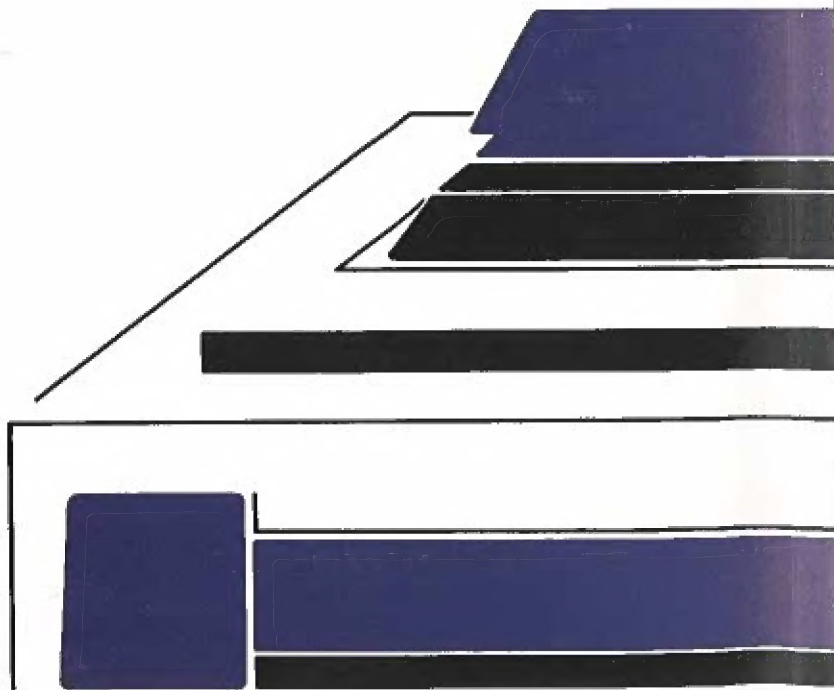




Proprinter Family Technical Reference

SC31-2587-3

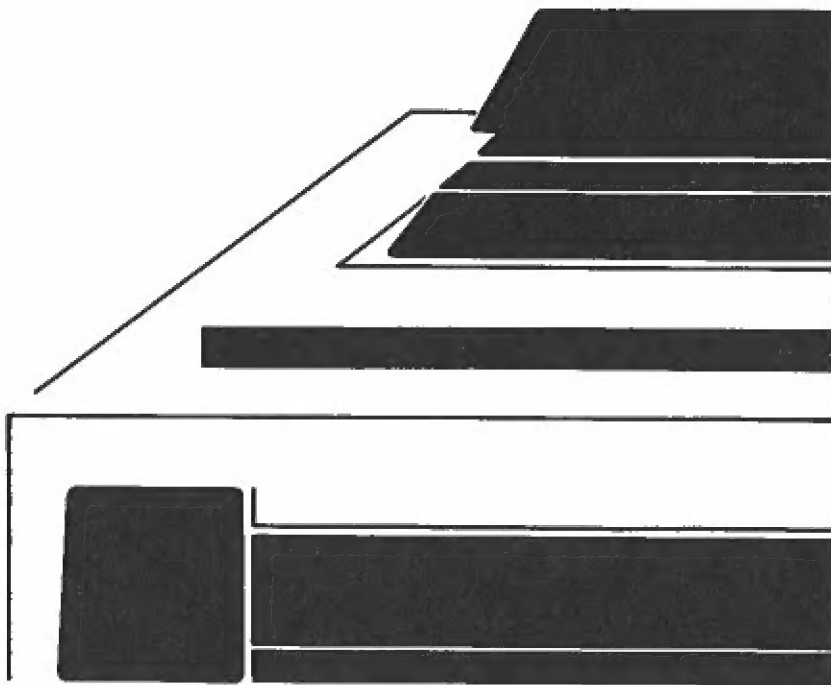






Proprinter Family Technical Reference

SC31-2587-3



Fourth Edition (January 1989)

This edition, SC31-2587-3, is a revision of, and obsoletes SC31-2587-2.

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About This Manual

The *PROPRINTER¹ Family Technical Reference* describes the design of the IBM Proprinter family and the standard and special codes that control the various printers. This manual also contains reference information for the various hardware options.

This manual is primarily for reference purposes. The information in this manual is important to the following people:

- Hardware designers
- Software designers
- Programmers
- Engineers
- Technicians
- Interested persons who need to understand the design and operation of the printer.

This manual is written for technical users. You must understand technical terms and understand the operation of the printer. You should read the *Guide to Operations* for your printer before using this manual.

This manual has these sections:

- **Section 1. Hardware** describes each functional part of the printer. This section describes the operating characteristics and requirements for the printer. This section also contains specifications for the parallel interface and serial interface option.

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- **Section 2. Software** describes the printer software, including:
 - The printer personalization switches
 - The printer function settings
 - Print buffers for the Proprinter Family
 - The FONTSET² Module for the Proprinter X24, Proprinter XL24, Proprinter X24E, and Proprinter XL24E
 - Diagnostics and test modes.
- **Section 3. Control Codes and Escape Sequences** are summarized.
- **Section 4. Programming** includes:
 - Character design and downloading
 - for the 9-wire printers including NLQ II³
 - for the 24-wire printers.
 - All-Points-Addressable graphics
 - Sheet Feeder programming.
- **Appendix A. Character Width, Start Address, and Lookup Tables** shows the widths and offsets of the proportional characters, the safe starting addresses for downloading character data after downloading a font or a group of fonts from FontSet or an NLS language diskette, and the lookup tables for the Proprinter X24 and Proprinter XL24 resident fonts.
- **Appendix B. Proprinter Card Layout and Logic Diagram.**
- **Appendix C. Proprinter II Card Layout and Logic Diagram.**
- **Appendix D. Proprinter II XL Card Layout and Logic Diagram.**
- **Appendix E. Proprinter XL Card Layout and Logic Diagram.**
- **Appendix F. Proprinter III and Proprinter III XL Card Layout and Logic Diagram.**

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- **Appendix G. Proprinter X24 and Proprinter XL24 Card Layout and Logic Diagram.**
- **Appendix H. Proprinter X24E and Proprinter XL24E Card Layout and Logic Diagram.**
- **Appendix I. Optional Serial Interface Card Layout and Logic Diagram.**
- **Appendix J. RS232/RS432 Serial Interface Card Layout and Logic Diagram.**

These publications contain more information about the Proprinter family:

- *Proprinter Guide to Operations*
- *Proprinter II, Proprinter XL, and Proprinter II XL Guide to Operations*
- *Proprinter X24 and Proprinter XL24 Guide to Operations*
- *Proprinter III and Proprinter III XL Guide to Operations*
- *Proprinter X24E and Proprinter XL24E Guide to Operations*
- For information on how to repair your printer, read the following:
 - *Proprinter, Proprinter II, Proprinter XL, and Proprinter II XL Hardware Maintenance and Service*
 - *Proprinter X24 and Proprinter XL24 Hardware Maintenance and Service*
 - *Proprinter III and Proprinter III XL Hardware Maintenance and Service*
 - *Proprinter X24E and Proprinter XL24E Hardware Maintenance and Service Manual.*

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Section 1. Hardware

General Description

The Proprietary family is a series of easy-to-use desktop printers that provide low-cost, high-quality output from your personal computer. They handle cut-form, document-on-demand, and continuous-form applications.

The **Proprietary**, **Proprietary II**, **XL**, **II XL**, **III**, and **III XL** are wire-matrix printers; each printer has a nine-wire print head.

The **Proprietary X24**, **XL24**, **X24E**, and **XL24E** are wire-matrix printers; each printer has a twenty-four-wire print head.

Impressions are made by forcing a hardened wire against a ribbon to transfer ink from the ribbon to the paper. A dot is printed each time the wire strikes the ribbon and paper. This impact printing technology has unique capabilities and limitations. The information in this manual helps you use the capabilities of dot-matrix impact printing.

Physical Characteristics

Dimensions are in millimeters (inches). Weight is in kilograms (pounds).

	Width	Height	Depth	Weight
Proprinter	422.1 (16.62)	132.1 (5.20)	354.0 (13.94)	7.95 (17.5) max.
Proprinter II and III	422.1 (16.62)	139.7 (5.50)	352.6 (13.88)	8.17 (18.0) max.
Proprinter XL, II XL, and III XL	574.5 (22.62)	144.8 (5.7)	352.6 (13.88)	10.98 (24.2) max.
Proprinter X24 and X24E	422.1 (16.62n)	139.7 (5.5)	352.6 (13.88)	8.67 (19.1) max.
Proprinter XL24 and XL24E	574.5 (22.62)	144.8 (5.7)	352.6 (13.88)	11.07 (24.4) max.
Sheet Feeder - Narrow Model	332.5 (13.09)	208 (8.19)	230 (9.06)	2.0 (4.4) max.
Sheet Feeder - Wide Model	484.5 (19.07)	208 (8.19)	230 (9.06)	2.6 (5.7) max.
Proprinter X24, III, and X24E with Sheet Feeder	422.5 (16.62)	362 (14.25)	336.6 (13.25)	10.67 (23.5) max.
Proprinter XL24, III XL, and XL24E with Sheet Feeder	574.5 (22.62)	367 (14.45)	336.6 (13.25)	13.67 (30.1) max.

Note: The depth for the Proprinter X24 and XL24 with the Sheet Feeder attached is measured with the continuous-form cover removed.

Print Head Description

The Proprinter family uses wire-matrix impact technology to generate characters. The Proprinter, Proprinter II, XL, II XL, III, and III XL have 9-wire print heads. The Proprinter X24, XL24, X24E, and XL24E have 24-wire print heads.

Proprinter, Proprinter II, XL, and II XL

The Proprinter, Proprinter II, XL, and II XL print head has nine wires arranged in a single vertical column. The diameter of each wire is 0.28 mm (0.011 in). The center-to-center distance between wires is 0.35 mm (1/72 in). The burst speed of the print head is 200 CPS (characters per second) at 10 CPI (characters per inch) draft. The print head has an impact force which is sufficient to generate readable copies on multipart forms up to and including 4 plies (original plus 3 copies) and envelopes.

Print Head Movement

The print head moves under control of a direct-current stepper motor. The maximum velocity of the print head is 508 mm (20 in) per second. The print head can print text while moving in both directions or graphics from left to right. When the print head is printing in both directions, it automatically finds the shortest path to print the next line.

Proprinter III and III XL

The Proprinter III and III XL print head has nine wires arranged in a single vertical column. The diameter of each wire is 0.28 mm (0.011 in). The center-to-center distance between wires is 0.35 mm (1/72 in). The burst speed of the print head is 270 CPS (characters per second) at 10 CPI (characters per inch) or 12 CPI draft. The print head has an impact force which is sufficient to generate readable copies on multipart forms up to and including 4 plies (original plus 3 copies) and envelopes.

Print Head Movement

The print head moves under control of a direct-current stepper motor. The maximum velocity of the print head is 686 mm (27 in) per second. The print head can print text while moving in both directions or graphics from left to right. When the print head is printing in both directions, it automatically finds the shortest path to print the next line.

Proprietary X24 and XL24

The Proprietary X24 and XL24 print head has twenty-four wires arranged in two parallel columns of twelve wires each. The diameter of each wire is 0.20 mm (0.008 in). The wires in each of the rows are vertically separated to produce a 0.141-mm (1/180-in) space between the centers of adjacent dots. The burst speed of the print head is 200 CPS at 10 CPI draft and 240 CPS at 12 CPI draft. The print head has an impact force sufficient to generate readable copies on one- and two-part forms.

Print Head Movement

The print head moves under control of a direct-current stepper motor. The maximum velocity of the print head is 508 mm (20 in) per second. The print head can print text while moving in both directions or graphics moving from left to right. When the print head is printing in both directions, it automatically finds the shortest path to print the next line.

Proprietary X24E and XL24E

The Proprietary X24E and XL24E print head has twenty-four wires arranged in two parallel columns of twelve wires each. The diameter of each wire is 0.20 mm (0.008 in). The wires in each of the rows are vertically separated to produce a 0.141-mm (1/180-in) space between the centers of adjacent dots. The vertical dot alignment is within 0.056 mm (0.002 in) maximum. The burst speed of the print head is 240 CPS at 10 CPI draft and 288 CPS at 12 CPI draft. The print head has an impact force which is sufficient to generate readable copies on multipart forms up to and including 4 plies (original plus 3 copies) and envelopes.

Print Head Movement

The print head moves under control of a direct-current stepper motor. The maximum velocity of the print head is 610 mm (24 in) per second. The print head can print text while moving in both directions or print graphics while moving from left to right. When the print head is printing in both directions, it automatically finds the shortest path to print the next line.

Environmental Considerations

Ambient Temperature (All Printers)

- During operation:
 - +10° to +40.6°C
(+50° to +105°F)
 - +15.6° - +32.2°C
(+60° - +90°F)
- When the printer is not operating:
 - +10° to +51.7°C
(+50° to +125°F)
- During storage:
 - 40° to +60°C
(-40° to +140°F)

Relative Humidity

The relative humidity range is 8 to 80%.

Ambient Temperature (with Sheet Feeder)

With sheetfeeder attached to the Proprinter X24, XL24, X24E, XL24E, III, or III XL:

- During operation:
 - +15.6° to +32.2°C
(+60° to +90°F)
- When the printer is not operating:
 - +10° to +51.7°C
(+50° to +125°F)
- During storage:
 - 40° to +60°C
(-40° to +140°F)

Relative Humidity

The relative humidity range is 20 to 80%.

Vibration

The printer is a desktop device. Although the printer is portable, do not operate the printer in vibration-prone areas.

Clearances

To ensure correct airflow, ensure that there is 50.8 mm (2 in) of space next to all exposed surfaces. Airflow is produced by natural convection.

Power Requirements

Power Consumption (All Proprinters Except X24E and XL24E)

120 volt-amperes (VA) maximum operating power
80 VA maximum idle power

Power Consumption (Proprinter X24E and XL24E)

156 volt-amperes (VA) maximum operating power
80 VA maximum idle power

Alternating Current (ac) Input Power

Your printer uses one of the following ac input power values.
This varies with the country that the printer was purchased in.

100 V ac 50/60 Hz
110 V ac 50/60 Hz
120 V ac 50/60 Hz
120 V ac 60 Hz
127 V ac 50/60 Hz
200 V ac 50/60 Hz
208 V ac 50/60 Hz
220 V ac 50/60 Hz
230 V ac 50/60 Hz
240 V ac 50/60 Hz

Power Cord

Printers for the U.S. and Canada have a 1.83-m (6.0-ft) power cord. Printers for all other countries have a 2.74-m (9.0-ft) power cord, with the correct plug to match the country requirements.

Noise Emission Values

Following are the noise emission values for the Proprinter family of printers. These values are for a production series of machines and are in accordance with ISO DIS 7779, and reported in conformance with ISO DIS 7574/4.

- L_{wad} Declared sound power emission level.
 L_{pam} Mean value of the sound pressure emission at the operator position.
 $<L_{pa}>_m$ Mean value of the space-average sound pressure emission at the one-meter position.

Proprinter, II, XL, II XL, III, and III XL

Parameter	Value
L_{wad}	7.4 bels (Operating) N/A (Idling)
L_{pam}	67 dB (Operating) N/A (Idling)
$<L_{pa}>_m$	60 dB (Operating) N/A (Idling)

Proprinter X24, XL24, X24E, and XL24E

Parameter	Value
L_{wad}	7.4 bels (Operating) N/A (Idling)
L_{pam}	66 dB (Operating) N/A (Idling)
$< L_{pa} >_m$	60 dB (Operating) N/A (Idling)

Printer Interface

This section discusses:

- the voltage levels for both the serial and parallel interface lines
- the parallel interface
- the serial interface.

Voltage Levels - Serial Interface (RS-232)

The maximum voltage level for control lines or data lines is ± 15 volts. A timing or control line is high if the voltage is more positive than +3 volts. A line is low if the voltage is more negative than -3 volts. Voltage reference is the signal ground on pin 7.

Note: Not available on the Proprinter III, III XL, X24E, or XL24E.

Voltage Levels (RS-232/RS-422)

The maximum voltage level for control lines or data lines is ± 5.2 volts. A timing or control line is high if the differential voltage is more positive than +0.2 volts. A line is low if the differential voltage is more negative than -0.2 volts.

Note: Not available on the Proprinter, Proprinter II, XL, II XL, X24, and XL24.

Voltage Levels - Parallel Interface

The maximum voltage level for control lines or data lines is +5.2 volts. A control or data line is high if the voltage is greater than +2.4 volts. A line is low if the voltage is less than +0.8 volts.

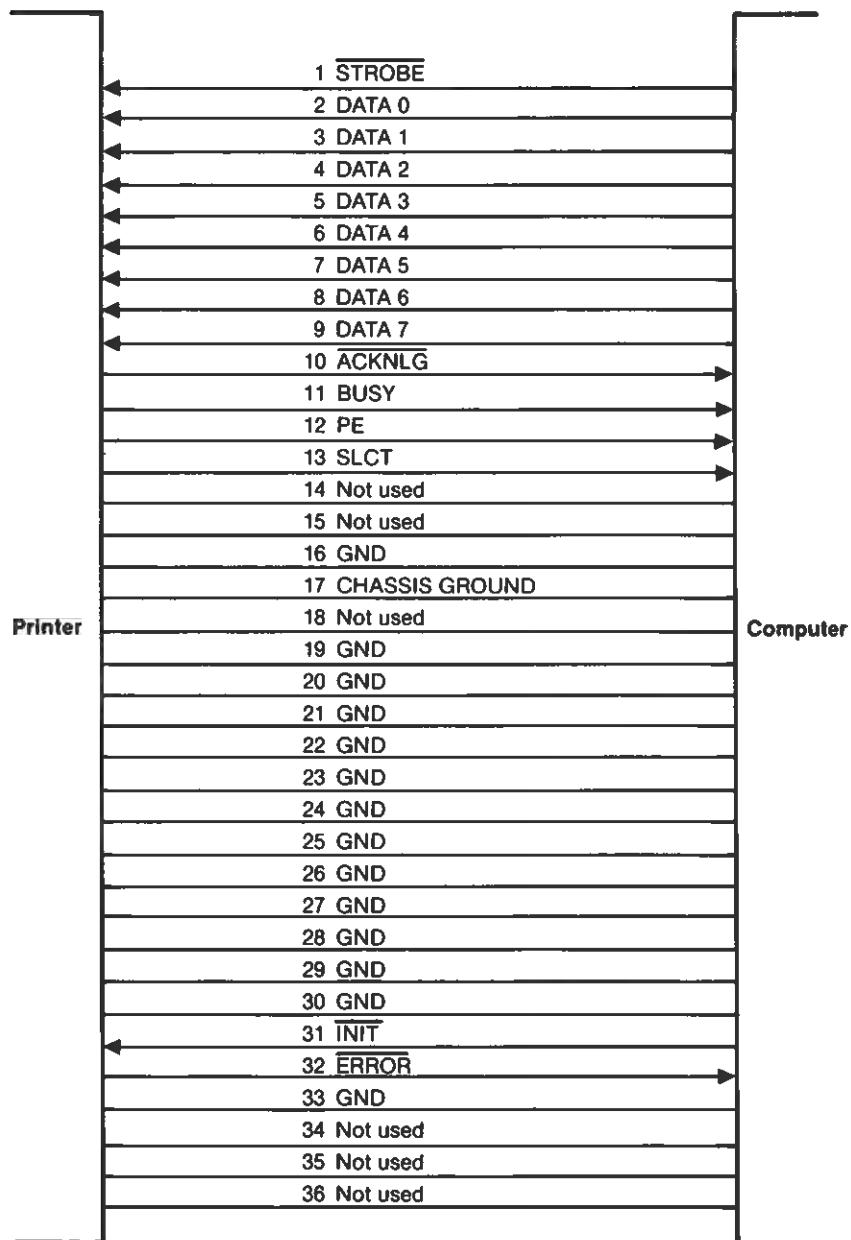
Parallel Interface Specifications

A parallel interface sends eight bits (a byte) of data at one time. The parallel interface is transistor-transistor-logic (TTL) compatible.

The table below summarizes the parallel interface structure for the Proprinter family. The pages that follow have more detailed information on the structure of the interface between the computer and the printer.

Line Name	Pin	Description
<u>STROBE</u>	1	Strobe
+ DATA	2-9	Eight Data Lines
<u>-ACKNLG</u>	10	Acknowledge
+ BUSY	11	Busy
+ PE	12	Paper End
+ SLCT	13	Select
CHASSIS GROUND	17	Frame Ground
GND	16, 19-30, 33	Ground
<u>-INIT</u>	31	Initialize
<u>-ERROR</u>	32	Error

To connect these printers to a computer, use the following pin connections:



Computer to Printer Communication

The parallel interface transfers data in only one direction: from computer to printer. The data path is eight bits wide. The printer and the computer synchronize data transfer with interface signals **STROBE**, **-ACKNLG**, and **+BUSY**. When the computer is ready to send a byte of data to the printer, the computer puts the byte of data on the data lines. Next, the computer sends a **STROBE** pulse to the printer. The printer responds with a **+BUSY** signal. After the printer has received the data, the printer pulses the **-ACKNLG** line. This signals the computer that the printer has read the byte of data into printer memory. If the printer buffers are not full and the printer can receive more data, the printer removes the **+BUSY** signal.

Timing

The chart below shows the timing of these signals. All timings are shown in microseconds.

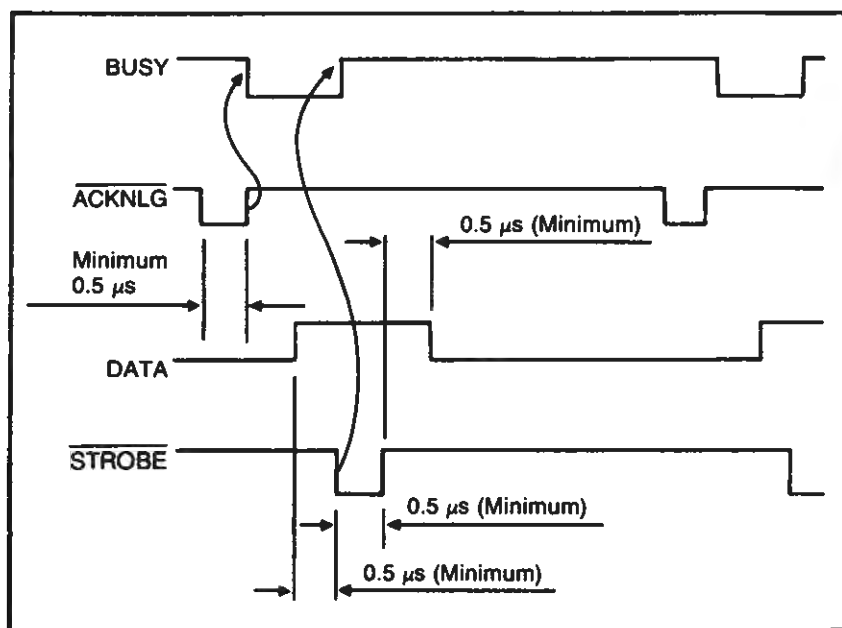


Figure 1-1. Parallel Interface Timing Diagram

Parallel Interface Line Definition

1 STROBE

When the printer receives the STROBE low from the computer, the printer reads the data from the interface and sets the +BUSY line high. STROBE must not occur when the +BUSY line is high, to prevent unpredictable results.

2-9 +DATA

These signals are the eight bits of parallel data sent from the computer. A high level indicates a logical 1. A low level indicates a logical 0. The printer reads data from the +DATA lines when a STROBE pulse is received.

10 -ACKNLG

The -ACKNLG pulse tells the computer that the data from the previous STROBE pulse has been read in. An -ACKNLG pulse is also generated by the printer being powered on, or at the completion of the printer being initialized by an -INIT requested by the computer.

11 +BUSY

When the printer sets +BUSY high, it cannot receive data. The +BUSY line goes high in response to a STROBE pulse. The +BUSY line remains high until the data is read in. +BUSY is also high when:

- The receive buffer is full
- An out-of-paper condition occurs
- The printer receives an -INIT signal
- The **Online** key is pressed to go offline
- An error condition in the printer occurred.

12 +PE

The printer sets Paper End (+PE) high when approximately 12.7 mm (0.5 in) of paper remains in the printer. +PE remains high until the operator loads paper and presses the **Online** key.

13 +SLCT

When the printer is ready, it sets the +SLCT line high. The +SLCT line goes low when:

- The **Online** key is pressed to go offline
- There is an error or out-of-paper condition
- When the printer receives an **ESC Q**. It ignores all incoming data except **DC1**. **DC1** returns the printer to a select state.

14-15

Not used.

16 GND

Logic ground.

17 CHASSIS GROUND

Ground level.

18

Not used.

19-30 GND

Ground level.

31 -INIT

-INIT from the system resets the printer to its initial power-on state. The +BUSY line goes high, and any received data is printed. When -INIT goes low, the printer resets to the power-on default state. -INIT sent to a Proprinter, II, II XL, III, or III XL does not change the download storage area, and a selected download font remains in effect. -INIT sent to a Proprinter X24, XL24, X24E, or XL24E sets the printer to the user-defined default font or the printer default font.

32 -ERROR

The printer sets the -ERROR line low if the printer detects an error or out-of-paper condition. A critical error condition exists, when -ERROR is low and +PE is low.

33 GND

Ground level.

34-36

Not used.

Serial Interface Option (RS-232)

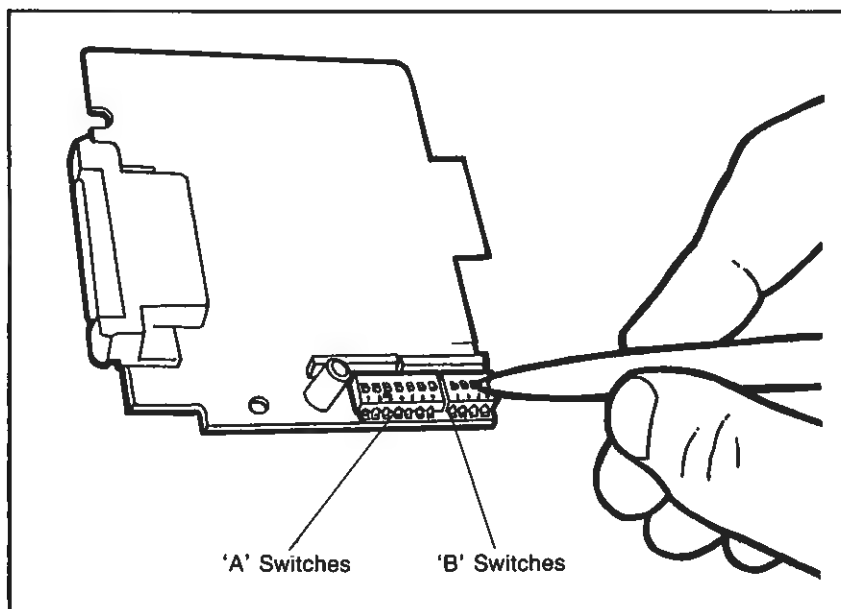
The serial interface option is supplied to permit connection to a computer's serial port. This circuit card is a serial-to-parallel converter, which does not change the data being passed to the printer. You can use this serial interface option on the Proprinter, Proprinter II, XL, II XL, X24, and XL24.

Note: The parallel interface cannot operate while the serial interface is installed.

Serial Interface Switches

Warning: Before you change any switch settings, set the printer power switch to **Off (O)**.

The following illustration shows the location of the switches on the serial interface card.



Serial Interface Switch Settings

The printer responds to switch changes only when you switch the printer power to **On (I)**. All serial interface switches are set to Off at the factory. The following table shows the possible switch settings.

Speed (bps)	A1	A2	A3
19200 bps	on	on	on
9600 bps	off	off	off
4800 bps	off	off	on
2400 bps	off	on	off
1200 bps	off	on	on
600 bps	on	off	off
300 bps	on	off	on
150 bps	on	on	off
Parity	A4	A5	
No parity	off	off	
Ignore parity	off	on	
Odd parity	on	off	
Even parity	on	on	
Protocol	A6		
XON/XOFF protocol	off		
DTR pacing	on		
Data Bits	B1		
8 bits	off		
7 bits	on		
Stop Bits	B2		
1 stop bit	off		
2 stop bits	on		
Print Test	B3		
Normal operation	off		
Test mode	on		

Note: A7 and B4 are *always off*. When "ignore parity" is set on, the received parity is ignored and the serial card transmits using even parity. For all other parities, the transmitted parity matches the received parity.

Serial Interface Cable Connections

Computer Signal	Printer Signal (Pin)
XMIT	TXD (2)
RCV	RXD (3)
DSR	RTS (4)
CD, RTS	CTS (5)
DTR	DSR (6)
SG	SG (7)
CTS	DTR (20)

Serial Interface Cable

The recommended serial interface cable for the IBM PC or IBM PS/2 is IBM part number 8509386. The following is a diagram of the serial interface cable:

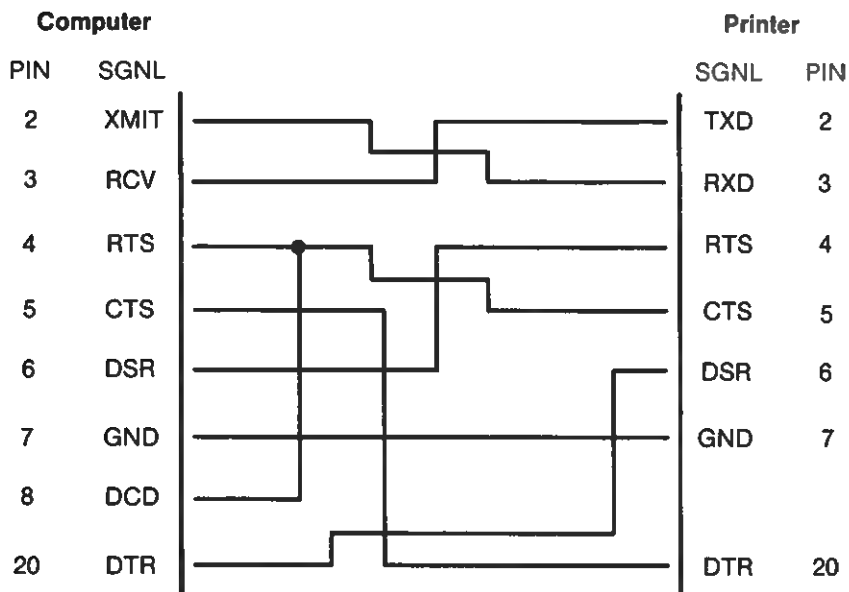


Figure 1-2. Serial Interface Cable Diagram

Serial Interface Option (RS-232/RS-422)

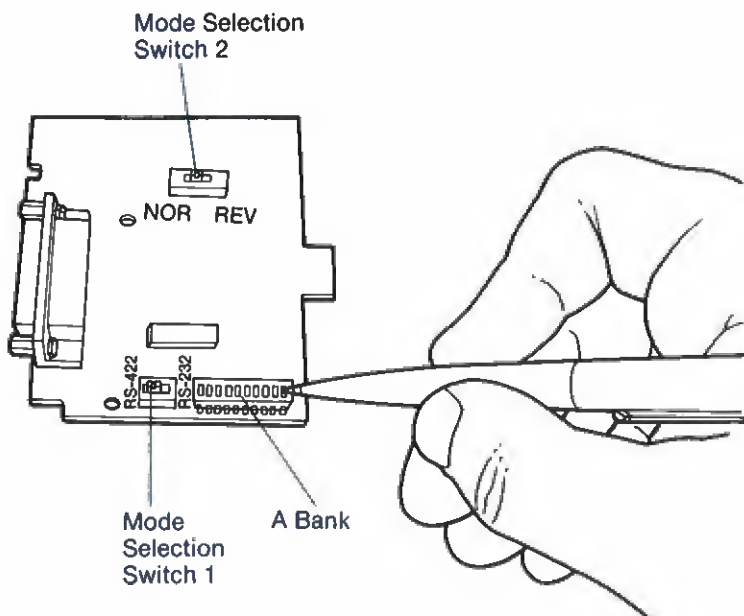
The serial interface option is supplied to permit connection to a computer's serial port. This circuit card is a serial-to-parallel converter, which does not change the data being passed to the printer. You can use the RS-232/RS-422 serial interface option with the Proprinter III, III XL, X24E, and XL24E.

Note: The parallel interface cannot operate while the serial interface is installed.

Serial Interface Switches

Warning: Before you change any switch settings, set the printer power switch to **Off (O)**.

The following figure shows the location of the switches on the serial interface card.



Serial Interface Switch Settings

The printer responds to switch changes only when you switch the printer power to **On (I)**. All serial interface switches are set to Off at the factory. The following table shows the possible switch settings.

Speed (bps)	A1	A2	A3	A4
38400 bps (RS-422 only)	off	off	off	on
19200 bps	on	on	on	off
9600 bps	off	off	off	off
4800 bps	off	off	on	off
2400 bps	off	on	off	off
1200 bps	off	on	on	off
600 bps	on	off	off	off
300 bps	on	off	on	off
150 bps	on	on	off	off
Data Bits	A5			
8 bits	off			
7 bits	on			
Parity	A6	A7		
No parity	off	off		
Ignore parity	off	on		
Odd parity	on	off		
Even parity	on	on		
Stop Bits	A8			
1 stop bit	off			
2 stop bits	on			
Protocol	A9			
XON/XOFF protocol	off			
DTR pacing (RS-232 only)	on			
Print Test	A10			
Normal operation	off			
Test mode	on			

Serial Interface Cable Connections

Computer Signal	Printer Signal (Pin)
XMIT	TXD (2)
RCV	RXD (3)
DSR	RTS (4)
CD, RTS	CTS (5)
DTR	DSR (6)
SG	SG (7)
CTS	DTR (20)

Serial Interface Cable (RS-232)

The recommended serial interface cable for the IBM PC or IBM PS/2 is IBM part number 8509386. The following is a diagram of the serial interface cable:

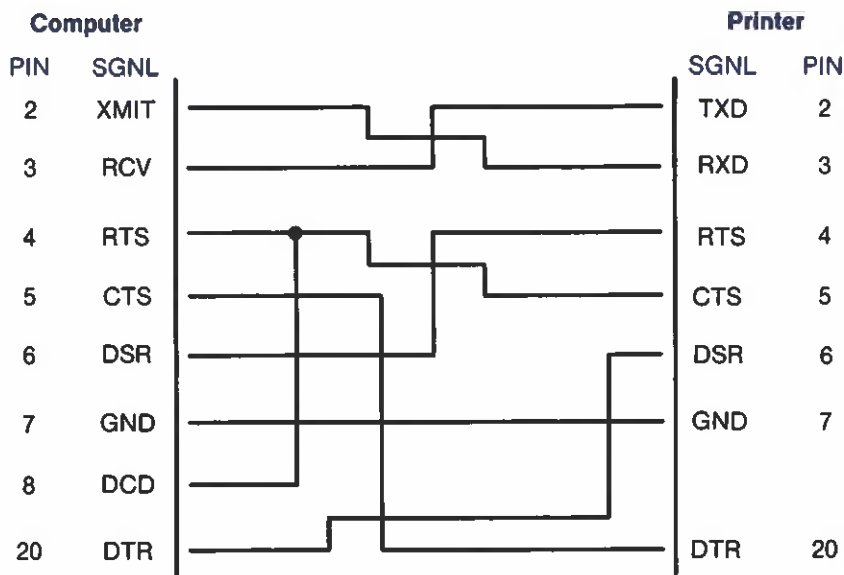


Figure 1-3. Serial Interface Cable (RS-232) Diagram

Serial Interface Cable (RS-422)

The recommended serial interface cable for the IBM Series I is IBM part number 6844552. The following is a diagram of the serial interface cable with switch 2 in **NOR** position (mode selection):

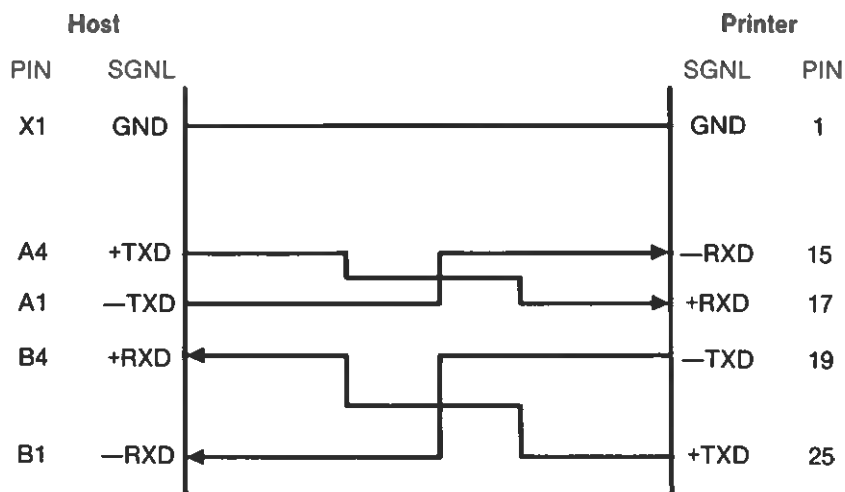


Figure 1-4. Serial Interface Cable (RS-422) Diagram

Serial Interface Pin Definition (RS-232)

The RS-232 and RS-232/RS-422 (the RS-232/RS-422 mode selection switch is in the RS-232 position) supports eight lines as follows:

Pin #	Signal Name	Printer Definition
1	Chassis Ground	
2	TXD (Transmit Data)	Output Signal
3	RXD (Receive Data)	Input Signal
4	RTS (Request to Send)	Output Signal (Set high when ready)
5	CTS (Clear to Send)	Input Signal
6	DSR (Data Set Ready)	Input Signal (Ready to Communicate)
7	Signal Ground	
20	DTR (Data Terminal Ready)	Output Signal (to be used as a busy signal)

Serial Interface Line Descriptions

Ensure that your computer or terminal supplies the following signals:

Transmit Data (TXD, Pin 2): This line is for transmission of data from the serial interface option in the printer to your computer or terminal. For XON/XOFF protocol, the serial interface transmits only XON (X'11') and XOFF (X'13'). The printer does not transmit any data when you use DTR pacing protocol. Clear to Send (CTS) must be high for transmission to take place.

