	1110 1001	
234	EA	1110 1010	
235	EB	1110 1011	
236	EC	1110 1100	
237	ED	1110 1101	
238	EE	1110 1110	
239	EF	1110 1111	
240	F0	1111 0000	
241	F1	1111 0001	

STANDARD ASCII CODES

DECIMAL	HEXADECIMAL	BINARY	CHARACTER
242	F2	1111 0010	
243	F3	1111 0011	
244	F4	1111 0100	
245	F5	1111 0101	
246	F6	1111 0110	
247	F7	1111 0111	
248	F8	1111 1000	
249	F9	1111 1001	
250	FA	1111 1010	
251	FB	1111 1011	
252	FC	1111 1100	
253	FD	1111 1101	
254	FE	1111 1110	
255	FF	1111 1111	

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APPENDIX

D

DUAL IN-LINE PACKAGE (DIP) SWITCHES

Some of your printer's most important functions are user-selectable through its DIP switches. The following table gives both the preset positions of the switches and their characteristics in the on and off modes.

Table D-1. DIP switch settings and their functions.

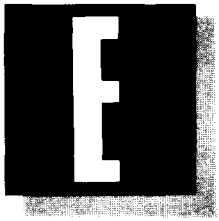
SWITCH NO.	FUNCTION	ON	OFF	PRESET
1-1	Paper-out detector	Disables printer when paper is out	Allows printer to print without paper	ON
1-2	Form length	11 inches	12 inches	ON
1-3	Line spacing	1/6th inch	1/8th inch	ON
1-4	On-line/ off-line	On-line at power-on	Off-line at power-on	ON
1-5	Character set	Draft-quality	Letter-quality	ON
1-6	Print pitch	Pica (10 cpi)	Elite (12 cpi)	ON
1-7	7- or 8-bit interface	Set to 8 bits	Set to 7 bits	ON
1-8	Auto line feed	Line feed not performed by input of CR code	Automatic line feed performed by input of CR code	ON

2-1 2-2 2-3	Selection of international character set	See Table D-2 below	ON ON ON
2-4	Unused		
2-5 2-6 2-7 2-8	Print quality alignment adjustment, preset at factory for each printer. Record original factory set position for future reference. **Do not change factory adjustment.** These switches should be adjusted only by authorized service technicians.		
2-9	unused		
2-10	Allocated for future use		ON

Table D-2. Selection of the International Character Set.

SWITCH NO.			COUNTRY
2-1	**2-2**	**2-3**	
ON	ON	ON	USA
OFF	ON	ON	France
ON	OFF	ON	Germany
OFF	OFF	ON	England
ON	ON	OFF	Denmark
OFF	ON	OFF	Sweden
ON	OFF	OFF	Italy
OFF	OFF	OFF	Spain

APPENDIX



CHARACTER SETS OF THE PRINTER

■ LETTER-QUALITY (LQ) CHARACTER SET AND DRAFT-QUALITY (DQ) CHARACTER SET

The code lists of the letter-quality character set and the draft-character set are shown below.

Decimal	Character	Function	Decimal	Character		
0	<NUL>	End tab settings	34	"	"	
7	<BEL>	Bell	35	#	#	*
8	<BS>	Backspace	36	$	$	
9	<HT>	Horizontal tab	37	%	%	
10	<LF>	Line feed	38	&	&	
11	<VT>	Vertical tab	39	'	'	Apostrophe
12	<FF>	Form feed	40	(	(	
13	<CR>	Carriage return	41	)	)	
14	<SO>	Expanded print on	42	*	*	
15	<SI>	Condensed print on	43	+	+	
17	<DC1>	On line	44	,	,	Comma
18	<DC2>	Pica pitch	45	-	-	Hyphen
19	<DC3>	Off line	46	.	.	Period
20	<DC4>	Expanded print off	47	/	/	
24	<CAN>	Cancel text	48	0	0	
27	<ESC>	Escape	49	1	1	
30	<RS>	End macro	50	2	2	
31	<US>	VFU setting	51	3	3	
32		Space	52	4	4	
33	!	!	53	5	5	

*This character may be different if you are using an international character set other than the USA set. The characters for each set are shown on page 113.

Decimal	Character		
54	6	6	
55	7	7	
56	8	8	
57	9	9	
58	:	:	
59	;	;	
60	<	<	
61	=	=	
62	>	>	
63	?	?	
64	@	@	*
65	A	A	
66	B	B	
67	C	C	
68	D	D	
69	E	E	
70	F	F	
71	G	G	
72	H	H	
73	I	I	
74	J	J	
75	K	K	
76	L	L	
77	M	M	
78	N	N	
79	O	O	
80	P	P	
81	Q	Q	
82	R	R	
83	S	S	
84	T	T	
85	U	U	
86	V	V	
87	W	W	
88	X	X	
89	Y	Y	
90	Z	Z	

Decimal	character		
91	[	[	*
92	\	\	*
93	]	]	*
94	^	^	*
95			
96	`	`	*
97	a	a	
98	b	b	
99	c	c	
100	d	d	
101	e	e	
102	f	f	
103	g	g	
104	h	h	
105	i	i	
106	j	j	
107	k	k	
108	l	l	
109	m	m	
110	n	n	
111	o	o	
112	p	p	
113	q	q	
114	r	r	
115	s	s	
116	t	t	
117	u	u	
118	v	v	
119	w	w	
120	x	x	
121	y	y	
122	z	z	
123	{	{	*
124	¦	¦	*
125	}	}	*
126	~	~	*
127	<DEL>		Delete

*These characters may be different if you are using an international character set other than the USA set. The characters for each set are shown on page 113.

International Character Sets

If you want to access the international character sets, you can get to them in either of two ways: (1) position the DIP switches according to Table D-2 in Appendix D, or (2) use the appropriate escape code shown below in Figure E-3. Then enter the decimal or hexadecimal codes for the character you want, as illustrated in the chart.

Decimal	USA	England	Germany	Denmark	France	Sweden	Italy	Spain
35	#	#	#	£	#	#	#	₧
64	@	à	§	@	@	É	@	@
91	[	°	Ä	[	Æ	Ä	°	¡
92	\	ç	Ö	\	Ø	Ö	\	Ñ
93	]	§	Ü	]	Å	Å	é	¿
94	^	^	^	^	^	Ü	^	^
96	`	`	`	`	`	é	ç	`
123	{	é	ä	{	æ	ä	à	¨
124	|	ç	ö	|	ø	ö	ò	ñ
125	}	è	ü	}	å	å	è	}
126	~	¨	ß	~	~	ü	ì	~

■ *BLOCK GRAPHICS CHARACTER SET*

The codes for block graphics characters are shown below. The printer always uses unidirectional printing when it prints block graphics.

