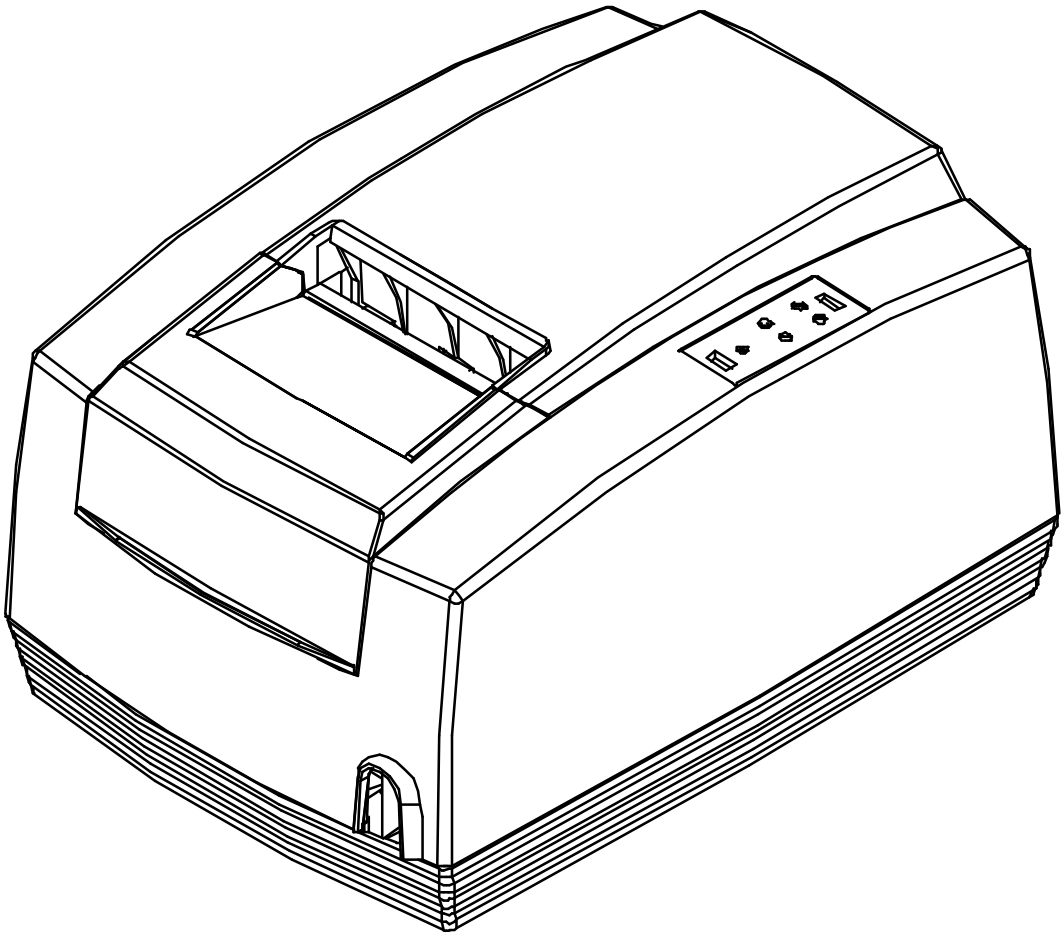
POSjet™ 1000 ***RECEIPT PRINTER***

PROGRAMMER'S GUIDE



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June 2, 2000

Change History

Initial Release Rev A April 19, 2000

Rev B. June 2, 2000
1. Removed pre-release change log.
2. Added references to Color Ready Configurations and how to configure to Color operation.
3. Added an ordering supplies section
4. Corrected a number of command titles
5. Corrected the quick reference table. Commands and descriptions were shifted.

Introduction

Disclaimer

Information in this publication is subject to change without notice. However, as product improvements become available, TransAct Technologies Incorporated will make every effort to provide updated information for the products described in this publication.

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Chapter 1:

Overview of the POSjet™ 1000 Printer

Who should read this book?

This book is intended for system engineers or integrators. It contains the information needed to integrate the POSjet™ 1000 Printer with a point-of-sale terminal and to program the terminal to communicate with the printer.

What does this book cover?

This programmer's guide provides the following material:

- Start-up information including diagnostics and fault conditions
- Command descriptions
- Character fonts
- Printer features
- Parallel and RS-232 interface information
- Communications and buffers
- Command code reference tables

Warranty Information

All POSjet™ 1000 Printers come with a standard 24-month standard warranty covering both parts and labor that starts upon shipment from the factory. An optional extended warranty, covering both parts and labor for an additional 12 months, may be purchased separately. For more information concerning the warranty options, please contact the Sales Department at TransAct's Ithaca facility. See "Contacting TransAct's Ithaca facility" on page 2.

Service Information

TransAct Technologies Incorporated has a full service organization to meet your printer service and repair requirements. If your printer needs service, please contact your service provider first. If any problems still persist, you can directly contact the Ithaca facility's Technical Support Department at (607) 257-8901 or (877) 7ithaca for a return authorization. International customers should contact your distributor for services. TransAct offers the following service programs to meet your needs.

Extended Warranty
Depot Repair
Maintenance Contract
Internet Support

Where can you find more information?

An Operator's Guide is available that describes the setup and use of the POSjet™ 1000 Printer. It describes basic procedures such as changing the paper and replacing the ink cartridge. A Maintenance Manual is also available; however, it is designed to help trained, service technicians repair the printer. For information about ordering these books, refer to the next section.

In addition to the documentation listed above, a number of drivers are available that will support various environments.

Windows 95 Print Driver with Documentation	**Part No. 100-9167**
Windows NT 4.0 Print Driver with Documentation	**Part No. 100-9170**
OPOS Drivers with Documentation	**Part No. 100-9732**
Master Character Set Definitions	**Part No. 100-9785**

Internet Support

TransAct Technologies Incorporated maintains an Internet web site. The address is http://www.transact-tech.com The technical support page contains support information for our printers. The POSjet™ 1000 Printer support pages offer the latest information. They include the current version of this manual; program examples; test procedures; programming instructions; and supported print drivers.

Contacting TransAct's Ithaca facility

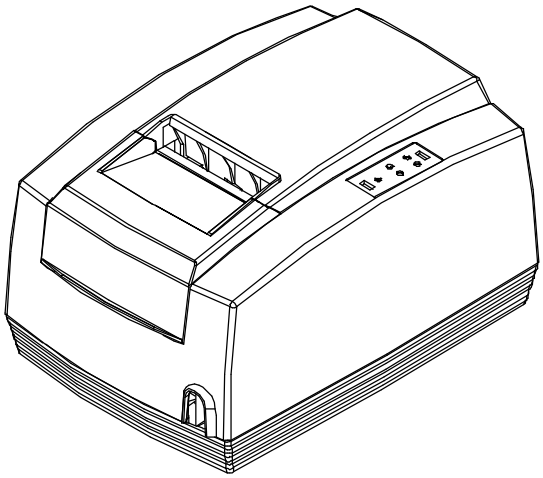
Contact TransAct's Ithaca facility for general information about the POSjet™ 1000 Printer and how it works with your system. The Sales and Technical Support Departments will be able to help you with most of your questions. Call the Technical Support Department to receive technical support; order documentation; receive additional information about the POSjet™ 1000; or send in a printer for service. To order supplies; receive information about other Ithaca products; or obtain information about your warranty, contact the Sales Department. To receive information on International distribution, look on our web site at www.transact-tech.com

You may reach both the Sales and Technical Support Departments at the following address and telephone or fax numbers:

TransAct Technologies Incorporated
Ithaca Facility
20 Bomax Drive
Ithaca, NY 14850 USA

Telephone	(877) 7ithaca or (607) 257-8901
Main fax	(607) 257-8922
Sales fax	(607) 257-3868
Technical Support fax	(607) 257-3911
Web site	http://www.transact-tech.com

Chapter 2: General Description
Model PJ1000 Inkjet Receipt Printer



Standard Features

The following features are common to the entire family of printers:

- **Up to 12 lines per second at 10 characters per line**
- **5.0 inches per second paper slew speed**
- **2.5-inch print zone**
- **One color printing**
- **Latch-in ink cartridge**
- **Dual cash drawer drivers with status (Single Modular)**
- **Centronics parallel or serial RS-232C interface**
- **Configurable receiver buffer**
- **Custom logo graphic print buffer in nonvolatile memory**
- *Insta-Load*™ **paper loading capability**
- *PowerPocket*™ **(*External power supply that can be housed inside printer)***
- **Self diagnostics**
- **Set up and configuration utility program**
- **Characters per inch (cpi) selections of 13, 14.8, and 17.3**
- **Three print fonts - Draft, Large Draft, and Near Letter Quality (NLQ)**
- **Selectable printing of bold, italic, size scaling and/or rotated (4- 90° rotations)**

Optional Features

The optional features either replace a standard feature or enhance the operation of the printer. All optional features are installed at the factory and must be selected when the printer is ordered.

- **Autocutter (partial cut)**
- **Two-color printing**
- **Two Color Ready**[1]
- **USB interface**
- **Adjustable paper low sensor**
- **Kitchen buzzer**

[1] The PJ1000 printer is available with a dual pen carriage but without the second pen installed. This printer is termed Color Ready. See the configuration section for changing a "Color Ready" printer to two color.

Chapter 3:

General Specifications

Printing Specifications

Printing method	Thermal ink jet
Cartridge arrangement	12 nozzle
Print dot diameter	0.34 mm (0.012 inch)
Print dot pitch	0.244 mm (0.0096 inch)
Printing directions	bidirectional, logic seeking
Print zone (maximum)	63.5 mm (2.5 inch)
Characters per second	Refer to Table 1
Characters per line	Refer to Table 1
Characters per inch	Refer to Table 1

Print Pitch Capability *(Characters per Inch)*		Maximum Characters per Line (*2.5-inch Print Zone)*	Approximate Characters per Second[2]
Single-wide	Double-wide		
13.0	6.5	32	100
14.86	7.43	37	315
17.3	8.67	43	360

Table 1 Character Specifications

Characters per Line	Minimum Lines per Second[3]
10	12
20	10
30	8
40	6

Table 2 Print Speed Specifications

2 The value is based on a single full 2.5-inch print line. Line feed time is not included.

3 Print speed is calculated with the 12 x 12 font at 17.3 cpi and 8 lpi spacing. If head maintenance needs to be done, the print speed will be less.

Character Pitch

Each character has at least one half-column inter-character spacing included within the cell size. The inter-character spacing provides the maximum character pitch as shown in the table below. Change the spacing between characters in one of two ways. The first is to request that right side spacing be added between characters; the other is to request a specific pitch in characters per inch. When a specific character per inch (cpi) is selected, the printer calculates the number of half dot columns that must be inserted between characters to print at the requested cpi. It is not always possible to print at exactly the requested pitch. The printer selects the closest possible pitch to the one chosen.

Character Cell	12 x 12 Font	12 x 14 Font	24 x 16 Font
Horizontal	12	14	16
Vertical	12	12	24
Maximum	17.33	14.86	13
1 dot added	16	13.87	12.24
2 dots added	14.86	13	11.56
3 dots added	13.87	11.76	10.95
4 dots added	13	11.56	10.4
5 dots added	12.24	10.95	9.9
6 dots added	11.56	10.4	9.45

Table 3 Possible Character Pitches

Character Generation

Standard Print

The three resident fonts in the printer are Draft, Large Draft, and Near Letter Quality (NLQ). The cell size for each is different.

Character Cell	Draft	Large Draft	NLQ
Horizontal	12	14	16
Vertical	12	12	24

Table 4 Cell Size for Draft, Large Draft,and NLQ Fonts

Draft Font

The draft font is defined in the 12 x 12 cell to use six full- and five half-columns horizontally. In general, most characters are only nine dots wide; however, to provide readable international characters, the minimum cell size is kept at 12. The minimum cell size provides at least one half-column between any character.

The vertical format never uses the top dot, and the bottom two dots are used for character decenders and underline. The draft font provides the most print per line and the most efficient use of ink per character.

```
01  ............
02  ....0.0.....
03  ...0...0....
04  ..0.....0...
05  .0.......0..
06  .0.0.0.0.0..
07  .0.......0..
08  .0.......0..
09  .0.......0..
10  .0.......0..
11  ............
12  ............
```

Figure 1 Draft 12 x 12 Font

Large Draft Font

The large draft font is defined in the 12 x 14 cell to use seven full, and six half columns horizontally, which provides at least one half-column between any character.

The vertical format uses the first ten rows for the characters and the bottom two for character decenders and underline. The large draft font is larger than the draft font and is more readable. It, however, provides fewer characters per line and uses more ink per character.

```
01  .....0.0......
02  ....0...0.....
03  ....0...0.....
04  ...0.....0....
05  ..0.......0...
06  ..0.......0...
07  .0.0.0.0.0.0..
08  .0.........0..
09  0...........0.
10  0...........0.
11  ..............
12  ..............
```

Figure 2 Large 12 x 14 Font

Near Letter Quality (NLQ) Font

The near letter quality font is defined in the 24 x 16 cell that is printed in two passes. Horizontally, 15 dots are typically used, providing at least one half-column between any two characters.

The vertical format uses rows four through 19 for the basic character, rows one through three for accents, and rows 20 through 24 for decenders and underlines. Because NLQ font

makes two passes, the vertical size is slightly larger than large draft font. Vertical resolution is doubled.

NLQ font is easily readable and has a higher contrast than the draft or large draft fonts. It, however, provides fewer characters per line and uses more ink per character than either draft font.

```
01  ................
02  ................
03  ................
04  .......0........
05  .......0........
06  ......0.0.......
07  .....0...0......
08  .....0...0......
09  ....0.....0.....
10  ....0.....0.....
11  ....0.....0.....
12  ...0.......0....
13  ...0.......0....
14  ..00000000000...
15  ..0.........0...
16  ..0.........0...
17  .0...........0..
18  .0...........0..
19  0000.......0000.
20  ................
21  ................
22  ................
23  ................
24  ................
```

Figure 3 NLQ 24 x 16 Font

In non-Ithaca emulation modes, only the draft and large draft fonts are available. They provide a close approximation to the Epson 9 x 9 and 7 x 9 formats available in the TM200 model printer.

Rotated Print

To provide printing flexibility, rotated print is available. Rotated print mode rotates the print in any of three 90° orientations. In 90° and 270° rotated mode, the print data is first buffered by the printer, processed (rotated), and then printed. Buffering the data delays the print process as it takes some time to process the data before it is printed. In 180° mode, the print is simply inverted. Rotated print is not available for NLQ font or when the printer is in Epson mode.