Receive Data (RXD, Pin 3): This line is for receiving data from your computer or terminal. The serial interface option ignores data unless DSR is high.

Request to Send (RTS, Pin 4): This signal is set high and remains high while the printer power is on and the serial interface option is operational.

Clear to Send (CTS, Pin 5): The serial interface monitors this signal only when you select the XON/XOFF protocol. CTS must be high for the serial interface option to transmit data.

Data Set Ready (DSR, Pin 6): The serial interface ignores data unless DSR is high.

Signal Ground (SG, Pin 7): This pin connects to logic ground and establishes a common reference for the data and control signals.

Data Terminal Ready (DTR, Pin 20): This signal is set high and remains high while the printer power is on and the serial interface option is operational. However, if you use DTR pacing protocol (switch A6 on for the RS-232 or switch A9 on for the RS-232/RS-422), the DTR high level tells the computer or terminal that the printer is ready to receive more data. The DTR low level tells the computer or terminal that the printer is busy and cannot receive data.

XON/XOFF Protocol

When XON/XOFF protocol is selected, the serial interface card sends an XOFF (DC3 XX'13') control code to indicate to the computer that the interface is busy and not ready to receive more data. The serial interface sends an XON (DC1 XX'11') to the computer when the interface is ready to receive more data.

DTR Pacing

DTR controls the data flow from the computer. When the serial interface is + BUSY (buffer is full, printer is out of paper, or an error is detected), DTR is dropped to indicate to the computer that the printer (serial interface) cannot receive more data.

Serial Interface Pin Definition (RS-232/RS-422)

The RS-232/RS-422 supports five lines with the polarity selection switch in the **NOR** position and the mode selection switch is in the RS-422 position. The selections are:

Pin #	Signal Name	Printer Definition
1	Chassis Ground	
15	- RXD (Receive Data)	Input Signal
17	+ RXD (Receive Data)	Input Signal
19	- TXD (Transmit Data)	Output Signal
25	+ TXD (Transmit data)	Output Signal

The serial interface supports five lines with the polarity selection switch in the **REV** position. The selections are:

Pin #	Signal Name	Printer Definition
1	Chassis Ground	
15	+ RXD (Receive Data)	Input Signal
17	- RXD (Receive Data)	Input Signal
19	+ TXD (Transmit Data)	Output Signal
25	- TXD (Transmit data)	Output Signal

Serial Interface Line Descriptions

Ensure that your computer or terminal supplies the following signals:

Transmit Data (+ TXD, - TXD): These lines are used for transmission of data from the serial interface card in the printer to your computer or terminal. For XON/XOFF protocol, the serial interface transmits only XON (X'11') and XOFF (X'13').

Receive Data (+ RXD, - RXD): These lines are used for receiving data from your computer or terminal.

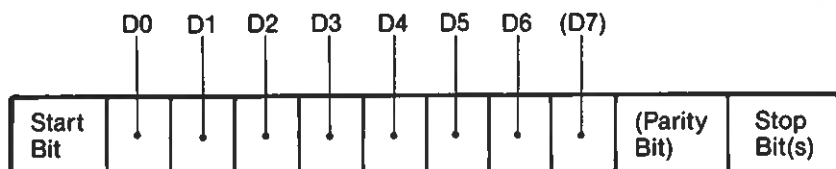
XON/XOFF Protocol

When XON/XOFF protocol is selected, the serial interface card sends an XOFF (DC3 X'13') control code to indicate to the computer that the interface is busy and not ready to receive more data. The serial interface sends an XON (DC1 X'11') to the computer when the interface is ready to receive more data.

Data Frame Structure

A data frame consists of:

- A start bit
- 7 or 8 data bits
- No parity bit or 1 parity bit
- 1 or 2 stop bit(s).



Using combinations of these elements, 9, 10, 11, and 12 bits per frame are possible.

You can calculate the maximum character-transfer rate by dividing the data rate by the number of bits per frame.

For example:

If the switches are set for 1200 bps, 8 data bits, odd parity, and 1 stop-bit (11-bit frame), the maximum transfer rate is equal to $1200/11$, which is 109.1 characters per second.

There are four possible parity settings: Odd, Even, No, and Ignore. When **Odd** parity is selected, the serial interface expects to receive data frames with odd parity. The serial interface transmits XOFF and XON with odd parity. If the serial interface detects a parity error, the printer prints an inverted question mark (?) instead of the character sent by the system.

When **Even** parity is selected, the serial interface expects to receive data frames with even parity. The serial interface transmits XOFF and XON with even parity. If the serial interface detects a parity error, the printer prints an inverted question mark (?) instead of the character sent by the system.

When **No** parity is selected, the serial interface transmits XON and XOFF without parity bits. The serial interface expects no parity bit when it receives data.

When **Ignore** parity is selected, the serial interface expects a parity bit when the interface receives a data frame. The serial interface ignores whether the parity bit is odd or even. The serial interface uses **Even** parity when it transmits XON and XOFF.

If the serial interface detects a framing or parity error, an inverted question mark (?) is printed. The RS-232/RS-422 serial interface prints 192 inverted question marks (?) if an overrun error is indicated. A common cause of this type of error is incorrect switch settings on the serial interface option card. If you have this error, determine the parity, speed, number of data bits, and number of stop bits used by the system, and set the serial interface option switches to match the system.

Serial Interface Diagnostic Capabilities

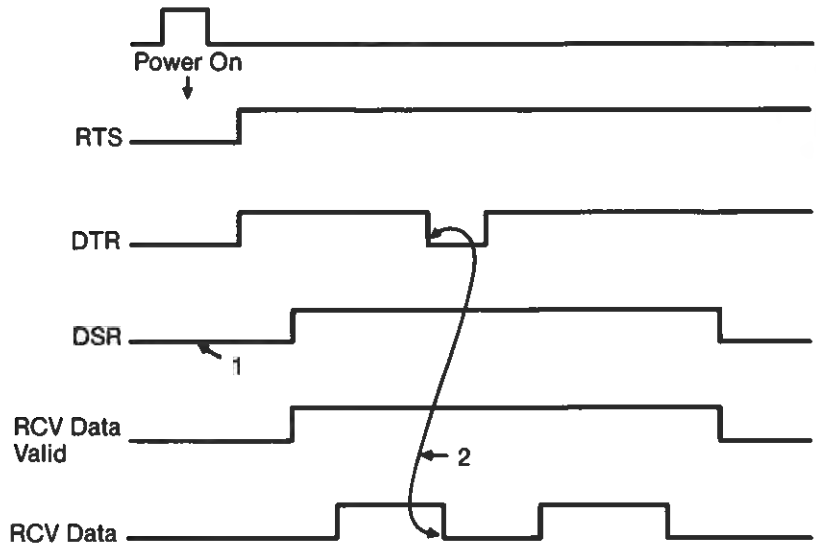
- Internal tests at power-on time check the RAM and ROM circuitry. Failure is indicated by seven successive "beeps."
- The serial interface circuit card has a switch that enables an additional test of the connection between the serial interface card and the printer circuit board. Setting this switch on generates a printout of the release level of the serial interface card, copyright information, and the printer character set.

To run the self-test:

1. Switch off the printer power.
2. Set switch B3 (RS-232 serial interface) or switch A10 (RS-232/RS-422 serial interface) on.
3. Switch the printer power on.

If the printer does not generate a printout, there is a problem with the serial interface card. Check the switch settings and ensure that the serial interface card is correctly installed.

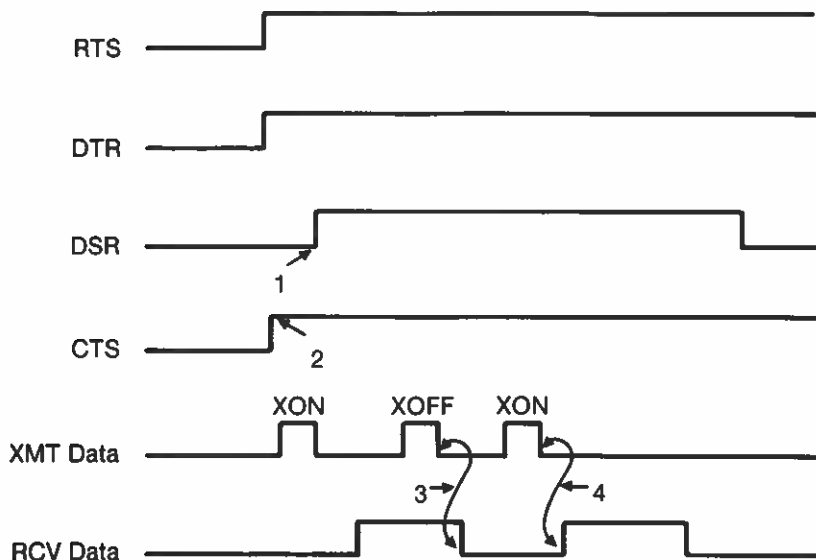
DTR Pacing Timing



Notes:

1. Data that is received when DSR is low is considered invalid and is discarded.
2. DTR is dropped to indicate to the computer that the receive buffer is full. When this occurs, approximately 10 bytes or less are left in the buffer (RS-232 only; the RS-232/RS-422 has 140 bytes or less).

XON/XOFF Timing



Notes:

1. Data that is received when DSR is low is considered invalid and is discarded.
2. CTS is required in order for the XON/XOFF protocol to work. XON is sent when CTS is detected after a Power On Reset. However, the computer is not required to detect this initial XON before it transmits data to the printer, because the printer might be switched on before the computer or terminal is switched on.
3. The serial interface card transmits an XOFF to indicate to the computer that the receive buffer is full. When this occurs, approximately 10 bytes or less remain in the buffer (RS-232 only; the RS-232/RS-422 has 140 bytes or less).
4. An XON is transmitted to the computer when buffer space is available. The serial interface card is ready to receive more data.

Form Specifications

Card stock is not recommended for your printer. Form length should not be less than 76.2 mm (3.0 in).

Paper Thickness for Proprinter, Proprinter II, XL, II XL, III, and III XL

The printer accepts paper from 0.05 to 0.36 mm (0.002 to 0.014 in) thick. Thickness should not exceed the above limitations.

Paper Thickness for Proprinter X24 and Proprinter XL24

The printer accepts paper from 0.05 to 0.15 mm (0.002 to 0.006 in) for any one-part form or two-part form. Two-part forms should be glued on the edge.

An example of a one-part form is 45-to-90-g/m² (12-to-24-lb) paper, with a thickness of 0.06 to 0.11 mm (0.0023 to 0.0045 in). Forms that are more than 241 mm (9.5 in) wide should be 56 to 90 g/m² (15 to 24 lb) with a paper thickness of 0.07 to 0.11 mm (0.0028 to 0.0045 in).

An example of a two-part form is two sheets of paper with a maximum of one sheet of carbon paper.

Paper Thickness for Proprinter X24E and Proprinter XL24E

The printer accepts paper from 0.05 to 0.30 mm (0.002 to 0.012 in) for any one- to four-part forms or envelopes. Multipart forms should be glued on the edge.

An example of a one-part form is 45-to-90-g/m² (12-to-24-lb) paper, with a thickness of 0.06 to 0.11 mm (0.0023 to 0.0045 in). Forms that are more than 241 mm (9.5 in) wide should be 56 to 90 g/m² (15 to 24 lb) with a paper thickness of 0.07 to 0.11 mm (0.0028 to 0.0045 in).

An example of a two-part form is two sheets of paper with a maximum of one sheet of carbon paper.

Paper Length

The minimum form length is 76.2 mm (3 in). The line spacing value and the stored form length determine the maximum form length. The maximum recommended text line spacing is 85/72 inch. Line spacing values above 85/72 inch can cause unpredictable results. The maximum number of lines per page is 255. Therefore:

$255 \times 85/72 =$ Maximum *recommended* form length of
301 inches or 7645 mm.

Paper Width

The paper width shown for continuous forms includes the pinfeed holes.

Proprinter, Proprinter II, X24, III, and X24E

These printers have a maximum print line of 203.2 mm (8.0 in).

	Maximum	Minimum
Continuous Form Width	254 mm (10.0 in)	76.2 mm (3.0 in)
Cut Form Width	279.4 mm (11.0 in)	76.2 mm (3.0 in)

Proprinter XL, II XL, XL24, III XL, and XL24E

These printers have a maximum print line of 345.4 mm (13.6 in).

	Maximum	Minimum
Continuous Form Width	381 mm (15 in)	76.2 mm (3.0 in)
Cut Form Width	419.1 mm (16.5 in)	76.2 mm (3.0 in)

Sheet Feeder Form Specification

	Maximum	Minimum
Proprinter X24, III, and X24E Width	215.9 mm (8.5 in)	139.7 mm (5.5 in)
Proprinter XL24, III XL, and XL24E Width	363.98 mm (14.33 in)	139.7 mm (5.5 in)

The Sheet Feeder uses paper weights from 60 to 90 g/m² (16 to 24 lb) and has a 100-sheet capacity.

Ribbon Specifications

The life of the ribbon for the Proprinter, Proprinter II, III, X24, and X24E is approximately three million characters. The life of the Proprinter II XL, XL, XL24, III XL, and XL24E ribbon is approximately four million characters.

Proprinter, Proprinter II, and III Ribbon

- Length: 18.3 m (60.0 ft)
- Width: 11.11 mm (0.4375 in)
- Thickness: 0.099 mm (0.004 in)
- Fabric: Nylon

Note: Do not use this ribbon on the Proprinter X24, XL24, X24E, or XL24E.

Proprinter XL, II XL, and III XL Ribbon

- Length: 24.8 m (81.0 ft)
- Width: 11.11 mm (0.4375 in)
- Thickness: 0.099 mm (0.004 in)
- Fabric: Nylon

Note: Do not use this ribbon on the Proprinter X24, XL24, X24E, or XL24E.

Proprinter X24 and X24E Ribbon

- Length: 18.3 mm (60.0 ft)
- Width: 11.11 mm (0.4375 in)
- Thickness: 0.099 mm (0.004 in)
- Fabric: Nylon

Note: Do not use this ribbon on the Proprinter, II, XL, II XL, III, and III XL.

Proprinter XL24 and Proprinter XL24E Ribbon

- Length: 24.8 mm (81.0 ft)
- Width: 11.11 mm (0.4375 in)
- Thickness: 0.099 mm (0.004 in)
- Fabric: Nylon

Note: Do not use this ribbon on the Proprinter, II, XL, II XL, III, and III XL.

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2. Software

Software

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Section 2. Software

This section shows the Proprinter family switch settings and printer-function settings with their definitions. It also describes form controls, buffers, and diagnostics.

Switch Settings

See your *Guide to Operations* for the procedures on how to set a switch or printer-function setting. You can override these settings with control characters and escape sequences. These controls are summarized in Section 3, "Control Codes and Escape Sequences," and explained in detail in the *Guide to Operations* for your printer.

Proprinter Switch Settings

Factory switch settings:

- In the U.S. and Canada, all switches are off.
- In other countries, switches 4 and 5 are on and others are off.

This table describes each switch:

Switch	Meaning	On	Off
1	Out-of-Paper Alarm	No alarm when the Paper Out light comes on.	Alarm sounds when the Paper Out light comes on.
2	Slashed Zeros	Slashed zeros.	Normal zeros.
3	Automatic Line Feed	Automatic LF after CR. ESC 5 overrides.	No automatic LF after CR. ESC 5 overrides.
4	Form Length	12-inch forms. ESC C overrides.	11-inch forms. ESC C overrides.
5	Character Set	Select Character Set 2. ESC 7 overrides.	Select Character Set 1. ESC 6 overrides.
6	Automatic Carriage Return	Automatic CR on LF, VT, and ESC J .	No automatic CR on LF, VT, and ESC J .
7	Reserved	Reserved	Reserved

Out-of-Paper Alarm (Switch 1): When this switch is on, the printer does not beep when the **Paper Out** light comes on.

Note: This switch does not affect the beep when the printer receives a BEL command or when an error causes the **Paper Out** light to blink.

Slashed Zeros (Switch 2): When this switch is on, the printer prints a zero with a slash instead of a standard zero.

Automatic Line Feed (Switch 3): When this switch is on, the printer does an automatic line feed when the printer receives a CR (carriage return) command. When switch 3 is off, a CR control code does not cause an automatic line feed. You can use ESC 5 to permit or prevent an automatic line feed.

Form Length (Switch 4): When this switch is on, the printer uses a form length of 304.8 mm (12 in). When this switch is off, the printer uses a form length of 279.4 mm (11 in). You can use ESC C to change the form length.

Character Set (Switch 5): When this switch is on, the printer uses Character Set 2. When this switch is off, the printer uses Character Set 1. You can use ESC 6 and ESC 7 to select character sets.

Automatic Carriage Return (Switch 6): When this switch is on, the printer does an automatic carriage return after a vertical forms movement.

Switch 7: The setting for this switch must be off.

Proprinter XL Switch Settings

Factory switch settings:

- In the U.S. and Canada, switch 1 is on and others are off.
- In other countries, switches 1, 4, and 5 are on and others are off.

This table describes each switch:

Switch	Meaning	On	Off
1	Line Length	13.6-inch Print Line. ESC X overrides.	8.0-inch Print Line. ESC X overrides.
2	Slashed Zeros	Slashed zeros.	Normal zeros.
3	Automatic Line Feed	Automatic LF after CR. ESC 5 overrides.	No automatic LF after CR. ESC 5 overrides.
4	Form Length	12-inch forms. ESC C overrides.	11-inch forms. ESC C overrides.
5	Character Set	Select Character Set 2. ESC 7 overrides.	Select Character Set 1. ESC 6 overrides.
6	Automatic Carriage Return	Automatic CR on LF, VT, and ESC J .	No automatic CR on LF, VT, and ESC J .
7	Reserved		Should always be off.
8	Reserved	Your printer might not have this switch.	Should always be off.

Line Length (Switch 1): When this switch is on, the printer uses a 345.4-mm (13.6-in) print line. When this switch is off, the printer uses an 203.2-mm (8.0-in) print line. You can override this switch by sending the **ESC X** sequence.

Slashed Zeros (Switch 2): When this switch is on, the printer prints a zero with a slash instead of a standard zero.

Automatic Line Feed (Switch 3): When this switch is on, the printer does an automatic line feed when the printer receives a **CR** (carriage return) command. When switch 3 is off, a **CR** control code does not cause an automatic line feed. You can use **ESC 5** to permit or prevent automatic line feed.

Form Length (Switch 4): When this switch is on, the printer uses a form length of 304.8 mm (12 in). When this switch is off, the printer uses a form length of 279.4 mm (11 in). You can use **ESC C** to change the form length.

Character Set (Switch 5): When this switch is on, the printer uses Character Set 2. When this switch is off, the printer uses Character Set 1. You can use **ESC 6** and **ESC 7** to select character sets.

Automatic Carriage Return (Switch 6): When this switch is on, the printer does an automatic carriage return after a vertical forms movement.

Switch 7: The setting for this switch must be off.

Switch 8: Your printer might not have this switch. If your printer has this switch, it must be off.

Proprinter II Switch Settings

Factory switch settings:

- In the U.S. and Canada, switch 7 is on and others are off.
- In other countries, switches 4, 5, and 7 are on and others are off.

This table describes each switch:

Switch	Meaning	On	Off
1	Form Feed Enable	Ignore Form Feed from host when printer is at top of form.	Honor Form Feed.
2	Select NLQ	Selects NLQ Font from operator panel.	Selects NLQ II Font from operator panel.
3	Automatic Line Feed	Automatic LF after CR. ESC 5 overrides.	No automatic LF after CR. ESC 5 overrides.
4	Form Length	12-inch forms. ESC C overrides.	11-inch forms. ESC C overrides.
5	Character Set	Select Character Set 2. ESC 7 overrides.	Select Character Set 1. ESC 6 overrides.
6	Automatic Carriage Return	Automatic CR on LF, VT, and ESC J.	No automatic CR on LF, VT, and ESC J.
7	Reserved	Should always be on.	
8	Reserved	Your printer might not have this switch.	Should always be off.

Form Feed Enable (Switch 1): When this switch is on, a Form Feed that is received from the host will be ignored if the present print position is on line one and no printable data is on the present page. When this switch is off, a Form Feed that is received from the host advances the paper one form length.

Select NLQ (Switch 2): When this switch is off, NLQ II is the font printed when NLQ is selected from the operator panel. When this switch is on, NLQ is the font printed when NLQ is selected from the operator panel. The operator panel selection can be overridden with **ESC I**.

Automatic Line Feed (Switch 3): When this switch is on, the printer does an automatic line feed when the printer receives a CR (carriage return) command. When switch 3 is off, a CR control code does not cause an automatic line feed. You can use **ESC 5** to permit or prevent an automatic line feed.

Form Length (Switch 4): When this switch is on, the printer uses a form length of 304.8 mm (12 in). When this switch is off, the printer uses a form length of 279.4 mm (11 in). You can use **ESC C** to change the form length.

Character Set (Switch 5): When this switch is on, the printer uses Character Set 2. When this switch is off, the printer uses Character Set 1. You can use **ESC 6** and **ESC 7** to select character sets.

Automatic Carriage Return (Switch 6): When this switch is on, the printer does an automatic carriage return after a vertical forms movement.

Switch 7: The setting for this switch must be on.

Switch 8: Your printer might not have this switch. If your printer has this switch, it must be off.

Proprinter II XL Switch Settings

Factory printer-function settings:

- In the U.S. and Canada, switches 1 and 7 are on and others are off.
- In other countries, switches 1, 4, 5, and 7 are on and others are off.

This table describes each switch:

Switch	Meaning	On	Off
1	Line Length	13.6-inch Print Line. ESC X overrides.	8.0-inch Print Line. ESC X overrides.
2	Select NLQ	Selects NLQ Font from operator panel.	Selects NLQ II Font from operator panel.
3	Automatic Line Feed	Automatic LF after CR. ESC 5 overrides.	No automatic LF after CR. ESC 5 overrides.
4	Form Length	12-inch forms. ESC C overrides.	11-inch forms. ESC C overrides.
5	Character Set	Select Character Set 2. ESC 7 overrides.	Select Character Set 1. ESC 6 overrides.
6	Automatic Carriage Return	Automatic CR on LF, VT, and ESC J .	No automatic CR on LF, VT, and ESC J .
7	Reserved	Should always be on.	
8	Reserved	Your printer might not have this switch.	Should always be off.

Line Length (Switch 1): When this switch is on, the printer uses a 345.4-mm (13.6-in) print line. When this switch is off, the printer uses an 203.2-mm (8.0-in) print line. You can override this switch setting by sending the **ESC X** sequence.

Select NLQ (Switch 2): When this switch is off, NLQ II is the font printed when NLQ is selected from the operator panel. When this switch is on, NLQ is the font printed when NLQ is selected from the operator panel. The operator panel selection can be overridden with **ESC I**.

Automatic Line Feed (Switch 3): When this switch is on, the printer does an automatic line feed when the printer receives a CR (carriage return) command. When switch 3 is off, a CR control code does not cause an automatic line feed. You can use **ESC 5** to permit or prevent an automatic line feed.

Form Length (Switch 4): When this switch is on, the printer uses a form length of 304.8 mm (12 in). When this switch is off, the printer uses a form length of 279.4 mm (11 in). You can use **ESC C** to change the form length.

Character Set (Switch 5): When this switch is on, the printer uses Character Set 2. When this switch is off, the printer uses Character Set 1. You can use **ESC 6** and **ESC 7** to select character sets.

Automatic Carriage Return (Switch 6): When this switch is on, the printer does an automatic carriage return after a vertical forms movement.

Switch 7: The setting for this switch must be on.

Switch 8: Your printer might not have this switch. If your printer has this switch, it must be off.

Proprinter III and III XL Settings

Factory printer-function settings:

- In the U.S. and Canada, all settings are off.
- In other countries, settings 7, 8, and 10 are on and others are off.

This table describes each printer-function setting:

Setting	Function	On	Off
1	Out-of-Paper Alarm	No alarm when the Paper Out light comes on.	Alarm sounds when the Paper Out light comes on.
2	Sheet Feeder	Enable sheet feeder.	Disable sheet feeder.
3	Line Length (Wide Carriage) Form Feed Enable (Narrow Carriage)	8.0-inch Print Line. ESC X overrides. Ignore Form Feed from host when printer is at top of form.	13.6-inch Print Line. ESC X overrides. Honor Form Feed.
4	Select NLQ	Selects NLQ Font from operator panel.	Selects NLQ II Font from operator panel.
5	Unidirectional NLQ	Print NLQ in one direction.	Print NLQ two directions.
6	20-Pitch Condense mode	12 CPI/Condensed invokes 12 CPI.	12 CPI/Condensed invokes 20 CPI.

Setting	Function	On	Off
7	Switch from U.S.A. to multilingual font	Use multilingual fonts.	Use U.S.A. fonts.
8	Character Set	Select Character Set 2. ESC 7 overrides.	Select Character Set 1. ESC 6 overrides.
9	Slashed Zeros	Slashed zeros.	Normal zeros.
10	Form Length	12-inch forms. ESC C overrides.	11-inch forms. ESC C overrides.
11	Automatic Line Feed	Automatic LF after CR. ESC 5 overrides.	No automatic LF after CR. ESC 5 overrides.
12	Automatic Carriage Return	Automatic CR on LF, VT, and ESC J .	No automatic CR on LF, VT, and ESC J .

Out-of-Paper Alarm (Setting 1): When this setting is on, the printer does not beep when the **Paper Out** light comes on.

Note: This setting does not affect the beep when the printer receives a **BEL** command or when an error causes the **Paper Out** light to blink.

Sheet Feeder (Setting 2): When this setting is on, the optional sheet feeder is supported with the correct paper-motor movement sequences. Cut sheets are fed from the sheet feeder and ejected into the sheet feeder's output tray. The **Paper Out** light and audible alarm are not activated unless the feed sequence fails to load paper.

Line Length (Setting 3): On the Proprinter III XL, when this setting is off, the printer uses a 345.4-mm (13.6-in) print line. When this setting is on, the printer uses a 203.2-mm (8.0-in) print line. You can override this setting by sending the **ESC X** sequence.

Form Feed Enable (Setting 3): On Proprinter III, when this setting is off, a Form Feed that is received from the host advances the paper one form length. When this setting is on, the printer ignores the Form Feed if the present print position is on line one and no printable data is on the page.

Select NLQ (Setting 4): When this setting is off, NLQ II is the font printed when you select NLQ from the operator panel. When this setting is on, NLQ is the font printed when NLQ is selected from the operator panel. The operator panel selection can be overridden with **ESC I**.

Unidirectional NLQ (Setting 5): When this setting is off, the printer prints in two directions (the first pass of NLQ or NLQ II is in one direction and the second pass is in the other direction). When this setting is on, the printer prints NLQ or NLQ II in one direction only (both passes go in the same direction).

20-Pitch Condense Mode (Setting 6): When this setting is off, the 12 CPI and Condensed commands invoke 20 CPI. When this setting is on, the 12 CPI and Condensed commands invoke 12 CPI.

Switch from U.S.A. to Multilingual Font (Setting 7): When this setting is off, the printer prints using the U.S.A. fonts. When this setting is on, the printer prints using the multilingual fonts.

Character Set (Setting 8): When this setting is on, the printer uses Character Set 2. When this setting is off, the printer uses Character Set 1. You can use ESC 6 and ESC 7 to select character sets.

Slashed Zeros (Setting 9): When this setting is on, the printer prints a zero with a slash instead of a standard zero.

Form Length (Setting 10): When this setting is on, the printer uses a form length of 304.8 mm (12 in). When this setting is off, the printer uses a form length of 279.4 mm (11 in). You can use ESC C to change the form length.

Automatic Line Feed (Setting 11): When this setting is on, the printer does an automatic line feed when the printer receives a CR (carriage return) command. When the setting is off, a CR control code does not cause an automatic line feed. You can use ESC 5 to permit or prevent an automatic line feed.

Automatic Carriage Return (Setting 12): When this setting is on, the printer does an automatic carriage return after a vertical forms movement.

Proprinter X24 and Proprinter XL24 Switch Settings

Factory switch settings:

- In the U.S. and Canada, all switches are off.
- In other countries, switches 4 and 5 are on and others are off.

Note: The Proprinter X24 ignores switch 1.

This table describes each switch:

Switch	Meaning	On	Off
1	Line Length	8.0-inch Print Line. ESC X overrides.	13.6-inch Print Line. ESC X overrides.
2	Sheet Feeder	Enable sheet feeder.	Disable sheet feeder.
3	Automatic Line Feed	Automatic LF after CR. ESC 5 overrides.	No automatic LF after CR. ESC 5 overrides.
4	Form Length	12-inch forms. ESC C overrides.	11-inch forms. ESC C overrides.
5	Character Set	Select Character Set 2. ESC 7 overrides.	Select Character Set 1. ESC 6 overrides.
6	Automatic Carriage Return	Automatic CR on LF, VT, and ESC J.	No automatic CR on LF, VT, and ESC J.
7	Alternate Graphics Mode	Use alternate graphics support.	Do not use alternate graphics support.

Line Length (Switch 1): On the Proprinter XL24, when this switch is off, the printer uses a 345.4-mm (13.6-in) print line. When this switch is on, the printer uses an 203.2-mm (8.0-in) print line. The Proprinter X24 ignores this switch. You can override this switch by sending the **ESC X** sequence.

Sheet Feeder (Switch 2): When this switch is on, the optional sheet feeder is supported with the correct paper motor movement sequences. Cut sheets are fed from the sheet feeder and ejected into the sheet feeder's output tray. The **Paper Out** light and audible alarm are not activated unless the feed sequence fails to load paper.

Automatic Line Feed (Switch 3): When this switch is on, the printer does an automatic line feed when the printer receives a CR (carriage return) command. When switch 3 is off, a CR control code does not cause an automatic line feed. You can use **ESC 5** to permit or prevent an automatic line feed.

Form Length (Switch 4): When this switch is on, the printer uses a form length of 304.8 mm (12 in). When this switch is off, the printer uses a form length of 279.4 mm (11 in). You can use **ESC C** to change the form length.

Character Set (Switch 5): When this switch is on, the printer uses Character Set 2. When this switch is off, the printer uses Character Set 1. You can use **ESC 6** and **ESC 7** to select character sets.

Automatic Carriage Return (Switch 6): When this switch is on, the printer does an automatic carriage return after a vertical forms movement.

Alternate Graphics Mode (Switch 7): When this switch is on, the printer prints high-resolution 24-wire APA graphic commands like those used with the Epson LQ-800¹/LQ-1000¹ printers. When this switch is on, there is an automatic carriage return on a line feed and no automatic carriage return on other vertical movements. When this switch is on, conflicting IBM ASCII command definitions are superseded.

¹ Trademark of Epson America, Inc.

Proprinter X24E and Proprinter XL24E Settings

Factory settings:

- In the U.S. and Canada, all settings are off.
- In other countries, settings 6, 7, and 9 are on and the others are off.

Note: The Proprinter X24E ignores printer-function-setting 3.

This table describes each printer-function setting:

Setting	Function	On	Off
1	Out-of-Paper Alarm	No alarm when the Paper Out light comes on.	Alarm sounds when the Paper Out light comes on.
2	Sheet Feeder	Enable sheet feeder.	Disable sheet feeder.
3	Line Length (wide carriage only)	8.0-inch Print Line. ESC X overrides.	13.6-inch Print Line. ESC X overrides.
4	Alternate Graphic Mode	Use alternate graphics support.	Do not use alternate graphics support.
5	Reserved	Reserved.	Reserved.
6	Switch from U.S.A. to multilingual font	Use multilingual fonts.	Use U.S.A. fonts.
7	Character Set	Select Character Set 2. ESC 7 overrides.	Select Character Set 1. ESC 6 overrides.
8	Slashed Zeros	Slashed zeros.	Normal zeros.
9	Form Length	12-inch forms. ESC C overrides.	11-inch forms. ESC C overrides.

Setting	Function	On	Off
10	Automatic Line Feed	Automatic LF after CR. ESC 5 overrides.	No automatic LF after CR. ESC 5 overrides.
11	Automatic Carriage Return.	Automatic CR on LF, VT, and ESC J .	No automatic CR on LF, VT, and ESC J .
12	Reserved	Reserved.	Reserved.

Out-of-Paper Alarm (Setting 1): When this setting is on, the printer does not beep when the **Paper Out** light comes on.

Note: This setting does not affect the beep when the printer receives a **BEL** command or when an error causes the **Paper Out** light to blink.

Sheet Feeder (Setting 2): When this setting is on, the optional sheet feeder is supported with the correct paper-motor movement sequences. Cut sheets are fed from the sheet feeder and ejected into the sheet feeder's output tray. The **Paper Out** light and audible alarm are not activated unless the feed sequence fails to load paper.

Line Length (Setting 3): On the Proprinter XL24E, when this setting is off, the printer uses a 345.44-mm (13.6-in) print line. When this setting is on, the printer uses a 203.2-mm (8.0-in) print line. The Proprinter X24E ignores this setting. You can override this setting by sending the **ESC X** sequence.

Alternate Graphic Mode (Setting 4): When this setting is on, the printer uses alternate graphics support. When this setting is off, the printer does not use alternate graphics support.

Switch from U.S.A. to Multilingual Font (Setting 6): When this setting is off, the printer prints using the U.S.A. fonts. When this setting is on, the printer prints using the multilingual fonts.

Character Set (Setting 7): When this setting is on, the printer uses Character Set 2. When this setting is off, the printer uses Character Set 1. You can use **ESC 6** and **ESC 7** to select character sets.

Slashed Zeros (Setting 8): When this setting is on, the printer prints a zero with a slash instead of a standard zero.

Form Length (Setting 9): When this setting is on, the printer uses a form length of 304.8 mm (12 in). When this setting is off, the printer uses a form length of 279.4 mm (11 in). You can use **ESC C** to change the form length.

Automatic Line Feed (Setting 10): When this setting is on, the printer does an automatic line feed when the printer receives a **CR** (carriage return) command. When the setting is off, a **CR** control code does not cause an automatic line feed. You can use **ESC 5** to permit or prevent an automatic line feed.

Automatic Carriage Return (Setting 11): When this setting is on, the printer does an automatic carriage return after a vertical forms movement.

Form Control and Output Specifications

This section describes spacing controls and print speed specifications for the Proprinter family of printers.

Line Spacing

The Proprinter family of printers can print with line spacing of: 1/6 inch, 1/8 inch, 7/72 inch, n/72 inch, or n/144 inch. The minimum spacing is 1/144 inch.

The Proprinter family emulates n/216-inch spacing. The Proprinter X24, XL24, X24E, and XL24E also emulate spacing at n/180 inch and n/60 inch. For all emulations, spacing is actually to the nearest 1/144 inch.

Text Line Spacing

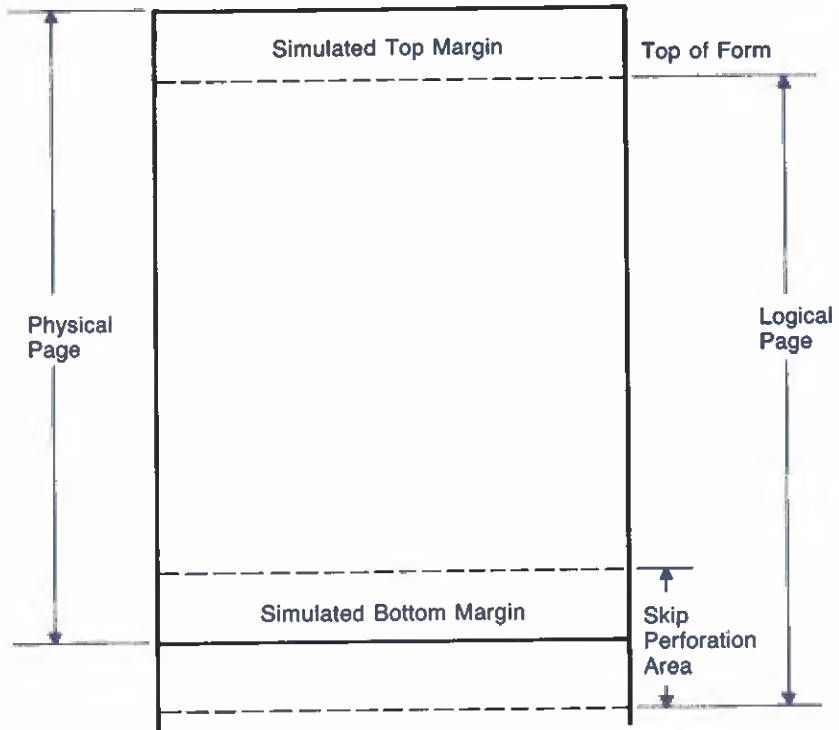
The default is six lines per inch. To set text line spacing, use **ESC A**. To start text line spacing (set with **ESC A**), use **ESC 2**.

Graphics Line Spacing

The computer controls graphics line spacing. Use **ESC J** for graphics line spacing. Use **ESC 3** to store graphics line spacing. There is no default value for graphics line spacing.

Top and Bottom Margin Emulation

The printers do not support top or bottom margins. You can provide top or bottom margins using software. By setting top-of-form (TOF) and skip perforation, the printers can simulate top and bottom margins.



Vertical spacing caused by the Graphics Line Spacing (ESC J) escape code can cause the printer to move into the skip-perforation area.

Any other vertical movement that places the print line in the skip-perforation area initiates an advance to the next top of form.