Decimal	Character	Decimal	Character
176	▒	192	└
177	▒	193	┴
178	▒	194	┬
179	│	195	├
180	┤	196	─
181	┤	197	┼
182	┤	198	├
183	┐	199	├
184	┐	200	└
185	┤	201	┌
186	┆	202	┴
187	┐	203	┬
188	┘	204	├
189	┘	205	─
190	┘	206	┼
191	┐	207	┴

Decimal	Character
208	⊥
209	╤
210	╥
211	╙
212	╘
213	╒
214	╓
215	╫
216	╪

Decimal	Character
217	┘
218	┌
219	
220	
221	
222	
223	▀
224	α
225	ß

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

APPENDIX

DESIGNING BIT-IMAGE GRAPHICS

In Appendix E, we showed you the many block graphic characters provided by the printer. You can use these characters to create bar graphs, pie charts, or just about any kind of graphic image you can think of. In addition to block graphics, we'd like to introduce you to bit-image graphics—for the truly imaginative user who will settle for nothing less than total control of the printer. You'll see that its bit-image graphics give you new capabilities in business applications, computer art, and even allows you to create your own "alphabet"!

When you program the printer to perform bit-image graphics, you literally control every pin on its 24-pin print head. As a result, you can print as many as 1,440 dots horizontally, and up to 1,320 dots vertically on an 8 1/2-x-11-inch page.

■ FOUR MODES FOR BIT-IMAGE GRAPHICS

The printer has four distinct bit-image modes, allowing you to print:

- 8-bit graphics, with 1 data byte controlling each column,
- 16-bit graphics, with 2 data bytes controlling each column,
- 24-bit graphics, with 3 data bytes controlling each column, and
- 8x3-bit graphics, in which each byte controls 3 columns of graphics data and each bit controls 3 pins of the print head.

The relationships between your graphics data and the pins on the print head are shown in Figures F-1, F-2, F-3 and F-4 for the four bit-image modes.

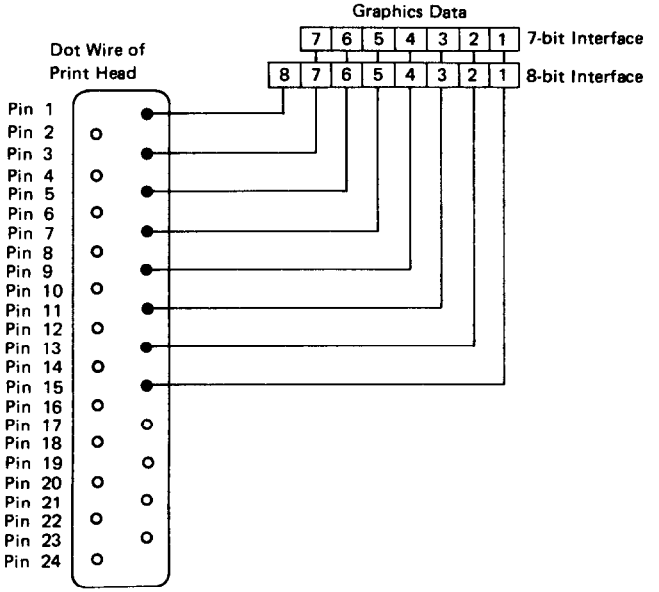


Figure F-1. Pin relationship of the 8-bit graphics mode.

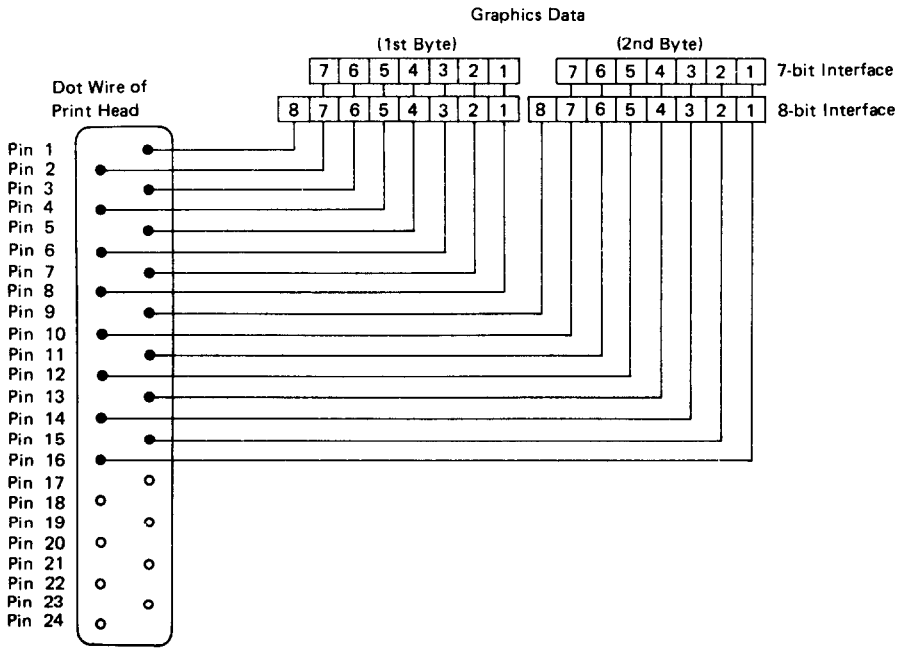


Figure F-2. Pin relationship of the 16-bit graphics mode.

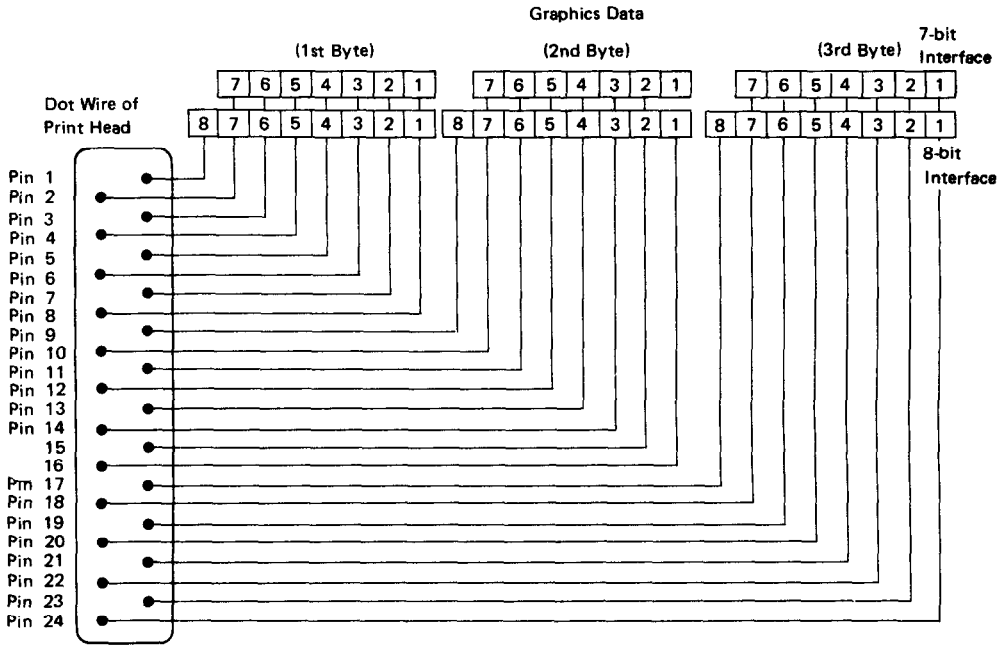


Figure F-3. Pin relationship of the 24-bit graphics mode.