Physical Specifications

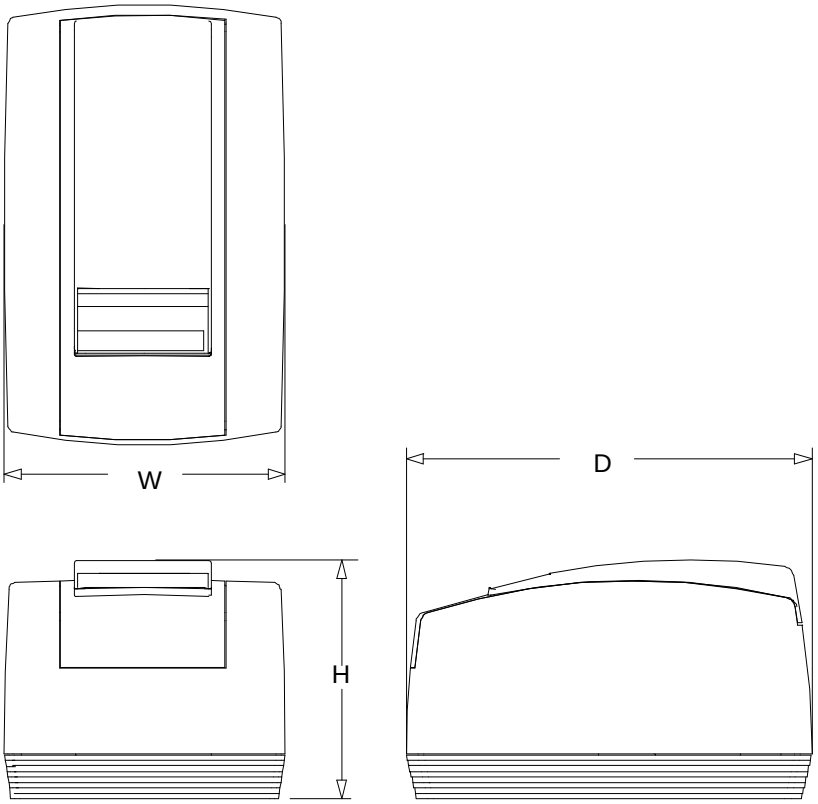


Figure 4 Printer Dimensions

Dimensions

Maximum Dimensions	Without Knife			With Knife		
	W	D	H	W	D	H
Dimensions in inches	6.75	9.75	5.34	6.75	9.75	5.81
Dimensions in mm	171.45	247.65	135.64	171.45	247.65	147.57

Table 5 Printer Dimensions

Weight

Approximate weight 6 lbs (2.7 kg)
Shipping weight 8 lbs (3.6 kg)

Electrical Characteristics

External Powered AC

The POSjet™ 1000 Printer is designed to be AC self-powered in domestic and international markets. The printer is equipped with a detachable universal input power supply that is designed to operate worldwide without modification.

Supply Voltage Rating (VAC)	Supply Voltage Range (VAC)	Frequency (Hz)	Rated Power (watts)	Idle Current (amps)	Printing Current (amps)
100-240	90-264	47 - 63	24	0.04 @ 120VAC 0.02 @ 240VAC	0.2 @ 120VAC 0.1 @ 240VAC

Table 6 Standard Power Input Requirements

Optionally, the POSjet™ 1000 Printer can be operated with an external 24-volt DC power supply.

Supply Voltage Rating (VDC)	Supply Voltage Range (VDC)	Frequency (Hz)	Peak Power (watts)	Idle Current (amps)	Current (amps)
24-5+10%	22.8 -26.4[4]	DC	48 (maximum) 24 (Printing maximum)	0.125	2.0 (Cash Drawer Fire) 1.2 (Printing maximum)

Table 7 Power Input Requirements Optional 24-volt DC Supplied from Host

[4] For DC powered printers, the cash drawer is supplied directly from the DC input supply. The cash drawer requirements may effect the allowable range of voltages.

Media Specifications

Ink Cartridge Overview

For complete print cartridge specifications refer to the HP C6602A Specification.

Print cartridge specification	HP C6602A5	
Cartridge arrangement	12 vertical nozzles	
Typical print dot diameter	0.0100 inch (0.254 mm)	
Vertical dot pitch	0.0104 inch (0.264 mm) or 96 dpi	
Ink dry time	0.4 sec @ 23oC, 50%RH6	
Cartridge life	6 million characters at 16 dots per character (average)	
Cartridge Color	Black and/or red (other colors when available)	
TransAct Part Numbers	3 Pac-Black	100-02347
	3 Pac-Red	100-02349
	6 Pac-Black	100-02348
	6 Pac-Red	100-02350
HP Part Numbers	Black Cartridge	HP C6602A
	Red Cartridge	HP C6602R
	(All cartridge information based on HP test data.)	

Receipt Paper (one-ply receipt)

Paper feed method	friction feed	
Paper feed pitch	default - 0.125 inch (1/8 inch or 3.175 mm)	
paper width	3.0 inches (76 mm)	
Roll diameter	4.0 inches (102 mm)	
Paper thickness	0.003 - 0.0037 inches (0.076 - 0.094 mm)	
Roll paper core	Inside Dia. 0.44 inch or more (7/16 inch or 11.11 mm)	
Typical roll footage	330 feet (100 m)	
Paper low indicator	Optional adjustable Paper Low Sensor based on paper roll diameter.	
Receipt paper out	Less than 2.0 inches (51 mm) of paper remaining	
TransAct Part Numbers	1 Roll	98-02021
	25 Case	98-02022

[5] Print cartridge specifications are controlled by Hewlett Packard. Information here is for reference only.
[6] See Hewlett Packard specification.

Receipt Printing

RECEIPT PAPER ROLL

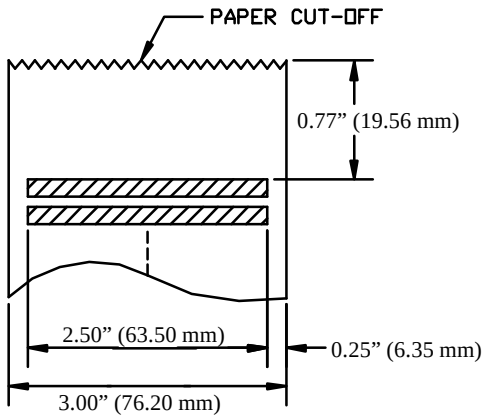


Figure 5 Receipt Printable Area

Receipt Printing, Autocutter Position

The paper tear off is positioned 0.77 inches (19.56 mm) from the last line of print. The autocutter is positioned 1.06 inch (26.92 mm) from the last print line.

Autocutter (Partial Cut Option)

A receipt autocutter is an optional feature with all POSjet™ 1000 Printers.

Cutter type	Guillotine
Media width	3.0 inches (76.20 mm)
Media thickness range	0.003 to 0.004 inch (0.076 to 0.10 mm)
Cut to line of print	1.06 inch (26.92 mm)
Cutter life	1,000,000 cuts

Paper Out

A receipt paper out sensor is provided as a standard feature. It senses when there is approximately two inches of paper left on the paper roll.

Paper Low

A receipt paper-low sensor is provided as an optional feature. An operator-adjustable paper-low assembly allows the printer to sense when the paper roll is between 1.50 and 0.75 inches (38.1 and 19.05 mm) in diameter. It is adjustable to compensate for various paper core dimensions.

Cash Drawer Drivers

Interface Description

The POSjet™ 1000 Printer supports dual cash drawers with status. The driver in the printer is capable of supplying 24 V DC at up to 1.5 amps and 250 milliseconds. The POSjet™ 1000 Printer defines cash drawer closed as switch open. If the drawer is disconnected, the printer considers it closed. Since the printer does not act on the cash drawer status, the application can interpret cash drawer status any way it wants.

Driver connector type (standard)	Single RJ11 connector with 24V sink drivers
Driver voltage	24 volts (Refer to power supply specification)
Driver current	1 amp maximum with current limit
Pulse duration	250 msec maximum
Drawer status	Open/close drawer status provided to printer

The cash drawer can be configured for one of three configurations. The communications adapter board has a 14-pin head with a 10-pin jumper installed on it. The jumper position defines the configuration of the cash drawer.

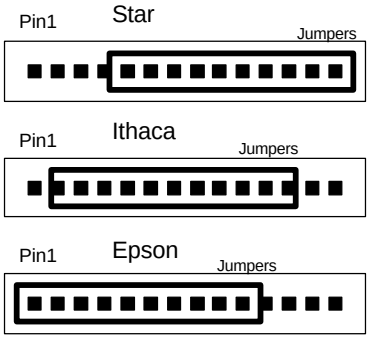


Figure 6 Cash Drawer Selection

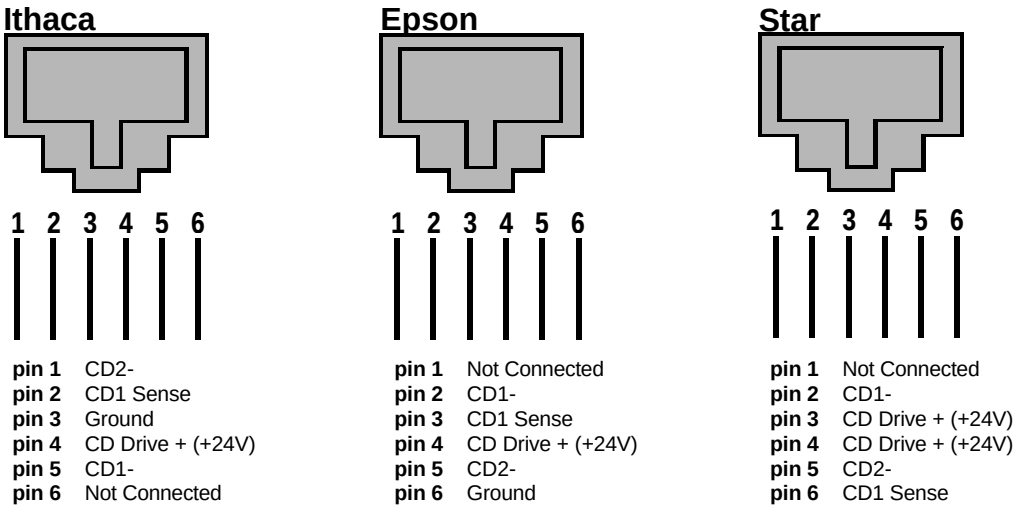


Figure 7 Cash Drawer Pin Assignment

Pin Number	Ithaca		Epson		Star	
	Signal Name	Direction	Signal Name	Direction	Signal Name	Direction
1	Drawer kick out drive Signal 2	Output sink drive	Not Connected		Not Connected	
2	Drawer open/close signal	Input	Drawer kick out drive Signal 1	Output Sink drive	Drawer kick out drive Signal 1	Output Sink Drive
3	Signal Ground		Drawer open/close signal	Input	+24V DC	
4	+24V DC		+24V DC		+24V DC	
5	Drawer kick-out drive signal 1	Output Sink Drive	Drawer kick out drive Signal 2	Output Sink Drive	Drawer kick-out drive signal 2	Output Sink Drive
6	not Connected		Signal Ground		Drawer open/close signal	Input

Table 8 Cash Drawer Connector

Kitchen Buzzer

The kitchen buzzer is a factory-installed option that can be provided as an optional feature. It is triggered upon command from the host terminal to make a sound loud enough to be heard under noisy conditions.

Cover Interlock

A printer-cover interlock switch is provided as a standard feature. When the cover is open, the carriage assembly centers to allow servicing, and the printer goes off-line and removes drive power to the carriage. Going off-line prevents an operator from inadvertently getting their hands pinched by the carriage assembly.

Display Pass Through

The display pass through feature allows a pole display to be interconnected with the printer. The printer is connected to a host system with a special serial cable. The host sends serial data to the printer and the printer sends serial data to the pole display. The printer does not provide power to the display. During normal printer operation, no data is passed to the display. In pass through mode, all received data is passed on to the display.

The Restrictions and Considerations for Pass through

1. Pass through only works on serial printers with DTR flow control.
2. XON/XOFF mode does not work correctly.
3. All inquire ([ENQ]) commands are active when not in actual pass through mode. If, for example, an [ENQ] command for cash drawer status is received by the printer, the response is transmitted. When pass through is active, all data except the [ENQ] is passed. The printer does not look for or act on any commands other than inquires.
4. If pass through data is sent to the printer in continuous mode (i.e. as fast as possible), each [ENQ] character in the sequence delays the transmit data by one byte. The printer buffer size is limited. If the buffer overruns, data will be lost.
5. Modem handshake signals from the printer are not controlled during past through. Their state is set by printer status. Opening the cover toggles the control lines. When the printer cover is open, it accepts data, including all [ENQ] commands. If an [ENQ] # is received when off-line, pass through is entered.
6. Previously buffered data is processed by the printer in pass through mode. Printer performance is degraded by the processing of pass through data.
7. In 8-bit, no parity mode, data is passed through unaltered. In all other modes, the parity is checked, stripped, and then regenerated by the printer.
8. Pass through has no affect on a printer in parallel mode.

Communications Interface

Parallel Interface Adapters

There are two parallel interface adapters. One is a 25-pin, D-shell connector. The pin-out is such that the printer interfaces to a standard IBM PC parallel printer interface with a one-to-one cable. The second adapter provides the same interface with a standard centronics 36-pin connector. Both adapters provide a dual cash drawer interface and an optional buzzer. The following table lists Interface signals and pin definitions when attempting to use Interface adapters.