Use of CR and LF Instead of Line Wrap

When the printer receives too many text characters to print on a line, the printer inserts a carriage return (CR) and line feed (LF) (automatic line wrap). The printer wraps only when the printer is printing text characters. If the printer is printing APA graphic data, the printer discards the excess data.

For best results, write your program to send both a CR and LF, instead of relying on your printer to generate one or both for you.

The following table shows how many characters fit on a line for different print modes:

Print Mode	Characters per line (Narrow Carriage)	Characters per line (Wide Carriage)
10 CPI DP	80	136
12 CPI DP	96	163
Condensed	137	233
10 CPI Double-Wide	40	68
12 CPI Double-Wide	48	81
Condensed, Double-Wide	68	116
20 CPI (Proprinter III and III XL)	160	273
20 CPI, Double-Wide (Proprinter III and III XL)	80	136

Vertical Spacing

Commands to select $n/216$ -inch vertical spacing are normally used for eight-bit-APA graphics. You can use the following two commands to move or select vertical line spacings of $n/216$ inch:

- **ESC J n** Variable line spacing (move $n/216$ inch)
- **ESC 3 n** Graphics line spacing (set spacing to $n/216$ inch).

When n is a multiple of 3, the printer moves the exact amount. When n is NOT a multiple of 3, the printer moves to the nearest increment of $1/144$ inch.

Most bit-image graphics programs move paper in multiples of $3/216$ inches, because the increment is some multiple of the dot size of the printer ($1/72 = 3/216$ inch for the Proprietary). However, the correct vertical position and page length integrity are always maintained even for uneven multiples of 3. The following chart shows the results for uneven multiples of 3:

Requested Movements (inch)	Actual Movements (inch)	Total Actual Movements (inch)
24/216	16/144	24/216 (16/144)
1/216, 23/216	1/144, 15/144	24/216 (16/144)
1/216, 1/216, 22/216	1/144, 0/144, 15/144	24/216 (16/144)
1/216	1/144	1/144
1/216, 1/216, 1/216	1/144, 0/144, 1/144	2/144

End-of-Form Sensor

The printers signal End of Form (EOF) when approximately 22.9 mm (0.9 in) of paper remains. The printer continues to print until 12.7 mm (0.5 in) of paper remains. When 12.7 mm of paper remains:

- The Proprietary Paper Out light comes on and the printer beeps.
- On the other printers, the Paper Out light blinks and the printer beeps.
- The printers do not beep if the alarm is switched off.

If you have the Sheet Feeder installed on the Proprietary X24 or Proprietary XL24, see "Sheet Feeder (Switch 2)" on page 2-15. If you have the Sheet Feeder installed on the Proprietary III or Proprietary III XL, see "Sheet Feeder (Setting 2)" on page 2-12. If you have the Sheet Feeder installed on the Proprietary X24E or Proprietary XL24E, see "Sheet Feeder (Setting 2)" on page 2-18.

Form Movement

To move cut forms, the printers use feed rollers. To move continuous forms, the printers use pinfeed tractor wheels. The printers can move paper at apparent $n/216$ -inch increments under control of the computer. See "Line Spacing" on page 2-19 for more information. The Proprietary, Proprietary II, Proprietary XL, Proprietary II XL, Proprietary III, and Proprietary III XL move the paper 76.2 mm (3.0 in) per second. The Proprietary X24, Proprietary XL24, Proprietary X24E, and Proprietary XL24E move the paper 100.3 mm (3.95 in) per second.

Print Speeds (CPS) for the Proprinter, II, II XL, XL, X24, and XL24

This section contains the print speeds of the Proprinter, Proprinter II, II XL, XL, X24, and XL24.

Mode	9-wire head	24-wire head
DP 10/12 CPI	200	200/240
17.1 CPI	171.25	171.25
Emphasized 10/12 CPI	100	100/120
NLQ or LQ 10 or 12 CPI	40	67
Double-Wide 10/12 CPI	100	100/120
Double-Wide 17.1 CPI	85.6	85.6
Super/Subscript 10/12 CPI	66.67	100/120
Super/Subscript 17.1 CPI	68.5	171.25
Double-High	Variable	Variable
Double-High Double-Wide	Variable	Variable

Note: The Proprinter II and Proprinter II XL can print 12 CPI at 240 CPS when you select FASTFONT².

² Trademark of IBM

Print Speeds (CPS) for the Proprinter III, III XL, X24E, and XL24E

This section contains the print speeds of the Proprinter III, III XL, X24E, and XL24E.

Mode	9-wire head	24-wire head
DP 10/12 CPI	270	240/288
17.1 CPI	230.85	205.2
20 CPI	270	Not supported
Emphasized 10 or 12 CPI	135	120/144
NLQ or LQ 10 or 12 CPI bidirectional	67.5	80
NLQ or LQ 10 or 12 CPI unidirectional	54	80
Double-Wide 10 or 12 CPI	135	120/144
Double-Wide 17.1 CPI	115.42	102.6
Double-Wide 20 CPI	135	Not supported
Super/Subscript 10/12 CPI	93.33	120/144
Super/Subscript 17.1 CPI	92.5	205.2
Double-High	Variable	Variable
Double-High Double-Wide	Variable	Variable

Note: The Proprinter III and Proprinter III XL can print 12 CPI at 324 CPS when you select Fastfont.

Buffers

The Proprinter family has internal print buffers. The buffer size can be increased by adding the Print Buffer Option.

Proprinter Buffers

The internal buffer size is approximately 600 bytes. The buffer is divided into the print buffer of 274 bytes (2 print buffers of 137 bytes each) and a buffer for received print data. The optional print buffer adds 5K to the buffer. The 5K additional buffer is standard in printers shipped in countries other than the U.S. and Canada.

Proprinter II and Proprinter II XL Buffers

Proprinter II and Proprinter II XL buffer size is approximately 4500 bytes. Memory is divided between the receive buffer (4096 bytes) and two print buffers (236 bytes each). When the optional 8K buffer is installed, the receive buffer is increased to 12 288 bytes.

With the optional 8K buffer installed, you can download NLQ II fonts. The download area for NLQ II requires 7K bytes. When an NLQ II font is downloaded, the receive buffer area is decreased from 12K to 5K bytes.

The 8K additional buffer is standard in printers shipped in countries other than the U.S. and Canada.

Proprinter XL Buffers

Proprinter XL buffer size is approximately 4500 bytes. Memory is divided between the receive buffer (4096 bytes) and two print buffers (236 bytes each). When the optional 8K buffer is installed, the receive buffer is increased to 12 288 bytes.

The 8K additional buffer is standard in printers shipped in countries other than the U.S. and Canada.

Proprinter X24 and Proprinter XL24 Buffers

The buffer is divided into the 6144-byte receive buffer and two print buffers of 236 bytes each. Printers shipped in countries other than the U.S. and Canada contain an additional 8K buffer.

Proprinter III and Proprinter III XL Buffers

The buffer size is approximately 7600 bytes. There are two print buffers (236 bytes each) and a 7K receive buffer. If you have the optional 32K buffer installed, the receive buffer is increased to 36K (3K is allocated for a DP font download area).

With the optional 32K buffer installed, you can download two NLQ II fonts. The download area for the two NLQ II fonts requires 17K bytes. When the NLQ II fonts are downloaded, the receive buffer area is decreased from 36K to 19K.

The 32K buffer is standard in printers shipped in countries other than the U.S. and Canada.

Proprinter X24E and Proprinter XL24E Buffers

The buffer is divided into an approximately 14K-byte receive buffer and two print buffers of 236 bytes each.

Ending the Print Buffer

The following control codes and escape sequences end the current print buffer and cause its contents to be printed. These codes might occur in any sequence. However, printing efficiency is enhanced by grouping them at the end of graphic data. Note that HT does not always end the buffer.

Data will also be printed when the buffer is full or after approximately one second of inactivity on the interface.

Note: Not all of the following control codes and escape sequences are available on all Proprinters.

SI	HT	LF
FF	CR	BS
DC4	SO	ESC E
ESC H	ESC G	ESC I
ESC L	ESC K	ESC P
ESC U	ESC S	ESC W
ESC Z	ESC Y	ESC -
ESC [@	ESC :	ESC g
ESC j	VT	DC2
ESC F	ESC J	ESC T
ESC X	ESC _	ESC K

Proprinter X24, XL24, X24E, and XL24E FontSet Module

The Proprinter X24, Proprinter XL24, Proprinter X24E, and Proprinter XL24E can contain a 32K non-volatile random-access-memory (RAM) module. This module can store downloaded fonts from user designs or from the FontSet diskettes available from IBM. It also stores user-defined defaults from the operator panel. The module is optional in the U.S. and Canada and standard in other countries.

Diagnostics

This section discusses diagnostics at power on, how to do the self-test and how to do a hex dump.

Power On Diagnostics

When the printer is switched on, it performs internal tests. These tests include the following:

- All lights come on to verify that they are not burned out.
- The read-only memory (ROM) is checked.
- Random-access memory (RAM) is checked. This test determines how much memory is present and tests each location.
- The printer checks the print-head position. The print head moves to the left margin, reads the home sensor, and calibrates the left-margin position.
- The printer checks for paper.

If paper is in the printer and all tests are successful, the Paper Out light goes off. The printer is ready to print.

If the Paper Out light blinks, the printer needs paper. However, the other tests are complete. When the Proprietary printer is out of paper, the Paper Out light remains on.

If QUIET mode is stored in the FontSet module memory on the Proprietary X24 and Proprietary XL24, the Paper Out light remains on.

Self-Test

The printer has a self-test to aid in problem determination. When self-test is selected, the printer performs the normal power-on internal tests (see above) and prints a test pattern. This test pattern is unique for each printer in the Proprietary family. For instructions to start the self-test and sample-test output, see the *Guide to Operations* for your printer.

Hex Dump

The printer has a hexadecimal dump mode to aid in debugging. All data, including both control and character data, prints in hexadecimal instead of ASCII.

The hex dump is useful because it lets you review the content of the data stream. Each character in the data stream prints as a two-character hex code and is followed by a space.

To use the hexadecimal dump mode:

1. Switch the printer power **Off (O)**.
2. Press and hold the Form Feed key or Feed key.
3. Switch the printer power **On (I)**.
4. After three to four seconds, release the Form Feed or Feed key.
5. Start your application program.

The printer prints any data that is sent to it (including any control characters) as hexadecimal codes.

To leave the Hex Dump mode, switch the printer power **Off (O)**.

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3. Control Code &
Escape Sequences

3. Control Code & Escape Sequences

Control Codes and Escape Sequences

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Section 3. Control Codes and Escape Sequences

Beeper	Hex 7
<i>BEL</i>	Dec 7
Backspace	Hex 8
<i>BS</i>	Dec 8
Cancel Data	Hex 18
<i>CAN</i>	Dec 24
Carriage Return	Hex 0D
<i>CR</i>	Dec 13
Select Printer	Hex 11
<i>DC1</i>	Dec 17
10 Characters-per-Inch Print	Hex 12
<i>DC2</i>	Dec 18
Deselect Printer	Hex 13
<i>DC3</i>	Dec 19
Cancel Double-Wide Printing by Line	Hex 14
<i>DC4</i>	Dec 20

Form Feed	Hex 0C
<i>FF</i>	Dec 12
Horizontal Tab	Hex 09
<i>HT</i>	Dec 09
Line Feed	Hex 0A
<i>LF</i>	Dec 10
Null	Hex 00
<i>NUL</i>	Dec 00
Condensed Printing	Hex 0F
<i>SI</i>	Dec 15
Double-Wide Printing by Line	Hex 0E
<i>SO</i>	Dec 14
Space	Hex 20
<i>SP</i>	Dec 32
Vertical Tab	Hex 0B
<i>VT</i>	Dec 11
Set Text Line Spacing	Hex 1B 41
<i>ESC A n</i> n = n/72 in	Dec 27 65
Set Vertical Tabs	Hex 1B 42
<i>ESC B n₁ n₂ ... n₂₅₅ 0</i> n's are tab stop positions between 1 and 255.	Dec 27 66

Set Form Length in Lines or Inches	Hex 1B 43
<i>ESC C n m</i> Lines: ESC C n Inches: ESC C 0 m	Dec 27 67
Set Horizontal Tabs	Hex 1B 44
<i>ESC D n₁ n₂ ...n₂₈ 0</i> n's are tab stop positions. Values for n begin with 1. The maximum value for n depends on the current patch.	Dec 27 68
Emphasized Printing	Hex 1B 45
<i>ESC E</i>	Dec 27 69
Cancel Emphasized Printing	Hex 1B 46
<i>ESC F</i>	Dec 27 70
Double-Strike Printing	Hex 1B 47
<i>ESC G</i>	Dec 27 71
Cancel Double-Strike Printing	Hex 1B 48
<i>ESC H</i>	Dec 27 72

*ESC I n***ESC I for Proprinter and Proprinter XL**

- 00 DP Resident
- 02 NLQ Resident
- 04 DP Download
- 06 NLQ Download

| ESC I for Proprinter II and Proprinter II XL

- 00 DP Resident
- 01 Fastfont (12 CPI) Resident
- 02 NLQ Resident
- 03 NLQ II Resident
- 04 DP Download
- 05 Fastfont (12 CPI) Download
- 06 NLQ Download
- 07 NLQ II Download

ESC I for Proprinter III and Proprinter III XL**HEX DEC**

- | | | |
|----|----|-------------------------------------|
| 00 | 0 | DP Resident |
| 01 | 1 | Fastfont (12 CPI) Resident |
| 02 | 2 | NLQ Resident |
| 03 | 3 | NLQ II Resident |
| 04 | 4 | DP Download |
| 05 | 5 | Fastfont (12 CPI) Download |
| 06 | 6 | NLQ Download |
| 07 | 7 | NLQ II Download |
| 0B | 11 | Alternate NLQ II (Italic): Resident |
| 0F | 15 | Alternate NLQ II: Download |

ESC I for Proprinter X24, XL24, X24E, and XL24E**HEX DEC**

- | | | |
|----|----|--|
| 00 | 0 | Normal (Draft) 10 CPI sans-serif (default) |
| 08 | 8 | Normal (Draft) 12 CPI (derived from 10 CPI draft) |
| 10 | 16 | Normal (Draft) 17 CPI (derived from 10 CPI draft) |
| 02 | 2 | Letter Quality 10 CPI courier |
| 0A | 10 | Letter Quality 12 CPI prestige elite |
| 12 | 18 | Letter Quality 17 CPI courier |
| 03 | 3 | Proportional Letter Quality courier |
| 04 | 4 | Downloaded 10 CPI Draft |
| 0C | 12 | Downloaded 12 CPI Draft (derived from the downloaded 10 CPI draft) |

HEX	DEC	
14	20	17 CPI Draft (derived from the downloaded 10 CPI draft)
06	6	Downloaded 10 CPI Letter Quality
0E	14	Downloaded 12 CPI Letter Quality
16	22	17 CPI Letter Quality (derived from the 10 CPI downloaded LQ)
07	7	Downloaded Proportional Letter Quality

Graphics Variable Line Spacing	Hex 1B 4A
ESC J n n is a number between 0 and 255. Use exact multiples of 3 to move exactly n/216 inch.	Dec 27 74
Normal-Density Bit-Image Graphics	Hex 1B 4B
ESC K n₁ n₂ v₁ v₂ ... v₄₈₀ Total bit-image bytes n = n ₁ + < n ₂ * 256* Bit-Image Data = v ₁ , v ₂ ... v ₄₈₀	Dec 27 75
Dual-Density Bit-Image Graphics (half-speed)	Hex 1B 4C
ESC L n₁ n₂ v₁ v₂ ... v₉₆₀ Total bit-image bytes n = n ₁ + < n ₂ * 256* Bit-Image Data = v ₁ , v ₂ ... v ₉₆₀	Dec 27 76
Set Automatic Perforation Skip	Hex 1B 4E
ESC N n n = number of lines	Dec 27 78
Cancel Automatic Perforation Skip	Hex 1B 4F
ESC O	Dec 27 79
Proportional Space Mode	Hex 1B 50
ESC P n n = 0 cancels; n = 1 activates Not available on the Proprinter.	Dec 27 80
Deselect Printer	Hex 1B 51
ESC Q n Proprinter X24 and X24E n = 36 (X'24'); Proprinter XL24 and XL24E n = 35 (X'23'); Proprinter, II, and III n = 3; Proprinter XL, II XL, and III XL n = 22 (X'16')	Dec 27 81

Set All Tabs to Power On Settings	Hex 1B 52
ESC R	Dec 27 82
Subscript or Superscript Printing	Hex 1B 53
ESC S n n = 0 superscript; n = 1 subscript	Dec 27 83
Cancel Subscript or Superscript	Hex 1B 54
ESC T	Dec 27 84
Print in One Direction	Hex 1B 55
ESC U n n = 0 bidirectional; n = 1 left-to-right	Dec 27 85
Continuous Double-Wide Printing	Hex 1B 57
ESC W n n = 0 ends; n = 1 begins	Dec 27 87
Set Horizontal Margins	Hex 1B 58
ESC X n m n = left margin; m = right margin Not available on the Proprietary.	Dec 27 88
Dual-Density Bit-Image Graphics (normal speed)	Hex 1B 59
ESC Y n₁ n₂ v₁ v₂ ... v₉₆₀ Total bit-image bytes n = n ₁ + <n ₂ * 256* Bit-Image Data = v ₁ ,v ₂ ...v ₉₆₀	Dec 27 89
High-Density Bit-Image Graphics	Hex 1B 5A
ESC Z n₁ n₂ v₁ v₂ ... v₁₉₂₀ Total bit-image bytes n = n ₁ + <n ₂ * 256* Bit-Image Data = v ₁ ,v ₂ ...v ₁₉₂₀	Dec 27 90

1/8-Inch Line Spacing	Hex 1B 30
ESC 0	Dec 27 48
7/72-Inch Line Spacing	Hex 1B 31
ESC 1	Dec 27 49
Start Text Line Spacing	Hex 1B 32
ESC 2	Dec 27 50
Graphics Line Spacing	Hex 1B 33
ESC 3 n n = n/216 inch n is between 0 and 255.	Dec 27 51
Set Top of Form	Hex 1B 34
ESC 4	Dec 27 52
Automatic Line Feed	Hex 1B 35
ESC 5 n n = 0 cancels; n = 1 begins	Dec 27 53
Select Character Set 2	Hex 1B 36
ESC 6	Dec 27 54
Select Character Set 1	Hex 1B 37
ESC 7	Dec 27 55
Continuous Overscore	Hex 1B 5F
ESC _ n n = 0 cancels; n = 1 begins	Dec 27 95
Continuous Underscore	Hex 1B 2D
ESC - n n = 0 cancels; n = 1 begins	Dec 27 45

12-Characters-per-Inch Printing	Hex 1B 3A
ESC :	Dec 27 58
Print Single Character From All Characters Chart	Hex 1B 5E
ESC ^	Dec 27 94
Print Continuously From All Characters Chart	Hex 1B 5C
ESC \ $n_1 n_2$ Total characters $n = n_1 + < n_2 * 256^*$	Dec 27 92
Set Presentation Highlight	Hex 1B 5B 40
ESC ! @ $n_1 n_2 m_1 m_2 m_3 m_4$	Dec 27 91 64
Set Initial Condition	Hex 1B 5B 4B
ESC ! K $n_1 n_2 init id parm1 parm2$	Dec 27 91 75
Not available on the Proprinter, Proprinter XL, II, II XL, X24, or XL24.	
Character Font Image Download	Hex 1B 3D
ESC =	Dec 27 61
Stop Printing	Hex 1B 6A
ESC j	Dec 27 106
Not available on the Proprinter, Proprinter II, XL, II XL, III, or III XL.	
Set Code Page	Hex 1B 5B 54
ESC ! T countlow counthigh 0 0 cpidhigh cpidlow	Dec 27 91 84
Not available on the Proprinter, Proprinter II, II XL, XL, III, III XL, X24, or XL24.	
Relative Move Inline Forward (n/120 in)	Hex 1B 64
ESC dn1n2	Dec 27 100
Not available on the Proprinter, Proprinter II, XL, II XL, III, or III XL.	

Set Vertical Units	Hex
	1B 5B 5C

ESC I \	Dec
	27 91 92

Syntax: ESC I \ countlow counthigh T-Units-Low T-Units-High
G-Units-Low G-Units-High

Not available on the Proprinter, Proprinter II, XL, II XL, III, or
III XL.

High-Resolution Graphics	Hex
	1B 5B 67

ESC I g countlow counthigh mode Bit-Image Data	Dec
	27 91 103

Not available on the Proprinter, Proprinter II, XL, II XL, III, or
III XL.

Graphics Line Spacing (AGM)	Hex 1B 33
------------------------------------	---------------

ESC 3 n	Dec 27 51
----------------	---------------

n = n/180 in

Not available on the Proprinter, Proprinter II, II XL, III, or III XL.

Set Text Line Spacing (AGM)	Hex 1B 41
------------------------------------	---------------

ESC A n	Dec 27 65
----------------	---------------

n = n/60 in

Not available on the Proprinter, Proprinter II, XL, II XL, III, or
III XL.

Graphics Variable Line Spacing (AGM)	Hex 1B 4A
---	---------------

ESC J n	Dec 27 74
----------------	---------------

n = n/180 in

Not available on the Proprinter, Proprinter II, XL, II XL, III, or
III XL.

Select Graphic Mode (AGM)	Hex 1B 2A
----------------------------------	---------------

ESC * Mode countlow counthigh Bit-Image Data	Dec 27 42
---	---------------

Not available on the Proprinter, Proprinter II, XL, II XL, III, or
III XL.

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4. Programming

Programming

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Section 4. Programming

This section explains downloading characters to the Proprietary family of printers and provides programming examples for several escape sequences.

The downloading feature of the Proprietary family lets you create custom fonts and special characters. You can create and print complete italic or foreign-language character sets. Or, you can create symbols and special characters that are not in the printer character sets. This section has two parts. The first part tells how to design and download a character for the 9-wire printers: Proprietary, Proprietary II, XL, II XL, III, and III XL. The second part tells how to design and download a character for the 24-wire printers, Proprietary X24, XL24, X24E, and XL24E.

This section contains several BASIC programming examples. When you enter the statements, let the BASIC editor create its own line break. If you use the same line breaks as in the example, your program might not work.

Designing and Downloading for Proprietary Nine-Wire Printers

This information shows you how to design and download characters for the nine-wire series of Proprietary printers.

Designing Draft and NLQ Characters

Draft and NLQ characters can be designed for the Proprietary, Proprietary XL, II, II XL, III, and III XL.

For draft and NLQ characters, the 9-wire printers use a character matrix that is twelve-dots wide and nine-dots high. Ascending characters generally use the top 7 rows, establishing row 7 as the baseline. Descending characters generally use the bottom 7 rows. You can only design characters that are eleven-dots wide. The space for dot twelve must be blank. Generally the maximum

width is nine columns, starting with column one. This permits spacing between characters.

Each character is printed using a maximum of eight of the nine wires in the printhead. The top eight wires print ascending characters. The bottom eight wires print descending characters.

Design Note

The Proprietary (U.S. model) can download only ascending and descending characters. Do not download block graphic characters or shading characters to the Proprietary (U.S. model). You should not use any diagonal lines in your design when you are designing block graphics for Proprietary (non-U.S. models), Proprietary XL, II, II XL, III, and III XL. Shading characters are not enhanced in NLQ mode.

To design a character for both draft and NLQ, read the section **How Dots Are Added in NLQ Mode** below.

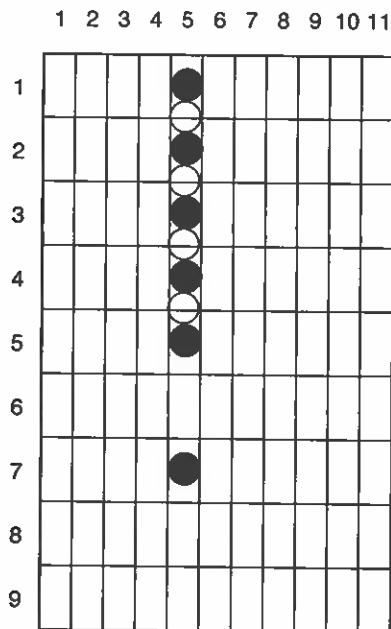
How Dots Are Added in NLQ Mode

The 9-wire printers can print downloaded draft characters in NLQ. Downloaded characters print at the same speed as standard characters. You design the characters for DP mode, and the printer adds the additional dots to each character for NLQ mode. **If you want to print the character in both DP and NLQ modes, you must specify all the dots in the horizontal lines.** The 9-wire printers eliminate horizontal adjacent dots when they print in DP mode.

The following illustrations show how the IBM 9-wire Proprinters add dots in various situations:

Vertical Lines

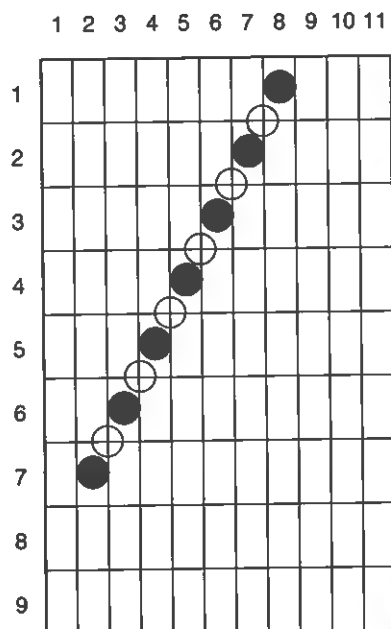
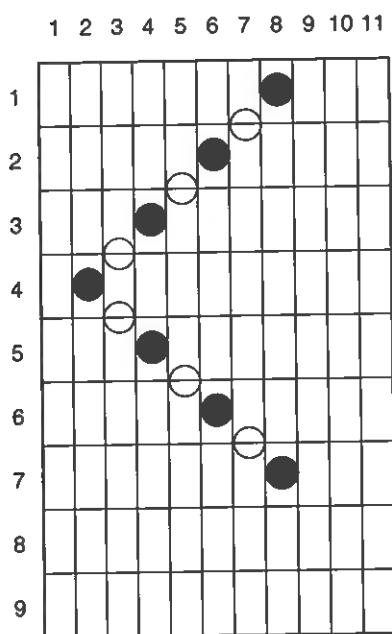
The following drawing shows how the printer adds dots to a vertical line:



Note: Solid dot - must be specified in the font.
Hollow dot - generated by the printer.

Diagonal Lines

These drawings show how the printer adds dots to diagonal lines.

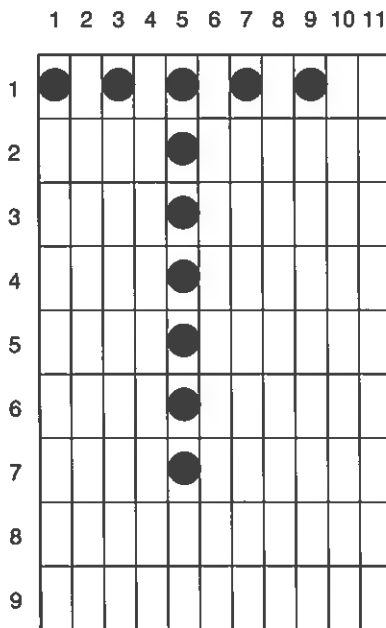
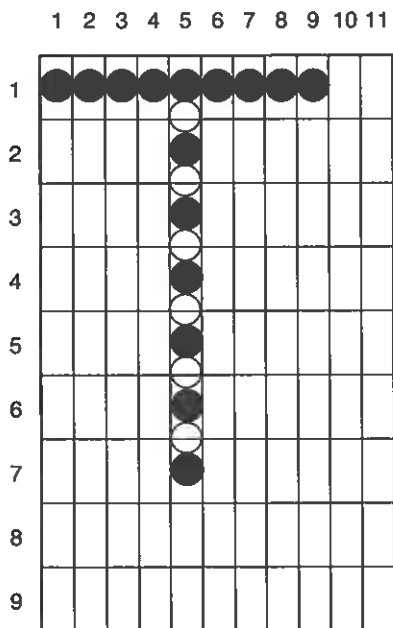


Note: Solid dot - must be specified in the font.
Hollow dot - generated by the printer.

Intersections of Vertical and Horizontal Lines

The drawing on the left shows how the printer adds the vertical dots to a vertical line that intersects a horizontal line.

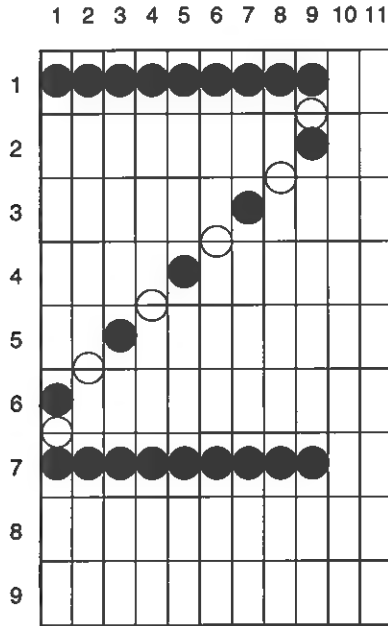
The character design must specify all dots in the horizontal line. The printer removes adjacent dots from horizontal lines when printing in DP mode. The drawing on the right shows the same character printed in DP mode.



Note: Solid dot - must be specified in the font.
Hollow dot - generated by the printer.

Diagonal Intersecting Horizontal Line

This drawing shows how the printer adds dots at the intersection of horizontal and diagonal lines. The printer considers the point of intersection as a two-dot vertical line.

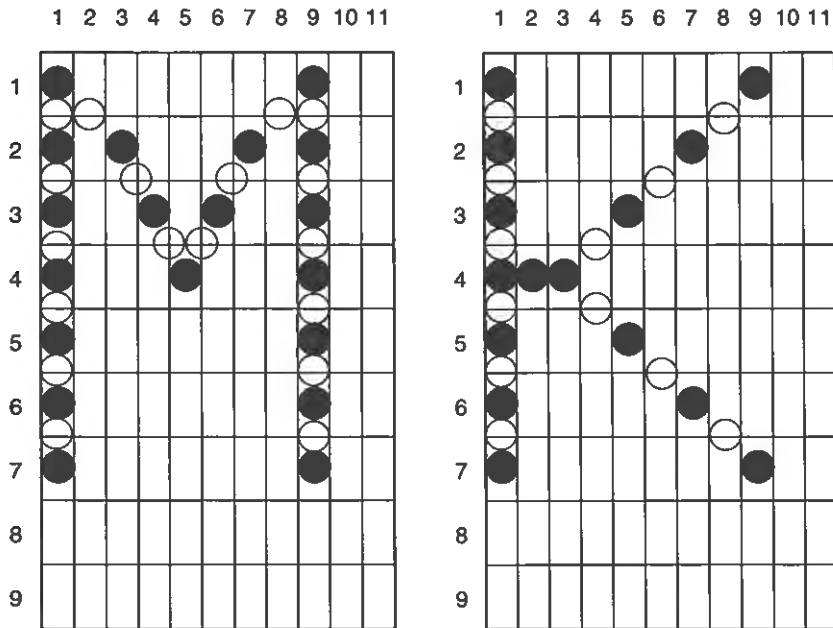


Note: Solid dot - must be specified in the font.
Hollow dot - generated by the printer.

Diagonal Intersecting Vertical Line

The drawing of the **M** shows how the printer adds dots when a diagonal line meets the end of a vertical line.

When a diagonal line intersects a vertical line, at a point other than the end of the vertical line, you should specify a horizontal dot at the intersection to improve character appearance. This ensures that the character is acceptable in DP mode. The character design must specify all the dots along the horizontal line. The printer will remove adjacent dots from horizontal lines when printing in DP mode. The drawing of the **K** shows this situation.



Note: Solid dot - must be specified in the font.
Hollow dot - generated by the printer.

Designing Fastfont Characters

You can print Fastfont characters on the Proprieter II, II XL, III, and III XL.

The character matrix for Fastfont characters is ten-dots wide and nine-dots high. Ascending characters generally use the top seven rows, establishing row seven as the baseline. Descending characters use the bottom seven rows. Fastfont characters must be no wider than nine dots. The space for dot ten must be blank. If you design a Fastfont character that is wider than nine dots, it is truncated when printed.

You cannot print Fastfont characters in NLQ mode, so the printer will not add any dots to your design.

Designing NLQ II Characters

NLQ II characters can be printed by Proprieter II, II XL, III, and III XL.

NLQ II characters are designed on a character matrix that is 24-dots wide and 18-dots high. Ascending characters generally use the top 15 rows, establishing row 15 as the baseline. Descending characters use the bottom 16 rows (rows 3 through 18). The maximum width of a character is 23 dots. The space for dot 24 must be blank. The maximum height of a character is 16 dots, beginning with row 1 (for ascenders) or row 3 (for descenders). If you design a character that is higher than 16 dots, part of the character is truncated when printed.

Consecutive horizontal dots are eliminated (except in emphasized mode) when characters are printed. To ensure a character looks the same when printed left to right or right to left, the number of consecutive horizontal dots in a character design should be **odd**.

Here are some rules to aid you in designing characters that will blend with the resident characters. When you design a capital letter, use rows 2 through 15. If you are designing a lowercase letter such as "a," "c," or "e," use rows 6 through 15. For lowercase ascenders such as "b," "d," or "f," use rows 1

through 15. For a lowercase descenders such as "g," "p," or "q," use rows 6 through 18.

Downloading Characters for Nine-Wire Proprinters

The Proprinter and Proprinter XL each have one download area, which can store one draft or NLQ downloaded character set.

Note: You can print NLQ from the draft font by using the ESC I 6 command. See "How Dots Are Added in NLQ Mode" on page 4-3.

The Proprinter (U.S. model) can download 94 characters from hexadecimal 21 (X'21') to hexadecimal 7E (X'7E'). This Proprinter cannot download block graphics or shading characters. Proprinters shipped in other countries can download 256 characters including block graphics and shading characters. The Proprinter cannot print using proportional spacing.

The Proprinter XL can download up to 256 characters into any area of the character set. There are no restrictions on downloading characters. The Proprinter XL can print using proportional spacing.

The Proprinter II and Proprinter II XL have two download areas. One download area is for a draft character set and can store 256 draft characters in any area of the character set. These printers can print using proportional spacing. The draft download area can alternately be used to store a downloaded Fastfont. The second download area is for an NLQ II character set and requires the optional (U.S. and Canada only) 8K print buffer to be installed. The number of characters that can be stored in the NLQ II download area depends on the designs of the characters; see "Downloading an NLQ II Character Set" on page 4-19. There are no restrictions on the type of character that can be downloaded.

The Proprinter III and Proprinter III XL each have three download areas. The first download area is for a draft character set and can store 256 characters in any area of the character set. These printers can print using proportional spacing. The draft download area can alternately be used to store a downloaded Fastfont. The other two download areas are for NLQ II and

need the optional (U.S. and Canada only) 32K print buffer to be installed. Any type of character can be downloaded.

Initializing the Download Areas

The Proprinter (U.S. model) does not copy the resident draft character set to the download buffer when the machine is switched on. The Proprinter in other countries and the Proprinter XL copy the resident draft character set to the download buffer when the machine is switched on. The download area can be explicitly initialized by sending an **ESC = 0 0** command.

The Proprinter II and Proprinter II XL copy the resident draft character set to the download area when the machine is switched on. The NLQ II download area is dynamically allocated from the receive buffer when the first NLQ II download command is received. When this command is received, the NLQ II download area is initialized to the resident NLQ II font.

The Proprinter III and Proprinter III XL might or might not initialize the draft download area when the machine is switched on. If you have printer-function-setting 7 on and you do not have the optional (U.S. and Canada only) 32K print buffer installed, the draft download area is initialized to code page 850. If the optional 32K print buffer is installed, the two NLQ II download areas are also initialized to code page 850 courier-like and italic fonts. If printer-function-setting 7 is off and the optional 32K print buffer is not installed, the draft download area is dynamically allocated from the receive buffer when the first draft download is received. If the optional 32K print buffer is installed, the draft download area is initialized to the code-page 437 draft font. The two NLQ II download areas are dynamically allocated from the receive buffer when the first NLQ II download command is received. The NLQ II download areas are then initialized to code-page 437 courier-like and italic fonts.

You can manually initialize the download areas for Proprinter II, II XL, III, and III XL. An **ESC = 0 0** command initializes only the draft download area to the resident draft or NLQ character set (code-page 437). **ESC = 01 00 20** is an alternative way to do the same thing as **ESC = 0 0**. **ESC = 01 00 21** initializes the NLQ II download areas to the resident NLQ II fonts (code-page

437). In the Proprinter III and Proprinter III XL, both NLQ II download areas are initialized by **ESC = 01 00 21**. One area is initialized to the courier-like font and the other area is initialized to the italic font.

For Proprinter III and Proprinter III XL, you can also use the Set Initial Conditions (SIC) command to initialize the download areas. See "Set Initial Conditions (SIC)" on page 4-50.

Downloading a Draft/NLQ Character Set

The **ESC =** command is used for downloading.

Syntax	ESC =
Data Structure	Hex 1B 3D
	Dec 27 61

This sequence starts a character download. Each **ESC =** sequence can download up to 256 consecutive characters to all members of the Proprinter family except Proprinter (U.S. model), which can receive only 94 consecutive characters. A later download can overlay an existing font, either completely or partially.

The cell size of the downloaded characters is 9 dots high by 12 dots wide. Dot 12 is assumed to be blank. Downloaded line-drawing characters are expanded to 12 dots high when printed.

The two parts of the **ESC =** escape sequence are:

1. **Part one** includes *count 1*, *count 2*, *printer ID byte*, and the *start code*. Use this part once for each **ESC =** command.
2. **Part two** is made up of 13 bytes of data. The first two bytes of data are the *2 attribute bytes*, and the remaining 11 bytes (3 through 13) are *printable data*. Repeat this part (2 attribute bytes plus 11 printable bytes) for each character you download.