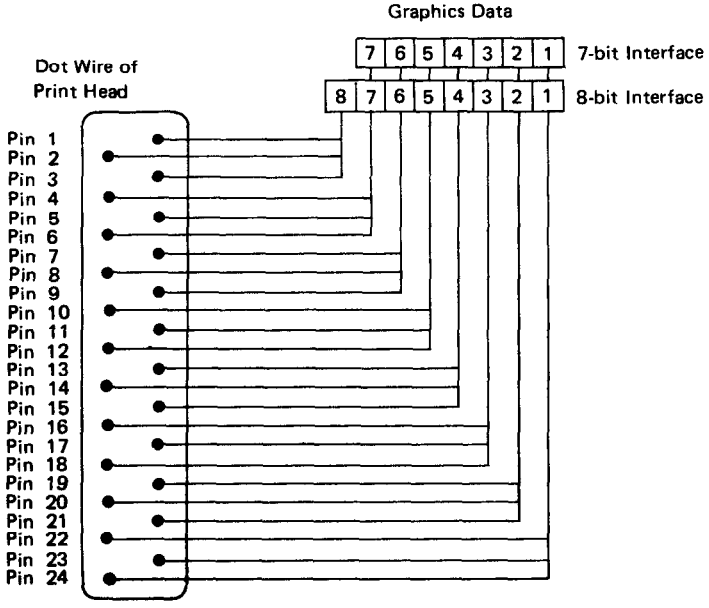


Figure F-4. Pin relationship of the 8x3-bit graphics mode.

■ *PRINTING 8-BIT GRAPHICS*

In 8-bit, normal-density graphics, the graphic image is divided into "dot columns", each directly corresponding to the pin configuration in the print head. Each "dot column" can be controlled by 1 byte of data. As a result, every bit in the byte corresponds to a particular pin in the print head (Figure F-1). This mode, which yields 180 dots per inch horizontally and up to 120 dots per inch vertically, uses the following setup format:

Table F-1. Setup codes for the printer's four graphics modes.

GRAPHICS MODE	ESCAPE CODE SEQUENCE
8-bit	<ESC> Y "*n1*" "*n2*" "*m1*" "*m2*".. .
16-bit	<ESC> I "*n1*" "*n2*" "*m1*" "*m2*".. .
24-bit	<ESC> V "*n1*" "*n2*" "*m1*" "*m2*".. .
8x3-bit	<ESC> K "*n1*" "*n2*" "*m1*" "*m2*".. .

Using this code sequence, the "*n1*" and "*n2*" tell the printer how many bytes of graphics data (measured in dot columns) you are going to send per line. (The "*m1*", "*m2*", etc., tell the printer exactly which pins to fire on each column. We'll demonstrate this shortly.)

■ *SPECIFYING THE NUMBER OF DOT COLUMNS.*

To determine the values of *n1* and *n2*, you will need to calculate the width (in dot columns) of your graphics image and send this information to the printer. To do this, you'll have to convert the number of dot columns into two separate values, using the formula given in Table F-2. This conversion is necessary because the maximum number you can send in one byte is 255, while normal-density graphics mode can print as many as 1,440 columns across the page. The formula shown in Table F-2 allows you to tell the printer exactly what your printing parameters will be, specifying the exact number of bytes to represent dot columns. (In the formula, x = the number of dot columns in your graphic image; thus, if you have a total of 500 columns, divide 500 by 256. Since 256 "goes into" 500 only once, *n2* = 1. *n1* is the remainder of this division, so *n1* = 244.

Specifying the graphics data

When you have entered <ESC> Y *n1* and *n2*, you've set up the 8-bit graphics mode, telling the printer how much data to expect per line. Now you are free to specify the exact picture itself (the "*m1*, *m2*, etc."of the sequence). Figure F-5 shows that each pin on the print head is labeled with a value; the topmost pin has the highest value, and each pin corresponds to a particular value in descending order.

Table F-2. Calculating the width of your graphic image.

IF THE NUMBER OF COLUMNS RANGES FROM:	THEN *n1* IS:	AND *n2* IS:
1 to 255	x	0
256 to 511	x - 256	1
512 to 767	x - 512	2
768 to 1023	x - 768	3
1024 to 1279	x - 1024	4
1280 to 1440	x - 1280	5

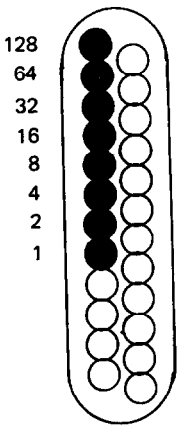


Figure F-5. Pin values for 8-bit graphics.

To fire, say, the second pin from the top, you'll send the BASIC code CHR$(64). You can fire several pins at once by adding their values and sending the sum total in a single BASIC CHR$ code. Thus:

To fire the 1st, 3rd and 4th pins, add their values (128 + 32 + 16) —> then send the BASIC CHR$ code: —> CHR$(176)

Here's a short program to show you how you can implement 8-bit graphics to make a simple zigzag image (Figure F-6).

```
NEW
10 'PRINT GRAPHIC PATTERN
20 WIDTH "LPT1:",255
30 LPRINT CHR$(27) CHR$(89) CHR$(94) CHR$(1);
40 FOR I=1 TO 25
50 FOR J=0 TO 6
60 LPRINT CHR$(2^J);
```

```
70 NEXT J
80 FOR J=6 TO 0 STEP -1
90 LPRINT CHR$(2^J);
100 NEXT J
110 NEXT I
120 WIDTH "LPT1:",80
130 LPRINT
```

Figure F-6. A zigzag pattern created with 8-bit graphics.

In line 30 of this program, we selected normal-density graphics and indicated that 350 characters of graphics data would follow {94 + (1 * 256) = 350}. The loop between lines 40 and 110 is repeated 25 times; this is what gives us the zigzag effect. The loop from lines 50 to 70 creates the lines that slope up; the loop between lines 80 and 100 prints downward-sloping lines. This is an example of plotting a very simple mathematical function to create a design.

Combining text and graphics

It's also possible to mix text and graphics in one line. This can be useful for labeling charts and graphs, or even for inserting graphics into text. Try adding these lines to the program:

```
25 LPRINT "WOW!";
115 LPRINT " THIS IS GREAT!";
```

If you run the program with these lines added, you should get a printout that looks like this:

Figure F-7. Graphics pattern inserted within text.

There is one thing you must remember when you print this kind of program: all graphics data must print on the same line. The graphics command is turned off at the end of each line, even if you have specified that more graphics codes will follow.

■ *PRINTING A DESIGN OR GRAPHIC PICTURE*

Since you control the firing of every pin, you can print nearly anything that you can draw. In our next example, we'll demonstrate the printer's ability to plot computer art of your own design.

The best way to start is to lay out your image on graph paper. You can print eight rows (seven with a 7-bit interface) of dot columns with each pass of the print head, so begin by drawing a heavy hor-

izontal line every eight rows on your graph paper. The dot columns are represented by the column of eight blocks between the horizontal lines. Each of the blocks on the graph represents a pin on the print head. It may be helpful to write the pin values (128, 64, 32, etc.) down the left side of each row. Now you can use a pencil or felt tip marker to draw the picture you want on the graph paper (Figure F-8). After you have filled in the "dots" that you want to print, add up the values of each column of dots: the sum total represents one byte.