25-pin Connector	36-pin Connector	Signal	Description	Direction
Pin 1	Pin 1	STROBE	Clock data to printer	Host to Printer
Pins 2-9	Pins 2-9	D0 - D7	Data	Host to Printer
Pin 10	Pin 10	ACK\	Printer accepted data	Printer to Host
Pin 11	Pin 11	BUSY	Printer busy	Printer to Host
Pin 12	Pin 12	PE	Paper Out/Status	Printer to Host
Pin 13	Pin 13	SLCT	Printer selected	Printer to Host
Pin 14	Pin 14	AUTOFD	Autofeed paper	Host to Printer
Pin 15	Pin 32	FAULT\	Printer error	Printer to Host
Pin 16	Pin 31	INIT\	Initialize printer	Host to Printer
Pin 17	Pin 36	SLIN	Select printer	Host to Printer
	Pin 17	FG	Frame ground	Printer to Host
-	Pin 18	+5V	Peripheral logic high	Printer to Host
Pins 18-25	Pins 16, 19-30	GND	Ground	

Table 9 Parallel Port Pin-outs

Signal Levels

Voltage levels		0 V and +5 V (nominal)
Logic levels		
Logic one	Driver	+2.4 V to +5 V
	Receiver	+2.0 V to +5 V
Logic zero	Driver	0 V to +0.4 V
	Receiver	0 V to +0.8 V

Current requirements

Logic one	Source	0.25 ma at +2.4 V
Logic zero	Sink	16 ma
Line termination		
Data and control		3.3k ohm to +5 V
Strobe		1.2k ohm to +5 V

Serial Interface

Serial Port Features

The serial port features are as follows:

Baud Rates	300, 600, 1200, 2400, 4800, 9600, 19.2K, 38.4K, and 57.6K
Bit Patterns	8-bit no parity; 8-bit odd; 8-bit even; 7-bit no parity; 7-bit odd; 7-bit even
Flow Control	DTR and XON/XOFF

Serial RS-232 Communication

Serial Port Pin-out

9-pin	25-pin	Signal	Description
Pin 1	Pin 22	DCD	Data Carrier Detect
Pin 2	Pin 3	RX	Receive Data
Pin 3	Pin 2	TX	Transmit Data
Pin 4	Pin 20	DTR	Data Terminal Ready
Pin 5	Pin 7	GND	Signal Ground
Pin 6	Pin 6	DSR	Data Set Ready
Pin 7	Pin 4	RTS	Request to Send
Pin 8	Pin 5	CTS	Clear to Send
Pin 9	Pin 22	SSD	Secondary Data

Table 10 Serial Port Pin-outs

Because both the host and printer are DTE's (Data Terminal Equipment), they use the same serial port pin-outs. If the cable that is used to connect the host to the printer is a pin-to-pin interconnect, it will not work. Therefore, a null modem or turn-around cable must be used to interconnect the host and the printer.

Signal levels

The serial interface meets EIA RS-232 Requirements of -15 V to –3 V:
mark = off = Logic 1 and +3 V to +15 V: space = on = Logic 0

USB Interface

The USB interface is a Version 1.0-compliant interface. It is implemented through a Standard Series "B" Receptacle as defined in the USB Specification. The printer is self-powered and does not draw power from the USB interface cable.

Note: The standard USB interface does not have enough power to run the printer.

Environmental

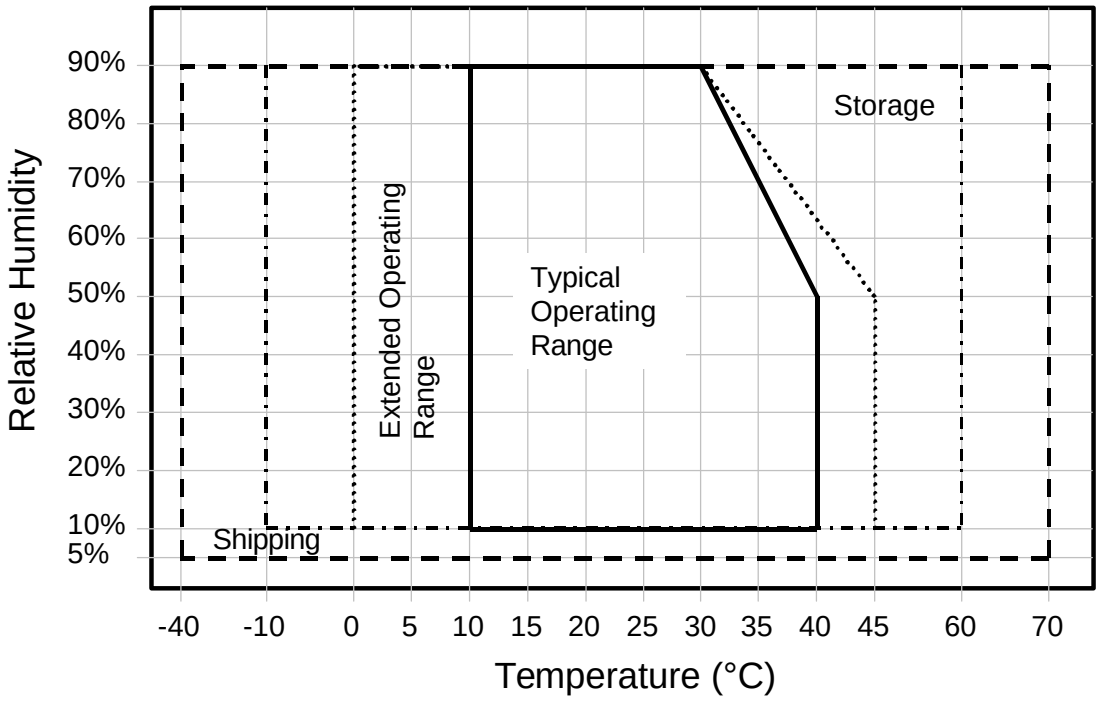


Figure 8 Temperature and Humidity Ranges

Temperature

Operating	10 to 40 °C
Extended Operating	0 to 45 °C
Storage	-10 to 60 °C
Shipping	-40 to 70 °C

Humidity

Operating	10 to 90% Relative humidity (noncondensing)
Storage	10 to 90% Relative humidity (noncondensing)
Shipping	5 to 90% Relative humidity (noncondensing)

The typical operating range, as shown in Figure 8, provides full printer reliability. Extended range may degrade the mean time between failures (MTBF) of the printer.

In the extended environmental range, the ink cartridge life and may be reduced.

Chapter 4:

How to Care for the POSjet™ 1000 Printer

The POSjet™ 1000 Printer uses Hewlett Packard thermal ink jet print cartridges (HP C6602A). The HP C6602A print cartridge is designed for point of sale applications, has a low ownership cost, and a long life. Like any ink jet printer, the POSjet™ 1000 Printer has features that extend the life and reliability of the print cartridge. Unlike consumer ink jet print cartridges, the HP C6602A print cartridge does not need to be capped when not in use. Consequently, the POSjet™ 1000 is ready to print at all times. Consumer ink jet printers cover and seal the print head to prevent drying when the printer is not in use. The HP C6602A cartridge does not need to be sealed. However, the cartridge is still an ink jet cartridge and must have periodic maintenance to keep it functional. Maintenance consists of cleaning the excess ink from the face of the cartridge ("wiping") and firing ink into a reservoir to clean the print jets ("spitting"). The printer performs these functions as transparently to the host application as possible. However, the printer cannot perform basic maintenance procedures if printer power is removed.

The POWER button on the POSjet™ 1000 Printer does not completely remove the power from the printer.

Standby/Power Off

When the POWER button is pressed or the power down command is received, the POSjet™ 1000 Printer enters a standby low power mode. The printer is not completely off but is in standby[7]. The printer should not be completely powered off for more than a few days. To keep the print cartridge from completely drying out, the printer must be periodically used. To assure periodic use, the printer occasionally wakes from sleep mode, performs head maintenance, and goes back to sleep. If the printer is completely powered off, head maintenance cannot occur, and the print cartridge dries, degrades over time, and becomes inoperative.

The power should not be removed from the printer without first placing the printer in standby mode. (Push the POWER button). When the printer goes into standby mode, the print cartridge is prepared for a period of inactivity. Standby mode maximizes the time the print cartridge can be left without being used. If power is removed from the printer before it goes into standby mode, the ink on the face of the cartridge may dry and block the print jets. If the print jets are plugged, the cartridge will have to be replaced. When the printer is placed in standby mode (with power applied), it can sit unattended for extended periods without degrading the print cartridge.

Standby mode is remembered even if the power is removed. When power is reapplied, the printer starts, performs Level 0 diagnostics, and reenters standby mode.

[7] The printer draws about four watts of power in standby mode.

Remote Power Down

The POSjet™ Printer has a command that instructs it to enter standby mode. When the command is issued, the printer performs print cartridge maintenance and enters standby mode. Unlike pushing the POWER button, remote power down mode leaves the communications active. All commands except the exit power down command are ignored.

If the POWER button is pressed after the power down command is issued, the printer will reactivate. If power is lost after the power down command is issued, the printer will remember it is in power down mode, but will not reactivate the communications link. The POWER button must be pushed to restart the printer.

Shipping Printers

Never ship a printer by any means with a print cartridge installed. The pressure variations can cause the cartridge to become unprimed and/or purge. If you are going to ship a printer, remove and discard the print cartridge or cartridges.

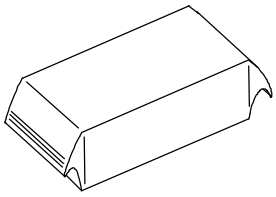
Care of Ink Cartridges

Ink cartridges should be stored in the sealed HP packaging. Once a print cartridge is unsealed, it should be placed in an operating printer. If a printer is taken out of service, the print cartridge should be removed and discarded.

Installing and Changing Ink Cartridges

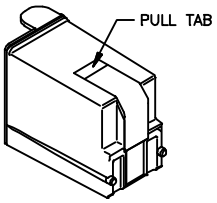
1. Remove new ink cartridge from sealed pouch. *(Hold cartridge by round plastic tab to avoid contamination.)*
2. Remove Mylar tape from face of new cartridge.
3. Open front cover of printer *(Opening front cover automatically opens paper cover at the same time).*
4. Pull down blue cartridge latch/latches.
5. Take out old ink cartridge(s). Place new cartridge(s) into carriage. Hold plastic tab to ensure clean installation. Black cartridges go into left carriage. Color cartridges go into right carriage. *(tab faces to front of printer.)*
6. Close blue latch/latches.
7. Close front cover of printer.

1

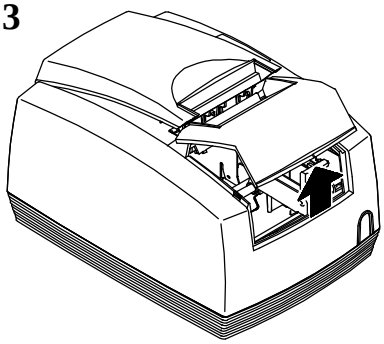


Caution:
Do not touch ink cartridge's metallic connector surface with your fingers. Doing so will contaminate the connector and produce bad print quality.

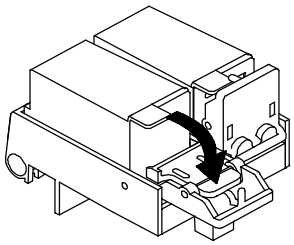
2



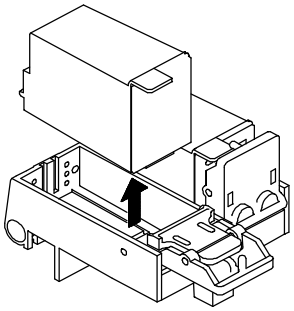
3



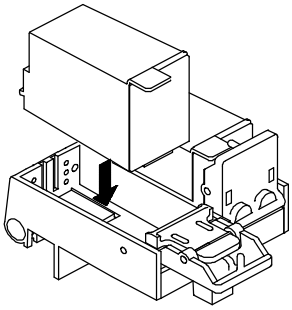
4



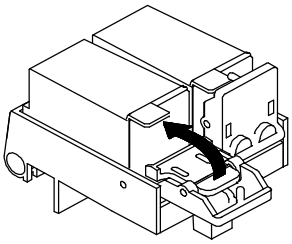
5a-remove old cartridge



5b-replace with new cartridge



6



When You Have Two Ink Cartridges

The POSjet™ 1000 is available in single or dual cartridge configurations. Several physical differences exist between the single and dual cartridge printers. The most obvious is the ability to install two ink cartridges in a dual cartridge printer. The second and less obvious is the dual wiper in a dual cartridge printer. For the printer to operate correctly, the firmware needs to know how many cartridges are installed and the color of the second cartridge.

Carriage Configuration	Left Pen	Right Pen	Wiper	Configurations
Single	Black	Not Used	Fixed	Black Only
Dual (Color Ready)	Black	Not Used	Dual	Black - None
Dual	Black	Red	Dual	Black - Red
Dual	Black	Green*	Dual	Black - Green
Dual	Black	Blue*	Dual	Black - Blue
Dual	Black	Custom*	Dual	Black - Red, Green, or Blue[8]

Table 11 Carriage Configurations

NOTE:

If a single cartridge printer is configured for dual operation, the printer will not function because the second cartridge is not installed.

If a dual cartridge printer is configured as a single cartridge printer, the dual wiper mechanism will not function. If only a single cartridge is installed in a dual cartridge carriage, the printer must be configured "Black".

It is not possible to configure the printer to operate with two black cartridges. If a second black cartridge is installed, the printer will not maintain it, and the cartridge will dry out and become unusable.

Do not store a spare cartridge in the second position. To place a cartridge in the second position, it must be unsealed. However, once the seal is broken, the cartridge begins drying.

8 Custom second colors, when available, should select the closest primary color.

* Not yet available.

Installing Paper

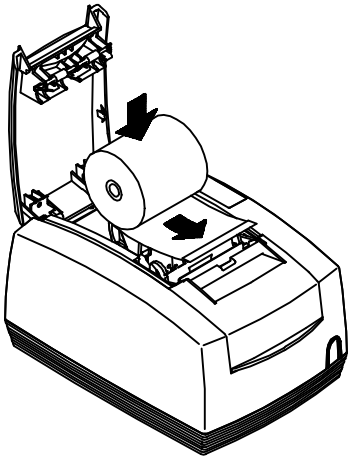
Before you attempt to load the paper roll make sure that the printer is plugged in and that the power indicator light is green. If this is a new instillation, a small receipt roll is supplied with the printer.

1. Open rear cover of printer.

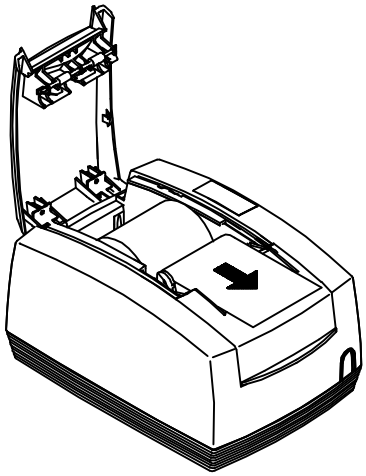
2. Insert the new paper roll so that the paper unwinds from the bottom and rests on the top of the front cover. (Make sure paper is to the top front edge of the front cover.) This is done to give the printer enough room to complete the automatic loading process and prepare for operation.

3. Close the rear paper roll compartment cover. The printer will automatically load the paper through the feeding mechanism. If the paper does not feed, repeat the steps.

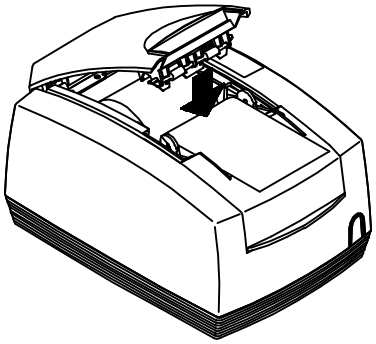
1



2



3



Changing Interface Adapters

The interface adapter on the POSjet™ 1000 Printer can be changed in the field.