Part One `CHR$(27);"=";CHR$(count1);
CHR$(count2);CHR$(20);CHR$(Start-code);`

Part Two `CHR$(attribute byte 1);CHR$(attribute
byte 2); CHR$(col.1);....CHR$(col.11);`

Downloading Details

This section shows how to specify the download count, ID byte, attributes, and printable data.

Determining the Count

Count 1 and *count 2* specify the number of bytes to be downloaded. To calculate the values of *count 1* and *count 2*:

1. Calculate the *total count* with this formula:

$$\text{total count} = (\text{number of characters} \times 13) + 2$$

2. If the total count is less than 256, then *count 1* = *total count* and *count 2* = 0. For example, for two characters:

$$\text{total count} = (2 \times 13) + 2 = 28$$

$$\text{count 1} = 28$$

$$\text{count 2} = 0$$

3. If the total count is 256 or more, divide the number of bytes by 256. *Count 1* = the remainder and *count 2* = the integer part of the result. For example, for 94 characters:

$$\text{total count} = (94 \times 13) + 2 = 1224$$

$$1224/256 = 4 \text{ } 200/256$$

$$\text{count 1} = 200$$

$$\text{count 2} = 4$$

Printer ID Byte

The printer ID byte is the value assigned to identify the printer. To download a font derived from the DP font to the Proprinter, XL, II, II XL, III, III XL, the ID byte is decimal 20.

Start Code

The start code is the ASCII decimal value (code point) for the first download character. The download characters replace normal characters starting at that code point. For example, to download a character set that replaces characters starting with the uppercase letter A, use a start-code equal to 65 (ASCII A = decimal 65). You can, of course, start your download character set at any point in the character table. All character codes must be consecutive from the start-code point.

Note: The Proprinter (U.S. model) receives download data only between X'21' and X'7E.'

Specifying the Download Data

Each font character is made up of 13 bytes of data. There are 2 bytes of attribute data and 11 bytes of printable data. The following information describes the specifications of the attribute bytes and the printable data.

Attribute Bytes (Bytes 1 and 2): Attribute bytes 1 and 2 are the first two bytes of each download character definition.

Attribute byte 1 specifies the character type and additional information.

Bit	Function
7	0 if the character is an ascending character. 1 if the character is a descending character (for example g). This bit is ignored if bit 0 or bit 1 is set to 1.
6 - 2	Currently ignored.

1,0

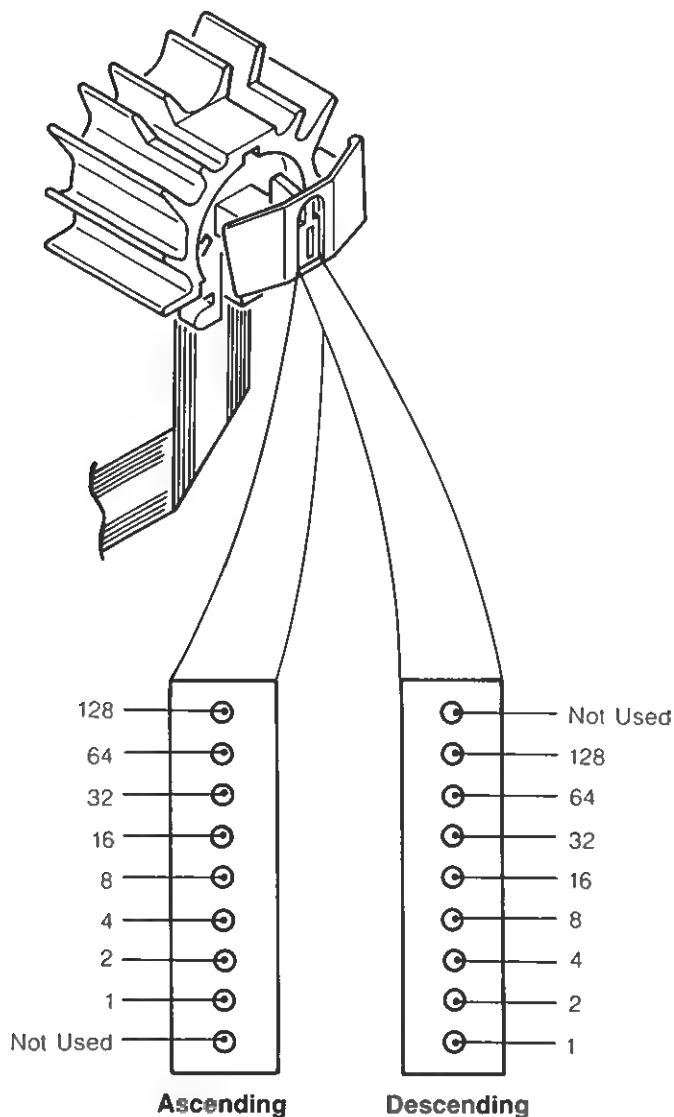
- 00** No 12-high expansion. Bit 7 is valid.
- 01** Line-drawing character. The dots in row 8 are extended downward to rows 9, 10, 11, and 12. Bit 7 is ignored. Use this mode to create characters similar to resident font characters 179 to 223.
- 10** Shading character. The dots in rows 1, 2, 3, and 4 are repeated as rows 9, 10, 11, and 12. NLQ mode is ignored. Use this mode to create characters similar to resident font characters 176 to 178.

Attribute byte 2 specifies proportional-spacing information. Bits 6 - 0 specify spacing information. Set these bits to 0 if proportional spacing is not desired. When you use proportional spacing with a downloaded font that has bits 6 - 0 set to 0, all 11 bytes of character data print.

Note: Proprinter does not print using proportional spacing.

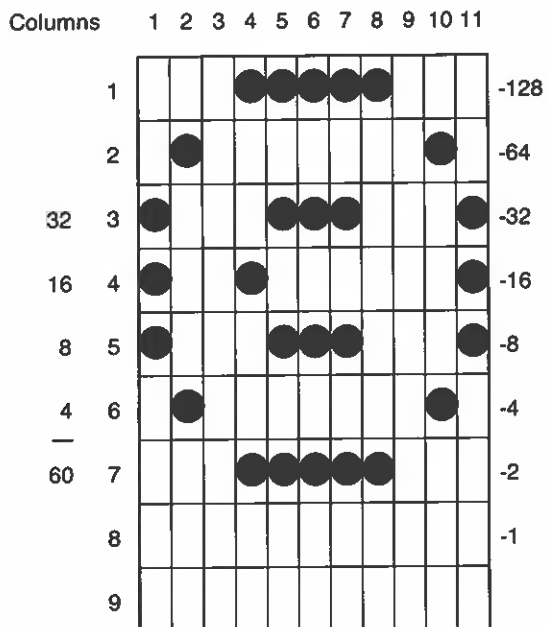
Bit	Function
7	Reserved
6,5,4	Interpreted as a binary number. Specifies the number of leading bytes to ignore. This number is the offset. Up to 7 bytes can be ignored. The count starts with byte 1.
3,2,1,0	Interpreted as a binary number. Specifies the number of dot-columns to be printed. Each character is followed by a mandatory blank byte that cannot be eliminated. This byte is not included in the character width. Widths greater than 11 will be treated as 11.

Printable Data (Bytes 3 through 13): Bytes 3 through 13 define the printable data. These bytes are unique to each character, and you must specify them for each download character. The printer prints one byte at a time. Each wire in the print head has a corresponding bit in each byte. To make the wire print, you switch the bit on (set it to one).



Designing and Downloading the Copyright (©) Symbol

Designing a Character for DP Mode: Determine the printable data by summing the values of the print wires that you want to print. This example shows how the 11 bytes of printable data for the © symbol were determined.



Decimal Values = 56 68 0 146 170 170 170 130 0 68 56

Hexadecimal Values = 38 44 00 92 AA AA AA 82 00 44 38

Downloading the Copyright (©) Symbol: This example replaces the at (@) character, decimal 64, with the copyright (©) symbol. This character is an ascender character without proportional spacing. *Count 1* and *count 2* for the example are:

total count = $(1 \times 13) + 2 = 15$

count 1 = 15

count 2 = 0

ID byte = CHR\$(20)

code = CHR\$(64)

attribute 1 = CHR\$(0)

attribute 2 = CHR\$(0)

Download Character Example

```
20 LPRINT CHR$(27); "="; CHR$(15); CHR$(0);  
   CHR$(20); CHR$(64); CHR$(0); CHR$(0);  
   CHR$(60); CHR$(66); CHR$(0); CHR$(153);  
   CHR$(165); CHR$(165); CHR$(165); CHR$(129);  
   CHR$(0); CHR$(66); CHR$(60);
```

This example loads data for the copyright symbol into the printer. The data remains in the download storage area until you:

- Set the power switch to Off (O).
- Overlay the data with other character data.
- Send the following to the printer to clear the download font buffer: LPRINT CHR\$(27); "="; CHR\$(0); CHR\$(0);

Using the Downloaded Character

When you want to print the copyright (©) symbol:

- To select the download characters, send ESC I 6 to the printer.
- To use the character, request ASCII character 64. In BASIC, the request is `LPRINT CHR$(64)`. The printer prints the © symbol.
- If you are using a Proprietary printer in the U.S., you should use ESC I 2 immediately following the symbol to return to the resident font. Because the U.S. model of the Proprietary printer does not initialize the download area, you must place an ESC I 6 immediately before each request and an ESC I 2 after each request.

Downloading a Fastfont Character Set

To download a Fastfont character, you must have a Proprinter II, II XL, III, or III XL.

Fastfont character sets are downloaded the same way as draft or NLQ fonts. The only difference is that for each character downloaded, bytes 12 and 13 (printable data) should be blank, because a Fastfont character can be no more than nine-dots wide.

After you have downloaded your Fastfont characters, use **ESC I 5** to select the downloaded characters.

For more information on downloading characters, see "Downloading a Draft/NLQ Character Set" on page 4-11.

Downloading an NLQ II Character Set

To download NLQ II characters, you must have a Proprinter II, II XL, III, or III XL. If you have a Proprinter II or II XL, the optional 8K (U.S. and Canada) print buffer must be installed. If you have a Proprinter III or III XL, the optional 32K (U.S. and Canada) print buffer must be installed.

The Proprinter II and II XL have 5.5K available for storing NLQ II downloaded characters. Only one NLQ II font can be stored in the download area. The 5.5K is part of the receive buffer and is allocated only for downloading on receipt of the first NLQ II download command.

The Proprinter III and III XL have 17K available for storing NLQ II downloaded characters. The 17K is divided into two download areas. Each download area can store one NLQ II font. The 17K download buffer is part of the receive buffer and is allocated for downloading on receipt of the first NLQ II download command. The first download area is initialized to a courier-like font. The other download area is initialized to an italic font. Since there are two download areas, you must select one of the areas for downloading before you send the download command. To select the first NLQ II download area, use **ESC I 7**; to select the second NLQ II download area, use **ESC I 15**.

The **ESC =** command is used for downloading. Read the following command description carefully to understand the differences between the **ESC =** command for NLQ II and the **ESC =** command for draft/NLQ and Fastfont.

Download Command (ESC =) for NLQ II

The **ESC =** command has two parts:

1. **Part one** includes *count 1*, *count 2*, *printer ID byte*, and the *start code*. Use this part once for each **ESC =** command.
2. **Part two** is made up of 48 bytes of data. The first two bytes of data are the *2 attribute bytes*, and the remaining 46 bytes (3 through 48) are *printable data*. The character grid for NLQ II is 23 dots wide by 18 dots high. There are two bytes of data for each dot column. Repeat part two (2 attribute bytes plus 46 printable bytes) for each character you download.

Part One `CHR$(27); "="; CHR$(count1);
CHR$(count2); CHR$(21); CHR$(Start-code);`

Part Two `CHR$(attribute byte 1); CHR$(attribute
byte 2); CHR$(1st pass of col.
1); CHR$(2nd pass of col.
1); ... CHR$(1st pass of col.
23); CHR$(2nd pass of col. 23);`

Determining the Count

Count 1 and *count 2* specify the number of bytes to be downloaded. To calculate the values of *count 1* and *count 2*:

1. Calculate the *total count* with this formula:
2. If the total count is less than 256, then *count 1* = *total count* and *count 2* = 0. For example, for two characters:

$$\text{total count} = (\text{number of characters} \times 48) + 2$$

$$\text{total count} = (2 \times 48) + 2 = 98$$

$$\text{count 1} = 98$$

$$\text{count 2} = 0$$

3. If the total count is 256 or more, divide the number of bytes by 256. *Count 1* = the remainder and *count 2* = the integer part of the result. For example, for 94 characters:

$$\text{total count} = (94 \times 48) + 2 = 4514$$

$$4514/256 = 17 \text{ } 162/256$$

$$\text{count 1} = 162$$

$$\text{count 2} = 17$$

Printer ID Byte

The printer ID byte is the value assigned to identify the printer. The ID for NLQ II is decimal 21.

Start Code

The start code is the ASCII value (code-point) for the first downloaded character. It must be in the range of hexadecimal X'00' to X'FF'. The download characters replace normal characters starting at that code point. For example, to download a character set that replaces characters starting with the uppercase letter A, use a start-code equal to X'41' (ASCII A = X'41'). You can, of course, start your downloaded character set at any point in the character table. All character codes must be consecutive from the start-code point.

Specifying the Download Data

Each font character is made up of 48 bytes of data. There are 2 bytes of attribute data and 46 bytes of character data. This field of 48 bytes must be repeated for each character. The section below describes the specifications of the attribute bytes and the character data.

Attribute Bytes (Bytes 1 and 2): Attribute bytes 1 and 2 are the first two bytes of each download character definition.

Attribute byte 1 specifies the character type and additional information.

Bit	Function
7	0 if the character is an ascending character. 1 if the character is a descending character (for example g). This bit is ignored if bit 0 or bit 1 is set to 1.
6 - 2	Currently ignored and should always be zero.
1,0	00 No 12-high expansion. Bit 7 is valid. 01 Line-drawing character. Expand the bottom row 15 down to rows 17, 19, 21, and 23. Expand the bottom row 16 down to rows 18, 20, 22, and 24. The ascender/descender bit (7) above is ignored. This type mode should be used to create characters similar to resident font characters 179 to 223 (decimal). 10 Shading character. Expand the top dots in rows 1, 3, 5, and 7 down to rows 17, 19, 21, and 23. Expand the top dots in rows 2, 4, 6, and 8 down to rows 18, 20, 22, and 24. The ascender/descender bit (7) is ignored. This type mode should be used to create characters similar to resident font characters 176 to 178 (decimal).

Attribute byte 2 is reserved when specifying NLQ II.

Character Data (Col 1 - Col 23): Character data defines the column data for each character from left to right. Although there are actually 24 columns to a character, the 24th column is always a blank. Therefore only 23 columns can be defined. There are two bytes per dot-column, so there are 46 bytes of printable data for each character.

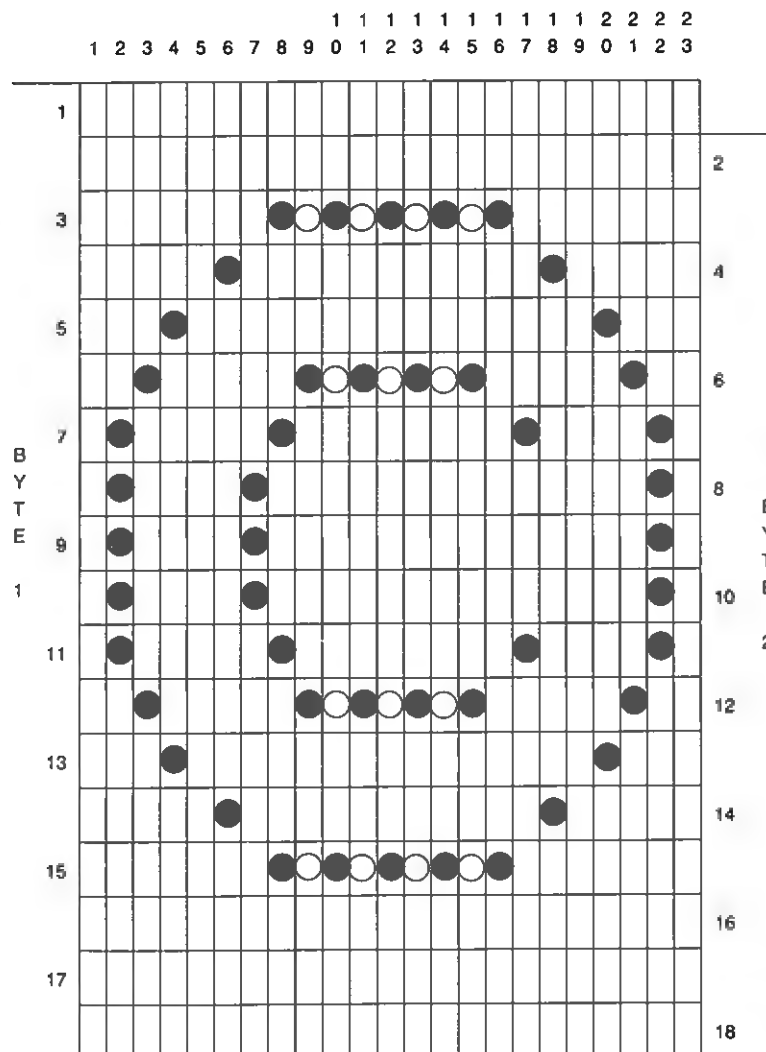
The two bytes of each dot-column are defined as follows. The first byte defines dot positions 1, 3, 5...15 for normal and ascending characters or 3, 5, 7...17 for descending characters. The second byte defines positions 2, 4, 6...16 for normal and ascending characters or 4, 6, 8...18 for descending characters.

Although consecutive horizontal dots are eliminated (except in emphasized mode), you should consider them in your design. The number of consecutive horizontal dots should always be ODD (for example 1, 3, 5, 7, 9) to ensure that a character appears the same when printed left-to-right or right-to-left.

The Proprietary II, II XL, III, and III XL do compression on the NLQ II downloaded character data. The compression algorithm is based on not storing a column that is identical to the column just to its left. If you designed your character without consecutive horizontal dots, then you cannot have any consecutive duplicate dot-columns. You can add consecutive horizontal dots to fill your design and act as place holders to take advantage of the compression algorithm.

This figure shows the copyright symbol as it is designed and printed. Solid dots indicate downloaded and printed dots. Hollow dots indicate dots that are added to fill the design and take advantage of the compression algorithm.

The Proprietary II and II XL each have 5.5K bytes of storage for NLQ II download characters. The Proprietary III and III XL each have 17K bytes of storage for NLQ II download characters. If you take advantage of data compression, you can store more character data in the storage area. For example, the 256 characters of the resident NLQ II font are stored in 5.5K. When the download area is full, additional download data is discarded.



Byte 1 00 1C 00 22 00 00 08 55 41 41 41 41 41 41 41 14 00 00 22 00 1C 00
 Byte 2 00 18 24 00 00 42 18 00 24 24 24 24 24 24 00 00 42 00 00 24 18 00

The following BASIC program downloads the copyright (©) symbol to replace the ampersand (&) symbol, and prints the © symbol.

```
10 REM Download a NLQ II copyright symbol
   into character 38
20 LPRINT CHR$(27);"=";CHR$(50);CHR$(0);CHR$(21);
   CHR$(38);CHR$(0);CHR$(0);CHR$(0);
   CHR$(0);CHR$(28);CHR$(24);CHR$(0);
   CHR$(36);CHR$(34);CHR$(0);CHR$(0);
   CHR$(0);CHR$(0);CHR$(66);CHR$(8);
   CHR$(24);CHR$(85);CHR$(0);CHR$(65);
   CHR$(36);CHR$(65);CHR$(36);
30 LPRINT CHR$(65);CHR$(36);CHR$(65);
   CHR$(36);CHR$(65);CHR$(36);
   CHR$(65);CHR$(36);CHR$(65);
   CHR$(36);CHR$(65);CHR$(0);
   CHR$(20);CHR$(0);CHR$(0);
   CHR$(66);CHR$(0);CHR$(0);
   CHR$(34);CHR$(0);CHR$(0);
   CHR$(36);CHR$(28);CHR$(24);
   CHR$(0);CHR$(0);
40 LPRINT CHR$(27);"I";CHR$(7);
   "This is download NLQ II, print ";CHR$(38)
```

Character Design and Downloading for the Proprinter X24, XL24, X24E, and XL24E

This information shows you how to design and download characters for the 24-wire series of Proprinters. The examples use binary and hexadecimal notation to describe the procedure. The information can be applied to most programming languages.

To download the information to the Proprinter X24, XL24, X24E, and XL24E, you must have the FontSet Module installed. The module supplies the additional memory necessary for downloading.

Design Considerations

The 24-wire printers use a character matrix that is 24-dots high. The width of the character matrix can vary. Typical monospaced characters widths are:

- Draft - 10 dots
- 10 CPI LQ - 36 dots
- 12 CPI LQ - 30 dots.

Proportional characters in the Proprinter X24, XL24, X24E, and XL24E are based on a 7-unit width system where 1 unit is equal to 1/60 inch. Because 1 dot-column equals 1/360 inch, 1 unit is equal to 6 dot-columns. Proportional character width may vary from 3 units to 7 units.

If you want to design a character that is n dots wide, you can only use $n-1$ dots. The n th dot-column must always be specified as a blank. For example, a 10 CPI character that is 36 dot-columns wide is designed with 35 dot-columns of data; the last column must be specified as a blank.

Row 20 is generally used as the baseline. However, you may use all 24 rows for your character design.

The Proprietary X24, Proprietary XL24, Proprietary X24E, and Proprietary XL24E cannot print two horizontal dots next to each other. If you design a character with consecutive horizontal dots, the first dot prints, and the second does not. Every alternate dot in the row of consecutive dots is printed starting with the 1st, 3rd, 5th, and so on, until the group of consecutive dots ends (that is, there is a break in the row of dots). The inability to print consecutive horizontal dots is not direction dependent. If you are printing left to right, the first consecutive dot in the design is printed and the dot to its right is not printed. If you are printing right to left on a Proprietary X24 or XL24, the last consecutive dot in the design is printed, and the dot to its left is not printed. If you are printing right to left on a Proprietary X24E or XL24E, the internal algorithms compensate and print the design as it would appear if printed from left to right.

After you have designed the character, you can compress the character data to conserve memory. The compression algorithm is based on not storing a column that is identical to the column just to its left. To compress a character design, you must add consecutive dots to fill the design and act as place holders.

After completing the design, calculate the character data and the lookup table data. Then download the data and print the character.

The Download Sequence

This information shows the download sequence. The download sequence is used to download character data, lookup table data, and for an entire font, the font descriptor byte. Following this discussion are examples using the sequence. The examples include designing and downloading a monospaced draft character and designing and downloading a proportional character.

The download sequence is:

ESC =(Countlow)(Countlow)(ID Byte)
(Start-Low)(Start-High)(Data)

Count	Count is the number of bytes of data being downloaded starting with the printer ID byte. The count is a 2-byte hexadecimal value downloaded as the low byte followed by the high byte.
Printer ID Byte	The printer ID byte is a 1-byte number that identifies the printer. The ID byte for the Proprinter X24, XL24, X24E, and XL24E is decimal 35 or X'23'.
Start Address	When downloading character data, the start address is the absolute address of the start of the character data. When downloading lookup table data, the start address is the address of the new entry in the lookup table. The start address is a 2-byte hexadecimal value downloaded as the low byte followed by the high byte.
Data	When data is character data, it comes from the character design. When downloading lookup table data, data is as follows:

Data Entry When Downloading Lookup Table Data

Bytes 1 and 2	The absolute address of the character's image data.
Byte 3 (Attribute Byte 1)	
Bit 7	1 indicates that this is a block graphic character (connects at 6 LPI).
Bit 6	0 indicates a downloaded character. 1 indicates a resident character.
Bits 5-0	The number of character data dot-columns stored in memory.

Byte 4 (Attribute Byte 2)

- Bits 7,6** The type of block graphic character.
00 = Shading Character
01 = Line Drawing Character
10 = Underscore Character
11 = Not Supported
- Bits 5-0** The number of dot-columns of character data printed minus one.
For a 10 CPI letter quality
36 column character, bits 5-0 would be 35.

Bytes 5-9

Used for the compression mask. There is one bit per dot-column with bit 7 of byte 5 mapping to the leftmost column. For a character with 36 dot-columns when decompressed, bit 4 of byte 9 would map to the rightmost column. All zeros indicate that a character is not compressed. If a proportional character has more dot-columns than compression mask bits, then the remaining dot-columns must be stored without compression. Only 39 dot-columns can be compressed. Bit 40 of the compression mask is reserved.

Lookup Tables Notes

- ASCII Character 255, X'FF' cannot be defined. It is a mandatory space and is the same size as ASCII character 32, X'20'.
- ASCII Character 0, X'00' is the zero slash. Whatever character is downloaded to X'00' will replace the zero. If the zero slash is selected from the operator panel, the download character is printed instead of ASCII character X'30'.
- All block graphic characters are 30 dots high, even though only 24 dots are defined for each column. An underscore character is defined as a blank-block graphic character (all zeros). The underscore is generated by the printer during the second pass. A shading-block graphic character repeats dots 1-6 of each column as dots 25 through 30 respectively. A line-drawing-block graphic character repeats dots 23 and 24 as the pairs 25 and 26, 27 and 28, and 29 and 30.
- An entry can point to any character data image whether resident or downloaded. Multiple entries can point to the same image. The address of an undefined entry should be zeros. An undefined entry is printed as a space.

Managing the Download Area

If you are downloading and know the status of preceding download information, you should not have any conflicts in character management. If, however, there is previously downloaded information in the download area and you are not sure of its status, you can write over the download area with the resident lookup tables for code-page 437. To write over any existing download data, you can send ESC = 0 0.

Sending ESC = 0 0 clears existing download data, copies the resident lookup tables to the download area, and erases information you saved using selection 5 (Proprinter X24 and XL24) or selection 4 (Proprinter X24E and XL24E) in the setup-mode menu. You can send ESC = 0 0 with X'1B3D0000' or in BASIC,
LPRINT CHR\$(&H1B);CHR\$(&H3D);CHR\$(&H00);
CHR\$(&H00);

Note: The lookup tables copied using the ESC = 0 0 command point to the resident code-page 437 (U.S.) fonts. The code-page ID is zeroed (Proprinter X24E and XL24E only) to aid switching between resident and downloaded fonts with ESC I commands. After receiving an ESC = 0 0 command, the download area appears empty and the pitch lights do not indicate a download is available. Any valid download command activates the download access.

If you are using a Proprinter X24E or XL24E and your download starts at location X'800F' (NLS lock-out byte), the code-page ID is automatically zeroed. If you want to load only the NLS lock-out byte without changing the code-page ID; load two bytes, X'800E' (unused) with a zero and X'800F' with the new lock-out value.

For more information about the code-page ID (Proprinter X24E and XL24E) and the NLS lock-out value, see "Downloading a New Font" on page 4-48.

The following two headings give examples to get you started. The first is an example of designing and downloading a draft character without compression. The second example illustrates how to design and download a proportional character with compression. Following the examples is a discussion of downloading an entire font.

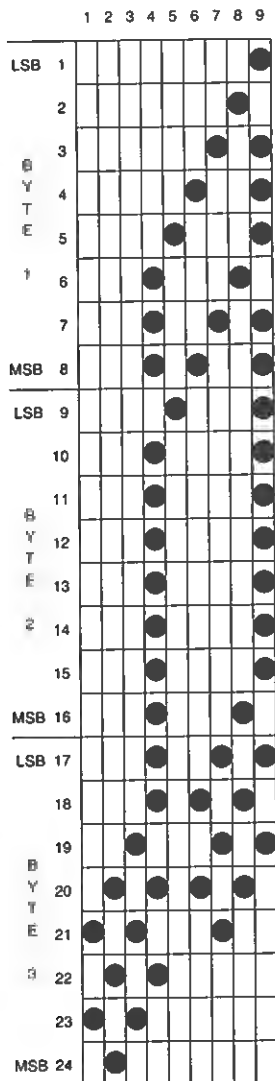
Designing Monospaced Draft Characters

When designing monospaced draft characters, it is best to design the character for 10 CPI output and use as many dot-columns as possible. This method also creates a better designed 12 CPI draft character.

To design a draft character, start with a 9 dot wide by 24 dot high grid. Although the character matrix for a draft character is 10 dots wide, the last column must be blank.

This example shows the draft design for the two-sixteenth-notes character (ASCII 14) from the all characters chart. Because this design does not use consecutive horizontal dots, you cannot use character compression.

Note: A blank column must be added after the last column of this character.



Byte 1 00 00 00 07 08 11 22 44 8B
 Byte 2 00 00 00 7F 80 00 00 01 FE
 Byte 3 0A 15 2A D4 00 50 A8 50 A0

Creating the Character Data

Each dot-column is sent to the printer as three bytes of data. To get the value for the first byte of data, convert the binary values of the top eight print wires to hexadecimal. To get the value for the second byte of data, convert the binary values of the center eight print wires to hexadecimal. To get the value for the third byte of data, convert the binary values of the bottom eight print wires to hexadecimal. The most significant bit of each byte is the top dot. The least significant bit of each byte is the bottom dot.

The figure on page 4-32 shows the hexadecimal value for each byte in each column of the character. For example, the last byte of column one is binary 0000 1010 or hexadecimal 0A. Therefore the character data is (spaces are added for clarity):

```
X'00000A 000015 00002A 077FD4 088000
110050 2200A8 440150 BBFEA0'
```

Downloading the Character Data

- You can start the character data at any unused memory address greater than X'A413'. This example uses X'B000'.
- Send the following to the printer. (Spaces are added for clarity.)

```
X'1B 3D 2100 23 00B0
00000A 000015 00002A 077FD4 088000
110050 2200A8 440150 BBFEA0 000000'
```

- X'1B' is the ESC character.
- X'3D' is the = character.
- X'2100' is the count, low byte first then high byte.
- X'23' is the printer ID byte (35 decimal).
- X'00B0' is the start address, low byte first then high byte.
- The remaining data is the character data from the bottom of the two-sixteenth-notes figure plus the last blank column.

This BASIC statement downloads character data to the printer.

```
LPRINT CHR$( &H1B );CHR$( &H3D );CHR$( &H21 );  
CHR$( &H00 );CHR$( &H23 );CHR$( &H00 );CHR$( &HB0 );  
CHR$( &H00 );CHR$( &H00 );CHR$( &H0A );CHR$( &H00 );  
CHR$( &H00 );CHR$( &H15 );CHR$( &H00 );CHR$( &H00 );  
CHR$( &H2A );CHR$( &H07 );CHR$( &H7F );CHR$( &HD4 );  
CHR$( &H08 );CHR$( &H80 );CHR$( &H00 );CHR$( &H11 );  
CHR$( &H00 );CHR$( &H50 );CHR$( &H22 );CHR$( &H00 );  
CHR$( &HA8 );CHR$( &H44 );CHR$( &H01 );CHR$( &H50 );  
CHR$( &HBB );CHR$( &HFE );CHR$( &HA0 );CHR$( &H00 );  
CHR$( &H00 );CHR$( &H00 );
```

Creating the Lookup Table Data

Before creating lookup table data, make note of the following memory addresses.

- The valid download address range for the Proprinter X24 and XL24 is X'800F' to X'FFFF'.
- The valid download address range for the Proprinter X24E and XL24E is X'800C' to X'FFFF'.
- The character 0 lookup table entry addresses for the resident fonts are:
 - Draft (10 and 12 CPI) - X'8011'
 - Courier 10 CPI Letter Quality - X'8912'
 - Courier Proportional LQ - X'9213'
 - Prestige Elite 12 CPI LQ - X'9B14'
- Download character data can start at any address greater than X'A413'.

In this example the inverted exclamation mark, ASCII character 173, is replaced with the two-sixteenth-notes character. Entry zero of the draft table starts at X'8011' and there are nine bytes per entry, so:

$9 * 173 = 1557 = X'615'$ (the offset into the table)
 $X'615' + X'8011' = X'8626'$ (offset + character 0
lookup table address)

The address for the new lookup table entry for
ASCII character 173 is X'8626'.

Downloading the Lookup Table Data

Send the following lookup table information to the printer:
(Spaces are added for clarity).

X'1B 3D 0C00 23 2686 B000 0A 09 0000000000'

- X'1B' is the ESC character.
- X'3D' is the = character.
- X'0C00' is the count, low byte first then high byte.
- X'23' is the printer ID byte (35 decimal).
- X'2686' is the address of the new entry in the lookup table, low byte first then high byte calculated above.
- Lookup table download data:
 - X'B000' is the start address of the character data, high byte first then low byte.
 - X'0A' is the number of stored columns, including the last blank column.
 - X'09' is the number of columns of data when the character is printed not including the last blank column.
 - X'0000000000' indicates the 5 mask bytes which are zero because the character data is stored without compression.

This BASIC statement downloads lookup table data to the printer.

```
LPRINT CHR$( &H1B );CHR$( &H3D );CHR$( &H0C );  
CHR$( &H00 );CHR$( &H23 );CHR$( &H26 );CHR$( &H86 );  
CHR$( &HB0 );CHR$( &H00 );CHR$( &H0A );CHR$( &H09 );  
CHR$( &H00 );CHR$( &H00 );CHR$( &H00 );CHR$( &H00 );  
CHR$( &H00 );
```

Printing the Character

To print the character at 12 CPI download draft, send the following sequence:

`X'1B490CAD'`

- `X'1B'` is the ESC character.
- `X'49'` is the I character.
- `X'0C'` selects downloaded draft 12 CPI.
- `X'AD.'` is the ASCII character 173.

This BASIC statement prints the download character in 10 CPI draft.

```
LPRINT CHR$( &H1B ) ; CHR$( &H49 ) ; CHR$( &H04 ) ; CHR$( &HAD ) ;
```

This BASIC program sends ESC = 0 0, downloads and prints the two-sixteenth-notes character.

```
100 WIDTH "LPT1:",255
110 REM Download a Draft Character to
Proprietary X24 or XL24
120 REM Use ESC = 0 0 to initialize the
Download Area
130 LPRINT CHR$(&H1B);CHR$(&H3D);
CHR$(&H00);CHR$(&H00);
140 REM Download the Character Data for the
new ASCII Character 173
150 LPRINT CHR$(&H1B);CHR$(&H3D);CHR$(&H21);
CHR$(&H00);CHR$(&H23);CHR$(&H00);
160 LPRINT CHR$(&HB0);CHR$(&H00);CHR$(&H00);
CHR$(&HOA);CHR$(&H00);CHR$(&H00);
170 LPRINT CHR$(&H15);CHR$(&H00);CHR$(&H00);
CHR$(&H2A);CHR$(&H07);CHR$(&H7F);
180 LPRINT CHR$(&HD4);CHR$(&H08);CHR$(&H80);
CHR$(&H00);CHR$(&H11);CHR$(&H00);
190 LPRINT CHR$(&H50);CHR$(&H22);CHR$(&H00);
CHR$(&HA8);CHR$(&H44);CHR$(&H01);
200 LPRINT CHR$(&H50);CHR$(&HBB);CHR$(&HFE);
CHR$(&HA0);CHR$(&H00);CHR$(&H00);
210 LPRINT CHR$(&H00);
220 REM Download the Lookup Table Entry to
replace ASCII Character 173
230 LPRINT CHR$(&H1B);CHR$(&H3D);CHR$(&H0C);
CHR$(&H00);CHR$(&H23);CHR$(&H26);
240 LPRINT CHR$(&H86);CHR$(&HB0);CHR$(&H00);
CHR$(&HOA);CHR$(&H09);CHR$(&H00);
250 LPRINT CHR$(&H00);CHR$(&H00);
CHR$(&H00);CHR$(&H00);
260 REM Use ESC I Command to select the
Download Font and print the Character
in 10 CPI draft
270 LPRINT CHR$(&H1B);CHR$(&H49);CHR$(&H04);
CHR$(&HAD);
280 END
```

Designing Proportionally Spaced Characters

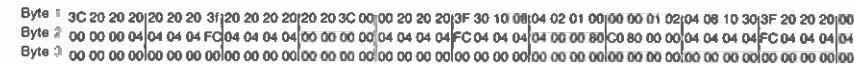
Proportional characters in the Proprinter X24, Proprinter XL24, Proprinter X24E, and Proprinter XL24E are based on a 7-unit width system described in "Design Considerations" on page 4-26.

Typical proportional character widths are:

- 3 unit character - 18 dot-columns wide (3 x 6)
- 4 unit character - 24 dot-columns wide (4 x 6)
- 5 unit character - 30 dot-columns wide (5 x 6)
- 6 unit character - 36 dot-columns wide (6 x 6)
- 7 unit character - 42 dot-columns wide (7 x 6).

You are not restricted to following this unit system when designing a proportional character. However, you may not design a character that is wider than 42 dots.

1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 3 4 4
1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1



Mask 0 0 1 0 1 1 1 0 0 1 1 1 0 1 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

 2 F 7 4 3 0 0 0 0 2

Creating the Character Data

Each dot-column is sent to the printer as three bytes of data. To get the value for the first byte of data, convert the binary values of the top eight print wires to hexadecimal. To get the value for the second byte of data, convert the binary values of the center eight print wires to hexadecimal. To get the value for the third byte of data, convert the binary values of the bottom eight print wires to hexadecimal. The most significant bit of each byte is the top dot. The least significant bit of each byte is the bottom dot.

The figure shows the hexadecimal value for each byte in each column of the character. For example, the first byte of column one is binary 0011 1100 or hexadecimal 3C.

Compressing the Character

To make a compression mask, set the mask bit for each column without a duplicate to the left to zero, and all consecutive repeating columns to one. Note that only 39 columns can be compressed. The figure on page 4-39 shows that column 40 is the same as column 39, however, column 40 must be stored. Therefore, compression mask bit 40 is set to zero.