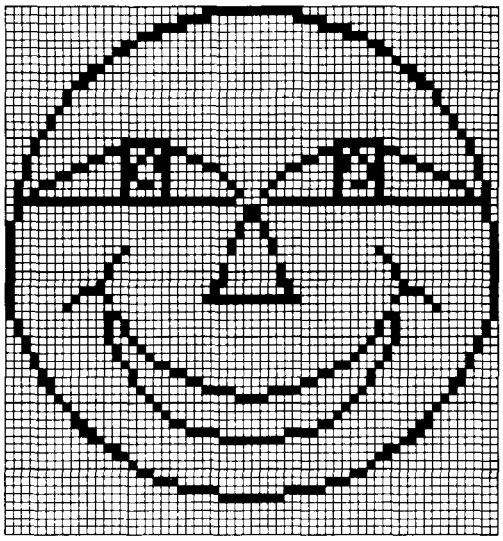


Figure F-8. Planning your graphic design on graph paper.

In the program below, we have taken the graphics information from the design in Figure F-8 and put it into BASIC data statements:

```
NEW
10 WIDTH "LPT1:",255
20 LPRINT CHR$(27) CHR$(51) CHR$(10)
30 FOR ROW=1 TO 8
40 LPRINT CHR$(27) "Y" CHR$(60) CHR$(0);
50 FOR COLUMN=1 TO 60
60 READ X
70 LPRINT CHR$(X);
80 NEXT COLUMN
90 LPRINT CHR$(10);
100 NEXT ROW
110 LPRINT
120 LPRINT "SMILE"
130 DATA 0,0,0,0,0,0,0,0,0,0
```

```
140 DATA 1,1,2,4,12,8,16,16,48,32
150 DATA 32,96,64,64,192,128,128,128,128,128
160 DATA 128,128,128,128,128,192,64,64,96,32
170 DATA 32,48,16,16,8,12,4,2,1,1
180 DATA 0,0,0,0,0,0,0,0,0,0
190 DATA 0,0,0,0,1,6,8,48,64,192
200 DATA 128,0,0,0,0,0,0,0,0,0
210 DATA 0,0,0,0,0,0,0,0,0,0
220 DATA 0,0,0,0,0,0,0,0,0,0
230 DATA 0,0,0,0,0,0,0,0,0,128
240 DATA 192,64,48,8,6,1,0,0,0,0
250 DATA 0,7,57,195,5,5,9,9,17,17
260 DATA 33,33,65,65,255,153,165,197,177,255
270 DATA 65,65,33,33,17,17,9,5,2,0
280 DATA 0,2,5,9,17,17,33,33,65,65
290 DATA 255,177,197,165,153,255,65,65,33,33
300 DATA 17,17,9,9,5,5,195,57,7,0
310 DATA 63,192,0,0,0,0,0,0,0,0
320 DATA 0,0,1,2,4,0,0,0,0,0
330 DATA 0,0,0,0,0,0,1,12,48,192
340 DATA 192,48,12,1,0,0,0,0,0,0
350 DATA 0,0,0,0,0,4,2,1,0,0
360 DATA 0,0,0,0,0,0,0,0,192,63
370 DATA 252,3,0,0,0,0,0,8,16,32
380 DATA 32,96,151,4,3,0,0,0,0,0
390 DATA 0,0,0,0,16,112,208,16,16,16
400 DATA 16,16,16,208,112,16,0,0,0,0
410 DATA 0,0,0,0,0,3,4,151,96,32
420 DATA 32,16,0,0,0,0,0,0,3,252
430 DATA 0,0,192,48,12,6,1,0,0,0
440 DATA 0,0,128,96,16,140,66,33,16,16
450 DATA 8,8,4,4,2,2,2,2,1,1
460 DATA 1,1,2,2,2,2,4,4,8,8
470 DATA 16,16,33,66,140,16,96,128,0,0
480 DATA 0,0,0,1,6,12,48,192,0,0
490 DATA 0,0,0,0,0,0,0,128,96,48
500 DATA 24,8,4,6,2,1,0,0,128,64
510 DATA 32,32,16,16,16,16,8,8,8,8
520 DATA 8,8,8,8,16,16,16,16,32,32
530 DATA 64,128,0,0,1,2,6,4,8,24
540 DATA 48,96,128,0,0,0,0,0,0,0
550 DATA 0,0,0,0,0,0,0,0,0,0
560 DATA 0,0,0,0,0,0,128,128,64,64
570 DATA 64,32,32,32,32,32,16,16,16,16
580 DATA 16,16,16,16,32,32,32,32,32,64
```

```
590 DATA 64,64,128,128,0,0,0,0,0,0
600 DATA 0,0,0,0,0,0,0,0,0,0
```

SMILE

Figure F-9. Picture of a smile.

The data lines of our program (lines 130–600) correspond to the eight horizontal sections of the graph. In each line, we have entered the pin firing values calculated from the information drawn on the graph. The program used to create a picture from this data is actually quite simple. Please follow along for a brief explanation of how it works:

LINE 20 — In this statement, we enter the codes to change line spacing to 10/120ths of an inch. This causes the lines to just slightly touch each other, but not to overlap.

You can experiment with line spacing in your graphics, but in general, overlapping lines will cause your picture to be distorted. On the other hand, if the line spacing is too wide, your image will have unwanted "gaps" in it. To adjust the line spacing in your graphic image, just enter a different value in n/120ths of an inch: a higher value for wider spacing, or a lower value for narrower spacing.

LINE 30 — In this statement, we set up the number of rows to print—in our example, eight—by using the BASIC "for/next" loop.

LINE 40 — Now we're ready to enter the code to set up the graphics mode we want to use. The <ESC> "Y" sets up 8-bit graphics, and the "60" and "0" are the values of *n1* and *n2*, respectively.

LINE 50 — This statement sets up the number of dot columns that will be contained in the image, by using a BASIC "nested" for/next loop.

LINE 60 — Reads the data for a single column.

LINE 70 Prints the data read in line 60.

LINE 80 Continues the nested for/next loop, which causes all 60 columns in a row to be read and printed.

LINE 90 Causes a line feed.

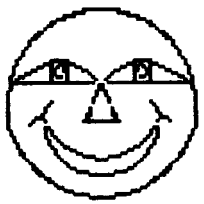
LINE 100 Instructs the nested for/next loop to continue to read and print subsequent rows until all eight rows have been printed.

LINE 120 Tells the printer to print the word "smile" underneath the graphic image.

When you've run this program, your result should be similar to the picture illustrated in Figure F-9. Now try running the same program again, with the following minor changes to lines 90 and 110:

- In line 20, change "10" to "15".
- In line 40, change "Y" to "K".

When your printer prints the new program, it will look like this:



SMILE

Figure F-10. "Smiling" in the 8x3-bit mode.

That's how easy it is to print a picture using 8x3-bit mode! 8x3-bit graphics mode is similar to the 8-bit mode, except that each bit in the data byte controls three pins, not just one. Thus, the 8x3-bit mode will print the same image three times as wide and three times as dense as the one shown in Figure F-9.