In most cases, adapters are interchangeable without altering the printer firmware. However, you may have to load new firmware and/or boot loader before you change the adapter. Check with Technical Support for firmware compatibility between adapters before ordering. See "Contacting TransAct's Ithaca facility" on page 2.

Removing the Old Adapter

1. Remove the old adapter.
2. Remove the power from the printer.
3. Turn over the printer. Take care not to allow the cover to open or the paper to fall.
4. Disconnect the current communications and cash drawer cables.
5. If equipped, remove the power supply by unsnapping the retainer and sliding out the power supply.
6. Disconnect the power supply from the adapter.
7. Remove the adapter retaining screw.
8. Slide the adapter sideways-towards the power supply pocket-and remove it.

Install the new adapter

1. Slide the adapter into the printer. Make sure the adapter sits flush with the retaining screw mounting bracket. The retaining screw should also line up with the hole in the new adapter.
2. Install the retaining screw.
3. Reconnect the power supply to the new adapter.
4. Reinstall the power supply and reattach the retainer.
5. Connect the communications adapter and any cash drawers.
6. Turn over the printer, and reconnect the power.

Ordering Supplies

Your POSjet supplies can be ordered easily direct from TransAct via our website (www.transact-tech.com) or our telephone number (within the US toll free: (877) 7ithaca). (other inquires: (607) 257-8901). When calling by phone, please ask for the Sales Department. See "**Error! Reference source not found.**" on page **Error! Bookmark not defined.** for more details.

The following items may be ordered:

- Receipt paper
- Ink cartridges
- Cables

Paper

Receipt Paper	Type	Dimensions	Stock Number
1 Roll Large	single-ply	**Width:** 3.0 inches (76 mm) **Diameter:** 4.0 inches (102 mm) **Length:** 330 feet (100 m) **Thickness:** 0.003-0.0035 inches (0.076-0.089 mm)	98-02021
25 Roll Case	25 rolls single-ply	**Width:** 3.0 inches (76 mm) **Diameter:** 4.0 inches (102 mm) **Length:** 330 feet (100 m) **Thickness:** 0.003-0.0035 inches (0.076-0.089 mm)	98-02022

Table 12 Ordering Paper

Ink Cartridges

3 Pack Cartridges	Supplier	Stock Number
3 Pack Black	Transact's Ithaca Facility	100-02347
3 Pack Red	Transact's Ithaca Facility	100-02349
6 Pack Cartridges	**Supplier**	**Stock Number**
6 Pack Black	Transact's Ithaca Facility	100-02348
6 Pack Red	Transact's Ithaca Facility	100-02350

Table 13 Ordering Cartridges

New Ink Cartridges can be ordered from HP at www.hp-pos.com

Cables

Cables	Stock Number
110V Power Cable *(USA)*	98-02174
220V Power Cable *(Australia)*	98-02178
230V Power Cable *(International)*	98-02175
230V Power Cable *(IND/South Africa)*	98-02179
240V Power Cable *(UK)*	98-02176
Parallel Communication Cable 25 PIN Parallel Cable (Straight thru) 36 PIN Parallel Cable (Centronics type)	 253-9800007 253-9800002
Serial Communication Cable PC, 9-pin Female to 9-pin Female PC, 9-pin Female to 25-pin Female	 10-2020 10-2021

Table 14 Ordering Cables

Domestic and International power cables available.
Call for more information.

Chapter 5:

Control Codes Overview

This programmer's guide is designed to help users of the POSjet™ 1000 Printer develop applications. POSjet™ 1000 Printers are specialized point-of-sale printers that have several features not normally found on general-purpose printers. Because of these special features, POSjet™ 1000 Printers have unique control codes. This programmer's guide documents the control codes that are unique to the POSjet™ 1000 Printer.

Nomenclature

When describing control codes, confusion often occurs as to whether the description is decimal, hexadecimal, or ASCII. To minimize the problem, this programmer's guide uses the following nomenclature when describing control code sequences.

[ ]	Encloses a control character. [ ] represents a single, 8-bit value as defined in the standard ASCII tables. The ASCII Code Table in Appendix B lists the control codes. An example would be [ESC], which would represent a 1BH or 27 decimal.
< >	Encloses an 8-bit value in decimal format. The value is from zero to 255. An example is <2>, which represents 02H or 2 decimal.
<n>	Indicates a variable parameter. The variable parameter, <n>, can have a value from zero to 255. The meaning of <n> is described and defined in the description of the command.
<n_1> <n_2>	Indicates that there are two parameters, <n_1> and <n_2>, where both can have values from zero to 255.
<m_1> <m_2>	Is an Ithaca PrinterControl Language (IPCL) parameter consisting of two digits where <m_1> and <m_2> are ASCII characters from zero to nine. The parameter is combined to form a value from zero to 99. If <m_3> is included, the parameter is combined to be from zero to 999. If two values are specified, there must be two bytes added to the IPCL code. That is, if the command specifies <m_1> <m_2> and the desired value is five, it must be specified as 05.
x	All other characters in control strings represent ASCII characters. For example, [ESC] 1 represents 1BH followed by 31H.

In many cases, applications require that control sequences be specified in hexadecimal or decimal codes. In most cases, commands are specified in ASCII, hexadecimal, and decimal. The ASCII Code Table in Appendix B (page 218) lists ASCII, hexadecimal, and decimal equivalents.

Standard Emulation

The standard control codes for the POSjet™ 1000 Printer are extensions and subsets of the PcOS IBM emulation provided on other Ithaca products. In some cases, an application designed for a Series 50 Printer with IBM code sets will function with a POSjet™ 1000 Printer.

IPCL Codes

Ithaca Printer Control Language (IPCL) codes are part of PcOS and designed to control a printer without using control characters (i.e. characters less than 20H). Only the standard PcOS emulation supports IPCL.

In rare cases, an IPCL code will interfere with the text that is to be printed. The IPCL translator can be disabled with an [ESC] y <4> command.

EPOS Emulation

ESC/POS[9] is referred to here as EPOS. The POSjet™ 1000 Printer supports two Epson emulations. One emulation is for the TM200, and the other is a general EPOS emulation that has extensions that do not match any Epson printer.

The TM200 emulation is designed to allow POSjet™ 1000 Printers to be used with applications that are designed for Seiko Epson TM200 printers.

The EPOS emulation is an extension of the TM200 emulation that removes some of the limitations imposed by the TM200 and allows fuller use of the POSjet™ 1000 features.

It is intended that the standard Ithaca PcOS emulation be used for new applications. Not all features of POSjet™ 1000 Printers are supported by EPOS. Specifically, the ability to print color horizontal graphics is not supported.

Citizen 3500 Emulation

The POSjet™ 1000 Printer supports Citizen emulation modes.

Star Emulation

The POSjet™ 1000 Printer supports Star emulation modes.

Application Development

To aid application development, several chapters in this manual are designed to help the programmer understand the POSjet™ 1000 Printer. The next chapter provides a detailed description of each of the commands. Subsequent chapters provide explanations of how the printer works including a description of the internal print buffer, communications link, and interaction between the host computer and printer.

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9 ESC/POS is a registered trademark of the Seiko Epson Corporation.

Chapter 6:
Tables and Charts

Throughout this programmer's guide, charts and tables list commands and features. In most cases, the charts cross-reference the page that describes the command. Commands are grouped by function and may be difficult to find. To minimize the time it takes to find commands, code summary charts, arranged by code and function, are provided.

PcOS Printer Control Codes

The following section defines the POSjet™ 1000 Ithaca PcOS emulation. The native, Ithaca PcOS emulation provides the most flexibility and control over the printer. It is consistent with most previous Ithaca PcOS products and should be used when the printer is placed in a new application.

The new feature in the POSjet™ 1000 Printer is the ability to print color graphics. The control codes for color graphics are all new. Due to the complexity of color graphics, Ithaca provides several drivers to integrate into your application. Ithaca does not recommend that you generate drivers. In addition, Ithaca has created several tools that can be used to generate and maintain graphic images and files for print on the POSjet™ 1000. Information about drivers and tools are available on the TransAct web site and on a *POSjet™ Software Developer's Toolkit*. For more information about either of these options, contact Technical Support. See "Contacting TransAct's Ithaca facility" on page 2.

Quick PcOS Reference Chart

A quick reference chart for PcOS commands follows.

Command	Description	Page
Low Level Paper Motion Control		
[CR]	Carriage Return.	33
[LF]	Line feed.	33
Horizontal Motion Control		
[BS]	Back Space.	34
[HT]	Horizontal tab.	34
[ESC] D <n_1> <n_2> <n_3> ... <n_i> <0>	Set horizontal tab stops.	34
[ESC] R	Reset horizontal and vertical tab stops.	35
[ESC] a <n>	Set justification.	35
[ESC] n <n_1> <n_2>	Set horizontal position.	35
Vertical Motion Control		
[ESC] J <n>	Perform a fine line feed.	36
[ESC] d <n>	Feed <n> lines at current spacing.	38
[ESC] 0	Set 1/8-inch line spacing.	36
[ESC] 1	Set 7/72-inch line spacing.	37
[ESC] A <n>	Set variable line spacing to n/72 inch.	37
[ESC] 2	Begin variable line spacing. (Enable [ESC] A <n>).	37
[ESC] 3 <n>	Set variable line spacing to n/216 inch.	36
[ESC]]	Reverse line feed.	40
[VT]	Vertical tabs.	38
Vertical Motion Control		
[FF]	Form Feed.	39
[ESC] B <n_1> <n_2> <n_3> … <n_i> 0	Set vertical tab stops.	38
[ESC] C <n>	Set form length in lines.	39
[ESC] C [NUL] <n>	Set form length in inches.	40
[ESC] 4	Set top of form.	39
[ESC] 5 <n>	Set auto line feed.	40
[ESC] R	Reset horizontal and vertical tab stops.	35

Character Pitch		
[DC2]	Begin 10 cpi character pitch.	41
[ESC] :	Begin 12 cpi character pitch.	41
[SI]	Begin 17 cpi character pitch.	41
[ESC] [SI]	Begin 24 cpi character pitch.	41
[ESC] [P <n>	Set character pitch.	42
[ESC] V <n>	Set intercharacter spacing.	43
Command	**Description**	**Page**
Character Font		
[ESC] # <0>	Begin 12 x 12 draft print mode.	44
[ESC] I <n>	Set print quality mode.	44
[ESC] P <n>	Begin rotated font.	45
International Character Sets and Code Pages		
[ESC] ! <n>	Select international character set.	47
[ESC] $	Cancel user-defined characters.	54
[ESC] ^ <n>	Print control character.	51
[ESC] = <y> <c_1> <c_2> …	Define user-defined characters.	53
[ESC] [C <n>	Insert Euro character.	51
[ESC] [S …	Redefine character set.	52
[ESC] [T <n_h> <n_l>	Select character code page.	49
[ESC] > <n>	Enable user-defined characters.	54
[ESC] y <11>	Enable OCR characters.	55
[ESC] y <12>	Disable OCR characters.	57
Character Attributes		
[ESC] c <n>	Select color.	57
[SO]	Begin one-line double-wide print.	57
[DC4]	Cancel one-line double-wide print.	58
[ESC] W <n>	Begin multiline double-wide double-high mode.	58
[ESC] % G	Begin italics.	62
[ESC] % H	End italics.	62
[ESC] E	Begin emphasized print.	61
[ESC] F	End emphasized print.	61
[ESC] G	Begin enhanced print.	60
Character Attributes		
[ESC] H	End enhanced print.	60
[ESC] S <0>	Select superscript.	61
[ESC] S <1>	Select subscript.	61
[ESC] T	End superscript/subscript.	62
[ESC] - <n>	Enable/disable underline mode.	60

[ESC] _ <n>	Enable/disable overscore.	60
[ESC] [@ ...	Set print style. (See command description.)	59
Print Rotation		
[ESC] r <n>	Begin/end rotated print. (See command descriptions.)	64
[ESC] s <n>	Set rotated print line length.	67
[ESC] u <n_1> <m_1> … <0>	Set rotated print line spacing.	67
Graphic Mode		
[ESC] ? <m> <n>	Reassign graphic mode.	71
[ESC] K <n_1> <n_2>	Print single-density graphics (60h x 72v dpi).	68
[ESC] L <n_1> <n_2>	Print half-speed double-density graphics (120h x 72v dpi).	69
[ESC] U <n>	Begin/end unidirectional print.	71
[ESC] Y <n_1> <n_2>	Print full-speed double-density graphics (120h x 72v dpi).	69
[ESC] Z <n_1> <n_2>	Print quad-density graphics (240h x 72v dpi).	69
[ESC] * <m> <n_1> <n_2>	Print graphics in mode <m>.	70
[ESC] h <color> <length> <format> <data>	Process horizontal graphics data.	73
[ESC] * <m> <0> <	Set horizontal graphics mode.	74
User Store		
[ESC] [US] b <Name..> <0>	Begin named macro record.	79
[ESC] [US] c <Name..> <0>	Save user-defined characters.	80
[ESC] [US] d <Name..> <0>	Delete item from user store.	82
[ESC] [US] e <Name..> <0>	End named macro record.	79
[ESC] [US] f ALL <0>	Flush information from user store.	82
[ESC] [US] l <Name..> <0>	Load item from user store.	80
[ESC] [US] m <Name..> <0>	Save macro data in user store.	80
[ESC] [US] q <Name..> <0>	Report on user store.	82
[ESC] [US] r <Name..> <0>	Run macro data from user store.	81
[ESC] [US] s <Name..> <0>	Flag item as a start-up macro.	81
[ESC] g <0>	Process user macro.	84
[ESC] g <1>	Start macro record.	84
[ESC] g <2>	Stop macro record.	84
[ESC] g <3>	Stop macro record and save.	84
Bar Codes		
[ESC] b <n> ... [ETX]	Print bar code.	85
[ESC] [EM] B <n>	Set bar code height.	88
[ESC] [EM] J <n>	Set bar code justification, HRI print mode, and print direction.	88
Miscellaneous Control		
[BEL]	Audio Alert. (Option)	91
[CAN]	Clear print buffer.	90
[ESC] x <n>	Open cash drawer.	91
[ESC] q <n>	Query marker.	90
[ESC] w <n>	Enable dynamic response.	96
[ESC] y <n>	Control feature commands.	94

[ESC] X <n1> <n2>	Set left/right print margin.	89
[ESC] [BEL] <n1> <n2> <n3>	Configure audio alert.	92
[ESC] 8	Disable paper out sensor.	89
[ESC] 9	Enable paper out sensor.	89
[ESC] ~ <n>	Enable extended diagnostics.	95
[ESC] < <n>	Enable print suppress and data pass through.	93
[SOH] <n>	Begin multidrop control.	96
Series 50 Compatibility		
[BS]	Cash drawer command.	97
[BEL]	Cash drawer command.	97
[ESC] +	Cash drawer command.	97
[ESC] # or [ESC] d or [ESC] [RS] and [ESC] "	Pass through.	97
Printer Status Set and Inquire		
[ENQ] <n>	Inquire printer status. (Refer to command descriptions).	99

Print/Paper Motion

Low Level Paper Motion Control

Function	**Carriage return**
ASCII	[CR]
Hexadecimal	0DH
Decimal	<13>
IPCL	&%CR
EPOS	0DH

Description The [CR] command prints the contents of the print buffer (if any) and resets the next character print position to the left margin. A line feed is not performed unless autofeed is active. The print rotation direction and the left margin command define the left margin.