Next, convert the binary values to hexadecimal. The compression mask for the TM symbol is:

X'2E74300002'

If you use compression, download only dot-columns with mask bits set to zero. Data, with mask bits set to one, is generated by the printer according to the compression mask.

Downloading the Character Data

- You can start the character data at any unused memory address greater than X'A413'. This example uses X'A414'.
- Send the following to the printer. (Spaces are added for clarity.)

```
X'1B 3D 6000 23 14A4
3C0000 200000 200400 3FFC00 200400 200000
3C0000 000000 000400 200400 3FFC00 300400
100400 080400 040400 020000 010000 008000
00C000 008000 010000 020000 040400 080400
100400 300400 3FFC00 200400 200400 000400
000000'
```

- X'1B' is the ESC character.
- X'3D' is the = character.
- X'6000' is the count, low byte first then high byte.
- X'23' is the printer ID byte (35 decimal).
- X'14A4' is the start address, low byte first then high byte.
- The remaining data is the character data taken from the figure plus the last blank column. Note that consecutive duplicate dot-columns are not sent with the character data *unless* the character is wider than 39 columns. Columns 40 and 41 are not compressed. Consecutive duplicate dot-columns are added back in according to the compression mask.

This BASIC statement downloads the character data to the printer.

```
LPRINT CHR$( &H1B );CHR$( &H3D );CHR$( &H60 );  
CHR$( &H00 );CHR$( &H23 );CHR$( &H14 );CHR$( &HA4 );  
CHR$( &H3C );CHR$( &H00 );CHR$( &H00 );CHR$( &H20 );  
CHR$( &H00 );CHR$( &H00 );CHR$( &H20 );CHR$( &H04 );  
CHR$( &H00 );CHR$( &H3F );CHR$( &HFC );CHR$( &H00 );  
CHR$( &H20 );CHR$( &H04 );CHR$( &H00 );CHR$( &H20 );  
CHR$( &H00 );CHR$( &H00 );CHR$( &H3C );CHR$( &H00 );  
CHR$( &H00 );CHR$( &H00 );CHR$( &H00 );CHR$( &H00 );  
CHR$( &H00 );CHR$( &H04 );CHR$( &H00 );CHR$( &H20 );  
CHR$( &H04 );CHR$( &H00 );CHR$( &H3F );CHR$( &HFC );  
CHR$( &H00 );CHR$( &H30 );CHR$( &H04 );CHR$( &H00 );  
CHR$( &H10 );CHR$( &H04 );CHR$( &H00 );CHR$( &H08 );  
CHR$( &H04 );CHR$( &H00 );CHR$( &H04 );CHR$( &H04 );  
CHR$( &H00 );CHR$( &H02 );CHR$( &H00 );CHR$( &H00 );  
CHR$( &H01 );CHR$( &H00 );CHR$( &H00 );CHR$( &H00 );  
CHR$( &H80 );CHR$( &H00 );CHR$( &H00 );CHR$( &HC0 );  
CHR$( &H00 );CHR$( &H00 );CHR$( &H80 );CHR$( &H00 );  
CHR$( &H01 );CHR$( &H00 );CHR$( &H00 );CHR$( &H02 );  
CHR$( &H00 );CHR$( &H00 );CHR$( &H04 );CHR$( &H04 );  
CHR$( &H00 );CHR$( &H08 );CHR$( &H04 );CHR$( &H00 );  
CHR$( &H10 );CHR$( &H04 );CHR$( &H00 );CHR$( &H30 );  
CHR$( &H04 );CHR$( &H00 );CHR$( &H3F );CHR$( &HFC );  
CHR$( &H00 );CHR$( &H20 );CHR$( &H04 );CHR$( &H00 );  
CHR$( &H20 );CHR$( &H04 );CHR$( &H00 );CHR$( &H00 );  
CHR$( &H04 );CHR$( &H00 );CHR$( &H00 );CHR$( &H00 );  
CHR$( &H00 );
```

Creating the Lookup Table Data

Before downloading lookup table data or character data, make note of the following memory addresses.

- The valid download address range for the Proprietary X24 and XL24 is X'800F' to X'FFFF'.
- The valid download address range for the Proprietary X24E and XL24E is X'800C' to X'FFFF'.
- The character 0 lookup table addresses for the resident fonts are:
 - Draft (10 and 12 CPI) - X'8011'
 - Courier 10 CPI Letter Quality - X'8912'
 - Courier Proportional LQ - X'9213'
 - Prestige Elite 12 CPI LQ - X'9B14'.
- Download character data can start at an address greater than X'A413'.

In this example the inverted exclamation mark, ASCII character 173, is replaced with the trademark symbol. Entry zero of the proportional table starts at X'9213' and there are nine bytes per entry, so:

$9 * 173 = 1557 = X'615'$ (the offset into the table)
 $X'615' + X'9213' = X'9828'$
(offset + character 0
lookup table address)

The address for the new lookup table entry for ASCII character 173 is X'9828'.

Downloading the Lookup Table Data

Send the following lookup table information to the printer:
(Spaces are added for clarity.)

X'1B 3D 0C00 23 2898 A414 1F 29 2E74300002'

- X'1B' is the ESC character.
- X'3D' is the = character.
- X'0C00' is the count, low byte first then high byte.
- X'23' is the printer ID byte (35 decimal).
- X'2898' is the address of the new entry in the lookup table, low byte first then high byte.
- Lookup table download data.
 - X'A414' is the start address of the character data, high byte first then low byte.
 - X'1F' the number of stored columns, including the last blank column.
 - X'29' is the number of columns of data when the character is printed not including the last blank column.
 - The remaining data is the compression mask.

This BASIC statement downloads lookup table data to the printer.

```
LPRINT CHR$(&H1B);CHR$(&H3D);CHR$(&H0C);  
CHR$(&H00);CHR$(&H23);CHR$(&H28);CHR$(&H98);  
CHR$(&HA4);CHR$(&H14);CHR$(&H1F);CHR$(&H29);  
CHR$(&H2E);CHR$(&H74);CHR$(&H30);CHR$(&H00);  
CHR$(&H02);
```

Printing the Character

To print the character, send the following sequence:

X' 1B4907AD'

- 1B is the ESC character.
- 49 is the I character.
- 07 selects the download proportional font.
- AD is the ASCII character 173.

This BASIC statement prints the character.

```
LPRINT CHR$( &H1B) ;CHR$( &H49) ;CHR$( &H07) ;  
CHR$( &HAD) ;
```

This BASIC program sends ESC = 0 0, downloads, and prints the trademark symbol.

```
100 WIDTH "LPT1:",255
110 REM Download a Proportional Character to
Proprietary X24 or XL24
120 REM Use ESC = 0 0 to initialize the
Download Area
130 LPRINT CHR$(&H1B);CHR$(&H3D);CHR$(&H00);
CHR$(&H00);
140 REM Download the Character Data for the
new ASCII Character 173
150 LPRINT CHR$(&H1B);CHR$(&H3D);CHR$(&H60);
CHR$(&H00);CHR$(&H23);CHR$(&H14);
160 LPRINT CHR$(&HA4);CHR$(&H3C);CHR$(&H00);
CHR$(&H00);CHR$(&H20);CHR$(&H00);
170 LPRINT CHR$(&H00);CHR$(&H20);CHR$(&H04);
CHR$(&H00);CHR$(&H3F);CHR$(&HFC);
180 LPRINT CHR$(&H00);CHR$(&H20);CHR$(&H04);
CHR$(&H00);CHR$(&H20);CHR$(&H00);
190 LPRINT CHR$(&H00);CHR$(&H3C);CHR$(&H00);
CHR$(&H00);CHR$(&H00);CHR$(&H00);
200 LPRINT CHR$(&H00);CHR$(&H00);CHR$(&H04);
CHR$(&H00);CHR$(&H20);CHR$(&H04);
210 LPRINT CHR$(&H00);CHR$(&H3F);CHR$(&HFC);
CHR$(&H00);CHR$(&H30);CHR$(&H04);
220 LPRINT CHR$(&H00);CHR$(&H10);CHR$(&H04);
CHR$(&H00);CHR$(&H08);CHR$(&H04);
230 LPRINT CHR$(&H00);CHR$(&H04);CHR$(&H04);
CHR$(&H00);CHR$(&H02);CHR$(&H00);
240 LPRINT CHR$(&H00);CHR$(&H01);CHR$(&H00);
CHR$(&H00);CHR$(&H00);CHR$(&H80);
250 LPRINT CHR$(&H00);CHR$(&H00);CHR$(&HC0);
CHR$(&H00);CHR$(&H00);CHR$(&H80);
260 LPRINT CHR$(&H00);CHR$(&H01);CHR$(&H00);
CHR$(&H00);CHR$(&H02);CHR$(&H00);
270 LPRINT CHR$(&H00);CHR$(&H04);CHR$(&H04);
CHR$(&H00);CHR$(&H08);CHR$(&H04);
280 LPRINT CHR$(&H00);CHR$(&H10);CHR$(&H04);
CHR$(&H00);CHR$(&H30);CHR$(&H04);
290 LPRINT CHR$(&H00);CHR$(&H3F);CHR$(&HFC);
CHR$(&H00);CHR$(&H20);CHR$(&H04);
300 LPRINT CHR$(&H00);CHR$(&H20);CHR$(&H04);
CHR$(&H00);CHR$(&H00);CHR$(&H04);
310 LPRINT CHR$(&H00);CHR$(&H00);CHR$(&H00);
CHR$(&H00);
```

```
320 REM Download the Lookup Table Entry to
replace ASCII Character 173
330 LPRINT CHR$(&H1B);CHR$(&H3D);CHR$(&H0C);
CHR$(&H00);CHR$(&H23);CHR$(&H28);
340 LPRINT CHR$(&H98);CHR$(&HA4);CHR$(&H14);
CHR$(&H1F);CHR$(&H29);CHR$(&H2E);
350 LPRINT CHR$(&H74);CHR$(&H30);CHR$(&H00);
CHR$(&H02);
360 REM Use ESC I Command to select the Download
Font and print the Character
370 LPRINT CHR$(&H1B);CHR$(&H49);CHR$(&H07);
CHR$(&HAD);
380 END
```

Downloading a New Font

The first step in downloading a new font is designing and creating the character data for the characters in the font. You can download up to 256 characters. You may "share" resident characters by loading the lookup table entry with the address of the resident character and setting bit 6 in attribute byte 1 to 1. This indicates a resident character. Then set the other bytes of the lookup table entry appropriately. Appendix A shows the lookup table entries for all resident characters. Use Appendix A to get information about addresses and masks if you want to share resident characters. After selecting the characters you want to download and those you want to use from the resident fonts, you must create the character data and download it. Next, you must download the lookup table, being careful to use the correct addresses and masks for any shared characters.

The first downloadable address is X'800C' (Proprinter X24E and XL24E only). This is the first (high) byte of a two-byte code-page ID. The second (low) byte is stored at X'800D'. A zero code-page ID lets you switch between the resident fonts and downloaded fonts with the ESC I command. If the download font's code page ID is not zero and does not match the selected resident font, then a Set-Code Page command is required to select the font.

Note: The ESC = 0 0 command resets the code-page ID to 0 0. A download starting at location X'800F' also clears the code-page ID.

Address X'800E' is reserved and you should set it to zero.

The fourth downloadable address is X'800F'. (This is true of Proprinter X24E and XL24E only; it is the first downloadable address for Proprinter X24 and XL24.) This is the NLS lock-out byte. This byte controls the behavior of the operator panel pitch lights and the operator panel pitch key. Set this byte to zero if no change is desired to the default mode. For lock-out, set this byte to X'C4'. In lock-out mode, the operator panel cannot switch between resident and downloaded fonts (ESC I in the data stream can) and the pitch lights are not inverted for downloaded fonts. Note that ESC = 0 0 resets the NLS lock-out byte to 0.

The first lookup table must always begin at address X'8010'. If a second lookup table is present, it must begin at X'8911'. A third and fourth lookup table should begin at X'9212' and X'9B13' respectively. Four is the maximum number of lookup tables that

may be accessed. Character data can begin at address X'A414' or greater.

The first byte of any lookup table is the font descriptor byte. This byte should not be changed unless you are downloading a new lookup table. Changing this byte does not change the font characteristics. If the font descriptor byte does not match the characteristics of the font you have downloaded, the characters are unrecognizable when printed.

The font descriptor byte identifies the default font (the first font marked default is chosen if no user defined default has been stored using the operator panel menu), tells if another lookup table follows this one, and identifies the quality of the font. If the default font has a non-zero code-page ID (Proprinter X24E and XL24E), that code-page ID becomes the active code page when the printer is switched on. For letter quality fonts, the font descriptor byte also identifies the pitch of the font. If multiple lookup tables have the same combinations of pitch and quality, only the first one is accessible.

The Font Descriptor Byte

Bit 7	1 = this is the default font.
Bit 6	1 = another lookup table follows.
Bits 5,4	Reserved (Should be zero).
Bits 3-0	The quality and pitch field. 0000 = Draft 0001 = 10 CPI Letter Quality 0010 = 12 CPI Letter Quality 0011 = Proportional (Other values are not valid).

The pointers, control bytes, and compression masks for the 256 characters that make up an ASCII font reside in the next 2304 bytes of storage. Each character entry is nine bytes long. The entries are in ASCII order (character 0 is first and character 255 is last). The first two bytes of each entry are the absolute address of the first byte of the character's image data and are stored high-byte first, then low-byte. For examples of the download sequence, see "Designing Proportionally Spaced Characters" on page 4-38 or "Designing Monospaced Draft Characters" on page 4-31.

Set Initial Conditions (SIC)

This command is supported by the Proprinters III, III XL, X24E, and XL24E.

```
Syntax  ESC [ K countlow counthigh init ID
parm1                                     parm2
```

Data Structure	Hex
	1B 5B 4B n ₁ n ₂ init id p ₁ p ₂

Dec							
27	91	75	n_1	n_2	init	id	p_1, p_2

This command causes the printer to be reset to an initial state based on the parameters that follow. All data that has not been printed is printed before the printer is initialized.

COUNT COUNT is the number of bytes of data beginning with the **INIT** byte. The **COUNT** byte is a two-byte hexadecimal value that is processed low byte followed by high byte.

INIT This is the initialization byte. When you select this byte, the SIC command determines the kind of initialization that is performed. Either the factory default settings or user defined settings are used and those settings might or might not be saved permanently.

This byte supports six values. They are 0, 1, 4, 5, 254, and 255. If you specify an **INIT** value of 0, 1, or 254, the printer uses the user-defined **MODE** settings. If you specify the **INIT** value 4, 5, or 255, the printer uses the factory-default **MODE** settings.

ID This byte specifies the printer for which the following device-dependent parameter bytes are intended. If the ID does not address your printer, the parameter bytes that follow are ignored. The Proprinter III and III XL recognize ID values X'03' and X'16'. The Proprinter X24E and XL24E recognize ID values X'03', X'16', X'23', and X'24'.

PARMS The parameters are optional bytes(s) that can override the printer-function settings. If you specify an **INIT** value of 00, 01, 04, or 05, this override is temporary and will be cancelled when the printer is initialized. If you specify an **INIT** value of 254 or 255, the parameters are saved as the user-defined printer-function settings.

Note: For information on the factory default settings, see "Proprinter III and III XL Settings" on page 2-10 or "Proprinter X24E and Proprinter XL24E Settings" on page 2-16.

The INIT Byte

The possible values for the INIT byte are 0, 1, 4, 5, 254, and 255. The following is a description for each value:

INIT = 0 If you specify 00, the printer modes and printer-function settings are initialized using the user default settings. The download font area remains unchanged. If you select a download font, it will stay selected. If you specify a parameter (for example, count > 2), the parameter overrides the user-printer-function settings.

INIT = 1 If you specify 01, the printer modes and printer-function settings are initialized using the user default settings. The download font area is initialized according to printer-function-setting 7 (code-page 437 or 850) for the Proprinter III and III XL.

For the Proprinter X24E and XL24E, the download font area is initialized to code-page 437. Depending on how you have the printer-function-setting 6 set, the code page is reset to either 437 or 850. If you specify a parameter, the parameter overrides the user-printer-function settings.

INIT = 4 If you specify 04, the printer modes and printer-function settings are initialized using the factory default settings. The download font area remains unchanged. The download font selection is reset to the resident draft font selection. If you specify a parameter, the parameter overrides the factory printer-function settings.

INIT = 5 If you specify 05, the printer modes and printer-function settings are initialized using the factory default settings. The download font is initialized according to printer-function-setting 7 (code-page 437 or 850) for the Proprinter III and III XL.

For the Proprinter X24E and XL24E, the download font area is initialized to code-page 437. Depending on how you have the printer-function-setting 6 set, the code page is reset to either 437 or 850. If you specify a parameter, the parameter overrides the user-printer-function settings.

INIT = 254 This value is equivalent in performance to an **INIT** value of "01." However, the result of this initialization, including parameters that follow, if any, are saved in NVRAM and become the user-defined printer-function settings and modes.

INIT = 255 This value is equivalent in performance to an **INIT** value of "05." However, the result of this initialization, including parameters that follow, if any, are saved in NVRAM and become the user-defined printer-function settings and modes.

Programming notes:

INIT values that are not supported are treated as 00.

INIT values 254 or 255 should be used only when the printer is being set up for the first time.

Parameters

You can specify two parameter bytes (**PARM1** and **PARM2**). Each bit in each parameter byte has a function. The following charts define the **PARM1** and **PARM2** for Proprinter III and III XL and the Proprinter X24E and XL24E.

Proprinter III and III XL

PARM1

Bit	Function	On	Off
7	Discard byte.	Ignore this byte.	Process this byte.
6	Reserved		
5	Alarm	Disable Alarm.	Enable Alarm.
4	Automatic Carriage Return	No Carriage Return on vertical movement.	Carriage Return on vertical movement.

Bit	Function	On	Off
3	Automatic Line Feed	Automatic LF after CR.	No Automatic LF after CR.
2	Form Length	12-inch forms.	11-inch forms.
1	Slashed Zero	Slashed zeros.	Normal zeros.
0	Character Set	Select Character Set 2.	Select Character Set 1.

PARM2

Bit	Function	On	Off
7	Discard byte.	Ignore this byte.	Process this byte.
6	Switch from U.S.A. to multilingual fonts	Use multilingual fonts.	Use U.S.A. fonts.
5	Bidirectional NLQ (10 CPI)	Unidirectional.	Bidirectional (10 CPI only).
4	20-Pitch Condense mode	12 CPI/Condensed treated as invalid combination.	12 CPI/Condensed invokes 20 CPI.
3	Select NLQ	NLQ key Select NLQ font.	NLQ key select NLQ II font.
2	Form Feed Enable (Proprinter III only)	Ignore Form Feed from host when printer is at top of form.	Honor Form Feed.
1	Line Length (Proprinter III XL only)	8.0-inch paper.	13.6-inch paper.
0	Sheet Feeder	Enable Sheet Feeder.	Disable Sheet Feeder.

PARM1

Bit	Function	On	Off
7	Discard byte	Ignore this byte.	Process this byte.
6	Reserved		
5	Alarm	Disable Alarm.	Enable Alarm.
4	Automatic Carriage Return	No Carriage Return on vertical movement.	Carriage Return on vertical movement.
3	Automatic Line Feed	Automatic LF after CR.	No Automatic LF after CR.
2	Form Length	12-inch forms.	11-inch forms.
1	Slashed Zero	Slashed zeros.	Normal zeros.
0	Character Set	Select Character Set 2.	Select Character Set 1.

PARM2

Bit	Function	On	Off
7	Discard byte	Ignore this byte.	Process this byte.
6	Switch from U.S.A. to multilingual fonts	Use multilingual fonts.	Use U.S.A. fonts.
5	Reserved		
4	Reserved		
3	Reserved		
2	Reserved		
1	Line Length (Proprinter XL24E only)	8.0-inch paper.	13.6-inch paper.
0	Sheet Feeder	Enable Sheet Feeder.	Disable Sheet Feeder.

Programming notes:

If you specify parameters with an **INIT** value 0, 1, or 254, the user-defined printer-function settings are used.

If you specify parameters with an **INIT** value 4, 5, or 255, the factory-default printer-function settings are used.

If you do not specify parameters, the user-defined printer-function settings are always used.

If you specify an **INIT** value of 0, 1, or 254 and bit 7 of **PARM1** or **PARM2** is on, the parameter uses the user-defined printer-function setting.

If you specify an **INIT** value of 4, 5, or 255 and bit 7 of **PARM1** or **PARM2** is on, the parameter uses the factory-default printer-function setting.

Set Initial Conditions Command Matrix

The following matrix describes the Set Initial Conditions command:

INIT Byte Values	00	01	04	05	254	255
With Parameters	A B C	A B C'	A' B' C	A' B' C'	A B C'	A' B' C'
Without parameters	A B C	A B C'	A B' C	A B' C'	A B C'	A B' C'

- A - User-defined (saved) printer-function setting.
- A' - Factory default printer-function setting.
- B - User-defined (saved) mode settings.
- B' - Factory default mode settings.
- C - Download font preserved.
- C' - Download font erased.

Set Initial Conditions (SIC) Programming Examples

The following is an example of initializing the printer modes to the factory settings and the printer-function settings to the user-defined settings.

```
CHR$(27) : " [" ; "K" ; CHR$(1) ; CHR$(0) ; CHR$(4) ;
```

The following is an example of initializing the printer modes to the factory defaults and enabling the sheet feeder.

```
CHR$(27) : " [" ; "K" ; CHR$(4) ; CHR$(0) ; CHR$(4) ; CHR$(3) ;  
CHR$(128) : CHR$(1) ;
```

Note: The first parameter byte is ignored and is therefore set to 128.

The following is an example of initializing the printer modes to the user-defined settings, disabling the alarm, and disabling 20 CPI. The modes and printer function settings are saved permanently in NVRAM.

```
CHR$(27) : " [" ; "K" ; CHR$(4) ; CHR$(0) ; CHR$(254) ; CHR$(3) ;  
CHR$(32) : CHR$(16) ;
```

Code-Page Switching

Code-page switching is supported by the Proprinter X24E and XL24E using the Set-Code Page command. See "Set-Code Page" for the format of this command.

If you have a font in the printer with a code-page ID of 0 or a code-page ID identical to the requested code page, you have a match. If a match is not found, the Set-Code Page command is discarded. If a match is found, the printer switches to a font in that requested code page.

If you use the Set-Code Page command with a zero code page ($m1, m2 = 0, 0$), it disables the code-page checking. You select the resident fonts from the resident code page (U.S. 437) or multilingual code page (850), depending on the setting of printer-function-setting 6. If you have code-page checking active, commands with lower priority (for example, ESC I) are ignored if they cannot be satisfied with the present code page.

Set-Code Page

This command causes the printer to change the ID of the current code page. This command is ignored if an unavailable code page is specified.

Syntax

ESC[*T count low count high 0 0 cpid high cpid low*

Data Structure

Hex

| 1B | 5B | 54 | n_1 | n_2 | 00 | 00 | m_1 | m_2

Dec

| 27 | 91 | 84 | n_1 | n_2 | 00 | 00 | m_1 | m_2

Usage Notes

ESC[*T* changes the existing code-page ID. This command is ignored if an available code page is specified.

Note: Code-page 437 is the U.S. character set and code-page 850 is the multilingual character set.

Count low (n_1): This is a one-byte binary number that is the less-significant byte of the two-byte parameter count.

Count high (n_2): This is the binary number that is the more-significant byte of the two-byte parameter count. Zero is a valid count.

0 0: This field is always 0 0.

cpid high (m_1) and cpid low (m_2): This is a two-byte field, the high-order (most-significant) byte followed by the low-order byte. You specify the code page to be used with this two-byte value. You can use any value from X'0000' to X'FFFF'. If you select a value of X'0000', code-page checking is disabled. If you select a value of X'0001' to X'FFFF', the printer searches its memory for a font with a matching code-page ID or with a code-page ID of X'0000'. If a font is not found in either the resident memory or the download memory, this command is discarded and the current code-page ID is used.

Note: Code-pages 437 (X'01B5') and 850 (X'0352') are the resident code pages. If you download a font with a zero code-page ID, it matches any existing code page.

Example

This example changes code-page 437 to code-page 850.

```
BASIC          PRINT#1,CHR$(27);CHR$(91);CHR$(84);  
CHR$(4);        CHR$(0);CHR$(0);CHR$(0);CHR$(8);  
CHR$(50)
```

For more information about PRINT #1 see "Control Codes and Escape Sequences" in your Guide to Operations.

Font and Margin Changes

The following BASIC examples show the printer's ability to change margins, set tabs, and change fonts. The comments in the program listings describe the escape sequences used to produce the output.

Letter Example from a Nine-Wire Printer

XYZ Corporation INC.

1234 North-East Ave.
Chicago, Ill. 60048
(789)654-3210

Mr. A. Jones
567 Main St.
Louisville, Ky. 42000

Dear Mr. Jones,

In response to your inquiry concerning the GADGET that you recently purchased, yes the GADGET does work in the application you discussed.

To set the 'Action' function, press the ACT button twice. Listen for two short tones. If you hear the tones the 'Action' function is now active. Further information concerning how the GADGET uses this function is described in Appendix C of your user's manual.

Thank you for purchasing one of our GADGETs. If we can be of future help, please let us know.

Sincerely,

K. Doe
Customer Service Manager

Letter Example from a 24-Wire Printer

XYZ Corporation INC.

1234 North-East Ave.
Chicago, Ill. 60048
(789)654-3210

Mr. A. Jones
567 Main St.
Louisville, Ky. 42000

Dear Mr. Jones,

In response to your inquiry concerning the **GADGET** that you recently purchased, yes the **GADGET** does work in the application you discussed.

To set the 'Action' function, press the **ACT** button twice. Listen for two short tones. If you hear the tones the 'Action' function is now active. Further information concerning how the **GADGET** uses this function is described in Appendix C of your user's manual.

Thank you for purchasing one of our **GADGETs**. If we can be of future help, please let us know.

Sincerely,

K. Doe
Customer Service Manager

Basic Program Listing for Letter Example

```
10 REM This program prints out a typical letter
20 REM Turn on Letter Quality for
   Proprieter X24/XL24 or Near Letter
   Quality on Proprieter, II or XL
30 LPRINT CHR$(27);"I";CHR$(2);
40 LPRINT
50 LPRINT
60 LPRINT
70 LPRINT
80 LPRINT
90 REM set up a tab at column 42
100 LPRINT CHR$(27);"D";CHR$(42);CHR$(0);
110 REM set up the left margin at column 10,
    right margin at 70
120 LPRINT CHR$(27);"X";CHR$(10);CHR$(70);
130 REM turn on double high double wide print
    with line feeds unchanged
140 LPRINT CHR$(27);"[";"@";CHR$(4);CHR$(0);
    CHR$(0);CHR$(0);CHR$(2);CHR$(2);
150 REM turn on emphasized and double strike
160 LPRINT CHR$(27);"E";CHR$(27);"G";
170 LPRINT CHR$(9);"XYZ ";
180 REM CHR$9 is HT. You can turn off double
    wide, with ESC W or ESC [
190 LPRINT CHR$(27);"W";CHR$(0);
200 LPRINT "Corporation INC."
210 REM turn off emphasized and double-strike
220 LPRINT CHR$(27);"F";CHR$(27);"H";
230 REM turn off double high double wide print
    line feeds unchanged
240 LPRINT CHR$(27);"[";"@";CHR$(4);CHR$(0);
    CHR$(0);CHR$(0);CHR$(1);CHR$(1);
250 LPRINT CHR$(9);"1234 North-East Ave."
260 LPRINT CHR$(9);"Chicago, Ill. 60048"
270 LPRINT CHR$(9);"(789)654-3210"
280 LPRINT
290 LPRINT
300 LPRINT "Mr. A. Jones"
310 LPRINT "567 Main St."
320 LPRINT "Louisville, Ky. 42000"
330 LPRINT
340 LPRINT "Dear Mr. Jones,"
350 LPRINT
360 LPRINT "In response to your inquiry
    concerning the";
370 REM ESC E turns on emphasized ESC F
    turns it off"
380 LPRINT CHR$(27);"E";" GADGET ";
390 LPRINT CHR$(27);"F";"that you"
400 LPRINT "recently purchased, yes the";
410 REM turn on Emphasized"
420 LPRINT CHR$(27);"E";" GADGET ";
430 REM turn off emphasized
440 LPRINT CHR$(27);"F";"does work in the applica-"
450 LPRINT "tion you discussed."
```

```

460 LPRINT
470 LPRINT "To set the 'Action' function, press the";
480 REM turn on Emphasized"
490 LPRINT CHR$(27);"E";" ACT ";
500 REM turn off emphasized
510 LPRINT CHR$(27);"F";"button twice."
520 LPRINT "Listen for two short tones. If you
hear the tones the "
530 LPRINT "'Action' function is now active.
Further information "
540 LPRINT "concerning how the";
550 REM turn on Emphasized"
560 LPRINT CHR$(27);"E";" GADGET ";
570 REM turn off emphasized
580 LPRINT CHR$(27);"F";
590 LPRINT "uses this function is described in "
600 LPRINT "Appendix C of your user's manual."
610 LPRINT
620 LPRINT "Thank you for purchasing one of our";
630 REM turn on Emphasized"
640 LPRINT CHR$(27);"E";" GADGETs. ";
650 REM turn off emphasized
660 LPRINT CHR$(27);"F";"If we can be of"
670 LPRINT "future help, please let us know."
680 LPRINT
690 LPRINT "Sincerely,"
700 LPRINT
710 LPRINT
720 LPRINT
730 LPRINT "K. Doe"
740 LPRINT "Customer Service Manager"
750 REM Select resident draft font
760 LPRINT CHR$(27);"I";CHR$(0);
770 REM Form Feed
780 LPRINT CHR$(12);
790 REM Reset tabs to Power on settings
800 LPRINT CHR$(27);"R";

```

Invoice Example from a Nine-Wire Printer

TINY TOYS INC.

7000 North Blvd. Charlotte, N.C. 28277

(704)789-6677

April 30, 1987

Mrs. Adams

BIG Department Stores
1113 Standup St.
St. Louis, Mo. 77880

XX

QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL
3,000	Cry Dolls	\$10.00/ea.	\$30,000.00
1,000	Trucks	\$5.00/ea.	\$ 5,000.00
500	Model Cars	\$ 7.00/ea.	\$ 3,500.00
2,000	Bags of marbles	\$10.00/bx.	\$20,000.00

		Subtotal	\$58,000.00
		Tax	2,900.00

		TOTAL	\$60,900.00

Invoice Example from a 24-Wire Printer

TINY TOYS INC.

7000 North Blvd.

Charlotte, N.C. 28277

(704)789-6677

April 30, 1987

Mrs. Adams

BIG Department Stores

1113 Standup St.

St. Louis, Mo. 77880

XX

QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL
3,000	Cry Dolls	\$10.00/ea.	\$30,000.00
1,000	Trucks	\$ 5.00/ea.	\$ 5,000.00
500	Model Cars	\$ 7.00/ea.	\$ 3,500.00
2,000	Bags of marbles	\$10.00/bx.	\$20,000.00
Subtotal			\$58,000.00
Tax			2,900.00
TOTAL			\$60,900.00

Basic Program Listing for Invoice Example

```
10 REM This Program prints out an invoice
20 LPRINT
30 LPRINT
40 LPRINT
50 REM set the left margin to column 7, and the
right margin unchanged
60 LPRINT CHR$(27);"X";CHR$(7);CHR$(0);
70 REM Turn on Letter Quality in the Proprinter
X24/XL24 NLQ in the Proprinter, II or XL
80 LPRINT CHR$(27);"I";CHR$(2);
90 REM Turn on Double Wide
100 LPRINT CHR$(27);"W";CHR$(1);
110 REM Turn on Emphasized ESC E and
Double-Strike ESC G
120 LPRINT CHR$(27);"E";CHR$(27);"G";
130 REM Turn on Subscript
140 LPRINT CHR$(27);"S";CHR$(1);
150 REM Turn off Subscript
160 LPRINT "          TINY ";CHR$(27);"T";
170 REM Turn on Double High
180 LPRINT CHR$(27);"[e";CHR$(3);CHR$(0);CHR$(0);
CHR$(0);CHR$(34);
190 LPRINT "TOYS INC."
200 REM Line 200 is made with 34 character 196's
210 LPRINT "
"
220 REM line 220 turns off Double-High
230 LPRINT CHR$(27);"[";"@";CHR$(3);CHR$(0);
CHR$(0);CHR$(0);CHR$(17);
240 REM line 240 turns off emphasized, double
strike and double wide
250 LPRINT CHR$(27);"F";CHR$(27);"H";CHR$(27);
"W";CHR$(0);
260 LPRINT "7000 North Blvd.      Charlotte, N.C.
28277      (704)789-6677"
270 LPRINT
280 LPRINT
290 LPRINT
300 LPRINT "April 30, 1987"
310 LPRINT
320 LPRINT "Mrs. Adams";
330 REM turn on Double High
340 LPRINT CHR$(27);"[e";CHR$(3);CHR$(0);CHR$(0);
CHR$(0);CHR$(34);
350 LPRINT
360 REM turn off double high
370 LPRINT "BIG ";CHR$(27);"[";"@";CHR$(3);CHR$(0);
CHR$(0);CHR$(0);CHR$(17);
380 LPRINT "Department Stores"
390 LPRINT "1113 Standup St."
400 LPRINT "St. Louis, Mo. 77880"
410 LPRINT
420 REM turn on Emphasized, Double Strike,
Double High, Double Wide
430 LPRINT CHR$(27);"E";CHR$(27);"G";CHR$(27);
```

```

"[";"@";
CHR$(4);CHR$(0);CHR$(0);CHR$(0);CHR$(34);CHR$(2);
440 LPRINT "XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX"
450 REM turn off Emphasized, Double Strike, Double
High, Double Wide
460 LPRINT CHR$(27);"F";CHR$(27);"H";CHR$(27);"[";"@";
CHR$(4);CHR$(0);CHR$(0);CHR$(0);CHR$(17);CHR$(1);
470 LPRINT
480 REM set up horizontal tabs at columns 24, 44, 64
490 LPRINT CHR$(27);"D";CHR$(24);CHR$(44);
CHR$(64);CHR$(0);
500 REM turn on emphasized
510 LPRINT CHR$(27);"E";
520 REM CHR 9 is HT
530 LPRINT "QUANTITY";CHR$(9);"DESCRIPTION";
CHR$(9);"UNIT PRICE";CHR$(9);"TOTAL"
540 REM turn off emphasized
550 LPRINT CHR$(27);"F"
560 LPRINT "3,000";CHR$(9);"Cry Dolls";CHR$(9);
"$10.00/ea.";CHR$(9);"$30,000.00"
570 LPRINT "1,000";CHR$(9);"Trucks";CHR$(9);
"$5.00/ea.";CHR$(9);"$ 5,000.00"
580 LPRINT " 500";CHR$(9);"Model Cars";CHR$(9);
"$ 7.00/ea.";CHR$(9);"$ 3,500.00"
590 LPRINT "2,000";CHR$(9);"Bags of marbles";
CHR$(9);"$10.00/bx.";CHR$(9);"$20,000.00"
600 LPRINT "
"
610 REM turn on emphasized
620 LPRINT CHR$(27);"E";
630 LPRINT CHR$(9);CHR$(9);"Subtotal";
CHR$(9);"$58,000.00"
640 LPRINT CHR$(9);CHR$(9);"Tax";CHR$(9);"
2,900.00"
650 REM Turn on Double High
660 LPRINT CHR$(27);"@";CHR$(3);CHR$(0);
CHR$(0);CHR$(0);CHR$(34);
670 LPRINT CHR$(9);CHR$(9);CHR$(9);"
"
680 LPRINT CHR$(9);CHR$(9);"TOTAL";CHR$(9);
"$60,900.00"
690 REM turn off emphasized, double high,
and NLQ or letter quality
700 LPRINT CHR$(27);"F";CHR$(27);"[";"@";
CHR$(3);CHR$(0);CHR$(0);CHR$(0);CHR$(17);
CHR$(27);"I";CHR$(0);
710 REM reset tabs to power on setting
720 LPRINT CHR$(27);"R";
730 REM send a form feed CHR 12
740 LPRINT CHR$(12);

```

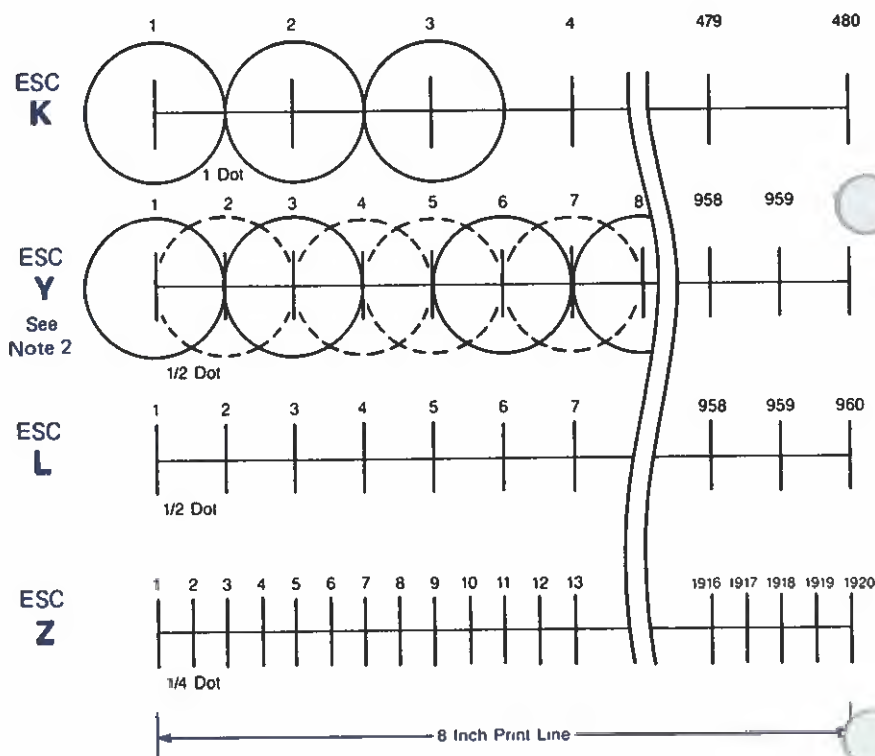
All-Points-Addressable (APA) Graphics

All-points-addressable, in computer graphics, is the ability to address and display or not display each picture element (pel) on a display surface.