To print in the 8x3-bit mode, remember: just use <ESC> K to set up the mode, and change the line spacing to 15/120ths of an inch. We hope you enjoy experimenting with 16-bit and 24-bit modes, too—you just may unleash a creative streak you never knew you had!

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APPENDIX

TECHNICAL SPECIFICATIONS

The following specifications are subject to change without notice.

■ *PRINTING*

Method	Serial impact dot matrix
Speed	Draft quality: 144 cps in elite 120 cps in pica 78 cps in condensed Letter quality: 47 cps in pica 54 cps in proportional printing
Direction	Bidirectional logic-seeking Unidirectional in LQ and graphics modes
Paper feed	Sprocket or friction feed, 10 lines per second at 1/6th inch line spacing
Line spacing	6 or 8 lines per inch (switch- and software selectable) Software selectable in increments of *n*/120ths of an inch
Character set	96 Letter-Quality characters 99 International LQ characters 96 Draft-Quality characters 99 International DQ characters 50 Block graphic characters

Character matrix	24 dot x 13 dot standard with true descenders 30 dot x 18 dot block graphics 24 dot x 34 dot LQ characters 24 dot x 14 - 36 dot proportional LQ characters 8 dot x 1440 dot 8-bit graphics 16 dot x 1440 dot 16-bit graphics 24 dot x 1440 dot 24-bit graphics 24 dot x 1440 dot 8x3-bit graphics
Character fonts	Pica (10 cpi) Elite (12 cpi) Condensed (16.7 cpi) Proportional Expanded (5, 6, and 8.35 cpi and proportional) Emphasized Double-strike
Special features	Self-test Continuous underline Backspace Vertical and horizontal programmable tabs Left and right margin set 7- or 8-bit selectable interface Bit-image column scan Perforation skip Reversible paper feed Macro instruction
Column width	Draft quality: 80 characters per line (pica) 96 characters per line (elite) 132 characters per line (condensed) 40 characters per line (pica expanded) 48 characters per line (elite expanded) 66 characters per line (condensed expanded) Letter quality: Proportional spacing 80 characters per line (pica) 40 characters per line (pica expanded)
Form length	11 or 12 inches

■ *PAPER AND RIBBON*

Single-sheet paper	5.5 - 8.5 inches wide 0.07 - 0.10 mm thick (1 part)
Sprocket-feed paper	4 - 10 inches wide 0.07 - 0.10 mm thick (1 part) 0.28 mm thick (3-part copies)
Ribbon	Black nylon ribbon cassette, multistrike, endless

■ *PRINTER*

Width	420 mm (16.5 in.)
Depth	368 mm (14.5 in.)
Height	148 mm (5.8 in.)
Weight	11 kg (approx.)
Power	120VAC +/-10%, 60 Hz, approx. 100 watts
Operating environment	10 - 40 deg. C (50 - 104 deg. F) 20 - 80% relative humidity, noncondensing
Paper feed system	Sprocket and friction feed
Buffer	1-line, expandable to 128K

■ *PARALLEL INTERFACE (STANDARD)*

Interface	Centronics-compatible
Transfer rate	1.000 - 6,000 cps
Synchron-ization	By externally-supplied $\overline{\text{STROBE}}$ pulses
Handshaking	By $\overline{\text{ACK}}$ and BUSY signals
Logic level	TTL-compatible

■ *SERIAL INTERFACE(OPTIONAL)*

Interface	RS-232C levels/20mA current loop (selectable)
Transfer rate	RS-232C: 150 - 19,200 bits per second (selectable) Current loop: 150 - 9,600 bits per second
Word length	1 start bit, 7 or 8 data bits, 1 or 2 stop bits; odd, even or no parity
Handshaking	By $\overline{\text{ACK}}$, BUSY and XON/XOFF signals (selectable)
Signal polarity	Mark: logic "1" (-3V to -15V or current on) Space: logic "0" (+3V to +15V or current off)

■ *IEEE-488 INTERFACE(OPTIONAL)*

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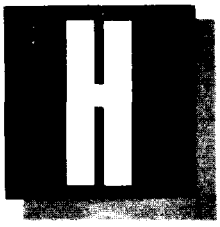
see Appendix H

APPENDIX



INTERFACES

This appendix contains the technical information necessary to connect the printer to your computer using each of the three possible interfaces: parallel, serial, and IEEE-488.

■ *THE PARALLEL INTERFACE*

Your printer uses a Centronics-compatible parallel interface capable of transferring from 1,000 to 6,000 characters per second. Externally supplied $\overline{\text{STROBE}}$ pulses accomplish synchronization of data transmission. $\overline{\text{ACK}}$ and BUSY signals govern the "handshaking" between your computer and the printer. Parallel interface uses a TTL-compatible logic level.

Functions of the connector signals

Pin 1 carries the $\overline{\text{STROBE}}$ pulse signal from the computer to the printer (see Figure H-1). When the computer has data ready for the printer it sets this signal to low value for at least 0.5 microseconds. When the printer sees this pulse on the $\overline{\text{STROBE}}$ pin, it reads the data supplied by the computer on pins 2-9. Each of these lines carries one bit of information. A logical "1" is represented by a high signal level, and a logical "0" is represented by a low signal level. The computer must maintain these signals for at least 0.5 microseconds before—and 0.5 microseconds after—the $\overline{\text{STROBE}}$ pulse.

When the printer has successfully received the byte of data from the computer, it sets the $\overline{\text{ACK}}$ signal (pin 10) low for approximately 9 microseconds. A high BUSY signal (pin 11) reports when the printer is unable to receive data. This signal will be high during data transfer when the printer is off-line, or when an error condition exists. See the circuit example of these signals in Figure H-2.

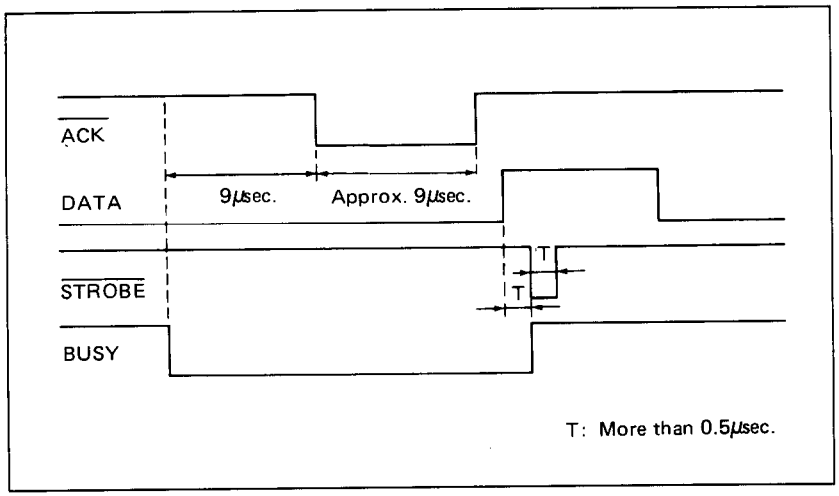


Figure H-1. Data transfer timing chart for the parallel interface.