Function	**Line feed**
ASCII	[LF]
Hexadecimal	0AH
Decimal	<10>
IPCL	&%LF
EPOS	0AH

Description The [LF] command prints the contents of the buffer (if any) and advances paper one line at the current default line spacing. The next character print position is not reset to the left margin unless auto-CR is active.

Horizontal Motion Control

Several commands can be used to control the horizontal position of characters. Many applications use space control to position fields. However, the POSjet™ 1000 Printer has the ability to control character position with horizontal tab stops. This is done using the horizontal tab [HT] to move to those tab stops.

Function	**Horizontal tab**
ASCII	[HT]
Hexadecimal	09H
Decimal	<9>
IPCL	&%HT
EPOS	[HT

Description The [HT] command inserts spaces in the print buffer up to the next tab stop. The default tab locations are every eight spaces.

Function	**Back space**
ASCII	[BS]
Hexadecimal	08H
Decimal	<8>
IPCL	&%BS
EPOS	[BS]

Description The [BS] command moves the print buffer one character width to the left. The pointer position cannot be moved to the left of the left margin. [BS] does not cause the buffer to be printed, the following data is OR'ed with the previous data.

Function	**Set horizontal tab stops**
ASCII	[ESC] D <n_1> <n_2> <n_3> ... <n_i> 0
Hexadecimal	1BH 44H <n_1> <n_2> <n_3> ... <n_i> 00H
Decimal	<27> <68> <n_1> <n_2> <n_3> ... <n_i> <0>
IPCL	none
EPOS	[ESC] D <n_1> <n_2> <n_3> ... <n_i> 0

Description The [ESC] D <n_1> <n_2> <n_3> ... <n_i> 0 command sets tab stops at the character columns specified by <n>. The end of the settings is specified by a <0>. All previously set tabs will be cleared. The restore-default procedure other than to respecify the tabs. Column sizes are in accordance with the current character pitch. Setting tabs that are beyond the station width is possible. A [CR] is inserted when the tab is used. Printing begins at the home position. The power up default is every eight spaces, i.e., 9, 17, 25, and so on.

Function	**Reset horizontal and vertical tab stops**
ASCII	[ESC] R
Hexadecimal	1BH 52H
Decimal	<27> <82>
IPCL	&%HV
EPOS	none

Description The [ESC] R command resets horizontal and vertical tab stops to the power up configuration. The power up horizontal default is every eight spaces, i.e., 9, 17, 25, and so on. The vertical default is every line.

Function	**Set Justification**
ASCII	[ESC] a <n>
Hexadecimal	1BH 61H <n>
Decimal	<27> <97> <n>
IPCL	&%JL, &%JC, &%JR
EPOS	[ESC] a <n>

Description The [ESC] a <n> command sets the horizontal justification.

Where <n>	**0 = Left justified**	**&%JL**
	1 = Center justified	&%JC
	2 = Right justified	&%JR
	8 = Left justified (no line feed)	None
	9 = Center justified (no line feed)	None
	10 = Right justified (no line feed)	None

The print format of the printer can be right, center, or left justified. The value of <n> specifies the justification. The power on default is left justified.

Note 1 The justify commands do not effect graphics.

Function	**Set horizontal position**
ASCII	[ESC] n $<n_1>$ $<n_2>$
Hexadecimal	1BH 6EH $<n_1>$ $<n_2>$
Decimal	<27> <110> $<n_1>$ $<n_2>$
IPCL	&%HP $<m_1>$ $<m_2>$ $<m_3>$
EPOS	[ESC]$ $<n_1>$ $<n_2>$

Description The [ESC] <n> $<n_1>$ $<n_2>$ command sets the print position to $<n_1>$ + $<n_2>$ * 256.

Vertical Motion Control

Function	**Perform a fine line feed**
ASCII	[ESC] J <n>
Hexadecimal	1BH 4AH <n>
Decimal	<27> <74> <n>
IPCL	&%FM <m_1> <m_2> <m_3>
EPOS	[ESC] J <n>

Description The [ESC] J <n> command prints the contents of the buffer (if any) and performs a line feed of n/216 inch. The default line spacing value is not changed. The next character print position is reset to the left margin if the Auto-CR mode is set.

Note 1 In EPOS mode, the command performs line feeds in n/144-inch increments.

Note 2 Immediately after APA graphics, the command is adjusted for the difference between 72 dpi graphics and 96 dpi print.

Function	**Set variable line spacing to n/216 inch**
ASCII	[ESC] 3 <n>
Hexadecimal	1BH 33H <n>
Decimal	<27> <51> <n>
IPCL	&%SV <m1> <m2> <m3>
EPOS	[ESC] 3 <n>

Description The [ESC] 3 <n> command sets the default line spacing to n/216 inch. Set n = 1 to 255. The line feed spacing used by [LF] is set to values other than 1/8 or 7/72 inch. The command takes effect immediately.

Note 1 In EPOS mode, the command performs line feeds in n/144-inch increments.

Function	**Set line spacing to 1/8 inch**
ASCII	[ESC] 0
Hexadecimal	1BH 30H
Decimal	<27> <48>
IPCL	&%ST
EPOS	[ESC] 2

Description The [ESC] 0 command sets the default line spacing to 1/8 inch (27/216 inch), which is the standard eight lines per inch line spacing at initial power-up.

Note 1 In EPOS mode, the command sets 1/6-inch spacing or six lines per inch.

Function	**Set line spacing to 21/216 inch or 7/72 inch**
ASCII	[ESC] 1
Hexadecimal	1BH 31H
Decimal	<27> <49>
IPCL	&%SG
EPOS	none

Description The [ESC] 1 command sets the default line spacing to 21/216 inch. Use 21/216-inch line spacing for all-points-addressable (APA) graphics printing.

Function	**Set variable line spacing to n/72 inch**
ASCII	[ESC] A <n>
Hexadecimal	1BH 41H <n>
Decimal	<27> <65> <n>
IPCL	none
EPOS	none

Description The [ESC] A <n> command sets the default line spacing to n/72. Set n = 1 to 85. Variable line spacing does not take effect until enabled by the [ESC] 2 command. The command is provided to maintain backward compatibility with the Ithaca Series 50, OKIDATA, IBM, and other printers. It can also be used to print on preprinted forms.

Function	**Enable [ESC] A <n> line spacing**
ASCII	[ESC] 2
Hexadecimal	1BH 32H
Decimal	<27> <50>
IPCL	none
EPOS	none

Description The [ESC] 2 command is a companion to the [ESC] A <n> command and puts the specified line spacing into effect. It remains in effect until another line spacing command is issued.

Function	**Feed <n> lines at the current spacing**
ASCII	[ESC] d <n>
Hexadecimal	1BH 64H <n>
Decimal	<27> <100> <n>
IPCL	&%FL <m1> <m2>
EPOS	[ESC] d

Description The [ESC] d <n> command prints the contents of the buffer (if any) and performs <n> line feeds at the current line spacing. The command does not change the default line spacing value. The next character print position is reset to the left margin.

Note 1 The IPCL command prints from 00 to 99 lines. For example, if you wish to feed 12 lines, the IPCL command would be as follows: &%FL12.

Function	**Vertical tab**
ASCII	[VT]
Hexadecimal	0BH
Decimal	<11>
IPCL	&%VT
EPOS	(VT)

Description The printer sets a line counter to the top of the form at reset and when a set top of form command is issued. By setting vertical tab stops, various form positions can be reached with a [VT] operation.

Function	**Set vertical tab stops**
ASCII	[ESC] B <n_1> <n_2> <n_3> ... <n_i> 0
Hexadecimal	1BH 42H <n_1> <n_2> <n_3> ... <n_i> 00H
Decimal	<27> <66> <n_1> <n_2> <n_3> ... <n_i> <0>
IPCL	none
EPOS	[ESC] B <n_1> <n_2> <n_3> ... <n_i> 0

Description The [ESC] B <n_1> <n_2> <n_3> ... <n_i> 0 command sets tab stops at line positions specified by <n>. The end of the setting is specified by a <0>. All previously set tabs will be cleared. If n_n is less than n_{n-1}, then the command is in error, and all of the following information is printed. In other words, tab stops must be entered sequentially in order to be accepted. A total of 64 tab stops can be specified. (The power on default is a vertical tab on every line).

Function	**Reset horizontal and vertical tab stops**
ASCII	[ESC] R
Hexadecimal	1BH 52H
Decimal	<27> <82>
IPCL	&%HV
EPOS	none

Description The [ESC] R command resets horizontal and vertical tab stops to power up configuration. The power up horizontal default is every eight spaces, i.e., 9, 17, 25, etc. The vertical default is every line.

Function	**Form Feed**
ASCII	[FF]
Hexadecimal	0CH
Decimal	<12>
IPCL	&%FF
EPOS	none

Description The [FF] command performs a form feed to the top of the form.

Note 1 The form feed command can be disabled by setting the form length to zero.

Function	**Set top of form**
ASCII	[ESC] 4
Hexadecimal	1BH 34H
Decimal	<27> <52>
IPCL	&%TF
EPOS	[ESC] L

Description The [ESC] 4 command sets the top of form to the current position.

Function	**Set form length in lines**
ASCII	[ESC] C <n>
Hexadecimal	1BH 43H <n>
Decimal	<27> <67> <n>
IPCL	&%SL <m_1> <m_2>
EPOS	[ESC] C <n>

Description The [ESC] C <n> command sets the form length to <n> lines at the current line spacing. If the current page position is greater than the new page length, the command also sets the current position as the top of form.

Function	**Set form length in inches**
ASCII	[ESC] C [NUL] <n>
Hexadecimal	1BH 43H <0> <n>
Decimal	<27> <67> <0> <n>
IPCL	&%SI <m_1> <m_2>
EPOS	none

Description The [ESC] C [NUL] <n> command sets the form length to <n> inches. If the current page position is greater than the new page length, the command also sets the current position as the top of form. If zero inches are specified, the form feed and vertical tab commands are ignored.

Function	**Begin auto line feed**
ASCII	[ESC] 5 <n>
Hexadecimal	1BH 35H <n>
Decimal	<27> <53> <n>
IPCL	&%MA (Begin)
IPCL	&%CA (End)
EPOS	none

Description The [ESC] 5 <1> command sets auto line feed mode. [ESC] 5 <0> command ends auto line feed mode.

Note 1 The begin and end auto line feed command overrides the configuration setting.

Function	**Reverse line feed**
ASCII	[ESC]]
Hexadecimal	1BH 5DH
Decimal	<27> <93>
IPCL	&%LR
EPOS	none

Description The [ESC]] command performs a reverse line feed at the current line spacing.

Note 1 The POSjet™ 1000 Printer can tolerate no more than 1/2 inch of reverse feed.

Character Pitch

Character pitch commands that set specific characters per inch (cpi) disable any right-side spacing set by the [ESC] V <n> command. In addition, when font changes are made, the character pitch is maintained.

Function	**Begin 10 cpi character pitch**
ASCII	[DC2]
Hexadecimal	12H
Decimal	<18>
IPCL	&%F3
EPOS	[ESC][SP] <n>
Description	The [DC2] command sets 9.905 characters per inch print pitch.

Function	**Begin 12 cpi character pitch**
ASCII	[ESC] :
Hexadecimal	1BH 3AH
Decimal	<27> <58>
IPCL	&%F2
EPOS	[ESC] [SP] <n>
Description	The [ESC] : command sets 12.235 characters per inch print pitch.

Function	**Begin 17 cpi character pitch**
ASCII	[SI]
Hexadecimal	0FH
Decimal	<15>
IPCL	&%F1
EPOS	[ESC] [SP] <n>
Description	The [SI] command sets 17.333 characters per inch print pitch.

Function	**Begin 24 cpi character pitch**
ASCII	[ESC] [SI]
Hexadecimal	1BH 0FH
Decimal	<27> <15>
IPCL	&%F4
EPOS	[ESC] [SP] <n>
Description	The [ESC] [SP] command sets 23.111 characters per inch print pitch.

Function	**Set character pitch**
ASCII	[ESC] [P <n>
Hexadecimal	1BH 5BH 50H <n>
Decimal	<27> <91> <80> <n>
IPCL	&%F<n>
EPOS	[ESC] [SP] <n>

Description The [ESC] [P <n> command sets character per inch print pitch to <n>. The printer resolution limits the exact print pitch. The following table lists the exact pitch for various values on <n>.

<n>	Resulting Characters per Inch	IPCL
1	1.000	
2	2.000	
3	3.014	
4	4.000	
5	4.952	
6	5.943	
7	6.933	
8	8.000	&%F7
9	9.043	
10	9.905	&%F3
11	10.947	
12	12.235	&%F2
13	13.000	
14	13.867	
15	14.857	&%F6
16	16.000	
17	17.333	&%F1
18	17.333	
19	18.909	
20	20.8	&%F5
21	20.8	
22	23.111	
23	23.111	
24	23.111	&%F4

Table 15 Character Pitch

This command disables any right-side spacing set by the [ESC] V <n> command. In addition when font changes are made, the character pitch is maintained.

Function	**Set intercharacter spacing**
Mode	Global
ASCII	[ESC] V <n>
Hexadecimal	1BH 56H <n>
Decimal	<27> <86> <n>
IPCL	none
EPOS	[ESC] [SP] <n>

Description The [ESC] V <n> command sets intercharacter spacing by adding white space between characters. The value of <n> sets the spacing in 216 of an inch. The printer can only set the spacing in 208 of an inch and converts 216 to the nearest 208 of an inch. Each font has a basic size, and the intercharacter spacing value is added to the basic size. Therefore, the affect of this command on characters per inch (cpi) will depend on the font selected.

Note 1 The [ESC] V <n> command disables any pitch settings established by pitch set commands that establish a cpi (like [ESC] [P <n>). After a set right-side spacing command is issued, the pitch will vary with font selection. Font selections use the current, active, right-side spacing.

Note 2 With the inter-character spacing command, the pitch cannot be set less than the font size. Therefore, it is not as effective as the pitch command, [ESC] [P <n>. The following table lists the cpi equivalent for several values of <n>.