Eight-Wire Graphic Designs

The Proprietary, Proprietary II, XL, II XL, III, and III XL support graphic commands **ESC K**, **ESC L**, **ESC Y**, and **ESC Z**.

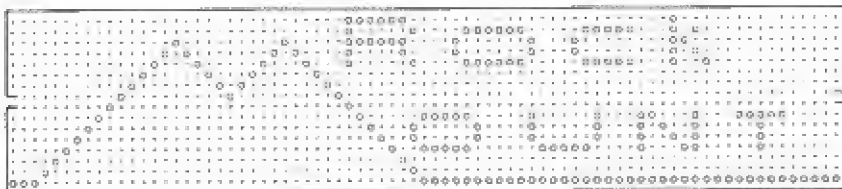
The following chart is for reference purposes only. It helps explain the dot placement for bit-image graphics along an eight-inch print line. For a 13.6-inch print line, the dot placement is the same, but the total number of dots is greater on a 13.6-inch print line.



Notes:

1. **ESC K** and **ESC L** modes: Dots can be centered at any position.
2. **ESC Y** and **ESC Z** modes: Although dots can be centered at any position, the printer cannot print dots at adjoining horizontal dot positions. For example, a dot is set at positions 1, 2, 3, 6, and 8 in **ESC Y** mode. The dot in position 2 would not print.

Creating APA graphic designs is similar to creating downloaded font characters. Instead of creating characters that are eleven dot columns wide and eight dots high, you can have as many as 1920 columns on a line. The height of the column is eight dots. **ESC 3** controls line spacing to produce adjoining rows of print. The following print pattern consists of two lines of print. The first line is 64 columns wide and the second line is 75 columns wide.

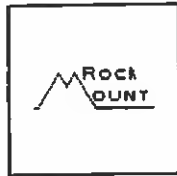


The following program shows how to print the pattern from the preceding page:

Graphic Design Example

```
100 rem***BEGIN***
110 rem***Set to 8 Dot Spacing (24/216)
120   LPRINT CHR$(27);"3";CHR$(24)
130 rem***Set Width to 255
140   WIDTH "LPT1:",255
150 rem***Data for first line
160   DATA 0,0,0,0,0,0,0,0,0,0
170   DATA 1,2,4,8,16,32,16,8,4,2
180   DATA 1,2,4,8,16,32,16,8,4,2
190   DATA 1,248,160,160,160,160,176,72,0,0,0
200   DATA 48,72,72,72,72,72,48,0,0,0,48
210   DATA 72,72,72,72,72,0,0,0,248,32,80,8
220 rem***Data for second line
230   DATA 1,1,1,2,4,8,16,32,64,128
240   DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
250   DATA 0,0,0,0,0,0,0
260   DATA 128,64,32,16,8,4,50,73,73,73
270   DATA 73,73,49,1,1,1,113,9,9,9,9,9,113
280   DATA 1,1,1,121,65,33,17,9,121,1,1,1
290   DATA 65,65,121,65,65,1,1,1,1,1
300 rem***Change to 960 Bit Image Graphic Mode
310 rem***Specify the Number of Bytes sent
320 rem***64 + (0 * 256) = 64 Bytes
330   LPRINT CHR$(27);"L";CHR$(64);CHR$(0);
330 rem***Read each column of dots and print
340   FOR COLUMN=1 TO 64
350     READ DOTS
360     LPRINT CHR$(DOTS);
370   NEXT COLUMN
380 rem***Read next line and print
390   LPRINT
400   LPRINT CHR$(27);"L";CHR$(75);CHR$(0);
410   FOR COLUMN=1 TO 75
420     READ DOTS
430     LPRINT CHR$(DOTS);
440   NEXT COLUMN
450   LPRINT CHR$(27);"2";
460 END
```

When you run this program, the output is:



Twenty-Four-Wire Graphic Designs

The Proprieter X24, Proprieter XL24, Proprieter X24E, and Proprieter XL24E printers support three groups of graphic commands: the **ESC K**, **ESC L**, **ESC Y**, and **ESC Z** commands common with the rest of the Proprieter family; high resolution graphics; and alternate graphics mode commands. Each of these has unique features that should be understood in order to select the optimum mode for the desired effect.

The Proprieter X24, Proprieter XL24, Proprieter X24E, and Proprieter XL24E support the eight-bit APA graphics commands (**ESC K**, **ESC L**, **ESC Y**, and **ESC Z**) with the same horizontal density and vertical height as in the other members of the Proprieter family. The 8-bits of APA data are mapped to the to 20 wires of the print head.

The following table shows how a Proprietary APA graphic data byte maps to the Proprietary X24, Proprietary XL24, Proprietary X24E, and Proprietary XL24E print-head wires. The table also shows which bits of the data byte map to which print wires.

The data bits must be on to fire the specific print-head wires.

Proprietary X24, XL24, X24E, and XL24E Print-Head Wires	Proprietary APA Graphics Data Byte
1	Bit 7
2	Bit 7
3	Bit 7 AND Bit 6
4	Bit 6
5	Bit 6
6	Bit 5
7	Bit 5
8	Bit 5 AND Bit 4
9	Bit 4
10	Bit 4
11	Bit 3
12	Bit 3
13	Bit 3 AND Bit 2
14	Bit 2
15	Bit 2
16	Bit 1
17	Bit 1
18	Bit 1 AND Bit 0
19	Bit 0
20	Bit 0

Note: AND denotes bits that are logically ANDed together to fire the print wire. If either bit is off, the print wire does not fire.

For graphic commands **ESC K**, **ESC L**, **ESC Y**, and **ESC Z**; linespacing should be set to $\frac{24}{216}$ inch to produce solid figures. Use **ESC 3** to set the linespacing.

In **BASIC**, set linespacing like this:
`LPRINT CHR$(27); "3"; CHR$(24);`

High Resolution Graphics, ESC [g

ESC [g is an extended command with eight modes. Each mode produces a unique combination of vertical and horizontal densities. Modes 4, 5, 6, 7, and 10 are not supported, and if used, the graphics command will be discarded. The other modes are defined as follows:

Mode	Horizontal Density	Wires	Comment
0	60	8	Same as ESC K graphics command.
1	120	8	Same as ESC L graphics command.
2	120	8	Same as ESC Y graphics command.
3	240	8	Same as ESC Z graphics command.
8	60	24	High resolution for ESC K.
9	120	24	High resolution for ESC L.
11	180	24	High resolution APA graphics.
12	360	24	High resolution APA graphics.

As shown in the chart, modes 0, 1, 2, and 3 are identical to ESC K, ESC L, ESC Y, and ESC Z, respectively. Use a linespacing of $^{24}_{216}$ inch to produce solid figures.

Modes 8 and 9 are high resolution versions of **ESC K** and **ESC L**, respectively. For mode 8, the horizontal density is the same as for **ESC K** (60 dots per inch). For mode 9, the horizontal density is the same as **ESC L** (120 dots per inch). However, you may now define all 24 wires instead of just 8 wires.

Modes 11 and 12 produce even higher resolution APA graphics. For mode 11, the horizontal density is 180 dots per inch. For mode 12, the horizontal density is 360 dots per inch.

The count specified in the **ESC [g** command gives the number of bytes of graphic data plus one (the mode byte is included in the count). The count is specified as low byte first, then high byte. The count is calculated the same way for all of the supported **ESC [g** modes.

The following information applies to all high resolution modes (8, 9, 11, and 12):

- Each column of data is defined by three bytes (24 bits, one bit for each print wire). The most significant bit of the first byte maps to the top wire. The least significant bit of the third byte maps to the bottom wire. The three bytes of data that form a dot-column must be grouped together in the graphics command. An example format of a high resolution graphics command is:

```
ESC [g(count-low)(count-high)(byte 1 of column 1)
(byte 2 of column 1)(byte 3 of column 1)
(byte 1 of column 2)(byte 2 of column 2)
(byte 3 of column 2) . . . (byte 1 of column n)
(byte 2 of column n)(byte 3 of column n)
```

- High resolution graphics are slow because of the volume of data required. If the graphics pattern that you want to print has extensive blank areas, it may be more effective to use a series of shorter graphics commands with relative move inline forward (**ESC d n1 n2**) commands to span over the blank areas. Also note that very dense patterns may encounter thermal delays while the print head cools.
- When printing high resolution graphics (24 wires), use a linespacing of 24/180-inch to produce a solid image. To set the linespacing to 24/180-inch, you must first use the Set Vertical Units command, **ESC [**, to set the base unit to 1/180-inch. Then, use the Graphics Linespacing command (**ESC 3**) to set the linespacing, or use the Graphics Variable linespacing command (**ESC J**) to do an immediate vertical move.

An example BASIC program segment to set linespacing to 24/180-inch is :

```
LPRINT CHR$(27); "[\"; CHR$(4); CHR$(0);  
CHR$(0); CHR$(0); CHR$(0); CHR$(180);  
LPRINT CHR$(27); "3"; CHR$(24);
```

For details on how to send the **ESC [g** command, see the *IBM Proprinter X24 and Proprinter XL24 Guide to Operations* or *IBM Proprinter X24E and Proprinter XL24E Guide to Operations*.

Alternate Graphics Mode

The alternate graphics mode permits the Proprinter X24, XL24, X24E, and XL24E to print APA graphics designed for the Epson LQ-800 and LQ-1000 printers. This mode does not support the Epson non-graphics data stream. The Proprinter X24, XL24, X24E, and XL24E support the same eleven modes of the **ESC *** command that the Epson LQ-800 and LQ-1000 support. The **ESC A**, **ESC 3**, and **ESC J** commands are also redefined and function similar to the Epson LQ-800 and LQ-1000 **ESC A**, **ESC 3**, and **ESC J** commands. To activate this mode, set the alternate graphics mode switch (switch 7 for the Proprinter X24 and Proprinter XL24 or printer-function-setting 4 for the Proprinter X24E and Proprinter XL24E) to ON before you switch the printer power On (I).

For more information, see the *IBM Proprinter X24 and Proprinter XL24 Guide to Operations* or *IBM Proprinter X24E and Proprinter XL24E Guide to Operations*.

Sheet Feeder Programming

Programming for the Sheet Feeder includes setting a switch or a printer-function setting and understanding the escape sequences, ESC A, ESC 2, and ESC C.

1. Ensure that switch 2 (Proprinter X24 and Proprinter XL24) or printer-function-setting 2 (Proprinter III, III XL, X24E, and XL24E) is set to ON. For instructions on changing the settings, see the *IBM Proprinter X24 and Proprinter XL24 Guide to Operations*, *IBM Proprinter X24E and Proprinter XL24E Guide to Operations*, or *IBM Proprinter III and Proprinter III XL Guide to Operations*.
2. To change text line spacing, see ESC A.
3. To start the line spacing set with ESC A, see ESC 2.
4. To change the form length, see ESC C and the setting for switch 5 (Proprinter X24 and XL24), printer-function-setting 10 (Proprinter III and III XL), or Printer-function-setting 9 (Proprinter X24E and XL24E).

To set the printer to accept 12-inch paper (70 lines at 6 lines per inch) from the Sheet Feeder, you can send the following BASIC command:

```
LPRINT CHR$(12);CHR$(27);CHR$(50);  
CHR$(27);CHR$(67);CHR$(70);
```

To set the printer to accept 6-inch paper from the Sheet Feeder, you can send the following BASIC command:

```
LPRINT CHR$(12);CHR$(27);CHR$(50);  
CHR$(27);CHR$(67);CHR$(0);CHR$(6);
```

For more information, see the *IBM Sheet Feeder for the Proprinter Family Guide to Operations*.

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5. Appendixes

Appendixes

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Appendix A. Character Width, Start Address, and Lookup Tables

The Character Width Tables specify the width and offset of each proportional character for the Proprinter family of printers.

The Start Address Table applies only to the Proprinter X24, XL24, X24E, and XL24E. It shows the safe starting addresses for downloading character data after a font has already been downloaded from FontSet or an NLS language diskette.

The Lookup Tables apply only to the Proprinter X24, XL24, X24E, and XL24E. These tables show the starting addresses and compression masks for each character's image data.

Proprinter II, XL, II XL, III, and III XL Character Width Table Using Code Page 437

Character Number (Decimal)	Width in Dots	Offset in Dot Spaces
0	12	0
1	12	0
2	12	0
3	12	0
4	10	1
5	12	0
6	12	0
7	12	0
8	12	0
9	12	0
10	12	0
11	12	0
12	12	0
13	12	0

Figure A-1 (Part 1 of 8). Character Width Table

Character Number (Decimal)	Width in Dots	Offset in Dot Spaces
12	12	0
13	12	0
14	12	0
15	12	0
16	12	0
17	12	0
18	12	0
19	12	0
20	12	0
21	12	0
22	12	0
23	12	0
24	12	0
25	12	0
26	12	0
27	12	0
28	12	0
29	12	0
30	12	0
31	12	0
32	12	0
33	5	4
34	8	2
35	12	0
36	12	0
37	12	0
38	12	0
39	6	3
40	6	3
41	6	3
42	12	0
43	12	0
44	6	3
45	12	0
46	6	3
47	10	1
48	12	0
49	8	2

Figure A-1 (Part 2 of 8). Character Width Table

Character Number (Decimal)	Width in Dots	Offset in Dot Spaces
50	12	0
51	12	0
52	12	0
53	12	0
54	12	0
55	12	0
56	12	0
57	12	0
58	6	3
59	6	3
60	10	1
61	12	0
62	10	1
63	10	1
64	12	0
65	12	0
66	12	0
67	12	0
68	12	0
69	12	0
70	12	0
71	12	0
72	12	0
73	8	2
74	12	0
75	12	0
76	12	0
77	12	0
78	12	0
79	12	0
80	12	0
81	12	0
82	12	0
83	12	0
84	12	0
85	12	0
86	12	0
87	12	0

Figure A-1 (Part 3 of 8). Character Width Table

Character Number (Decimal)	Width in Dots	Offset in Dot Spaces
88	10	1
89	12	0
90	12	0
91	8	2
92	10	1
93	8	2
94	12	0
95	12	0
96	6	3
97	12	0
98	11	0
99	11	0
100	11	0
101	12	0
102	12	0
103	11	0
104	12	0
105	8	2
106	8	2
107	10	1
108	8	2
109	12	0
110	12	0
111	11	0
112	11	0
113	11	0
114	11	0
115	12	0
116	10	1
117	12	0
118	12	0
119	12	0
120	10	1
121	12	0
122	10	1
123	9	1
124	4	4
125	9	2

Figure A-1 (Part 4 of 8). Character Width Table

Character Number (Decimal)	Width in Dots	Offset in Dot Spaces
126	12	0
127	12	0
128	12	0
129	12	0
130	12	0
131	12	0
132	12	0
133	12	0
134	12	0
135	12	0
136	12	0
137	12	0
138	12	0
139	9	1
140	10	1
141	8	2
142	12	0
143	12	0
144	12	0
145	12	0
146	12	0
147	11	0
148	11	0
149	11	0
150	12	0
151	12	0
152	11	0
153	11	0
154	12	0
155	12	0
156	12	0
157	12	0
158	12	0
159	12	0
160	12	0
161	12	0
162	12	0
163	12	0

Figure A-1 (Part 5 of 8). Character Width Table

Character Number (Decimal)	Width in Dots	Offset in Dot Spaces
164	12	0
165	12	0
166	12	0
167	12	0
168	12	0
169	12	0
170	12	0
171	12	0
172	12	0
173	12	0
174	12	0
175	12	0
176	12	0
177	12	0
178	12	0
179	12	0
180	12	0
181	12	0
182	12	0
183	12	0
184	12	0
185	12	0
186	12	0
187	12	0
188	12	0
189	12	0
190	12	0
191	12	0
192	12	0
193	12	0
194	12	0
195	12	0
196	12	0
197	12	0
198	12	0
199	12	0
200	12	0
201	12	0

Figure A-1 (Part 6 of 8). Character Width Table

Character Number (Decimal)	Width in Dots	Offset in Dot Spaces
202	12	0
203	12	0
204	12	0
205	12	0
206	12	0
207	12	0
208	12	0
209	12	0
210	12	0
211	12	0
212	12	0
213	12	0
214	12	0
215	12	0
216	12	0
217	12	0
218	12	0
219	12	0
220	12	0
221	12	0
222	12	0
223	12	0
224	12	0
225	12	0
226	11	0
227	12	0
228	12	0
229	12	0
230	12	0
231	11	0
232	12	0
233	12	0
234	12	0
235	12	0
236	12	0
237	12	0
238	10	1
239	12	0

Figure A-1 (Part 7 of 8). Character Width Table

Character Number (Decimal)	Width in Dots	Offset in Dot Spaces
240	12	0
241	12	0
242	10	1
243	10	1
244	12	0
245	12	0
246	12	0
247	11	0
248	8	2
249	6	3
250	6	3
251	12	0
252	10	1
253	8	2
254	8	2
255	12	0

Figure A-1 (Part 8 of 8). Character Width Table

Proprinter III and III XL Character Width Table **Using Code Page 850**

Character Number (Decimal)	Width in Dots	Offset in Dot Spaces
0	12	0
1	12	0
2	12	0
3	12	0
4	10	1
5	12	0
6	12	0
7	12	0
8	12	0
9	12	0
10	12	0
11	12	0
12	12	0
13	12	0
14	12	0
15	12	0
16	12	0
17	12	0
18	12	0
19	12	0
20	12	0
21	12	0
22	12	0
23	12	0
24	12	0
25	12	0
26	12	0
27	12	0
28	12	0
29	12	0
30	12	0
31	12	0
32	12	0

Figure A-2 (Part 1 of 7). Character Width Table

Character Number (Decimal)	Width in Dots	Offset in Dot Spaces
33	5	4
34	8	2
35	12	0
36	12	0
37	12	0
38	12	0
39	6	3
40	6	3
41	6	3
42	12	0
43	12	0
44	6	3
45	12	0
46	6	3
47	10	1
48	12	0
49	8	2
50	12	0
51	12	0
52	12	0
53	12	0
54	12	0
55	12	0
56	12	0
57	12	0
58	6	3
59	6	3
60	10	1
61	12	0
62	10	1
63	10	1
64	12	0
65	12	0
66	12	0
67	12	0
68	12	0
69	12	0
70	12	0

Figure A-2 (Part 2 of 7). Character Width Table

Character Number (Decimal)	Width in Dots	Offset in Dot Spaces
71	12	0
72	12	0
73	8	2
74	12	0
75	12	0
76	12	0
77	12	0
78	12	0
79	12	0
80	12	0
81	12	0
82	12	0
83	12	0
84	12	0
85	12	0
86	12	0
87	12	0
88	10	1
89	12	0
90	12	0
91	8	2
92	10	1
93	8	2
94	12	0
95	12	0
96	6	3
97	12	0
98	11	0
99	11	0
100	11	0
101	12	0
102	12	0
103	11	0
104	12	0
105	8	2
106	8	2
107	10	1
108	8	2

Figure A-2 (Part 3 of 7). Character Width Table

Character Number (Decimal)	Width in Dots	Offset in Dot Spaces
109	12	0
110	12	0
111	11	0
112	11	0
113	11	0
114	11	0
115	12	0
116	10	1
117	12	0
118	12	0
119	12	0
120	10	1
121	12	0
122	10	1
123	9	1
124	4	4
125	9	2
126	12	0
127	12	0
128	12	0
129	12	0
130	12	0
131	12	0
132	12	0
133	12	0
134	12	0
135	12	0
136	12	0
137	12	0
138	12	0
139	9	1
140	10	1
141	8	2
142	12	0
143	12	0
144	12	0
145	12	0
146	12	0

Figure A-2 (Part 4 of 7). Character Width Table

Character Number (Decimal)	Width in Dots	Offset in Dot Spaces
147	11	0
148	11	0
149	11	0
150	12	0
151	12	0
152	11	0
153	11	0
154	12	0
155	10	0
156	12	0
157	11	0
158	12	0
159	12	0
160	12	0
161	12	0
162	12	0
163	12	0
164	12	0
165	12	0
166	12	0
167	12	0
168	12	0
169	12	0
170	12	0
171	12	0
172	12	0
173	12	0
174	12	0
175	12	0
176	12	0
177	12	0
178	12	0
179	12	0
180	12	0
181	11	0
182	11	0
183	11	0
184	12	0

Figure A-2 (Part 5 of 7). Character Width Table

Character Number (Decimal)	Width in Dots	Offset in Dot Spaces
185	12	0
186	12	0
187	12	0
188	12	0
189	10	0
190	11	0
191	12	0
192	12	0
193	12	0
194	12	0
195	12	0
196	12	0
197	12	0
198	11	0
199	11	0
200	12	0
201	12	0
202	12	0
203	12	0
204	12	0
205	12	0
206	12	0
207	10	0
208	10	0
209	11	0
210	11	0
211	11	0
212	11	0
213	8	1
214	8	1
215	12	0
216	9	1
217	12	0
218	12	0
219	12	0
220	12	0
221	4	3
222	8	1

Figure A-2 (Part 6 of 7). Character Width Table

Character Number (Decimal)	Width in Dots	Offset in Dot Spaces
223	12	0
224	10	0
225	12	0
226	12	0
227	10	0
228	10	0
229	11	0
230	12	0
231	11	0
232	11	0
233	11	0
234	11	0
235	11	0
236	10	0
237	11	0
238	11	0
239	5	3
240	12	0
241	12	0
242	11	0
243	12	0
244	11	0
245	10	0
246	12	0
247	7	1
248	8	2
249	11	0
250	6	3
251	8	1
252	7	2
253	8	2
254	8	2
255	12	0

Figure A-2 (Part 7 of 7). Character Width Table

Proprinter X24, XL24, X24E, and XL24E Character Width Table Using Code Page 437 (U.S.)

Character Number (Decimal)	Description	Width in Dots
0	Slashed Zero	30
1	Smiling Face	30
2	Smiling Face, Reverse Image	30
3	Heart Suit Symbol	30
4	Diamond Suit Symbol/Solid Diamond	30
5	Club Suit Symbol	30
6	Spade Suit Symbol	30
7	Bullet	30
8	Bullet, Reverse Image	30
9	Open Circle	30
10	Open Circle, Reverse Image	30
11	Male Symbol	30
12	Female Symbol	30
13	Musical Eighth Note	30
14	Two Musical Sixteenth Notes	30
15	Sun Symbol	30
16	Forward Arrow Indicator	30
17	Back Arrow Indicator	30
18	Up-Down Arrow	30
19	Double Exclamation Points	30

Figure A-3 (Part 1 of 11). Character Width Table

Character Number (Decimal)	Description	Width in Dots
20	Paragraph	30
21	Section Sign	30
22	Solid Horizontal Rectangle	30
23	Up-Down Arrow, Perpendicular	30
24	Up Arrow	30
25	Down Arrow	30
26	Right Arrow	30
27	Left Arrow	30
28	Right Angle Symbol	30
29	Left-Right Arrow	30
30	Solid Triangle	30
31	Solid Triangle Inverted	30
32	Space	30
33	Exclamation Mark	30
34	Double Quote	30
35	Number Sign	30
36	Dollar Sign	30
37	Percent Sign	30
38	Ampersand	36
39	Apostrophe	18
40	Left Parenthesis	30
41	Right Parenthesis	30
42	Asterisk	30
43	Plus Sign	30
44	Comma	30
45	Hyphen, Minus Sign	30
46	Period, Decimal Point	30
47	Diagonal	30

Figure A-3 (Part 2 of 11). Character Width Table

Character Number (Decimal)	Description	Width in Dots
48	Digit Zero	30
49	Digit One	30
50	Digit Two	30
51	Digit Three	30
52	Digit Four	30
53	Digit Five	30
54	Digit Six	30
55	Digit Seven	30
56	Digit Eight	30
57	Digit Nine	30
58	Colon	30
59	Semicolon	30
60	Less-Than Sign	30
61	Equals Sign	30
62	Greater-Than Sign	30
63	Question Mark	30
64	Commercial At	30
65	Capital A	42
66	Capital B	42
67	Capital C	42
68	Capital D	42
69	Capital E	36
70	Capital F	36
71	Capital G	42
72	Capital H	42
73	Capital I	24
74	Capital J	30
75	Capital K	42
76	Capital L	36
77	Capital M	42
78	Capital N	42
79	Capital O	42
80	Capital P	36
81	Capital Q	42
82	Capital R	42
83	Capital S	36
84	Capital T	42

Figure A-3 (Part 3 of 11). Character Width Table

Character Number (Decimal)	Description	Width in Dots
85	Capital U	42
86	Capital V	42
87	Capital W	42
88	Capital X	42
89	Capital Y	42
90	Capital Z	36
91	Left Bracket	30
92	Reverse Diagonal	30
93	Right Bracket	30
94	Circumflex Accent	30
95	Underscore	30
96	Grave Accent	30
97	Small a	30
98	Small b	36
99	Small c	30
100	Small d	36
101	Small e	30
102	Small f	24
103	Small g	36
104	Small h	36
105	Small i	18
106	Small j	18
107	Small k	36
108	Small l	18
109	Small m	42
110	Small n	36
111	Small o	30
112	Small p	36
113	Small q	36
114	Small r	30
115	Small s	30
116	Small t	24
117	Small u	36
118	Small v	36
119	Small w	42
120	Small x	36

Figure A-3 (Part 4 of 11). Character Width Table

Character Number (Decimal)	Description	Width in Dots
121	Small y	36
122	Small z	30
123	Left Curly Bracket	30
124	Vertical line	30
125	Right Curly Bracket	30
126	Tilde Accent	30
127	Small House	30
128	Capital C Cedilla	42
129	Small u Diaeresis or Umlaut	36
130	Small e Acute	30
131	Small a Circumflex	30
132	Small a Diaeresis or Umlaut	30
133	Small a Grave	30
134	Small a Overcircle	30
135	Small c Cedilla	30
136	Small e Circumflex	30
137	Small e Diaeresis or Umlaut	30
138	Small e Grave	30
139	Small i Diaeresis	18
140	Small i Circumflex	18
141	Small i Grave	18
142	Capital A Diaeresis or Umlaut	42
143	Capital A Overcircle	42
144	Capital E Acute	36
145	Small ae Diphthong	42

Figure A-3 (Part 5 of 11). Character Width Table

Character Number (Decimal)	Description	Width in Dots
146	Capital AE Diphthong	42
147	Small o Circumflex	30
148	Small o Diaeresis or Umlaut	30
149	Small o Grave	30
150	Small u Circumflex	36
151	Small u Grave Umlaut	36
152	Small y Diaeresis or Umlaut	36
153	Capital O Diaeresis or Umlaut	42
154	Capital U Diaeresis or Umlaut	42
155	Cent Sign	30
156	Pound Sign	30
157	Yen Sign	30
158	Peseta Sign	42
159	Florin Sign	30
160	Small a Acute	30
161	Small i Acute	18
162	Small o Acute	30
163	Small u Acute	36
164	Small n Tilde	36
165	Capital N Tilde	42
166	Feminine Ordinal Indicator	30
167	Masculine Ordinal Indicator	30
168	Inverted Question Mark	30

Figure A-3 (Part 6 of 11). Character Width Table

Character Number (Decimal)	Description	Width in Dots
169	Start of Line	30
170	Logical Not, End of Line	30
171	Fraction One-Half	30
172	Fraction One-Quarter	30
173	Inverted Exclamation	30
174	Left-Angle Quotes	42
175	Right-Angle Quotes	42
176	Fill Character (weak)	30
177	Fill Character (medium)	30
178	Fill Character (heavy)	30
179	Vertical Center Bar - single	30
180	Right Side Tee - single	30
181	Right Side Tee -single vert/dbl horz	30
182	Right Side Tee -dbl vert/single horz	30
183	UR Corner -dbl vert/single horz	30
184	UR Corner -single vert/dbl horz	30
185	Right Side Tee -double	30
186	Vertical Center Bar -double	30

Figure A-3 (Part 7 of 11). Character Width Table

Character Number (Decimal)	Description	Width in Dots
187	UR Corner	30
	-double	
188	LR Corner	30
	-double	
189	LR Corner -dbl	30
	vert/single horz	
190	LR Corner	30
	-single vert/dbl	
	horz	
191	UR Corner	30
	-single	
192	LL Corner	30
	-single	
193	Bottom Side Tee	30
	-single	
194	Top Side Tee	30
	-single	
195	Left Side Tee	30
	-single	
196	Horizontal	30
	Center Bar	
	-single	
197	Cross	30
	Intersection	
	-single	
198	Left Side Tee	30
	-single vert/dbl	
	horz	
199	Left Side Tee	30
	-dbl vert/single	
	horz	
200	LL Corner	30
	-double	
201	UL Corner	30
	-double	
202	Bottom Side Tee	30
	-double	
203	Top Side Tee	30
	-double	

Figure A-3 (Part 8 of 11). Character Width Table

Character Number (Decimal)	Description	Width in Dots
204	Left Side Tee	30
	-double	
205	Horizontal	30
	Center Bar	
	-double	
206	Cross	30
	Intersection	
	-double	
207	Bottom Side	30
	Tee-single	
	vert/dbl horz	
208	Bottom Side	30
	Tee-dbl	
	vert/single horz	
209	Top Side Tee	30
	-single vert/dbl	
	horz	
210	Top Side Tee	30
	-dbl vert/single	
	horz	
211	LL Corner -dbl	30
	vert/single horz	
212	LL Corner	30
	-single vert/dbl	
	horz	
213	UL Corner	30
	-single vert/dbl	
	horz	
214	UL Corner -dbl	30
	vert/single horz	
215	Cross	30
	Intersection	
216	Cross	30
	Intersection	
217	LR Corner	30
	-single	
218	UL Corner	30
	-single	

Figure A-3 (Part 9 of 11). Character Width Table

Character Number (Decimal)	Description	Width in Dots
219	Fill Character - solid	30
220	Fill Character - lower half	30
221	Fill Character - right half	30
222	Fill Character - left half	30
223	Fill Character - upper half	30
224	Small Alpha	30
225	Small Sharp s	36
226	Capital Gamma	36
227	Small Pi	36
228	Capital Sigma	42
229	Small Sigma	36
230	Small Mu	36
231	Small Tau	30
232	Capital Phi	42
233	Capital Theta	42
234	Capital Omega	42
235	Small Delta	30
236	Infinity Symbol	30
237	Small Phi	42
238	Small Epsilon	30
239	Cap Intersection	30
240	Identity Symbol	30
241	Plus/Minus Sign	30
242	Greater Than or Equal	30
243	Less Than or Equal	30
244	Upper Integral Section	30
245	Lower Integral Section	30
246	Divide Sign	30
247	Nearly Equals	30

Figure A-3 (Part 10 of 11). Character Width Table

Character Number (Decimal)	Description	Width in Dots
248	Degree Symbol	30
249	Product or Middle Dot	30
250	Middle Dot Accent	30
251	Radical Symbol	30
252	Small n Superscript	30
253	Subscript Two (aka NS02)	30
254	Solid Square	30
255	Required Space	30

Figure A-3 (Part 11 of 11). Character Width Table

Proprinter X24, XL24, X24E, and XL24E Character Width Table Using Code Page 850 (Multilingual)

Character Number (Decimal)	Description	Width in Dots
0	Slashed Zero	30
1	Smiling Face	30
2	Smiling Face, Reverse Image	30
3	Heart Suit Symbol	30
4	Diamond Suit Symbol/Solid Diamond	30
5	Club Suit Symbol	30
6	Spade Suit Symbol	30
7	Bullet	30
8	Bullet, Reverse Image	30
9	Open Circle	30
10	Open Circle, Reverse Image	30
11	Male Symbol	30
12	Female Symbol	30
13	Musical Eighth Note	30
14	Two Musical Sixteenth Notes	30
15	Sun Symbol	30
16	Forward Arrow Indicator	30
17	Back Arrow Indicator	30
18	Up-Down Arrow	30
19	Double Exclamation Points	30

Figure A-4 (Part 1 of 10). Character Width Table

Character Number (Decimal)	Description	Width in Dots
20	Paragraph	30
21	Section Sign	30
22	Solid Horizontal Rectangle	30
23	Up-Down Arrow, Perpendicular	30
24	Up Arrow	30
25	Down Arrow	30
26	Right Arrow	30
27	Left Arrow	30
28	Right Angle Symbol	30
29	Left-Right Arrow	30
30	Solid Triangle	30
31	Solid Triangle Inverted	30
32	Space	30
33	Exclamation Mark	30
34	Double Quote	30
35	Number Sign	30
36	Dollar Sign	30
37	Percent Sign	30
38	Ampersand	36
39	Apostrophe	18
40	Left Parenthesis	30
41	Right Parenthesis	30
42	Asterisk	30
43	Plus Sign	30
44	Comma	30
45	Hyphen, Minus Sign	30
46	Period, Decimal Point	30
47	Diagonal	30

Figure A-4 (Part 2 of 10). Character Width Table

Character Number (Decimal)	Description	Width in Dots
48	Digit Zero	30
49	Digit One	30
50	Digit Two	30
51	Digit Three	30
52	Digit Four	30
53	Digit Five	30
54	Digit Six	30
55	Digit Seven	30
56	Digit Eight	30
57	Digit Nine	30
58	Colon	30
59	Semicolon	30
60	Less-Than Sign	30
61	Equals Sign	30
62	Greater-Than Sign	30
63	Question Mark	30
64	Commercial At	30
65	Capital A	42
66	Capital B	42
67	Capital C	42
68	Capital D	42
69	Capital E	36
70	Capital F	36
71	Capital G	42
72	Capital H	42
73	Capital I	24
74	Capital J	30
75	Capital K	42
76	Capital L	36
77	Capital M	42
78	Capital N	42
79	Capital O	42
80	Capital P	36
81	Capital Q	42
82	Capital R	42
83	Capital S	36
84	Capital T	42

Figure A-4 (Part 3 of 10). Character Width Table

Character Number (Decimal)	Description	Width in Dots
85	Capital U	42
86	Capital V	42
87	Capital W	42
88	Capital X	42
89	Capital Y	42
90	Capital Z	36
91	Left Bracket	30
92	Reverse Diagonal	30
93	Right Bracket	30
94	Circumflex Accent	30
95	Underscore	30
96	Grave Accent	30
97	Small a	30
98	Small b	36
99	Small c	30
100	Small d	36
101	Small e	30
102	Small f	24
103	Small g	36
104	Small h	36
105	Small i	18
106	Small j	18
107	Small k	36
108	Small l	18
109	Small m	42
110	Small n	36
111	Small o	30
112	Small p	36
113	Small q	36
114	Small r	30
115	Small s	30
116	Small t	24
117	Small u	36
118	Small v	36
119	Small w	42
120	Small x	36

Figure A-4 (Part 4 of 10). Character Width Table

Character Number (Decimal)	Description	Width in Dots
121	Small y	36
122	Small z	30
123	Left Curly Bracket	30
124	Vertical line	30
125	Right Curly Bracket	30
126	Tilde Accent	30
127	Small House	30
128	Capital C Cedilla	42
129	Small u Diaeresis or Umlaut	36
130	Small e Acute	30
131	Small a Circumflex	30
132	Small a Diaeresis or Umlaut	30
133	Small a Grave	30
134	Small a Overcircle	30
135	Small c Cedilla	30
136	Small e Circumflex	30
137	Small e Diaeresis or Umlaut	30
138	Small e Grave	30
139	Small i Diaeresis	18
140	Small i Circumflex	18
141	Small i Grave	18
142	Capital A Diaeresis or Umlaut	42
143	Capital A Overcircle	42
144	Capital E Acute	36
145	Small ae Diphthong	42

Figure A-4 (Part 5 of 10). Character Width Table

Character Number (Decimal)	Description	Width in Dots
146	Capital AE	42
	Diphthong	
147	Small o	30
	Circumflex	
148	Small o Diaeresis	30
	or Umlaut	
149	Small o Grave	30
150	Small u	36
	Circumflex	
151	Small u Grave	36
	Umlaut	
152	Small y Diaeresis	36
	or Umlaut	
153	Capital O	42
	Diaeresis or	
	Umlaut	
154	Capital U	42
	Diaeresis or	
	Umlaut	
155	O slash small	30
156	Pound Sign	30
157	O slash capital	42
158	Multiply	30
159	Florin Sign	30
160	Small a Acute	30
161	Small i Acute	18
162	Small o Acute	30
163	Small u Acute	36
164	Small n Tilde	36
165	Capital N Tilde	42
166	Feminine	30
	Ordinal	
	Indicator	
167	Masculine	30
	Ordinal	
	Indicator	
168	Inverted	30
	Question Mark	

Figure A-4 (Part 6 of 10). Character Width Table

Character Number (Decimal)	Description	Width in Dots
169	Registered Trademark Symbol	30
170	Logical Not, End of Line	30
171	Fraction One-Half	30
172	Fraction One-Quarter	30
173	Inverted Exclamation	30
174	Left-Angle Quotes	42
175	Right-Angle Quotes	42
176	Fill Character (weak)	30
177	Fill Character (medium)	30
178	Fill Character (heavy)	30
179	Vertical Center Bar - single	30
180	Right Side Tee - single	30
181	A Acute Capital	42
182	A Circumflex Capital	42
183	A Grave Capital	42
184	Copyright Symbol	30
185	Right Side Tee -double	30
186	Vertical Center Bar -double	30
187	UR Corner -double	30
188	LR Corner -double	30

Figure A-4 (Part 7 of 10). Character Width Table

Character Number (Decimal)	Description	Width in Dots
189	Cent Sign	30
190	Yen Sign	30
191	UR Corner -single	30
192	LL Corner -single	30
193	Bottom Side Tee -single	30
194	Top Side Tee -single	30
195	Left Side Tee -single	30
196	Horizontal Center Bar -single	30
197	Cross Intersection -single	30
198	A Tilde Small	30
199	A Tilde Capital	42
200	LL Corner -double	30
201	UL Corner -double	30
202	Bottom Side Tee -double	30
203	Top Side Tee -double	30
204	Left Side Tee -double	30
205	Horizontal Center Bar -double	30
206	Cross Intersection -double	30
207	International Currency Symbol	30

Figure A-4 (Part 8 of 10). Character Width Table

Character Number (Decimal)	Description	Width in Dots
208	ETH Icelandic Small	36
209	D Stroke cap./ETH Icelandic Capital	42
210	E Circumflex Capital	36
211	E Diaeresis Capital	36
212	E Grave Capital	36
213	I Dotless Small	18
214	I Acute Capital	24
215	I Circumflex Capital	24
216	I Diaeresis Capital	24
217	LR Corner -single	30
218	UL Corner -single	30
219	Fill Character - solid	30
220	Fill Character - lower half	30
221	Vertical Line, broken	30
222	I Grave Capital	24
223	Fill Character - upper half	30
224	O Acute Capital	42
225	Small Sharp s	36
226	O Circumflex Capital	42
227	O Grave Capital	42
228	O Tilde Small	30
229	O Tilde Capital	42
230	Micro Symbol	30
231	Thorn Icelandic Small	36

Figure A-4 (Part 9 of 10). Character Width Table

Character Number (Decimal)	Description	Width in Dots
232	Thorn Icelandic Capital	42
233	U Acute Capital	42
234	U Circumflex Capital	42
235	U Grave Capital	42
236	Y Acute Small	36
237	Y Acute Capital	42
238	Overline	30
239	Acute Accent	30
240	Syllable Hyphen	30
241	Plus/Minus Sign	30
242	Double Underscore	30
243	Three Quarters	30
244	Paragraph (USA)	30
245	Section Symbol (USA)/Paragraph Symbol (Europe)	30
246	Divide Sign	30
247	Cedilla Accent	30
248	Degree Symbol	30
249	Diaeresis/Umlaut Accent	30
250	Middle Dot Accent	30
251	One Superscript	30
252	Three Superscript	30
253	Subscript Two (aka NS02)	30
254	Solid Square	30
255	Required Space	30

Figure A-4 (Part 10 of 10). Character Width Table

Proprinter X24, XL24, X24E, and XL24E Start Addresses

These are the safe downloading addresses after a font or group of fonts has been downloaded using one of these diskettes:

US FontSet	X'C45A'
Multilingual FontSet	X'C92E'
NLS 850 Diskette	Multilingual DL4208A X'E093' DL4208B X'FEF0' DL4208D X'B491'
NLS 851 Diskette	Greek DL4208A X'CBFB' DL4208B X'F04F' DL4208D X'B491'
NLS 852 Diskette	Latin 2 DL4208A X'E02F' DL4208B X'FF6A' DL4208D X'B491'
NLS 853 Diskette	Turkish DL4208A X'D2CA' DL4208B X'F409' DL4208D X'B491'
NLS 855 Diskette	Russian DL4208A X'D7B9' DL4208B X'F718' DL4208D X'B491'
NLS 862 Diskette	Hebrew DL4208A X'B8D8' DL4208B X'DDB3' DL4208D X'B48B'
NLS 863 Diskette	(French-Canadian) DL4208A X'B23F' DL4208B X'D8DC' DL4208D X'B491'
NLS 864 Diskette	Arabic DL4208A X'ED3A' DL4208D X'B491'

Proprinter X24, XL24, X24E, and XL24E Lookup Tables

You can use these tables for locating specific address locations and descriptions of the resident fonts. This example describes the structure of a lookup table entry.