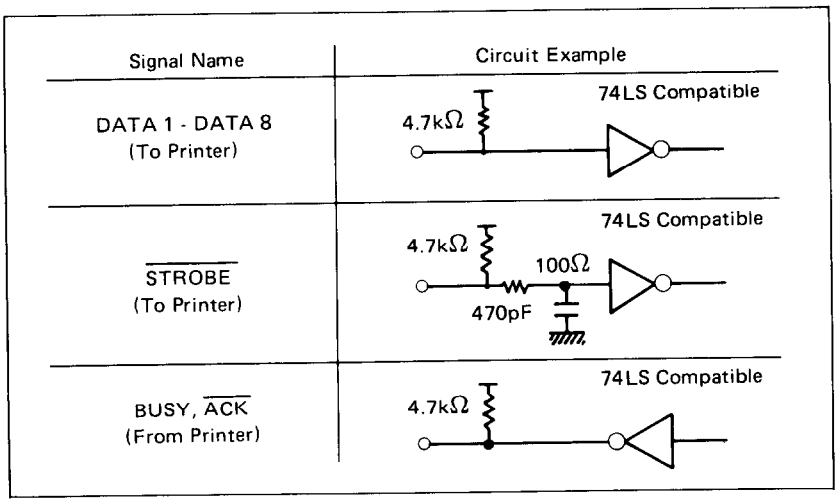


Figure H-2. Circuit example of the parallel interface.

Connector signals

The following chart describes the connector signals for the 36 pins of the parallel interface.

Table H-1. Parallel interface connector signals.

PIN	SIGNAL NAME	DIRECTION	FUNCTION
1	STROBE	IN	The STROBE pulse is used to read data. When this signal goes low, data is read in.
2	DATA 1	IN	The signals on pins 2-9 represent parallel data bits 1-8. Each signal is at a high level for logical 1 and at a low level for a logical 0.
3	DATA 2	IN	
4	DATA 3	IN	
5	DATA 4	IN	
6	DATA 5	IN	
7	DATA 6	IN	
8	DATA 7	IN	
9	DATA 8	IN	
10	ACK	OUT	This 9-microsecond pulse acknowledges the receipt of data.
11	BUSY	OUT	The BUSY signal indicates the operating condition of the printer. When this signal goes low, the printer is ready to accept data.
12	PAPER END	OUT	This signal is used to indicate "paper-out" status to the computer. This signal is normally low; when DIP switch 1-1 is off, this signal is held low.
13	SELECTED	OUT	The SELECTED signal is high when the printer is on-line.
14-15	N/C	—	Unused.
16	SIGNAL GND	—	Signal ground.
17	CHASSIS GND	—	Chassis ground.
18	+5VDC	OUT	External supply of +5VDC power (max. 50 mA).
19-30	TWISTED PAIR RETURN GND	—	Return line of various signals.
31	INPUT PRIME	IN	Resets all control circuits. A low signal level initializes the printer and clears buffer memory.
32	ERROR	OUT	This signal goes low when the printer detects an error.
33	EXT GND	—	External ground.
34-35	N/C		Unused.
36	N/C		TTL high level.

■ *THE SERIAL INTERFACE(OPTIONAL)*

Your printer uses either an RS-232C level or 20mA current loop to provide serial communication with your computer. (See the circuit diagrams contained in Figure H-3.) Using either interface, it can transfer from 150 to 9,600 bits per second. However, the printer can communicate at 19,200 bits per second using only an RS-232C level interface. Its word length is:

- 1 start bit
- 7 or 8 data bits (selectable)
- 1 or 2 stop bits (selectable)
- Odd, even or no parity (selectable)

You can select from the following four "handshake" modes:

- Serial BUSY, 1-byte mode
- Serial BUSY, 1-block mode
- ACK mode
- XON/XOFF mode

A mark or ON (logical 1) generates a signal of -3V to -15V. A space or OFF (logical 0) generates a signal of +3V to +15V.

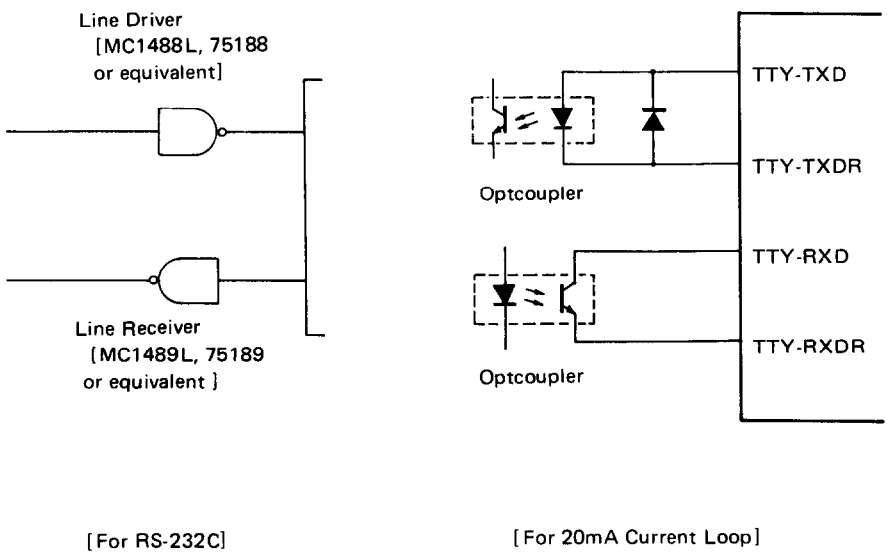


Figure H-3. Circuit diagrams of the serial interface.

Table H-2. Connector signals for the serial interface.

PIN	SIGNAL NAME	DIRECTION	FUNCTION
1	F-GND		Frame ground.
2	TXD	OUT	The TXD (transmit data) signal carries data from the printer
3	RXD	IN	The RXD (receive data) signal carries data to the printer
4	RTS	OUT	The RTS (request to send) signal is on when the printer is ready to receive data.
5	CTS	IN	The CTS (clear to send) signal is on when the computer is ready to send data.
6	DSR	IN	This signal line is used to check if the printer is ready for operation.
7	S-GND		Signal ground.
8	DCD	IN	When the DCD (data carrier detect) signal is on, the receive signal is within a specified range.
9	TTY TXDR		This pin indicates the signal line return of 20mA current loop for data transmission.
10	TTY TXD	OUT	Indicates the signal line of 20mA current loop for data transmission.
11	REV-CH	OUT	The REV-CH (reverse channel) pin is the signal line for busy protocols. This pin goes off when the buffer fills, and on when the printer is ready to receive data.
12	N/C		Unused.
13	S-GND		Signal ground.
14-16	N/C		Unused.
17	TTY TXDR		Indicates the signal line return of the 20mA current loop for data transmission.
18	TTY RXDR		Indicates the signal line return of the 20mA current loop for data reception.
19	TTY RXD	IN	Indicates the signal line of the 20mA current loop for data reception.
20	DTR	OUT	The DTR (data terminal ready) pin is on when the printer is ready to receive data.
21-22	N/C		Unused.
23	TTY RXDR		Indicates the signal line return of the 20mA current loop for data reception.
24	TTY TXD	OUT	Indicates the signal line of 20mA current loop for data transmission.
25	TTY RXD	IN	Indicates the signal line of the 20 mA current loop for data reception.