<n>	Small Draft (cpi)	Large Draft (cpi)	NLQ (cpi)
0	17.33	14.86	13
1	16	13.9	12.24
2	14.86	13	11.6
3	13.9	12.24	10.9
4	13	11.6	10.4
5	12.24	10.9	9.90

Table 16 Intercharacter Spacing

Character Font

Function	**Begin 12 x 12 draft print mode**
ASCII	[ESC] # <0>
Hexadecimal	1BH 23H 00H
Decimal	<27> <35> <0>
IPCL	&%QT
EPOS	[ESC] ! <n>

Description The [ESC] # <0> command begins 12 x 12 draft print mode. Draft print is provided to maintain compatibility with other Ithaca products.

Function	**Set print quality mode**
ASCII	[ESC] I <n>
Hexadecimal	1BH 49H <n>
Decimal	<27> <73> <n>
IPCL	&%QT 12 x 12 draft mode &%QU 12 x 14 large draft mode &%QL 24 x 16 near letter quality (NLQ) mode &%QS 24 x 16 near letter quality (NLQ) mode
EPOS	[ESC] x <n> and/or [ESC] ! <n>

Description The [ESC] I <n> command begins draft, large draft or near letter quality print mode.

Where n
0 = 12 x 12 draft
1 = 12 x 14 large draft
2 = 24 x 16 near letter quality (NLQ)
3 = 24 x 16 near letter quality (NLQ)
4 - 7 repeats 0 - 3

Draft print modes are high-speed print modes intended to provide quality print with minimal ink usage. The 12 x 12 draft font is the most efficient. The 12 x 14 large draft font produces a larger more readable character but with added ink usage. NLQ print mode is a two pass half-speed font. It provides what is generally regarded as near letter quality print at reduced speed with greater ink usage.

Note 1 In EPOS mode, [ESC] x <n> is similar to [ESC] I <n>. [ESC] ! <n> performs a similar function; however, NLQ is not available.

Note 2 NLQ fonts cannot be rotated 90° or 270°.

Note 3 Switching from draft to NLQ modes causes the printer to print all previously received information. Consequently, auto-center and right justify do not print mixed draft and NLQ font as expected.

Function	**Begin rotated font**
ASCII	[ESC] P <n>
Hexadecimal	1BH 50H <n>
Decimal	<27> <80> <n>
IPCL	&%RI {n=2} &%RF {n=1} &%RN {n=0}
EPOS	[ESC] V <n>

Description The [ESC] P <n> command sets the print font to a rotated 90° or 270° font.

Where n

n = 0 Normal
n = 1 Rotate 90° (Single pass, 12 x 12 draft)
n = 2 Rotate 270° (Single pass, 12 x 12 draft)
n = 5 Rotate 90° (Two pass, 12 x 12 draft or 12 x 14 large draft)
n = 6 Rotate 270° (Two pass, 12 x 12 draft or 12 x 14 large draft)

In Modes 1 and 2, 12 x 12 draft font is rotated 90 or 270° and printed in a single pass. Double-wide and double-high fonts are available. However, because the font is rotated, double wide makes the characters taller and double high makes the characters wider. Modes 1 and 2 distort the font, but they produce the fastest rotated print.

Modes 5 and 6 rotate the 12 x 12 draft or 12 x 14 large draft and maintain the aspect ratio of the fonts. Modes 5 and 6 require two passes by the print cartridge, which slows the print time considerably. The font that is rotated by Mode 5 or 6 is selected by the [ESC] I <n> command. <n> may be zero or one.

NLQ fonts cannot be rotated 90° or 270°. The current pitch sets the spacing between lines. If eight characters per inch (cpi) is set, the printer produces the equivalent of eight lines per inch (lpi) rotated print.

International Character Sets and Code Pages

The POSjet™ 1000 Printer supports 65 different international character sets. In IBM and EPOS printers, there are two ways of selecting a character set. One way substitutes international characters in the upper 128 characters of a standard character set. The substitution technique supports a few different countries. However, as more and more countries were added, too many characters were being replaced. It became a problem for the application to match the characters displayed and printed. To solve the problem, a second method of selecting a character set was developed - code pages. The printer and display use the same code page. The application displays and prints the same characters. IBM and EPOS defined new commands to select code pages and left the old commands in effect.

The POSjet™ 1000 Printer supports international character sets as well as code pages. To allow the most flexibility for the application programmer, both methods are extended in the POSjet™ 1000 Printer. In IBM mode, there are 19 character sets and 60 code pages. In EPOS mode, there are 57 character sets and five code pages.[10]

The POSjet™ 1000 Printer allows the IBM code page selection command to choose character sets as well as normal IBM code pages. The EPOS character set select command has been extended to allow additional character sets over and above the 11 defined by EPOS. The EPOS code page select command has not been extended because there is no EPOS definition beyond the first six ID's.

All characters in code pages as well as character sets are addressed as zero through 255. (Characters below 32 must be addressed with the [ESC] ^ <n> command.) Code pages may be changed at any time and are active for all features including rotated print. To allow other code pages to be created by an application, a redefine character set command is provided.

As discussed above, there are two commands for language selection in IBM mode. The first is [ESC] !, which selects one of 19 international character sets. The [ESC] ! command does not select all the possible sets and is provided for compatibility with older programs. The second is [ESC] [T, which selects any of the 58 code pages. In EPOS mode, the [ESC] R command has been expanded to select any of the 59 international character sets or code pages.

[10] Epson provides limited code page support through ID to code page translation. Only six translations are defined.

Function	**Select international character set**
ASCII	[ESC] ! <n>
Hexadecimal	1BH 21H <n>
Decimal	<27> <33> <n>
IPCL	&%CS <n>
EPOS	[ESC] R <n>

Description The [ESC] ! <n> command selects international character set <n>. In standard mode, the value of <n> is as follows.

<n>	Language	<n>	Language
64-'@'	ASCII (slashed zero)	73-'I'	Italian
65-'A'	ASCII (unslashed zero)	74-'J'	French Canadian
66-'B'	British	75-'K'	Spanish
67-'C'	German	76-'L'	Swedish II
68-'D'	French	77 -'M'	Swedish III
69-'E'	Swedish	78-'N'	Swedish IV
70-'F'	Danish	79-'O'	Turkish
71-'G'	Norwegian	80-'P'	Swiss I
72-'H'	Dutch	81-'Q'	Swiss II

Table 17 Language Table ID's

Country Code/ Language Set	Epson ID	Country Code/ Language Set	Epson ID
ASCII	0	Greek 437	38
French	1	Greek 928	39
German	2	Greek 437 Cyprus	41
British	3	ECMA-94	42
Danish I	4	Canada French	43
Swedish I	5	Cyrillic I-855	44
Italian	6	Cyrillic II-866	45
Spanish I	7	East Europe Latin II-852	46
Japanese	8	Greek 869	47
Norwegian	9	Windows East Europe	49
Danish II	10	Windows Greek	50
Spanish II	11	Latin 5 (Windows Turkey)	51
Latin American	12	Windows Cyrillic	52
French Canadian	13	Hungarian CWI	54
Dutch	14	Kamenicky (MJK)	55
Swedish II	15	ISO Latin 4 (8859/4)	56
Swedish III	16	Turkey-857	57
Swedish IV	17	Roman-8	58
Turkish	18	Hebrew NC (862)	60
Swiss I	19	Hebrew OC	61
Swiss II	20	Windows Hebrew	62
Cyrillic II-866	21	KBL- Lithuanian	63
Polska Mazovia	22	Ukrainian	66
ISO Latin 2	23	ISO Latin 6 (8859/10)	67
Serbo Croatic I	24	Windows Baltic	68
Serbo Croatic II	25	Cyrillic-Latvian	69
Multilingual	26	Bulgarian	72
Norway	27	Icelandic-861	73
Portugal	28	Baltic 774	74
Turkey	29		

Table 18 EPOS Language Table ID's

Function	**Select character code page**
ASCII	[ESC] [T <n_h> <n_l>
Hexadecimal	1BH 5BH 54H <n_h> <n_l>
Decimal	<27> <91> <84> <n_h> <n_l>
IPCL	&%CP <m_1> <m_2> <m_3> <m_4>
EPOS	[ESC] t <n>

Description The [ESC] [T <n_h> <n_l> command selects character code page <n_h> <n_l>. The POSjet™ 1000 Printer supports many code pages. The following code pages are supported.

Code Page	Country Code/Language Set	Decimal <n_h> <n_l>	Hex <n_h> <n_l>
64	USA (Slashed 0)	0,64	0H,040H
65	USA (Unslashed 0)	0,65	0H,041H
66	British	0,66	0H,042H
67	German	0,67	0H,043H
68	French	0,68	0H,044H
69	Swedish I	0,69	0H,045H
70	Danish	0,70	0H,046H
71	Norwegian	0,71	0H,047H
72	Dutch	0,72	0H,048H
73	Italian	0,73	0H,049H
74	French Canadian	0,74	0H,04AH
75	Spanish	0,75	0H,04BH
76	Swedish II	0,76	0H,04CH
77	Swedish III	0,77	0H,04DH
78	Swedish IV	0,78	0H,04EH
79	Turkish	0,79	0H,04FH
80	Swiss I	0,80	0H,050H
81	Swiss II	0,81	0H,051H
91	Welsh	0,91	0H,05BH
437	USA	1,181	1H,0B5H
774	Baltic 774	3,6	3H,006H
850	Multilingual	3,82	3H,052H
852	East Europe Latin II-852	3,84	3H,054H
855	Cyrillic I-855	3,87	3H,057H
857	Turkey 857	3,89	3H,059H
858	Multilingual Euro	3,90	3H,05AH
860	Portugal	3,92	3H,05CH
861	Icelandic-861	3,93	3H,05DH
862	Hebrew NC (862)	3,94	3H,05EH
863	Canada French	3,95	3H,05FH

Code Page	Country Code/Language Set	Decimal <n_h> <n_l>	Hex <n_h> <n_l>
865	Norway	3,97	3H,061H
866	Cyrillic II-866	3,98	3H,062H
869	Greek 869	3,101	3H,065H
874	Thailand	3,106	3H,06AH
895	Kamenicky (MJK)	3,127	3H,07FH
1008	Greek 437	3,240	3H,0F0H
1009	Greek 928	3,241	3H,0F1H
1011	Greek 437 Cyprus	3,243	3H,0F3H
1012	Turkey	3,244	3H,0F4H
1013	Cyrillic II-866	3,245	3H,0F5H
1014	Polska Mazovia	3,246	3H,0F6H
1015	ISO Latin 2	3,247	3H,0F7H
1016	Serbo Croatic I	3,248	3H,0F8H
1017	Serbo Croatic II	3,249	3H,0F9H
1018	ECMA-94	3,250	3H,0FAH
1019	Windows East Europe	3,251	3H,0FBH
1020	Windows Greek	3,252	3H,0FCH
1021	Latin 5 (Windows Turkey)	3,253	3H,0FDH
1022	Windows Cyrillic	3,254	3H,0FEH
1024	Hungarian CWI	4,0	4H,000H
1026	ISO Latin 4 (8859/4)	4,2	4H,002H
1027	Ukrainian	4,3	4H,003H
1028	Roman-8	4,4	4H,004H
1029	ISO Latin 6 (8859/10)	4,5	4H,005H
1030	Hebrew NC (862)	4,6	4H,006H
1031	Hebrew OC	4,7	4H,007H
1032	Windows Hebrew	4,8	4H.008H
1033	KBL- Lithuanian	4,9	4H,009H
1034	Windows Baltic	4,10	4H,00AH
1035	Cyrillic-Latvian	4,11	4H,00BH
1072	Bulgarian	4,48	4H,030H

Tabl 19 Code Page Definition Table

Note 1 The code page field is a 16-bit field that is equivalent to the code page number. For example, 1 * 256 + 181 = 437. For the IPCL command, the page is specified in ASCII as a 4-byte field.

Function	**Print control character**
ASCII	[ESC] ^ <n>
Hexadecimal	1BH 5EH <n>
Decimal	<27> <94> <n>
IPCL	&%CC <m1> <m2> <m3>
EPOS	[ESC] ^ <n>

Description The [ESC] ^ <n> command allows characters from zero to 31 codes to be printed. During normal operation, characters from zero to 31 are control characters. The command turns off control code translation for the following character. <n> can be from zero to 255.

Function	**Insert Euro character**
ASCII	ESC] [C <n>
Hexadecimal	1BH 5BH 43H <n>
Decimal	<27> <91> <67> <n>
IPCL	&%EU

Description The [ESC] [C <n> command allows an application to replace any character in the currently active character set with the Euro character. The character to be replaced is defined by <n>. For example, if the currently active character set is CP 850 (multilingual) and 0D5H character is to be the Euro character, "1BH 5BH 43H 0D5H" replaces the character at 0D5H with the Euro symbol.

Euro Character Substitution Matrix			
Name	Epson	IBM	Code Page Insertion Point
850	26	850	0xD5
Turkey 857	57	857	0XD5
Win Cyrillic	52	1022	0X88
Win Turkish	51	1021	0X80
Win Greek	50	1020	0X80
Win Hebrew	62	1032	0X80
Win Baltic	68	1034	0X80

Table 20 Euro Character Substitution Matrix

Function	**Redefine character set**
ASCII	[ESC] [S <L_L> <L_H> <B_C> <T_{1L}><T_{1H}> <T_{2L}><T_{2H}> <T_{3L}><T_{3H}> … <T_{nL}><T_{nH}>
Hexadecimal	1BH 5BH 53H …
Decimal	<27> <91> <83> …
IPCL	none

Description The [ESC] [S <L_L> <L_H> <B_C> <T_{1L}><T_{1H}> <T_{2L}><T_{2H}> <T_{3L}><T_{3H}> … <T_{nL}><T_{nH}> command allows an application to replace or redefine the active character set mapping in the printer.Where <L_L> <L_H> defines the total length of the following data: <L_L> + 256 * <L_H> = 1 + 2 * is the total number of characters to be replaced; <B_C> is the first character in the active map to be replaced; and <T_{1H}> <T_{1L}>[11] is the internal address of the replacement character image. The mapping of a print pattern to each character address is referred to a code page or character set. At any given time, the printer character set is comprised of 256 characters. Each character is addressed by an 8-bit value generally referred to as a character code. For example, if you want to print an 'A', it would be addressed by sending a <65> decimal to the printer. Sixty-five predefined code pages or character maps assign characters to a particular address built into the printer. Occasionally, an application needs to redefine a character or group of characters in a code page. The POSjet™ 1000 Printer allows the map for any code page to be redefined or replaced. The define character set command allows any character or group of characters to be replaced with any other printable character. Over 500 printable master characters are defined in the printer.For example, to redefine the character map for the 35th character and replace it with internal master character 346, the redefine character set command is used as follows:

```
[ESC] [ S <3> <0> <35> <90> <1>
      ^^^^  ^^  ^^^^^^
        |   |     +- 346th Character in the Master Set
        |   |              [(1 * 256) + 90]
        |   +------- 35th Character
        +----------- 3 bytes to follow [(0 * 256) + 3]
```

The new map remains until the printer is power cycled or the character set is redefined. The code page and character set commands completely redefine the table.