008912 A4145C2378000001E0

- X'8912' is the memory address of the lookup entry.
- X'A414' is the start address of the character data.
- X'5C' in binary notation is 0101 1100. Note that bit 6 is set to indicate that this is a resident character and that X'1C' is the number of stored columns, including the last blank column of the character image data.
- X'23' is the number of columns of data when the character is printed not including the last blank column.
- X'78000001E0' is the five compression mask bytes.
- ESC = 0 0 (U.S. or CP437) loads the following tables in the download memory.

The first entry of each table is the font descriptor byte.

10 CPI DRAFT FONT

008010	C0	0080E0	D5C74A090000000000
008011	D3454A090000000000	0080E9	D5E54A090000000000
00801A	D3634A090000000000	0080F2	D6034A090000000000
008023	D3814A090000000000	0080FB	D62149092000000000
00802C	D39F4A090000000000	008104	D63C49090100000000
008035	D3BD4A090000000000	00810D	D65746091E00000000
00803E	D3DB4A090000000000	008116	D66948090C00000000
008047	D3F94A090000000000	00811F	D6814A090000000000
008050	D417480940800000000	008128	D69F4A090000000000
008059	D42F48090C0000000000	008131	D6BD42097F80000000
008062	D44748090C0000000000	00813A	D6C346096180000000
00806B	D45F4A09000000000000	008143	D6D546094C80000000
008074	D47D4809180000000000	00814C	D6E749090800000000
00807D	D4954A09000000000000	008155	D7024A090000000000
008086	D4B34A09000000000000	00815E	D7204A090000000000
00808F	D4D14A09000000000000	008167	D73E4A090000000000
008098	D4EF4A09000000000000	008170	D75C44097380000000
0080A1	D50D4A09000000000000	008179	D76847094180000000
0080AA	D52B4A09000000000000	008182	D77D47094180000000
0080B3	D5494A09000000000000	00818B	D7924A090000000000
0080BC	D5674909080000000000	008194	D7B048091200000000
0080C5	D5824909040000000000	00819D	D7C846096180000000
0080CE	D59D48090C0000000000	0081A6	D7DA46091E00000000
0080D7	D5B546091C8000000000	0081AF	D7EC46096180000000

0081B8	D7FE4A090000000000	0083C2	DD8F48090180000000
0081C1	D81C48090C00000000	0083CB	DDA749090080000000
0081CA	D83446096180000000	0083D4	DDC24A090000000000
0081D3	D8464A090000000000	0083DD	DDE046091380000000
0081DC	D86448090880000000	0083E6	DDF249092000000000
0081E5	D87C49090800000000	0083EF	DE0D49090400000000
0081EE	D89749090400000000	0083F8	DE2848090C00000000
0081F7	D8B249090400000000	008401	DE4048090C00000000
008200	D8CD49090800000000	00840A	DE5848091800000000
008209	D8E848090C00000000	008413	DE7049090400000000
008212	D90049090800000000	00841C	DE8B48090C00000000
00821B	D91B46096180000000	008425	DEA348092200000000
008224	D92D46096180000000	00842E	DEBB49090800000000
00822D	D93F4A090000000000	008437	DED64A090000000000
008236	D95D46091E00000000	008440	DEF44A090000000000
00823F	D96F4A090000000000	008449	DF124A090000000000
008248	D98D4A090000000000	008452	DF304A090000000000
008251	D9AB4A090000000000	00845B	DF4E4A090000000000
00825A	D9C94A090000000000	008464	DF6C48090480000000
008263	D9E747093800000000	00846D	DF8444097380000000
00826C	D9FC48090C00000000	008476	DF9048091080000000
008275	DA1447093800000000	00847F	DFA84A090000000000
00827E	DA2947091C00000000	008488	DFC64A090000000000
008287	DA3E47091C00000000	008491	DFF44A090000000000
008290	DA534A090000000000	00849A	E00249090800000000
008299	DA7145093E00000000	0084A3	E01D4A090000000000
0082A2	DA8048091200000000	0084AC	E03B4A090000000000
0082AB	DA9847091880000000	0084B5	E05949090800000000
0082B4	DAAD49091000000000	0084BE	E0744A090000000000
0082BD	DAC846091E00000000	0084C7	E0924A090000000000
0082C6	DADA4A090000000000	0084D0	E0B04A090000000000
0082CF	DAF84A090000000000	0084D9	E0CE4A090000000000
0082D8	DB1648090C00000000	0084E2	E0EC48090C00000000
0082E1	DB2E47091C00000000	0084EB	E1044A090000000000
0082EA	DB434A090000000000	0084F4	E12249090800000000
0082F3	DB6148091800000000	0084FD	E13D4A090000000000
0082FC	DB7948090C00000000	008506	E15B47090380000000
008305	DB9146093300000000	00850F	E1704A090000000000
00830E	DBA348090C00000000	008518	E18E4A090000000000
008317	DBBB4A090000000000	008521	E1AC48092080000000
008320	DBD94A090000000000	00852A	E1C44A090000000000
008329	DBF74A090000000000	008533	E1E248090300000000
008332	DC154A090000000000	00853C	E1FA4A090000000000
00833B	DC334A090000000000	008545	E21848090C00000000
008344	DC5146094980000000	00854E	E2304A090000000000
00834D	DC634A090000000000	008557	E24E4A090000000000
008356	DC8146094980000000	008560	E26C4A090000000000
00835F	DC934A090000000000	008569	E28A4A090000000000
008368	D6BDC3893F80000000	008572	E2A848090C00000000
008371	DCB147094180000000	00857B	E2C048090C00000000
00837A	DCC648091800000000	008584	E2D84A090000000000
008383	DCDE49090800000000	00858D	E2F64A090000000000
00838C	DCF948090C00000000	008596	E3144A090000000000
008395	DD1149090800000000	00859F	E33249092000000000
00839E	DD2C48090C00000000	0085A8	E34D4A090000000000
0083A7	DD4448092200000000	0085B1	E36B4A090000000000
0083B0	DD5C48091800000000	0085BA	E38948090180000000
0083B9	DD7449090400000000	0085C3	E3A14A090000000000

0085CC	E3BF4A090000000000	008773	E76AC7492600000000
0085D5	E3DD4A090000000000	00877C	E77FC6496600000000
0085DE	E3FB4A090000000000	008785	E791C4497980000000
0085E7	E41949090800000000	00878E	E79DC4497980000000
0085F0	E43448090C00000000	008797	E7A9C6496600000000
0085F9	E44C4A090000000000	0087A0	E7BBC7492600000000
008602	E46A46091C80000000	0087A9	E7D0C5493980000000
00860B	E47C46091C80000000	0087B2	E7DFC5493980000000
008614	E48E4A090000000000	0087BB	E7EEC4497980000000
00861D	E4AC4A090000000000	0087C4	E7FAC3493F80000000
008626	E4CA46096180000000	0087CD	E803C3493F80000000
00862F	E4DC4A090000000000	0087D6	E80CC5493380000000
008638	E4FA4A090000000000	0087DF	E81BC4497980000000
008641	E518C9090800000000	0087E8	E827C3493F80000000
00864A	E533C8092200000000	0087F1	E8304A090000000000
008653	E54BC9092000000000	0087FA	E84E4A090000000000
00865C	E566C4497980000000	008803	E86C46091E00000000
008665	E572C5493980000000	00880C	E87E48091800000000
00866E	E581C5493980000000	008815	E89649090400000000
008677	E590C7492600000000	00881E	E8B148091800000000
008680	E5A5C7492600000000	008827	E8C94A090000000000
008689	E5BAC5493980000000	008830	E8E748092080000000
008692	E5C9C7492600000000	008839	E8FF4A090000000000
00869B	E5DEC6496600000000	008842	E91D48090C00000000
0086A4	E5F0C7492600000000	00884B	E93548090C00000000
0086AD	E605C7492600000000	008854	E94D48090C00000000
0086B6	E61AC7492600000000	00885D	E9654A090000000000
0086BF	E62FC5493980000000	008866	E9834A090000000000
0086C8	E63EC5493980000000	00886F	E9A149090800000000
0086D1	E64DC4497980000000	008878	E9BC49090800000000
0086DA	E659C5493980000000	008881	E9D744093F00000000
0086E3	E668C5493980000000	00888A	E9E348091200000000
0086EC	E677C4497980000000	008893	E9FB4A090000000000
0086F5	E683C3493F80000000	00889C	EA194A090000000000
0086FE	E68CC5493980000000	0088A5	EA37C7497000000000
008707	E69BC4497980000000	0088AE	EA4C47090380000000
008710	E6A7C6496600000000	0088B7	EA614A090000000000
008719	E6B9C6496600000000	0088C0	EA7F4A090000000000
008722	E6CBC6496600000000	0088C9	EA9D48090880000000
00872B	E6DDC7492600000000	0088D2	EAB548094080000000
008734	E6F2C7492600000000	0088DB	EACD46096180000000
00873D	E707C6496600000000	0088E4	EADF4A090000000000
008746	E719C3493F80000000	0088ED	EAFD49090080000000
00874F	E722C7492600000000	0088F6	EB1849090080000000
008758	E737C5493980000000	0088FF	EB3346094E00000000
008761	E746C7492600000000	008908	EB4542097F80000000
00876A	E75BC5493980000000		

END OF LOOKUP TABLE FOR 10 CPI DRAFT FONT

START OF LOOKUP TABLE FOR 10 CPI LQ FONT

008911	41	008B0A	AF9654237C01F803E0
008912	A4145C2378000001E0	008B13	AFD257237C050007E0
00891B	A4685923000FC003E0	008B1C	B01746237FFD6BFFE0
008924	A4B35B2301030203E0	008B25	B0294E237FC003FFE0
00892D	A504592304902483E0	008B2E	B05350237DA4924FE0
008936	A54F5B2300000003FE0	008B37	B08344237DFFFFFBEO
00893F	A5A059232800014FE0	008B40	B08F50237F24925BE0
008948	A5EB5B231000008FE0	008B49	B0BF53237E4A5007E0
008951	A63C48237FE5FA7FE0	008B52	B0F855237F800381E0
00895A	A6544D2368DFEC5BE0	008B5B	B1375F2330004000C0
008963	A67B50237C19F983E0	008B64	B1944F235E9FFE00E0
00896C	A6AB4F232B2FD353E0	008B6D	B1C156237009FE0060
008975	A6D8552303FC0027E0	008B76	B2034F236E5FFC80E0
00897E	A71750237F039C0FE0	008B7F	B2304923776FF3DBE0
008987	A7475723786A1001E0	008B88	B24B49237BDBFCFB60
008990	A78C542356899183E0	008B91	B26656236003FB04C0
008999	A7C856237601CE01A0	008B9A	B2A84A235DBBFDDBA0
0089A2	A80A4A237CEEEEEEBE0	008BA3	B2C646237DFF6FFBE0
0089AB	A8284A237D777773E0	008BAC	B2D84E23791BF49F60
0089B4	A846562379016809E0	008BB5	B30257237BB4000320
0089BD	A8884A237E67FCCFE0	008BBE	B347482377DBEFF6E0
0089C6	A8A64D2372DD4FCEE0	008BC7	B35F5A235A006005A0
0089CF	A8CD59237E000003E0	008BD0	B3AD5B235C800009A0
0089D8	A91844237DFFFFFFBE0	008BD9	B3FE54236027FE4060
0089E1	A924562379016809E0	008BE2	B43A4C237B97DF49E0
0089EA	A966562379016809E0	008BEB	B45E5B236002624060
0089F3	A9A8562379016809E0	008BF4	B4AF5323776EE001A0
0089FC	A9EA4E237FFFF400A0	008BFD	B4E857237C00D401E0
008A05	AA144E232005FFFFFE0	008C06	B52D4A236DDF6FBB60
008A0E	AA3E45237EDFFFF7E0	008C0F	B54B50235C93FC93A0
008A17	AA4D58232007FE0040	008C18	B57B5C2338006001C0
008A20	AA955A237C000003E0	008C21	B5CF5E2350006000A0
008A29	AAE35A237C000003E0	008C2A	B62956234E48612720
008A32	AB3142237FFFFFFFFFE0	008C33	B66B58236E00600760
008A3B	AB3748237FFC63FFE0	008C3C	B6B358237E000043E0
008A44	AB4F4E237F81F81FE0	008C45	B6FB45237FFB7F7FE0
008A4D	AB794E237CE1F873E0	008C4E	B70A5C2378000001E0
008A56	ABA355237E011807E0	008C57	B75E45237FFBFB7FE0
008A5F	ABE25923700C04C0E0	008C60	B76D4C237F4AF52FE0
008A68	AC2D5A2378004006E0	008C69	AB31C2A37FFFFFFFFFE0
008A71	AC7B48237FFC0FFFE0	008C72	B79149237EB52FFFE0
008A7A	AC934C237FF801FFE0	008C7B	B7AC53237C06BA0760
008A83	ACB74C237FF003FFE0	008C84	B7E553231412FF60E0
008A8C	ACDB58237FC200043E0	008C8D	B81E56237801E841E0
008A95	AD2346237BFF6FFDE0	008C96	B8605323706FD482C0
008A9E	AD354D237FF001FFE0	008C9F	B89954237803FD00E0
008AA7	AD5C44237DFFFFFFBE0	008CA8	B8D54B237EF93AF5E0
008AB0	AD6846237FFCF3FFE0	008CB1	B8F6562378035303A0
008AB9	AD7A5C2378000001E0	008CBA	B93858234A012A0760
008AC2	ADCE54237C01F803E0	008CC3	B9804A237E7AA7FDE0
008ACB	AE0A4A237E2DB7F7E0	008CCC	B99E4B237CFFC07FE0
008AD4	AE2856237E00A007E0	008CD5	B9BF582376840013A0
008ADD	AE6A552378007C07E0	008CDE	BA074A237CF54FFBE0
008AE6	AEA95423780016E7E0	008CE7	BA2554235A2E41C960
008AEF	AEE551237C0EF807E0	008CF0	BA6155236E412A0760
008AF8	AF1857237C001407E0	008CF9	BAA056237003FC00E0
008B01	AF5D53237CF8000FE0	008D02	BAE253235A093FB060

008D0B	BB1B532360DFC905A0	008F15	C97051237FA09117E0
008D14	BB544D237BED0D7B60	008F1E	C9A350237F004BAFE0
008D1D	BB7B56237C029203E0	008F27	C9D348237FF8C7FFE0
008D26	BBBD4F237BE4FD10E0	008F30	C9EB58237E000007E0
008D2F	BBEA54236E07482760	008F39	CA3358237C00000FE0
008D38	BC265A236C00600360	008F42	CA7BC9236FB7DBEDE0
008D41	BC7460232000600040	008F4B	CA96C9237BBDDDEEF60
008D4A	BCD458236680700B20	008F54	CAB1C9237EBF5FAFC0
008D53	BD1C5D236C000001C0	008F5D	CACCC4637FFF6FFFE0
008D5C	BD735A2379000003E0	008F66	CAD8C4637FFF6FFFE0
008D65	BDC14E237F7A00EFE0	008F6F	CAE4C4637FFF6FFFE0
008D6E	BDEB44237FFFB7FFE0	008F78	CAF0C6637FDBFDBFE0
008D77	BDF74E237FB802F7E0	008F81	CB02C6637FDBFDBFE0
008D80	BE214E237F0E970FE0	008F8A	CB14C4637FFF6FFFE0
008D89	BE4B5C2378000001E0	008F93	CB20C6637FDBFDBFE0
008D92	BE9F5A237000EC0060	008F9C	CB32C6637FDBFDBFE0
008D9B	BEED56236E03480760	008FA5	CB44C6637FDBFDBFE0
008DA4	BF2F582378029500E0	008FAE	CB56C6637FDBFDBFE0
008DAD	BF7756237805600EE0	008FB7	CB68C6637FDBFDBFE0
008DB6	BFB955237C02B80760	008FC0	CB7AC4637FFF6FFFE0
008DBF	BFF856237C02920760	008FC9	CB86C6637FFF6FFFE0
008DC8	C03A57237C00B00760	008FD2	CB92C4637FFF6FFFE0
008DD1	C07F55237801DA41E0	008FDB	CB9EC4637FFF6FFFE0
008DDA	C0BE56237802F500E0	008FE4	CBAAC4637FFF6FFFE0
008DE3	C10055237803FC00E0	008FED	CB86C4637FFF6FFFE0
008DEC	C13F592378014900E0	008FF6	CBC2C2637FFFFFFFFE0
008DF5	C18A50237E62A4CDE0	008FFF	CBC8C4637FFF6FFFE0
008DFE	C1BA52237E10A25DE0	009008	CBD4C4637FFF6FFFE0
008E07	C1F04C237E5A87FDE0	009011	CBE0C6637FDBFDBFE0
008E10	C2145E2330006000C0	00901A	CBF2C6637FDBFDBFE0
008E19	C26E5E2330006000C0	009023	CC04C6637FDBFDBFE0
008E22	C2C84E23776E919BE0	00902C	CC16C6637FDBFDBFE0
008E2B	C2F2582340F003F020	009035	CC28C6637FDBFDBFE0
008E34	C33A55236002CBE6C0	00903E	CC3AC6637FDBFDBFE0
008E3D	C37958237002F400E0	009047	CC4CC2637FFFFFFFFE0
008E46	C3C156237003FC00E0	009050	CC52C6637FDBFDBFE0
008E4F	C4035A2370029400E0	009059	CC64C4637FFF6FFFE0
008E58	C45156236E05480760	009062	CC70C6637FDBFDBFE0
008E61	C49358236E02002760	00906B	CC82C4637FFF6FFFE0
008E6A	C4DB5C236E000001C0	009074	CC8EC6637FDBFDBFE0
008E73	C52F58236005FA0060	00907D	CCA0C6637FDBFDBFE0
008E7C	C57752235C91F893A0	009086	CCB2C4637FFF6FFFE0
008E85	C5AD51237C059A97E0	00908F	CCBEC4637FFF6FFFE0
008E8E	C5E057237A00CC01E0	009098	CCCAC6637FDBFDBFE0
008E97	C6255A236600600660	0090A1	CCDCC6637FDBFDBFE0
008EA0	C6735B234B81040600	0090AA	CCEEC4637FFF6FFFE0
008EA9	C6C4542377C0006EE0	0090B3	CCFAC4637FFF6FFFE0
008EB2	C70057237C02120760	0090BC	CD06C4637FFF6FFFE0
008EBB	C7454E237E7A85ADE0	0090C5	CD12C2637FFFFFFFFE0
008EC4	C76F5B2370012800E0	0090CE	CD18C2637FFFFFFFFE0
008ECD	C7C057236E04082760	0090D7	CD1EC3637FFFBFFFE0
008ED6	C80556237700920760	0090E0	CD27C3637FFFDFFFE0
008EDF	C8475C235C000009A0	0090E9	CD30C2637FFFFFFFFE0
008EE8	C89B55237C03A015E0	0090F2	CD365E236001900020
008EF1	C8DA54237805FA01E0	0090FB	CD905A236E000C00E0
008EFA	C91654237E020527E0	009104	CDDE48235F6FEFF6E0
008F03	C95245237EDFFF7E0	00910D	CE650236C07F93DA0
008F0C	C96145237EFFFFB7E0	009116	CE26552362001F93E0

00911F	CE655423604FFC01C0	00919D	D15050237ED24927E0
009128	CEA152236E45E82760	0091A6	D180CF637FFF0184E0
009131	CED74F2377FC0F03E0	0091AF	D1AD4E23790C0FFFE0
00913A	CF045223485F6FA120	0091B8	D1D748237DFD6BFBE0
009143	CF3A58236003FC0060	0091C1	D1EF5023785E97A1E0
00914C	CF825A236001F80060	0091CA	D21F52237E01F807E0
009155	CFD056237002FE00E0	0091D3	D25548237FF2F4FFE0
00915E	D012552307830783E0	0091DC	D26D46237FFCF3FFE0
009167	D051582360076E0060	0091E5	D27F5E237E00000000
009170	D09951237807F84BE0	0091EE	D2D951237D807A4DE0
009179	D0CC52237813FC81E0	0091F7	D30C4D237F8B691FE0
009182	D10244237DFFFFFFBE0	009200	D33344237FDFFFBFEO
00918B	D10E46237BFF6FFDE0	009209	D33F42237FFFFFFFFE0
009194	D12050237E4924B7E0		

END OF LOOKUP TABLE FOR 10 CPI LQ FONT

START OF LOOKUP TABLE FOR 10 PROP LQ FONT

009212	43	00940B	F064541D600FC01800
009213	EB4B5B1D4000001800	009414	F0A0571D7014001800
00921C	A468581D0000FC00000	00941D	F0E5461D7FEB5FF800
009225	A4B35A1D0103020000	009426	F0F74D1D7F001FF800
00922E	A504581D0490248000	00942F	B053501D6D24927800
009237	A54F5B1D00000003800	009438	B083441D6FFFFFD800
009240	A5A0591D2800014800	009441	B08F501D792492D800
009249	A5EB5B1D1000008800	00944A	F11E531D7912007800
009252	A63C481D7F2FD3F800	009453	F157551D7000703800
00925B	A6544C1D68DFEC5800	00945C	F19660295C001E0006
009264	A67B501D60CFCC1800	009465	F1F652297BC3FFF006
00926D	A6AB4E1D2B2FD35000	00946E	F22C58297000FFC06E
009276	A6D8551D03FC002000	009477	F274522977A7FFC806
00927F	A717501D781CE07800	009480	F2AA49236F6FF3EDE0
009288	A747561D0770800800	009489	F2C54B2377DBFCEA60
009291	A78C531D5689918000	009492	F2E6592978007FCA06
00929A	A7C8551D300E700800	00949B	F3314E296F6F7FBD8C
0092A3	A80A4A1D6777775800	0094A4	F35B46176FDBF60000
0092AC	A8284A1D6BBBBB9800	0094AD	F36D4E1D64BF81F000
0092B5	A846561D480B404800	0094B6	F3975C297DED000006
0092BE	EB9C4A1D799FE67800	0094BF	F3EB48237BEDF7FB60
0092C7	EBBA4E1D4954FCE800	0094C8	F4035E295CA00C0146
0092D0	EBE4581D7000003800	0094D1	F45D5D297BB4000086
0092D9	A918441D6FFFFFD800	0094DA	F4B45A297004FFC802
0092E2	A924561D480B404800	0094E3	F5024E237BDBF700E0
0092EB	A966561D480B404800	0094EC	F52C5E297000774802
0092F4	A9A8561D480B404800	0094F5	F58655297BDBDD8022
0092FD	A9EA4D1D7FFF400800	0094FE	F5C554237803FA01E0
009306	AA144E1D2005FFF800	009507	F6014E297B77EDFB86
00930F	AA3E451D76FFFFB800	009510	F62B5C296F00578006
009318	AA4D581D2007801000	009519	F67F612938003C000C
009321	AA955A1D6000001800	009522	F6E2612938080C0406
00932A	AAE35A1D6000001800	00952B	F745642966000C0000
009333	EC2C421D7FFFFFFF800	009534	F7B159296E924C924C
00933C	EC32481D7FF18FF800	00953D	F7FC59237E000021E0
009345	EC4A4E1D7C0FC0F800	009546	F847451D7FEDFDF800
00934E	EC744E1D670FC39800	00954F	F8565B1D4000001800
009357	EC9E551D7008C03800	009558	F8A7451D7FBFB7F800
009360	ECDD521D7262464800	009561	F8B64E1D7D0782F800
009369	ED135A237000800DE0	00956A	AB31C29D7FFFFFFF800
009372	ED6148117E07800000	009573	F8E0491D75A97FF800
00937B	ED794C1D7FE007F800	00957C	F8FB531D603E407000
009384	ED9D4C1D7FE007F800	009585	F93452233416FF40E0
00938D	EDC1581D7080010800	00958E	F96A531D404FC41800
009396	AD23461D5FFB7FE800	009597	F9A35323605FAD05A0
00939F	EE094D1D7F800FF800	0095A0	F9DC541D600FD00800
0093A8	EE30441D77FFFFB800	0095A9	FA184C175F26A80000
0093B1	EE3C461D7FE79FF800	0095B2	FA3C5323601FEC0760
0093BA	EE4E5B1D4000001800	0095BB	FA7556234A017A0760
0093C3	EE9F541D600FC01800	0095C4	FAB745115F6F800000
0093CC	EEDB4A1D7C4DBFB800	0095CD	FAC64B112A07800000
0093D5	EEF9561D7002803800	0095D6	FAE75323776C8046E0
0093DE	EF3B531D604BC03800	0095DF	FB2046113EDF000000
0093E7	EF74531D70005BA800	0095E8	FB3258295DA1C90E46
0093F0	EFAD541D7012E01800	0095F1	FB7A53236E417A0760
0093F9	EFE9571D7000501800	0095FA	FBB3541D401FE00800
009402	F02E521D73F0003800	009603	FBEF53235A0B3FA060

00960C	FC285323605FCD05A0	009816	5A85511D7D0488B800
009615	FC61501D5A093B6800	00981F	5AB8501D78025D7800
00961E	FC91521D700FA03800	009828	5AE8481D7FF18FF800
009627	FCC749173E4FDA0000	009831	5B005A297FC00000FE
009630	FCE254236E07482760	00983A	5B4E5A297F800001FE
009639	FD1E5A235C006003A0	009843	7C09C51D7EFEFDF800
009642	FD6C612938040C0806	00984C	7C18C51D7FEEFFD800
00964B	FDCF58231D00E01720	009855	7C27C31D7FFEFFFF800
009654	FE175D2338000003A0	00985E	CACCC45D7FF6FFF800
00965D	FE6E581D6400009800	009867	CAD8C45D7FF6FFF800
009666	FEB64E1D77A00FB800	009870	CAE4C45D7FF6FFF800
00966F	FEE0441D7FFB7FF800	009879	CAFOC65D7DBFDBF800
009678	FEEC4E1D77C017B800	009882	CB02C65D7DBFDBF800
009681	FF164E1D7874B87800	00988B	CB14C45D7FF6FFF800
00968A	BE4B5C1D6000000000	009894	CB20C65D7DBFDBF800
009693	FF405B2970007D806E	00989D	CB32C65D7DBFDBF800
00969C	4FFF56236E03480760	0098A6	CB44C65D7DBFDBF800
0096A5	5041591D6004800800	0098AF	CB56C65D7DBFDBF800
0096AE	508C571D6006007000	0098B8	CB68C65D7DBFDBF800
0096B7	50D1541D601E407000	0098C1	CB7AC45D7FF6FFF800
0096C0	510D571D6014007000	0098CA	CB86C45D7FF6FFF800
0096C9	5152551D601E007000	0098D3	CB92C45D7FF6FFF800
0096D2	5191561D6007600800	0098DC	CB9EC45D7FF6FFF800
0096DB	51D3571D6007800800	0098E5	CBAAC45D7FF6FFF800
0096E4	5218551D600FC00800	0098EE	CBB6C45D7FF6FFF800
0096ED	5257581D6004900800	0098F7	CBC2C25D7FFFFFFF800
0096F6	529F4B111363000000	009900	CBC8C45D7FF6FFF800
0096FF	52C04E110168000000	009909	CCD4C45D7FF6FFF800
009708	52EA4A115A07800000	009912	CBE0C65D7DBFDBF800
009711	530862295C00120006	00991B	CBF2C65D7DBFDBF800
00971A	536E60295C001E0006	009924	CC04C65D7DBFDBF800
009723	53CE4F237B9742CDE0	00992D	CC16C65D7DBFDBF800
00972C	53FB5D29603B001F02	009936	CC28C65D7DBFDBF800
009735	545259293000BB7E4A	00993F	CC3AC65D7DBFDBF800
00973E	549D581D4007800800	009948	CC4CC25D7FFFFFFF800
009747	54E5541D401FE00800	009951	CC52C65D7DBFDBF800
009750	5521581D4014A00800	00995A	CC64C45D7FF6FFF800
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009762	55AE56236E05082760	00996C	CC82C45D7FF6FFF800
00976B	55F05D235C000001C0	009975	CC8EC65D7DBFDBF800
009774	56475B297004FFC002	00997E	CCA0C65D7DBFDBF800
00977D	569859295E00FFC006	009987	CCB2C45D7FF6FFF800
009786	56E3551D6026620800	009990	CCBEC45D7FF6FFF800
00978F	5722551D6803304800	009999	CCCAC65D7DBFDBF800
009798	5761581D1803006000	0099A2	CCDCC65D7DBFDBF800
0097A1	57A95F2925D0306800	0099AB	CCEEC45D7FF6FFF800
0097AA	5806531D3E00076800	0099B4	CCFAC45D7FF6FFF800
0097B3	583F571D6012007000	0099BD	CD06C45D7FF6FFF800
0097BC	588449115D2B000000	0099C6	CD12C25D7FFFFFFF800
0097C5	589F591D4009400800	0099CF	CD18C25D7FFFFFFF800
0097CE	58EA57236E02402760	0099D8	CD1EC35D7FFBFFF800
0097D7	592F56236E012A0760	0099E1	CD27C35D7FFEFFF800
0097E0	597160297B80000106	0099EA	CD30C25D7FF6FFF800
0097E9	59D1551D601D00A800	0099F3	5B9C5E1D0000000000
0097F2	5A10541D600FC01800	0099FC	5BF65A236E000C00E0
0097FB	5A4C531D7801227800	009A05	5C4448236FB7F7B60
009804	C952451D76FFFFFB800	009A0E	5C5C50236C07F93DA0
00980D	C961451D77FFFD800	009A17	5C8C5A297C0000FE4E

009A20	5CDA5423600FF807C0	009A9E	D150501D7692493800
009A29	5D1652236E45E82760	009AA7	D180CF5D7FF0184800
009A32	5D4C4D1D6FF0789800	009AB0	D1AD4E1D10C0FFF800
009A3B	5D735629701BEDF602	009AB9	D1D7481D6FEB5FD800
009A44	5DB55A297004FFC802	009AC2	D1EF501D42F4BD0800
009A4D	5E035A297008FFC402	009ACB	D21F521D700FC03800
009A56	5E51561D400BE00800	009AD4	D255481D7F97A7F800
009A5F	D012541D0783078000	009ADD	D26D461D7FE79FF800
009A68	5E9358297C01EDE00E	009AE6	D27F5E1D0000000000
009A71	5EDB511D700FC25800	009AEF	5F0E511D6C03D26800
009A7A	D0CC521D409FE40800	009AF8	5F414D1D7C5B48F800
009A83	D102441D6FFFFFD800	009B01	D333441D7EFFFFDF800
009A8C	D10E461D5FFB7FE800	009B0A	5F68421D7FFFFFFF800
009A95	D120501D724925B800		

END OF LOOKUP TABLE FOR 10 CPI PROP FONT

START OF LOOKUP TABLE FOR 12 CPI LQ FONT

009B13	02	009D0C	6445551D700A803800
009B14	5F6E581D7000003800	009D15	6484551D700E003800
009B1D	A468581D0000FC00000	009D1E	64C3461D7FF33FF800
009B26	A4B35A1D0103020000	009D27	64D5481D7FF81FF800
009B2F	A504581D0490248000	009D30	B053501D6D24927800
009B38	A54F5B1D00000003800	009D39	B083441D6FFFFFD800
009B41	A5A0591D2800014800	009D42	B08F501D792492D800
009B4A	A5EB5B1D1000008800	009D4B	64ED511D7C3001F800
009B53	A63C481D7F2FD3F800	009D54	6520571D7000209800
009B5C	A6544C1D68DFEC5800	009D5D	65655C1D2000001000
009B65	A67B501D60CFCC1800	009D66	65B94D1D6EDFE01800
009B6E	A6AB4E1D2B2FD35000	009D6F	65E0501D7017F81800
009B77	A6D8551D03FC002000	009D78	66104E1D5DBF901800
009B80	A717501D781CE07800	009D81	663A4B1D6E5FCF1800
009B89	A747561D0770800800	009D8A	665B4A1D6EDF679800
009B92	A78C531D5689918000	009D93	6679511D6017D89800
009B9B	A7C8551D300E700800	009D9C	66AC4A1D3B77BB7000
009BA4	A80A4A1D6777775800	009DA5	66CA481D6BFB7F5800
009BAD	A8284A1D6BBBBB9800	009DAE	66E24E1D687749E800
009BB6	A846561D480B404800	009DB7	670C531D5DB8005000
009BBF	5FB64E1D7C0FE07800	009DC0	67454A1D4F6FBF4800
009BC8	5FE04D1D70A9F3D800	009DC9	6763581D3200013000
009BD1	6007531D7E0000F800	009DD2	67AB561D4C80026800
009BDA	A918441D67FFFFD800	009DDB	67ED501D605FE81800
009BE3	A924561D480B404800	009DE4	681D4D1D6F2FDC0800
009BEC	A966561D480B404800	009DED	6844551D605E800800
009BF5	A9A8561D480B404800	009DF6	6883501D3DB9403800
009BFE	A9EA4D1D7FFF400800	009DFF	68B3511D705B603800
009C07	AA144E1D2005FFF800	009E08	68E64C1D62FB7D1800
009C10	AA3E451D76FFFFB800	009E11	690A501D5C0BF03800
009C19	AA4D581D2007801000	009E1A	693A591D3001001800
009C22	AA955A1D6000001800	009E23	69855C1D2000000800
009C2B	AAE35A1D6000001800	009E2C	69D95A1D1400002800
009C34	AB31421D7FFFFFFF800	009E35	6A27571D3801007000
009C3D	6040481D7FF03FF800	009E3E	6A6C581D7000003800
009C46	60584E1D7E07C0F800	009E47	6AB4451D7FF6FBF800
009C4F	6082551D6303011800	009E50	6AC3501D7F0003F800
009C58	60C1541D7C00483800	009E59	6AF3451D7FBEDFF800
009C61	60FD5C1D1000001000	009E62	6B024A1D7CD7ACF800
009C6A	6151591D7000008800	009E6B	AB31C29D7FFFFFFF800
009C73	619C481D7FF03FF800	009E74	6B204A1D7B4A5FF800
009C7C	61B44E1D7F8085F800	009E7D	6B3E531D604C60F000
009C85	61DE4E1D7F4203F800	009E86	6B77531D3807E01800
009C8E	6208571D700000B800	009E8F	6BB0521D7023F01800
009C97	AD23461D5FFB7FE800	009E98	6BE6501D649F807800
009CA0	624D481D7FF03FF800	009EA1	6C16511D702FE01800
009CA9	6265441D77FFFFB800	009EAA	6C494A1D7BE4FF4800
009CB2	6271461D7FF33FF800	009EB3	6C67561D600FC00000
009CBB	6283501D7F0003F800	009EBC	6CA9521D1803D27800
009CC4	62B3501D702FD03800	009EC5	6CDF4B1D7CF81FD800
009CCD	62E3461D7DFDBFB800	009ECE	6D004D1D687E07F800
009CD6	62F5571D7800003800	009ED7	6D27561D4D2001A000
009CDF	633A4F1D725F00F800	009EE0	6D69481D75FD3FE800
009CE8	6367531D780051B800	009EE9	6D81521D24711AD000
009CF1	63A04F1D727F007800	009EF2	6DB7521D1803D27800
009CFA	63CD551D7001C03800	009EFB	6DED521D604FC81800
009D03	640C531D7B80007800	009F04	6E234F1D4D25FA800