Serial busy protocols

In these protocols, the printer uses DTR (pin 20) and REV-CH (pin 11) to signal to the computer when it is able to accept data. These pins go on when the printer is ready to accept data. In the 1-byte mode, they go off after each character is received. In the 1-block mode, they go off only as the printer buffer approaches capacity. In both cases, they stay off if the buffer is too full to accept more data.

XON/XOFF protocol

This protocol uses the ASCII characters DC1 and DC3 (sometimes called XON and XOFF, respectively) to communicate with the computer. When the printer buffer approaches capacity, the printer sends a DC3 on TXD (pin 2) to tell the computer that it must stop sending data. When the printer is able to receive more data, it sends a DC1 on the TXD pin. The computer can then send more data until the printer sends another DC3.

ACK protocol

In the ACK protocol, the printer sends an $\overline{\text{ACK}}$ (ASCII 6) signal on the TXD pin each time it is prepared to receive a byte of data.

■ *THE IEEE-488 INTERFACE*

You may also use the IEEE-488 interface to connect printer to your computer. This 8-bit parallel interface uses a TTL-compatible logic level, and is capable of transferring characters at rates of up to 1 megabyte per second. Its transfer system is governed by a three-wire handshaking protocol, illustrated in Figure H-4.

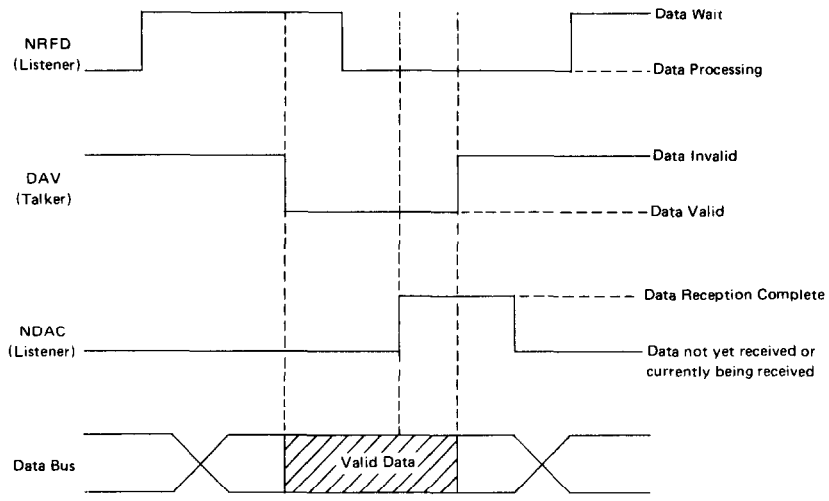


Figure H-4. Data transfer timing chart for the IEEE-488 interface.

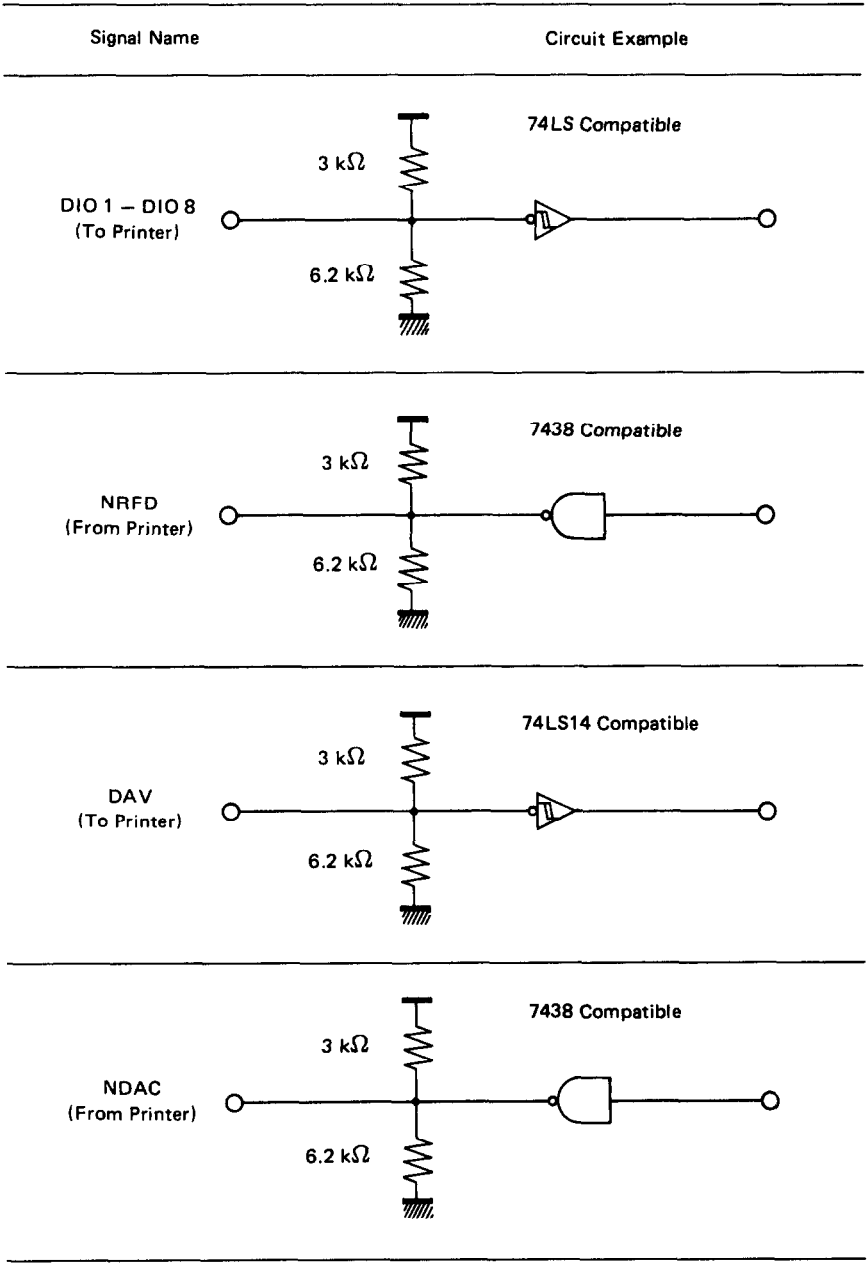


Figure H-5. Circuit example of the IEEE-488 parallel interface.

Table H-3. Connector signals for the IEEE-488 interface.

PIN	SIGNAL NAME	DIRECTION	FUNCTION
1 2 3 4	DIO 1 DIO 2 DIO 3 DIO 4	IN IN IN IN	These signals represent parallel data bits 1-4. Each signal is at a low level for a logical 1, and at a high level for logical 0.
5	N/C		Unused.
6	Data Valid (DAV)	IN	Indicates valid data.
7	Not Ready For Data (NRFD)	OUT	Indicates the completion of preparation for data reception.
8	Not Data Accepted (NDAC)	OUT	Indicates the completion of data reception.
9	Interface Clear (IFC)	IN	Initializes the interface.
10	N/C		Unused.
11	Attention (ATN)	IN	Indicates that data on the data bus is either an address or a command.
12	SHIELD		Shield.
13 14 15 16	DIO 5 DIO 6 DIO 7 DIO 8	IN IN IN IN	These signals represent parallel data bits 5-8. Each signal is at a low Level for a logical 1, and a high level for a logical 0.
17	Remote Enable (REN)	IN	Specifies remote/local.
18-23	GND		Ground.
24	LOGIC GND		Logic ground.