Note 1 The OCR character set disable command, [ESC] y <12>, also restores the character set to the original definition.

[11] The internal character map is provided in the *Master Character Set Definitions Guide*, PN 100-9785.

Function	**Define user-defined characters**
ASCII	[ESC] = <y> <c_1> <c_2> [<x_1> <d_1> … d(y *x* x_1)] … [<x_k> <d_1> … d (y *x* x_k)]
Hexadecimal	1BH 3DH <y> …
Decimal	<27> <51> <y> …
Range	y = 2 or 3 $32 \le c_1 \le c_2 \le 126$ $0 \le x \le 12$ (12 x 12 font) $0 \le x \le 14$ (12 x 14 font) $0 \le x \le 16$ (24 x 16 font) $0 \le d_1 \ldots d (y \times x) \le 255$
IPCL	none

Description

The [ESC] = <y> <c_1> <c_2> [<x_1> <d_1> … d(y *x* x_1)] … [<x_k> <d_1> … d (y *x* x_k)] command defines user-defined characters from character code <c_1> to <c_2>. <y> and <x> are the configurations of a user-defined character. <y> specifies the number of bytes in the vertical direction. <x> specifies the number of bytes in the horizontal direction. Character code ranges from zero to 255 (FFH) can be defined by <c_1> and <c_2>. Up to 32 user-defined characters can be defined. Data (<d>) specifies a bit printed to one and not printed to zero. At the default, user-defined characters are not defined and the internal character set is printed. Once the user-defined characters have been defined, they are available until [ESC] $ is executed; the user-defined characters are redefined; the power is turned off; or the printer is reset.

Each internal font, draft, large draft, and NLQ, has its own 32-character storage area. If possible, the currently selected font will be used to select which user-defined font is defined. If the font being defined is not suitable for the currently selected mode, a suitable font will be temporarily selected for the definition. If <y> = 2, the 12 x 12 draft font or the 12 x 14 large draft font can be defined. If <y> = 3, only the 16 x 24 NLQ font can be defined. If <y> = 2 and the NLQ font is active, the large draft user-defined font will be loaded. If <y> = 3 and a draft font is active, the NLQ user-defined font will be loaded. To aid in defining and generating user fonts, a font generation program is available from our web site or by contacting TransAct's Ithaca facility. Please see "Contacting TransAct's Ithaca facility" on page 2.

Function	**Cancel user-defined characters**
ASCII	[ESC] $
Hexadecimal	1BH 24H
Decimal	<27> <36>
IPCL	none

Description The [ESC] $ command removes all user-defined characters from the printer's memory. After the user-defined characters are canceled, the internal character set is printed.

Function	**Enable user-defined characters**
ASCII	[ESC] > <n>
Hexadecimal	1BH 3EH <n>
Decimal	<27> <62> <n>
Range	<0>, <1>, 0, or 1 1 Enables the characters 0 Disables the characters
IPCL	none

Description The [ESC] > <n> command enables or disables the user-defined user-defined characters are disabled, the internal character set is printed.

Function	**Enable OCR characters**
ASCII	[ESC] y <11>
Hexadecimal	1BH 79H 0BH
Decimal	<27> <121> <11>
IPCL	&%YX011
EPOS	[ESC] y <11>

Description The [ESC] y <11> command replaces 30 characters in the currently selected character set with OCR-MA3 characters. OCR characters are only available in NLQ mode; NLQ mode is automatically selected when OCR is enabled.

Note 1 Do not switch out of NLQ mode until after the OCR characters are disabled. Other fonts do not contain these characters and will not print correctly.

Note 2 The characters printed by the POSjet™ 1000 Printer follow the format defined in the ANSI X3.111-1986 Standard. They should be printed in ten or 12 cpi. By enabling enhanced print, the characters have improved definition but print at a slower speed.

Character	Name	Location Hex, Dec	ASCII Equivalent
0	Number 0	30H,48	0
1	Number 1	31H,49	1
2	Number 2	32H,50	2
3	Number 3	33H,51	3
4	Number 4	34H,52	4
5	Number 5	35H,53	5
6	Number 6	36H,54	6
7	Number 7	37H,55	7
8	Number 8	38H,56	8
9	Number 9	39H,57	9
A	Letter A	41H,65	A
B	Letter B	42H, 66	B
C	Letter C	43H,67	C
D	Letter D	44H,68	D
E	Letter E	45H, 69	E
F	Letter F	46H, 70	F
G	Letter G	47H, 71	G
H	Letter H	48H, 72	H
I	Letter I	49H, 73	I
J	Letter J	4AH, 74	J

Character	Name	Location Hex, Dec	ASCII Equivalent
K	Letter K	4BH, 75	K
L	Letter L	4CH, 76	L
M	Letter M	4DH,77	M
N	Letter N	4EH,78	N
O	Letter O	4FH, 79	O
P	Letter P	50H,80	P
Q	Letter Q	51H, 81	Q
R	Letter R	52H,82	R
S	Letter S	53H, 83	S
T	Letter T	54H, 84	T
U	Letter U	55H,85	U
V	Letter V	56H, 86	V
W	Letter W	57H, 87	W
X	Letter X	58H,88	X
Y	Letter Y	59H,89	Y
Z	Letter Z	5AH, 90	Z
¡	Symbol Hook	7EH,126	~
Þ	Symbol Chair	60H,96	`
à	Symbol Fork	5FH,95	_
+	Plus Sign	2BH,43	+
-	Minus Sign	2DH,45	-
.	Period	2EH,46	.
/	Slant	2FH,47	/
$	Dollar Sign	24H,36	$
>	Greater Than Sign	3EH,62	>
“	Quotation Mark	22H,34	“

Table 21 OCR MA-3

Function	**Disable OCR characters**
ASCII	[ESC] y <12>
Hexadecimal	1BH 79H 0CH
Decimal	<27> <121> <12>
IPCL	&%YX012
EPOS	[ESC] y <12>

Description The [ESC] y <12> command returns the 30 OCR characters to the previously selected character set. It does not restore the print mode.

Note Any character definitions defined by the redefine character set command are also replaced by the [ESC] y <12> command. Character Attribute Commands

Function	**Select color**
ASCII	[ESC] c <n>
Hexadecimal	1BH 63H <n>
Decimal	<27> <99> <n>
IPCL	&%CL <m_1>
EPOS	none

Description The [ESC] c <n> command selects the print color and should match the color of the pen installed.

Where <n>
0 = Black
1 = Red
2 = Green
3 = Blue

Function	**Begin one-line double-wide print**
ASCII	[SO]
Hexadecimal	0EH
Decimal	<14>
IPCL	&%MW
EPOS	none

Description The [SO] command causes subsequent characters to be printed at twice the currently selected character width. For example, ten cpi becomes five cpi, 17 cpi becomes 8.5 cpi, etc. The [SO] command remains in effect until: A valid line terminator is received ([CR], [LF], or [ESC] J <n> (fine line feed)); The command is canceled; or The maximum number of characters per line is reached and the printer performs an autoprint.

Function	**Cancel one-line double-wide print**
ASCII	[DC4]
Hexadecimal	14H
Decimal	<20>
IPCL	&%MN
EPOS	none

Description The [DC4] command cancels one-line double-wide mode set by the [SO] command and allows single- and double-wide characters to be printed on the same line.

Function	**Multiline double-wide and double-high mode**
ASCII	[ESC] W <n>
Hexadecimal	1BH 57H <n>
Decimal	<27> <87> <n>
IPCL	&%FD {n = 1} &%FS {n = 0} &%FH {n = 3} (Note: Single-wide, double-high mode is not available in IPCL mode.)
EPOS	[ESC] ! <n>

Description The [ESC] W <n> command controls multiline double-wide or double-high mode. Where n specifies the mode:

n = 0 is standard single-wide and single-high;
n = 1 begins double-wide;
n = 2 begins double-high; and
n = 3 begins double-wide double-high.

Note 1 The [ESC] W <n> command does not affect line spacing.

Note 2 In EPOS mode, [ESC] ! <n> performs a similar function; however, near letter quality (NLQ) is not available.

Where n Bits	**76543210**	**Function**
	1-------	Underline
	--1-----	Double-wide
	---1----	Double-high
	-------X	Font: 0 = draft; 1 = large draft

Function	**Set print style: double-wide, double-high, italic control**
ASCII	[ESC] [@ [EOT] [NUL] <k> [NUL] <n> <m>
Hexadecimal	1BH 5BH 40H 04H 00H <k> 00H <n> <m>
Decimal	<27> <91> <64> <04> <0> <K> <0> <n> <m>
IPCL	&%DH Double-high, double-wide, and double-space &%SH Single-high, single-wide, and single-space Also, see [ESC] W above.

Description The [ESC] [@ [EOT] [NUL] <k> [NUL] <n> <m> command sets double-wide, double-high, and italic print mode.

Where k bits

	76543210	
	----xxxx	Italic control
0	----0000	No change
1	----0001	Italics On
2	----0010	Italics Off

Where n bits

	76543210	
	----0nnn	Height multiplier (Maximum 4)
0	----0000	No change
	xxxx----	Line spacing
0	0000----	No change

Where m bits

	76543210	
	----0nnn	Width multiplier (Maximum 4)
0	----0000	No change

Note 1 The maximum height and width multiplier is four.

Function	**Begin underline**
ASCII	[ESC] - <n>
Hexadecimal	1BH 2DH 01H
Decimal	<27> <45> <n>
IPCL	&%MU (Begin)
IPCL	&%CU (End)
EPOS	[ESC] ! <n>

Description The [ESC] - <1> command begins underline print mode. All subsequent text, leading spaces, and trailing spaces are underlined. [ESC] - <0> ends the mode.

Note 1 In EPOS mode, [ESC] ! <n> performs a similar function; however, near letter quality (NLQ) is not available.

Where n Bits	`76543210`	**Function**
	`1-------`	Underline
	`--1-----`	Double-wide
	`---1----`	Double-high
	`-------X`	Font: 1 = Large Draft, 0 = Draft

Function	**Begin enhanced print**
ASCII	[ESC] G
Hexadecimal	1BH 47H
Decimal	<27> <71>
IPCL	&%ME
EPOS	[ESC] G <1>

Description All subsequent text is printed in enhanced print mode (two passes with a vertical offset). Enhanced printing provides a deeper resolution of each character and may enhance multiple part forms printing.

Function	**End enhanced print mode**
ASCII	[ESC] H
Hexadecimal	1BH 48H
Decimal	<27> <72>
IPCL	&%CE
EPOS	[ESC] G <0>

Description The [ESC] H command cancels enhanced print mode and returns to the currently selected font.

Function	**Begin emphasized print mode**
ASCII	[ESC] E
Hexadecimal	1BH 45H
Decimal	<27> <69>
IPCL	&%MM
EPOS	[ESC] E <1>

Description The [ESC] E command begins emphasized print mode (one pass with horizontal offset). Emphasized print is bolder than normal print.

Function	**End emphasized print mode**
ASCII	[ESC] F
Hexadecimal	1BH 46H
Decimal	<27> <70>
IPCL	&%CM
EPOS	[ESC] E <0>

Description The [ESC] F command cancels emphasized print mode.

Function	**Select superscript**
ASCII	[ESC] S <0>
Hexadecimal	1BH 53H 00H
Decimal	<27> <83> <0>
IPCL	&%SP
EPOS	none

Description The [ESC] S <0> command selects superscript. The following characters are printed half size on the upper side of the print line.

Note 1 Superscript is not available in all print modes.

Function	**Select subscript**
ASCII	[ESC] S <1>
Hexadecimal	1BH 53H 01H
Decimal	<27> <83> <1>
IPCL	&%SB
EPOS	none

Description The [ESC] S <1> command selects subscript. The following characters are printed half size on the bottom side of the print line.

Note Subscript is not available in all print modes.

Function	**End superscript or subscript**
ASCII	[ESC] T
Hexadecimal	1BH 54H
Decimal	<27> <84>
IPCL	&%SE
EPOS	none

Description The [ESC] T command ends superscript or subscript.

Function	**Begin italics**
ASCII	[ESC] % G
Hexadecimal	1BH 25H 47H
Decimal	<27> <37> <71>
IPCL	&%MI
EPOS	[ESC] 4

Description The [ESC] % G command begins italic print mode.

Note Italics are not available in all print modes.

Function	**End italics**
ASCII	[ESC] % H
Hexadecimal	1BH 25H 48H
Decimal	<27> <37> <72>
IPCL	&%CI
EPOS	[ESC] 5

Description The [ESC] % H command ends italic print mode.

Print Rotation Commands

Rotated print capabilities are available. The print mode commands listed below rotate the print in any of three 90° orientations. In 90° and 270° rotated mode, the print data is first buffered by the printer, processed (rotated), and then printed in one of three fonts. Consequently, printing time is delayed. In 180° mode, the print is simply inverted and mirrored, and no delay occurs.

In rotated 90° and 270° mode, the printer can support up to 40 lines of rotated print with up to 128 characters per line. One single pass and two double pass fonts with emphasize and enhanced attributes are available.

In free format rotated 90° and 270° mode, the print length is determined by the length of the longest line entered. In line formatted mode, the line length is set not by the longest line entered but by the maximum line length specified by the set line length command.

A line spacing table controls the spacing between lines. The table is defined by the rotated print line spacing ([ESC] u ...) command or by inserting [LF] or [ESC] J <n> commands in the rotated data. The [ESC] u command specifies the number of dots to be added between each printed line. Each line has an entry in the table. There is space for 40 lines. The default spacing is 1/8 inch between lines.

If a [LF] is used to specify the line spacing, it overrides the default table and sets spacing to 1/8 inch or eight lines per inch. If [ESC] J <n> is used, <n> specifies the spacing in n/216.