009F0D	6E50501D64BF422800	00A117	7B01521D7D2000F800
009F16	6E80531D73D2040800	00A120	7B37511D7800D4F800
009F1F	6EB9501D780FE03800	00A129	7B6A481D7FF03FF800
009F28	6EE94A1D7B93FE6800	00A132	7B82561D7002007800
009F31	6F07501D381F887800	00A13B	7BC4571D7800003800
009F3A	6F37591D3001003000	00A144	7C09C51D7EFEFDF800
009F43	6F825E1D0000000000	00A14D	7C18C51D7FEEFFD800
009F4C	6FDC571D5C01005000	00A156	7C27C31D7FFEFF800
009F55	70215A1D4000007000	00A15F	CACCC45D7FF6FFF800
009F5E	706F591D7800000800	00A168	CAD8C45D7FF6FFF800
009F67	70BA4A1D7B693F7800	00A171	CAE4C45D7FF6FFF800
009F70	70D8441D7FFB7FF800	00A17A	CAF0C65D7DBFDBF800
009F79	70E44A1D77E4B6F800	00A183	CB02C65D7DBFDBF800
009F82	71024D1D78B568F800	00A18C	CB14C45D7FF6FFF800
009F8B	BE4B5C1D6000000000	00A195	CB20C65D7DBFDBF800
009F94	7129561D7005801800	00A19E	CB32C65D7DBFDBF800
009F9D	716B531D380F807000	00A1A7	CB44C65D7DBFDBF800
009FA6	71A4561D7022401800	00A1B0	CB56C65D7DBFDBF800
009FAF	71E6561D7020807000	00A1B9	CB68C65D7DBFDBF800
009FB8	7228571D7000807000	00A1C2	CB7AC45D7FF6FFF800
009FC1	726D571D7020007000	00A1CB	CB86C45D7FF6FFF800
009FCA	72B2561D7020807000	00A1D4	CB92C45D7FF6FFF800
009FD3	72F4561D7003081800	00A1DD	CB9EC45D7FF6FFF800
009FDC	7336531D7023C03800	00A1E6	CBAAC45D7FF6FFF800
009FE5	736F531D7007C03800	00A1EF	CBB6C45D7FF6FFF800
009FEE	73A8531D7025213800	00A1F8	CBC2C25D7FFFFFF800
009FF7	73E14E1D7CCD0CD800	00A201	CBC8C45D7FF6FFF800
00A000	740B4D1D7CD52CD800	00A20A	CBD4C45D7FF6FFF800
00A009	74324D1D74943FD800	00A213	CBE0C65D7DBFDBF800
00A012	74595B1D6000001000	00A21C	CBF2C65D7DBFDBF800
00A01B	74AA571D600F001000	00A225	CC04C65D7DBFDBF800
00A024	74EF531D6C5A420800	00A22E	CC16C65D7DBFDBF800
00A02D	7528591D01C00A0000	00A237	CC28C65D7DBFDBF800
00A036	7573541D40143E6000	00A240	CC3AC65D7DBFDBF800
00A03F	75AF541D6047881800	00A249	CC4CC25D7FFFFFF800
00A048	75EB521D604FC81800	00A252	CC52C65D7DBFDBF800
00A051	7621571D6004881800	00A25B	CC64C45D7FF6FFF800
00A05A	7666531D3817807000	00A264	CC70C65D7DBFDBF800
00A063	769F561D3014807000	00A26D	CC82C45D7FF6FFF800
00A06C	76E1581D6800003800	00A276	CC8EC65D7DBFDBF800
00A075	7729521D604FC81800	00A27F	CCA0C65D7DBFDBF800
00A07E	775F541D3807807000	00A288	CCB2C45D7FF6FFF800
00A087	779B511D7022793800	00A291	CCBEC45D7FF6FFF800
00A090	77CE581D7800010800	00A29A	CCCAC65D7DBFDBF800
00A099	78165C1D0401000000	00A2A3	CCDC65D7DBFDBF800
00A0A2	786A561D4E80284000	00A2AC	CCEEC45D7FF6FFF800
00A0AB	78AC541D0F400E8800	00A2B5	CCFAC45D7FF6FFF800
00A0B4	78E8571D604020B000	00A2BE	CD06C45D7FF6FFF800
00A0BD	792D4E1D7CE90B5800	00A2C7	CD12C25D7FFFFFF800
00A0C6	7957571D6044801800	00A2D0	CD18C25D7FFFFFF800
00A0CF	799C551D3809007800	00A2D9	CD1EC35D7FFBFFF800
00A0D8	79DB561D1801407800	00A2E2	CD27C35D7FFBFFF800
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00A0EA	7A65541D7018039800	00A2F4	7C30581D6034000800
00A0F3	7AA1501D702FD03800	00A2FD	7C78551D5C0C600800
00A0FC	7AD1501D7E4030F800	00A306	7CB7481D5F6FBFC800
00A105	C952451D76FFFFB800	00A30F	7CCF501D700FE9C000
00A10E	C961451D77FFFD800	00A318	7CFF521D6010BF1800

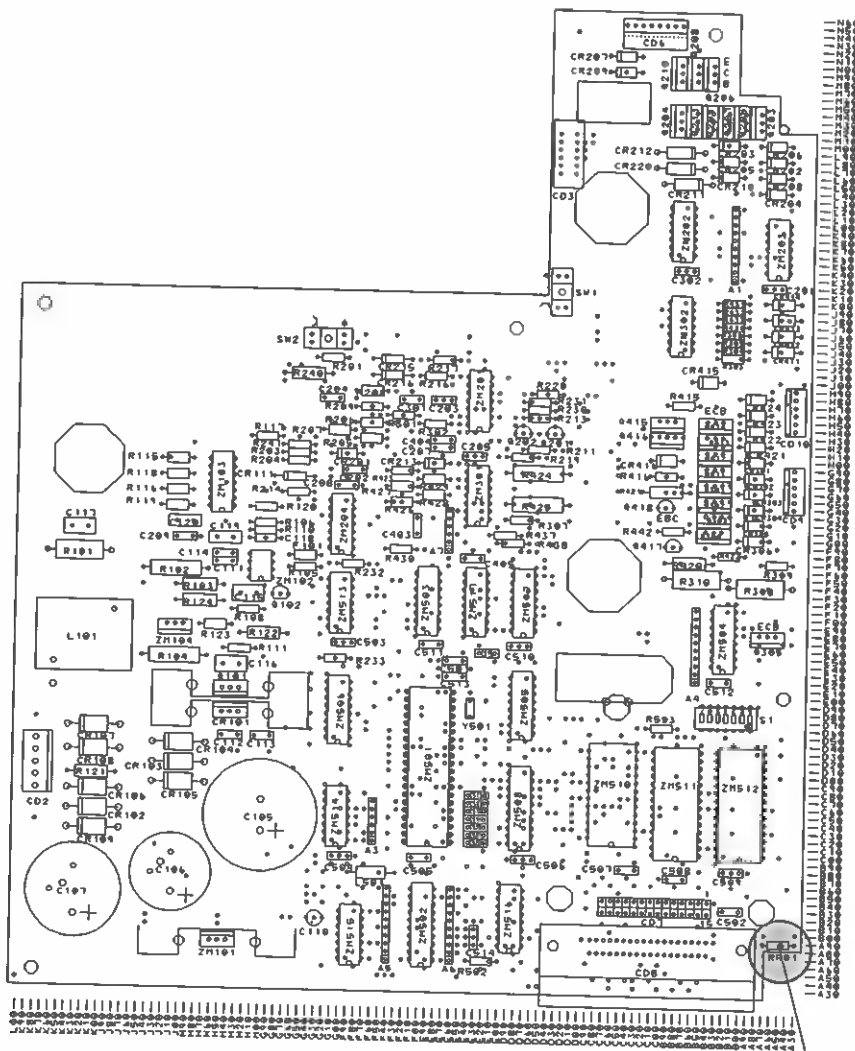
00A321	7D35531D604F807000	00A39F	D150501D7692493800
00A32A	7D6E571D3807800000	00A3A8	D180CF5D7FF0184800
00A333	7DB3511D63F8301800	00A3B1	D1AD4E1D10C0FFF800
00A33C	7DE6501D127B792000	00A3BA	D1D7481D6FEB5FD800
00A345	7E16541D404FC80800	00A3C3	D1EF501D42F4BD0800
00A34E	7E52541D408FE20000	00A3CC	D21F521D700FC03800
00A357	7E8E541D600FC01800	00A3D5	D255481D7F97A7F800
00A360	D012541D0783078000	00A3DE	D26D461D7FE79FF800
00A369	7ECA561D6048481800	00A3E7	D27F5E1D0000000000
00A372	7F0C501D780FD03800	00A3F0	7F3C501D7321A4D800
00A37B	D0CC521D409FE40800	00A3F9	7F6C4E1D7F2580F800
00A384	D102441D6FFFFFD800	00A402	D333441D7EFFFDF800
00A38D	D10E461D5FFB7FE800	00A40B	7F96421D7FFFFFFF800
00A396	D120501D724925B800		

END OF LOOKUP TABLE FOR 12 CPI LQ FONT

Appendix B. Proprinter Card Layout and Logic Diagram

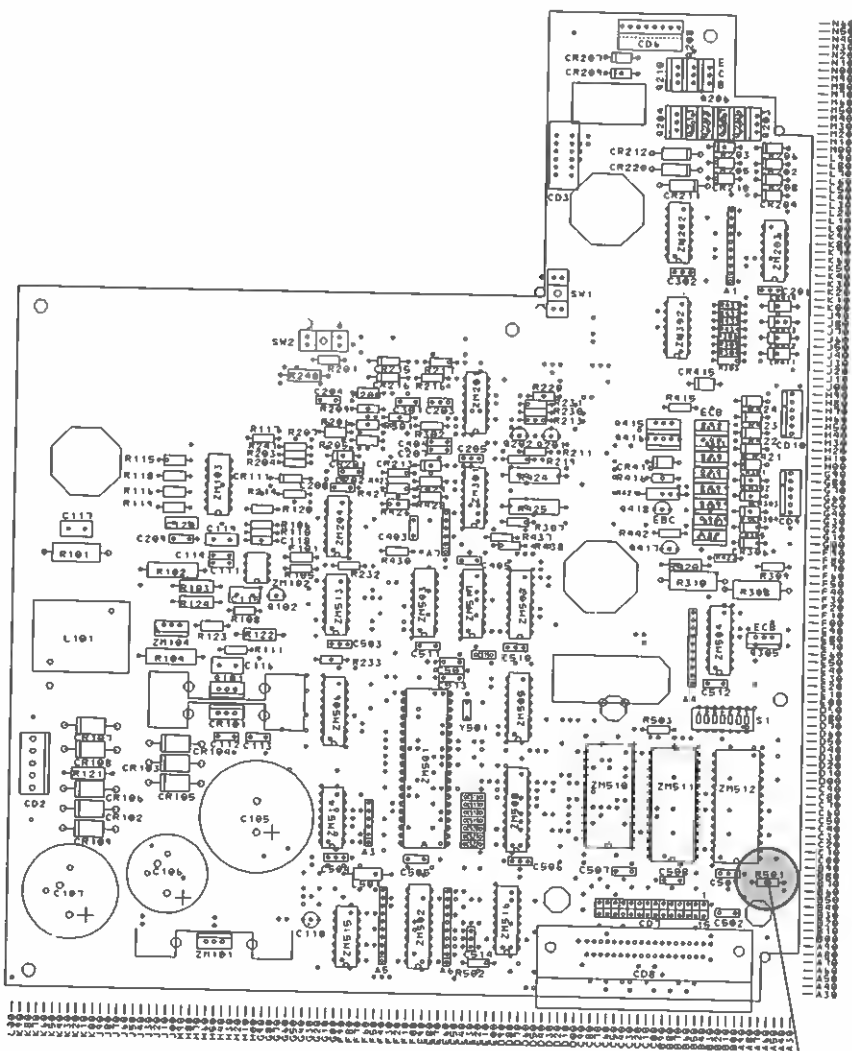
The Proprinter is shipped with two versions of printer logic cards. Although the wiring diagrams are the same in each version, the component layout on the logic card is different. To verify which version of logic card is in your machine, the card layout is labeled and keyed to the location of resistor R501.

Card Layout (Version 1)



Version 1

Card Layout (Version 2)

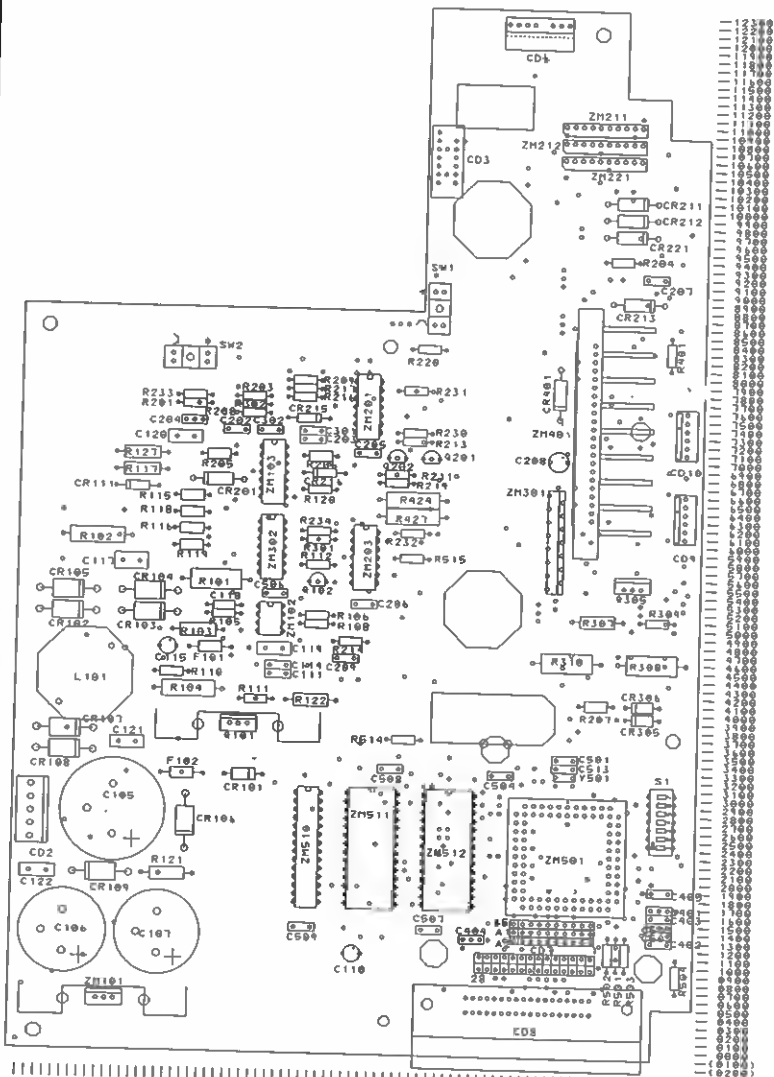


Version 2

Appendix C. Proprinter II Card Layout and Logic Diagram

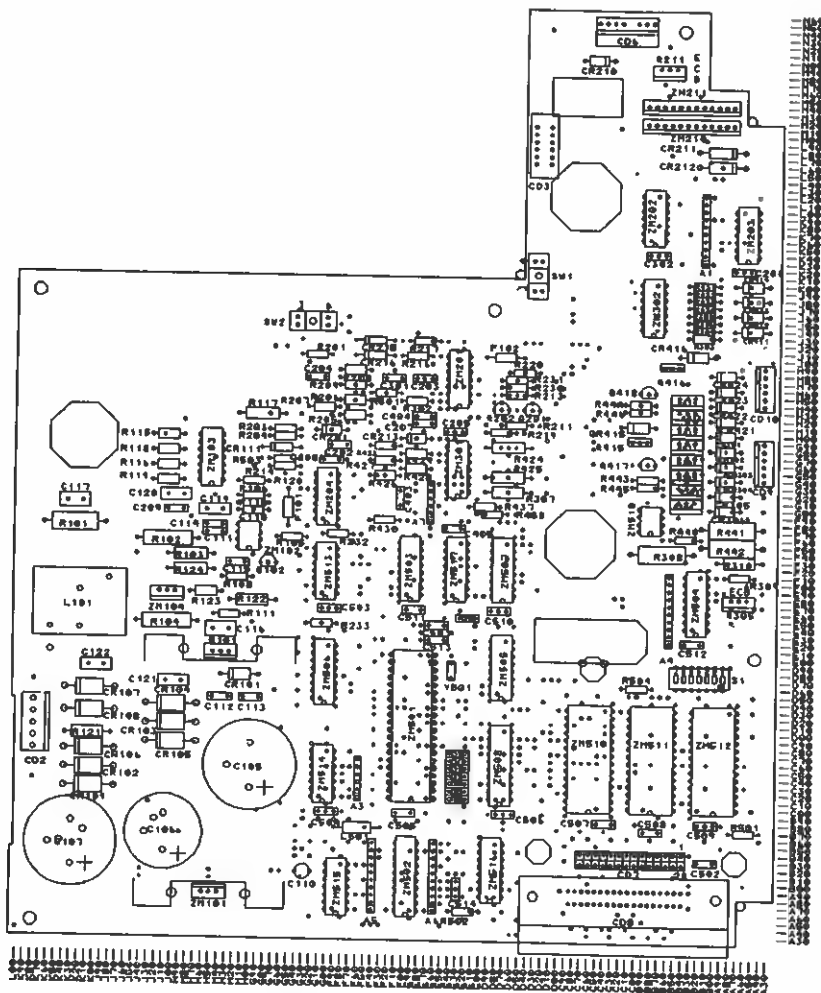
Appendix D. Proprinter II XL Card Layout and Logic Diagram

Card Layout



Appendix E. Proprinter XL Card Layout and Logic Diagram

Card Layout



Appendix F. Proprinter III and Proprinter III XL Card Layout and Logic Diagram

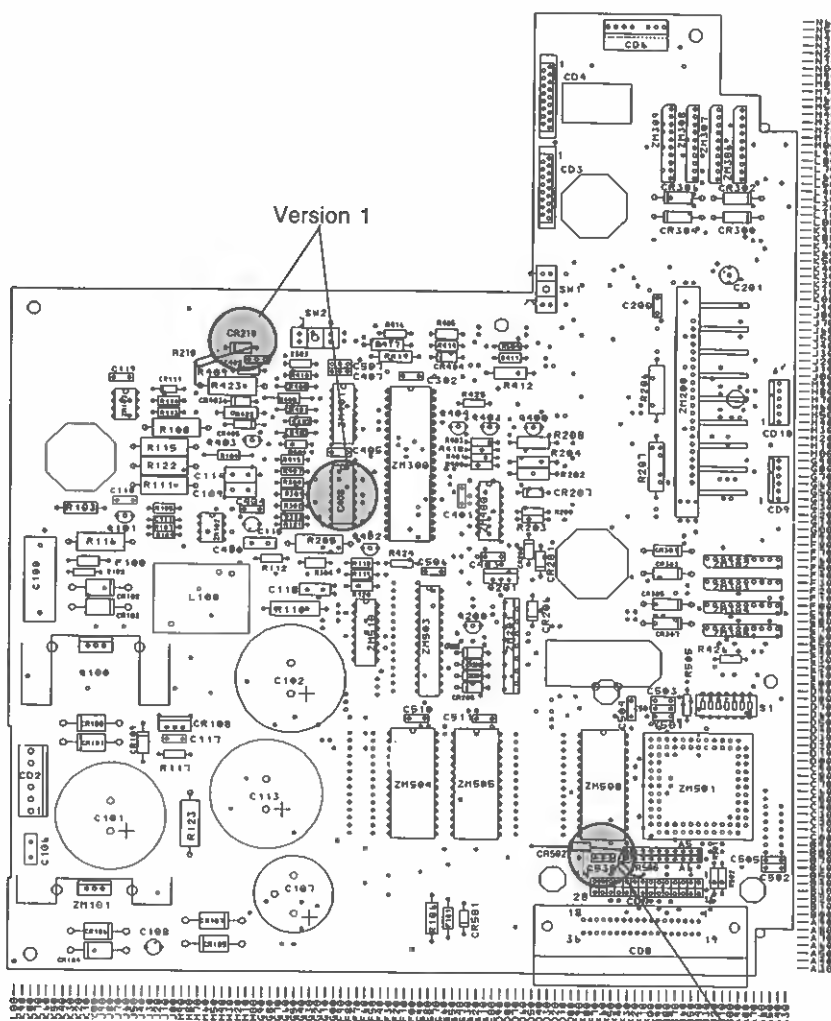
This is a detailed schematic diagram of an electronic circuit board, likely for a computer system. The layout includes numerous components labeled with alphanumeric codes:

- Integrated Circuits:** ZM01, ZM02, ZM03, ZM04, ZM05, ZM06, ZM07, ZM08, ZM09, ZM10, ZM11, ZM12, ZM13, ZM14, ZM15, ZM16, ZM17, ZM18, ZM19, ZM20, ZM21, ZM22, ZM23, ZM24, ZM25, ZM26, ZM27, ZM28, ZM29, ZM30, ZM31, ZM32, ZM33, ZM34, ZM35, ZM36, ZM37, ZM38, ZM39, ZM40, ZM41, ZM42, ZM43, ZM44, ZM45, ZM46, ZM47, ZM48, ZM49, ZM50.
- Resistors:** R01, R02, R03, R04, R05, R06, R07, R08, R09, R10, R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23, R24, R25, R26, R27, R28, R29, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R40, R41, R42, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R68, R69, R70, R71, R72, R73, R74, R75, R76, R77, R78, R79, R80, R81, R82, R83, R84, R85, R86, R87, R88, R89, R90, R91, R92, R93, R94, R95, R96, R97, R98, R99, R100.
- Capacitors:** C01, C02, C03, C04, C05, C06, C07, C08, C09, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C34, C35, C36, C37, C38, C39, C40, C41, C42, C43, C44, C45, C46, C47, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C59, C60, C61, C62, C63, C64, C65, C66, C67, C68, C69, C70, C71, C72, C73, C74, C75, C76, C77, C78, C79, C80, C81, C82, C83, C84, C85, C86, C87, C88, C89, C90, C91, C92, C93, C94, C95, C96, C97, C98, C99, C100.
- Connectors and Other Components:** CD1, CD2, CD3, CD4, CD5, CD6, CD7, CD8, CD9, CD10, CD11, CD12, CD13, CD14, CD15, CD16, CD17, CD18, CD19, CD20, CD21, CD22, CD23, CD24, CD25, CD26, CD27, CD28, CD29, CD30, CD31, CD32, CD33, CD34, CD35, CD36, CD37, CD38, CD39, CD40, CD41, CD42, CD43, CD44, CD45, CD46, CD47, CD48, CD49, CD50, CD51, CD52, CD53, CD54, CD55, CD56, CD57, CD58, CD59, CD60, CD61, CD62, CD63, CD64, CD65, CD66, CD67, CD68, CD69, CD70, CD71, CD72, CD73, CD74, CD75, CD76, CD77, CD78, CD79, CD80, CD81, CD82, CD83, CD84, CD85, CD86, CD87, CD88, CD89, CD90, CD91, CD92, CD93, CD94, CD95, CD96, CD97, CD98, CD99, CD100.

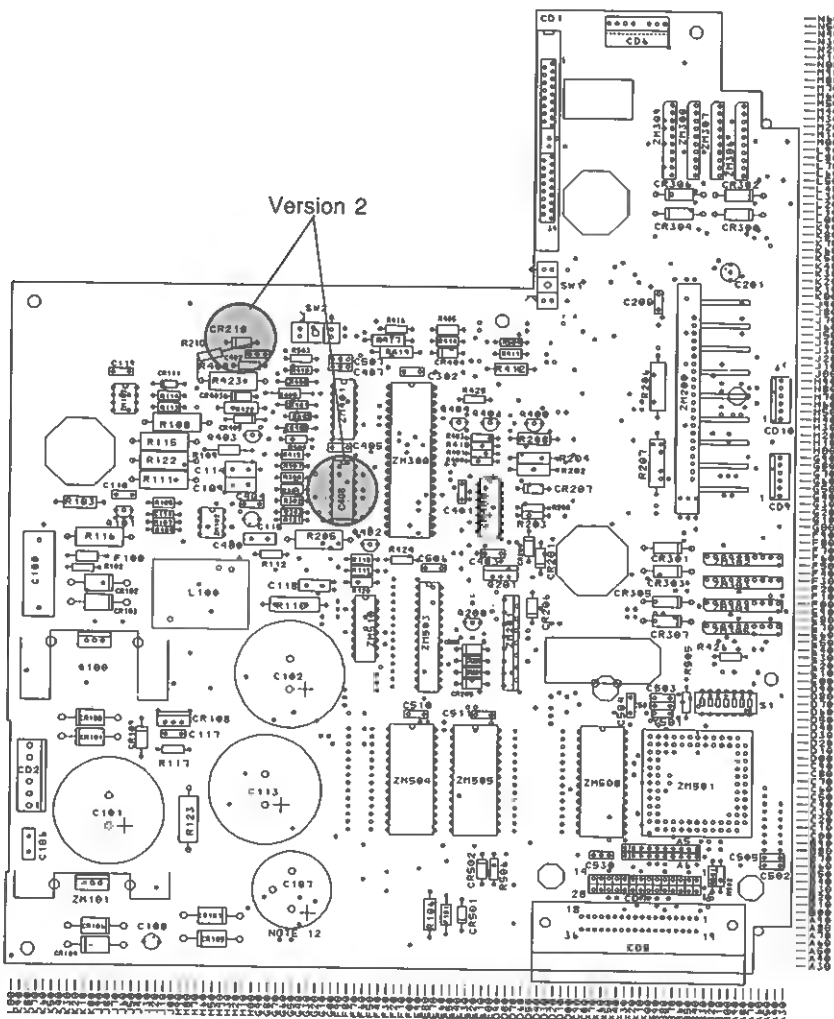
Appendix G. Proprietary X24 and Proprietary XL24 Card Layout and Logic Diagram

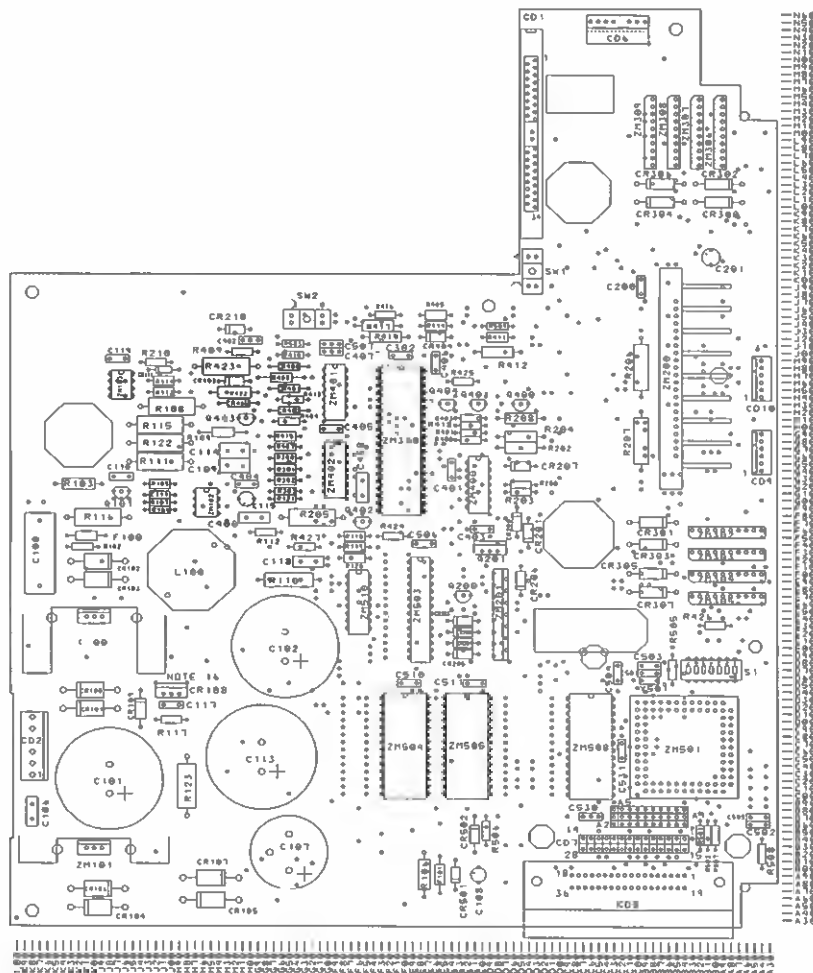
The Proprietary X24 and Proprietary XL24 are shipped with three versions of printer logic cards. The component layout on the logic card is different. To verify which version of logic card is in your machine, the card layout is labeled and keyed to the location of resistors R210 and R506. (R506 is located on the bottom of the card.)

The processor, memory, FontSet module, parallel interface, motor drivers, and power supply diagrams are the same for all versions of the logic card.

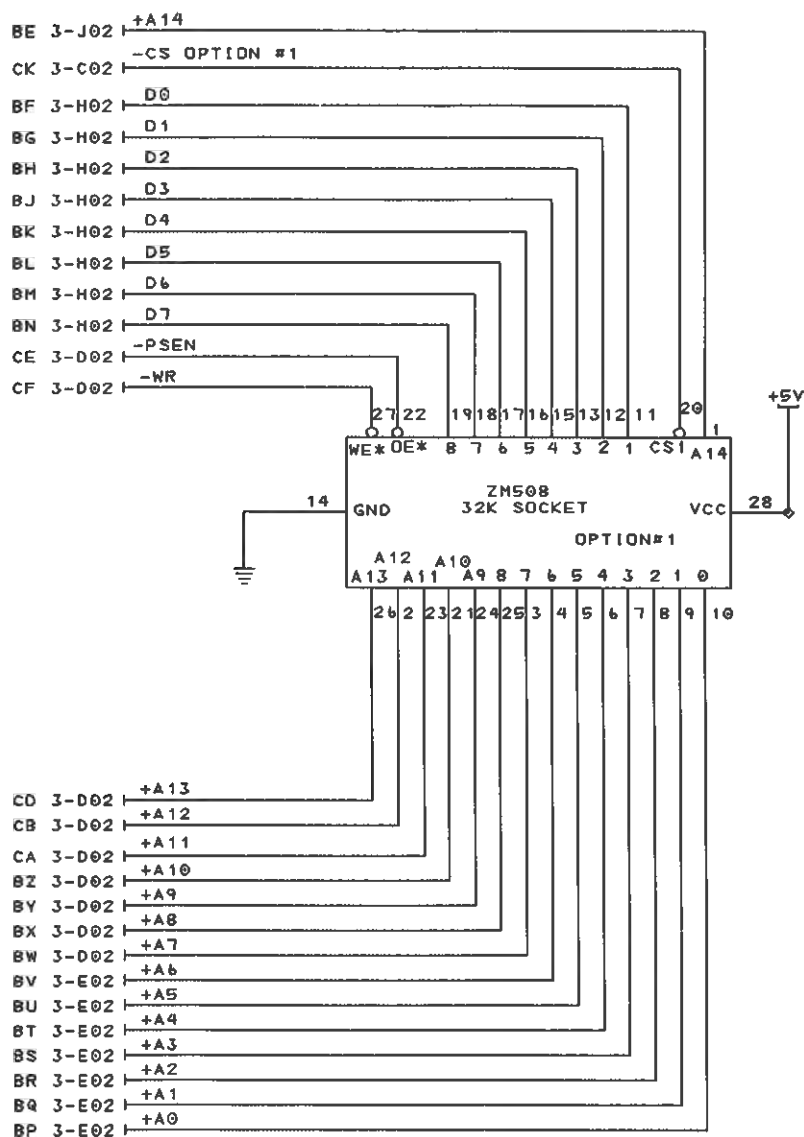


Version 1





FontSet Module (All Versions)



Appendix H. Proprinter X24E and Proprinter XL24E Card Layout and Logic Diagram

Appendix I. Optional Serial Interface Card Layout and Logic Diagram

There are two versions of the serial interface card. This section contains the layout and logic diagrams for both versions.

Appendix J. Optional RS-232/RS-422 Serial Interface Card Layout and Logic Diagram



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Glossary Terms and Abbreviations

This glossary includes terms and definitions from the IBM Vocabulary for Data Processing, Telecommunications, and Office Systems, SC20-1699.

alphameric. Pertaining to a character set that contains letters, digits, and usually other characters, such as punctuation marks.

ANSI. American National Standards Institute.

APA. See *All Points Addressable*.

All Points Addressable. In computer graphics, pertaining to the ability to address and display or not display each picture element (pel) on a display surface.

audible alarm. An alarm that is activated when predetermined events occur that require operator attention or intervention for system operation.

baud. See *baud-rate*.

baud rate. The rate of data transmission speed on a communications circuit (usually equal to one bit per second).

BCD. Binary Coded Decimal.

bi-directional. Printing in either direction, right-to-left or left-to-right.

buffer storage. A temporary storage in which data is held for processing.

carbon paper. Paper used to make more than one copy when impact printing.

channel. A data path that connects the processing unit, storage, and input/output devices.

characters-per-inch (CPI). The number of characters printed within an inch horizontally across a page.

Characters-per-second (CPS). The number of characters that print in one second.

code page. A set of 256 graphic designs (characters) associated with unique code points (values) from 0 through 255.

continuous forms. A continuous length of fanfolded forms with both edges punched for tractor feeding and with perforation between pages.

computer. (ISO) A data processor that can perform substantial computation, including numerous arithmetic or logic operations, without intervention by a human operator during a run.

compress. To press together so as to make smaller.

CPS. Characters-per-second.

CPI. Characters-per-inch.

cut form. A single form, not connected to other forms. The form can have more than one part; that is, it can have an original and one or more copies. Contrast with *continuous forms*.

download. To transfer data from a processing unit to an attached device such as a microcomputer for processing.

end-of-forms. A signal that indicates when the printer is at the bottom of the last form to be printed before reloading paper.

EOF. End-of-Forms.

first possible print line. A horizontal print line, near the top of the paper, above which the printer does not print.

form feed. Movement of an assigned part of a form to the printing position.

Hz. Hertz (Cycles).

impact printer. A printer in which printing is the result of mechanical impacts.

LED. Light-emitting diode.

line justification. To print a document with even right-hand and left-hand margins.

lines-per-inch. The number of lines of text or graphics that can be placed in one inch of space measured vertically.

LPM. Lines Per Minute.

LPI. Lines Per Inch.

mm. Metric Notation - millimeter.

monospacing. A method of spacing in which the space between characters does not vary. Contrast to proportional spacing.

near-letter-quality (NLQ) printing. A style of printing that enhances the quality of print characters.

NLQ. Near-Letter Quality.

operator panel. A functional unit containing switches used to control a printer or other data processing

units, or a portion of these devices that can contain indicators giving information on the functioning of the system.

output data. Data being delivered to or to be delivered from a device such as a printer or computer program.

paper jam. A condition in which paper forms have not fed correctly during printing and have become wedged in the feeding or printing mechanism, and therefore prevent the correct forward movement of the forms. (A paper jam usually causes one line to be printed on top of the other.)

pel. See *picture element*.

picture element. (pel) (1) In computer graphics, the smallest element of a display surface that can be independently assigned color and intensity. (2) The area of the finest detail that can be produced effectively on the recording medium.

platen. A backing, usually cylindrical, against which printing mechanisms strike or otherwise deposit ink to produce an image.

power switch. A device that makes and breaks the contact between equipment and the main electricity supply.

printer. (1) An output device that produces a durable record of data in the form of a sequence of discreet graphic characters belonging to a discreet character set. (2) A device that writes output data from a system on paper or other media.

processing. The performance of logical operations and calculations on data, including the temporary retention of data in processing storage while it is being operated upon.

proportional spacing. The function whereby characters are spaced according to their natural width.

print speed. The number of characters printed per unit of time.

printer operating speed. The rate at which printing occurs in characters-per-second or in lines-per-minute.

RAM. Random Access Memory.

ribbon guide. A device that guides the ribbon past the print head.

ROM. Read-Only Memory.

status indicator. A device that visually shows the condition of one or more operations during processing.

TOF. Top Of Forms.

tractor. The mechanism that controls movement of continuous form paper by the carrier holes.

U.S. United States.

V dc. Volts direct current.

V ac. Volts alternating current.

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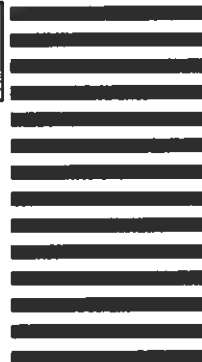
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