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Federal Communications Commission Radio Frequency Interference Statement

This equipment generates and uses radio frequency energy and, if not installed and used properly—that is, in strict accordance with the manufacturer's instructions—may cause interference to radio and television reception. It has been type-tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. If this equipment does cause interference to radio or television reception— which can be determined by turning the equipment off and on—the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna
- Relocate the computer with respect to the receiver
- Move the computer away from the receiver
- Plug the computer into a different outlet so that computer and receiver are on different branch circuits

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: "How to Identify and Resolve Radio-TV Interference Problems." This booklet is available from the U.S. Government Printing Office, Washington, D.C., 20402, Stock No. 004-000-00345-4.

For compliance with Federal Noise Interference Standard, this equipment requires a shielded cable.

This statement will apply only for printers marketed in the U.S.A.

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WARRANTY

STAR MICRONICS, INC., warrants this product to be free from defects in material and/or workmanship for a period of one year (if purchased after July 1, 1984) from the original date of purchase by the buyer other than for the purpose of resale. This warranty shall apply only if such original purchase by the buyer was made in the United States of America, of Canada.

This warranty shall apply only if the product fails to function properly under normal use. Should this product fail to be in good working order anytime during the one year warranty period, Star Micronics, Inc., will, at its sole option, repair or replace this product at no additional charge except as set forth below. The forgoing is STAR MICRONICS, INC., sole responsibility under this warranty, and any liability for incidental or consequential damages, is expressly disclaimed. Repair parts and replacement products shall be furnished on an exchange basis and shall be either new or reconditioned. All replaced parts and products shall become the property of STAR MICRONICS, INC.

Warranty coverage will not be granted if, in the sole opinion of STAR MICRONICS, INC., the defect or malfunction was caused by accident, abuse or misuse, neglect, improper packing or improper modifications, service by other than an authorized STAR service center, or where the serial number or rating label has been removed, defaced or altered.

Requests for warranty service shall include the buyer's purchase receipt or other valid proof of date of original consumer purchase, including the serial number of the product when a request for warranty service is made. The buyer is responsible for returning the STAR product, properly packaged in its original container, or an equivalent, to the nearest authorized STAR service center or to the dealer from whom the product was purchased. Any postage, insurance or

shipping costs incurred in presenting or sending the product for service is the sole responsibility of the buyer.

ALL EXPRESS AND IMPLIED WARRANTIES FOR THIS PRODUCT, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO A PERIOD OF ONE YEAR FROM THE DATE OF PURCHASE AND NO WARRANTIES EITHER EXPRESS OR IMPLIED WILL APPLY AFTER THIS PERIOD. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which may vary from state to state.

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ACKNOWLEDGEMENTS

SB-10: Star Micronics, Inc.
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VISICALC: VisiCorp
SUPERCALC: Sorcim Corporation
LOTUS 1-2-3: Lotus Development Corporation
IBM PC: International Business Machine Corporation
CP/M: Digital Research
PFS WRITER: Perfect Software Inc.
EASYWRITER II: Information Unlimited Software Inc.

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COMMAND QUICK REFERENCE

Print Style Commands

<ESC> 4	letter-quality mode
<ESC> 5	draft-quality mode
<ESC> R "*n*"	International Character Set

Font Pitch Controls

<ESC> p 1	proportional print
<ESC> p 0	cancel proportional print
<ESC> P	pica pitch
<ESC> M	elite pitch
<SI>	condensed pitch
<ESC> <SI>	condensed pitch
<SO>	expanded pitch
<ESC> <SO>	one line expanded print
<DC2>	cancel condensed print
<DC4>	cancel expanded print
<ESC> W 1	expanded print
<ESC> W 0	cancel expanded print

Special Print Modes

<ESC> G	double-strike print
<ESC> H	cancel double-strike print
<ESC> E	emphasized print
<ESC> F	cancel emphasized print
<ESC> − 1	underlined print
<ESC> − 0	cancel underlined print
<ESC> S 0	superscript printing
<ESC> S 1	subscript printing
<ESC> T	cancel superscript and subscript printing

<ESC> i 1	incremental mode
<ESC> i 0	cancel incremental mode
<ESC> U 1	select unidirectional print
<ESC> U 0	cancel unidirectional print
<ESC> <	one line of unidirectional print

Format Controls

<LF>	advance paper to the next line
<FF>	advance paper to the top of the next form
<VT>	advance paper to the next vertical tab
<ESC> 0	1/8th-inch line spacing
<ESC> 1	1/10th-inch line spacing
<ESC> 2	1/6th-inch line spacing
<ESC> A "*n*"	*n*/60ths-inch line spacing
<ESC> 3 "*n*"	*n*/120ths-inch line spacing
<ESC> J "*n*"	one time line feed of *n*/120th inch
<ESC> j "*n*"	one time reverse line feed of *n*/120th inch
<ESC> C "*n*"	set page length to "*n*" lines
<ESC> C 0 "*n*"	set page length to "*n*" inches.
<ESC> r "*n*"	set top margin
<ESC> N "*n*"	set bottom margin
<ESC> O	cancel top and bottom margins
<ESC> l "*n*"	set left margin
<ESC> Q "*n*"	set right margin
<ESC> B "*n1*" "*n2*"...0	set vertical tabs
<ESC> D "*n1*" "*n2*"...0	set horizontal tabs
<ESC> a "*n*"	advance page "*n*" lines
<ESC> <LF>	reverse the paper one line
<ESC> <FF>	reverse the paper to top of the page
<US>	set the vertical form unit (VFU)
<ESC> / "*n*"	select VFU channel
<ESC> b "*n*"	skip "*n*" print positions
<CR>	carriage return
<HT>	advance the paper to the next horizontal tab
<BS>	back space

Graphics Controls

<ESC> Y "*n1*" "*n2*" "*m1*" "*m2*" ..... 8-bit graphics mode
<ESC> K "*n1*" "*n2*" "*m1*" "*m2*" ..... 8x3-bit graphics mode
<ESC> I "*n1*" "*n2*" "*m1*" "*m2*" ..... 16-bit graphics mode
<ESC> V "*n1*" "*n2*" "*m1*" "*m2*" ..... 24-bit graphics mode

Macro Instruction Commands

<ESC> + ... <RS> ..... define macro
<ESC> ? ..... execute macro

Other Commands

<DC3> ..... set printer off-line
<DC1> ..... set printer on-line
<BEL> ..... sound printer bell
<CAN> ..... delete the last printable
<DEL> ..... character sent
<ESC> > ..... sets 8th bit to a logical 1
<ESC> = ... sets 8th bit to a logical 0
<ESC> # ..... accepts bit to a logical 0
<ESC> y 0 ..... disable the printers bell
<ESC> y 1 ..... enable the printers bell
<ESC> 8 ..... disable the paper-out detecter
<ESC> 9 ..... enable the paper-out detecter
<ESC> @ ..... reinitialize the printer