Function	**Begin rotated print**
ASCII	[ESC] r <n>
Hexadecimal	1BH 72H <n>
Decimal	<27> <114> <n>
IPCL	&%RX
EPOS	[ESC] T <3>

Description The [ESC] r <n> command starts rotated print mode where n defines the mode as follows:

Where n = x bits,	**76543210**	**Function**
	----xx00	End rotated print
	----xx01	Rotate 90°
	----0010	Rotate 180°
	----xx11	Rotate 270°
	----x1xx	Use line formatting

When n = 1 or 9, the print mode is rotated 90°. Print data is entered normally from left to right, top to bottom. When an end rotated print ([ESC] r <0>) command is received, the printer formats and prints the data. When n = 5 or 13, the print mode is rotated by 90° with formatting. The command differs from the [ESC] r <1> command because the line length is determined not by the longest line entered but by the line length set by the [ESC] s command. If input extends past the end of a line, it wraps around to the next line. When n = 3 or 11, the print mode is rotated 270° according to the currently stored format parameters. When n = 7 or 15, the print mode is rotated 270° according to the currently stored format parameters. The [ESC] r <7> command differs from the [ESC] r <3> command by spacing out the lines to the line length specified by the [ESC] s command. If input extends past the end of a line, it wraps around to the following line. When n = 2, the print mode is rotated 180°. All subsequent lines are rotated 180° and positioned at the opposite margin. All normal fonts and modes are available in 180° rotated mode. Format and font bits are ignored, and the command remains in effect until rotation is cancelled with an end rotated print ([ESC] r <0>) or a station select command.

Note 1 The last line of print must end with a line terminator before the end rotated command is issued. Any characters in the buffer that have not printed are printed un-rotated when a line terminator is received.

Note 2 In EPOS mode, the PJ1000 Printer does not fully implement page mode. The [ESC] T <n> command functions identically to normal mode, [ESC] r <n>, except the definition of <n> is different.

Note 3 Use the [ESC] I <n> command to select two-pass rotated font. The font selection must be made before the rotate command.

Note 4 Only enhanced and emphasized attributes are available for formatted, rotated print. These attributes are not available on a character basis. They affect all of the rotated text after the [ESC] r command. Enhanced and emphasized attributes must be set before the [ESC] r command is issued.

Rotated Print Summary

Function	**Begin 90° rotated print**
ASCII	[ESC] r <1>
Hexadecimal	1BH 72H 01H
Decimal	<27> <114> <1>
IPCL	&%R1

Function	**Begin 90° rotated print with line formatting**
ASCII	[ESC] r <5>
Hexadecimal	1BH 72H 05H
Decimal	<27> <114> <5>
IPCL	&%R5

Function	**Begin 270° rotated print**
ASCII	[ESC] r <3>
Hexadecimal	1BH 72H 03H
Decimal	<27> <114> <3>
IPCL	&%R3

Function	**Begin 270° rotated print with line formatting**
ASCII	[ESC] r <7>
Hexadecimal	1BH 72H 07H
Decimal	<27> <114> <7>
IPCL	&%R7
EPOS	[ESC] T <1>

Function	**Begin 90° rotated print with two pass font**
ASCII	[ESC] r <9>
Hexadecimal	1BH 72H 09H
Decimal	<27> <114> <2>
IPCL	&%R9 or &%RX09
EPOS	none

Function	**Begin 90° rotated print with two pass font and line formatting**
ASCII	[ESC] r <13>
Hexadecimal	1BH 72H 0BH
Decimal	<27> <114> <13>
IPCL	&%RX13
EPOS	none

Function	**Begin 270° rotated print with two pass font**
ASCII	[ESC] r <11>
Hexadecimal	1BH 72H 0BH
Decimal	<27> <114> <11>
IPCL	&%RX11
EPOS	none

Function	**Begin 270° rotated print with two pass font and line formatting**
ASCII	[ESC] r <15>
Hexadecimal	1BH 72H 0FH
Decimal	<27> <114> <15>
IPCL	&%RX15
EPOS	[ESC] T <1>

Function	**End rotated print**
ASCII	[ESC] r <0>
Hexadecimal	1BH 72H 00H
Decimal	<27> <114> <0>
IPCL	&%R0
EPOS	[ESC] { <0>

Description The [ESC] r <0> command prints the contents of the rotated print buffer (when in 90° or 270° rotated mode) and returns to normal print orientation. In 180° rotated mode, the printer returns to normal mode. Characters in the print buffer that have not been printed are not printed.

Function	**Set rotated print line length**
ASCII	[ESC] s <n>
Hexadecimal	1BH 73H <n>
Decimal	<27> <115> <n>
IPCL	&%RL <m_1> <m_2> <m_3>
EPOS	none

Description The [ESC] s <n> command sets the print line length used in autoformat rotated print mode. The maximum number of characters per line is 128. The power on default line length is 80 characters. To determine the number of available print lines, divide 1760 by the number of characters per line and round down to the nearest whole number. There must be a minimum of 80 characters per line, which allows up to 22 lines of print. A value less than 80 does not allow additional print lines. Values greater than 80 reduce the number of lines.

Function	**Set rotated print line spacing**
ASCII	[ESC] u <n_1> <m_1> <n_2> <m_2> ... <n_i> <m_i> <0>
Hexadecimal	1BH 75H <n_1> <m_1> <n_2> <m_2> ... <n_i> <m_i> 00H
Decimal	<27> <117> <n_1> <m_1> <n_2> <m_2> ... <n_i> <m_i> <0>
IPCL	none
EPOS	none

Description The [ESC] u <n_1> <m_1> <n_2> <m_2> ... <n_i> <m_i> <0> command adjusts the line spacing for each rotated print line where n_i is the line number and m_i is the spacing, in 1/8-inch intervals, between lines. The n_i value can be from one to 40value; m_i can be from one to 255. For the first print line, the distance is calculated from the left margin. If n_i or m_i is zero, the command is terminated. Any unspecified spacing is set to 1/8 inch. The values are used as a template for all subsequently rotated print. On power up, spacing is preset to 1/8 inch or eight lines per inch for all lines. The command is only effective during 90° and 270° rotated modes. It remains in effect until a new table is received or until the printer is power cycled. An [ESC] u <0> sets all lines to 1/8 inch. The table can be overridden by [LF] or [ESC] J <n> commands for rotated print data.

Graphic Mode

The POSjet™ 1000 Printer conforms to the basic definition of IBM all-points-addressable (APA) graphic commands. It is not designed to print large quantities of graphical data. The printer only prints graphics that are 2.5 inches wide. At this time, there is not a graphics mode for Epson.

The POSjet™ 1000 Printer always prints in one of the native resolutions of 104 x 96, 208 x 96, 104 x 192, or 208 x 192 dpi. To provide compatibility with the standard IBM APA resolutions, the printer internally modifies the graphics to print as expected. The printer converts the vertical resolution by altering the [ESC] J command (which is typically used for vertical spacing) and adjusting it so that horizontal passes touch as expected. The requested horizontal resolution is converted by data scaling. Because the vertical dpi of the printer is always greater, the resulting APA graphics printed on the POSjet™ 1000 Printer are slightly smaller than the same graphic printed on an impact printer. All of this is done transparently to the application; however, loss of resolution may result in some modes. If desired the [ESC] * <m> command can be used to select the native resolution.

Note 1 If the POSjet™ 1000 Printer is used with programs that convert text to graphics, the printer is slower than if the printer is sent ASCII text. The POSjet™ 1000 Printer is supported by a Windows' print driver that allows applications to select supported fonts.

Note 2 Generally, the horizontal graphic commands provide faster print than the APA graphic commands.

Standard APA Graphics

Function	**Print single-density graphics (60h x 72v dpi)**
ASCII	[ESC] K $<n_1>$ $<n_2>$
Hexadecimal	1BH 4BH $<n_1>$ $<n_2>$
Decimal	<27> <75> $<n_1>$ $<n_2>$
IPCL	none

Description The [ESC] K $<n_1>$ $<n_2>$ command prints $<n_1>$ + 256 * $<n_2>$ bytes of single-density graphics (60 dpi).

Function	**Print half-speed double-density graphics (120h x 72v dpi)**
ASCII	[ESC] L <n_1> <n_2>
Hexadecimal	1BH 4CH <n_1> <n_2>
Decimal	<27> <76> <n_1> <n_2>
IPCL	none
Description	The [ESC] L <n_1> <n_2> command prints <n_1> + 256 * <n_2> bytes of double-density graphics (120 dpi) at half speed allowing full and half dots to be printed.

Function	**Print full-speed double-density graphics (120h x 72v dpi)**
ASCII	[ESC] Y <n_1> <n_2>
Hexadecimal	1BH 59H <n_1> <n_2>
Decimal	<27> <89> <n_1> <n_2>
IPCL	none
Description	The [ESC] Y <n_1> <n_2> command prints <n_1> + 256 * <n_2> bytes of double-density graphics (120 dpi) at full speed with no consecutive dots. (The mode is generally used to print 120h by 144v dpi resolutions in two passes).

Function	**Print quad-density graphics (240h x 72v dpi)**
ASCII	[ESC] Z <n_1> <n_2>
Hexadecimal	1BH 5AH <n_1> <n_2>
Decimal	<27> <90> <n_1> <n_2>
IPCL	none
Description	The [ESC] Z <n_1> <n_2> command prints <n_1> + 256 * <n_2> bytes of quad-density graphics (240 dpi) at half speed with no consecutive dots. (The mode is generally used to print 240h by 144v dpi resolutions in two passes).

Extended APA Graphics

Function	**Print graphics in mode <m> (60h/ 120h/ 240h x 72v dpi)**
ASCII	[ESC] * <m> <n_1> <n_2>
Hexadecimal	1BH 2AH <m> <n_1> <n_2>
Decimal	<27> <42> <m> <n_1> <n_2>
IPCL	none

Description The [ESC] * <m> <n_1> <n_2> command selects one of three graphic modes as specified by <m>.

Where <m>

0	60 dpi	Full speed	8-bit slices
1	120 dpi	Half speed	8-bit slices
2	120 dpi	Full speed	8-bit slices
3	240 dpi	Full speed	8-bit slices
4	80 dpi	Full speed	8-bit slices
5	72 dpi	Full speed	8-bit slices
6	90 dpi	Full speed	8-bit slices
7	144 dpi	Full speed	8-bit slices
8,9	Not supported		
10	104 x 96 dpi		1 horizontal 1 vertical pass
11	208 x 96 dpi		2 horizontal 1 vertical pass
12	104 x 192 dpi		1 horizontal 2 vertical passes
13	208 x 192 dpi		2 horizontal 2 vertical passes
15,16	Not supported		

Function	**Reassign graphic mode**
ASCII	[ESC] ? <m> <n>
Hexadecimal	1BH 3FH <m> <n>
Decimal	<27> <63> <m> <n>
IPCL	none

Description The [ESC] ? <m> <n> command reassigns graphic mode <m> to resolution <n>. Possible values for <m> are K, L, Y, or Z. Resolutions, <n>, are zero to seven as follows:

Where <m>

0	60 dpi Full speed	8-bit slices	Default for K
1	120 dpi Half speed	8-bit slices	Default for L
2	120 dpi Full speed	8-bit slices	Default for Y
3	240 dpi Full speed	8-bit slices	Default for Z
4	80 dpi Full speed	8-bit slices	
5	72 dpi Full speed	8-bit slices	
6	90 dpi Full speed	8-bit slices	
7	144 dpi Full speed	8-bit slices	
10	104 x 96 dpi	1 horizontal, 1 vertical pass	
11	208 x 96 dpi	2 horizontal, 1 vertical pass	
12	104 x 192 dpi	1 horizontal, 2 vertical passes	
13	208 x 192 dpi	2 horizontal, 2 vertical passes	

Note 1 Modes 11 through 13 are designed to support horizontal graphics and not intended for APA graphics.

Function	**Begin unidirectional print**
ASCII	[ESC] U <1>
Hexadecimal	1BH 55H 01H
Decimal	<27> <85> <1>
IPCL	&%GU
EPOS	ESC] U <1>

Description The [ESC] U <1> command prints all data in unidirectional print mode to improve line to line registration for graphical data.

Note 1 Unidirectional print should be canceled before normal text is printed. Print time is slowed if it is not canceled.

Function	**Begin bidirectional print**
ASCII	[ESC] U <0>
Hexadecimal	1BH 55H 00H
Decimal	<27> <85> <0>
IPCL	&%GB
EPOS	[ESC] U <0>

Description The [ESC] U <0> command prints all data in bidirectional, logic-seeking print mode.

Horizontal Graphics (Color Graphics)

The POSjet™ 1000 Printer supports graphics sent as horizontal scan lines. Individual scan lines of graphic data are sent to the printer one line at a time. Although the POSjet™ 1000 Printer only supports two colors, the horizontal graphic command interface gives full color support for printer graphics. Full color support is provided to establish a full color standard for future printers. Color data is sent in one of three color planes. Typically, a red plane or scan line is sent, then green and blue. The sequence of lines defines one row of dots that is printed on the paper.

The horizontal graphic commands do not include resolution information. Therefore, only once before sending graphics data, set the graphics resolution by sending the ESC * command with a zero length (no data). The graphic resolution sets the internal graphic mode of the printer. The printer stays in graphic mode until it is changed by another command. Note: the bar code generation and other graphic commands change graphics mode.

The format of the horizontal graphic command follows.

For additional Information on Color Graphics See “Color Graphics” on page 212.

Function	**Process horizontal graphics data**
ASCII	[ESC] h <color> <length> <format> <data>
Hexadecimal	1BH 68H
Decimal	<27> <104>
IPCL	None
EPOS	None

Description The [ESC] h <color> <length> <format> <data> command processes horizontal graphic data. Where <color> is a byte that specifies the color of the data being sent.

<color> = 0 Use Previously Selected Color
1 Red
2 Green
4 Blue
16 Single Color (Black/White)

Note 1 Red, green, and blue pixels set to one at the same location result in white dot. While red, green, and blue pixels set to zero form a black dot. For black print, one represents a black dot and zero represents a white dot.

Note 2 More than one color may be set at a time. Setting the color to six would set green and blue simultaneously. Where <length> is a byte specifying the length of the data including the format byte.

<length> = 0 to 254 (255 is reserved for future use.)

Where <format> is a byte specifying the format of the graphics data.

<format> = 0 for raw data
1 for bit wise RLE compression
8 for byte wise RLE compression
254 for difference compression
255 for same as previous scan line data

Where <data> is the data bytes that define the graphics to be printed.

Function	**Set horizontal graphic mode**
ASCII	[ESC] * <m> <0> <0>
Hexadecimal	1BH 2AH <m> <0> <0>
Decimal	<27> <42> <m> <0> <0>
IPCL	none

Description The [ESC] * <m> <0> <0> command selects one of the three graphic modes specified by <m>. The two bytes after the mode must be zero.

Where <m>		
0,2,3,4,5,6,7	Standard Graphic Modes (See above.)	
8,9	Not supported	
10	104 x 96 dpi	1 horizontal, 1 vertical pass
11	208 x 96 dpi	2 horizontal, 1 vertical pass
12	104 x 192 dpi	1 horizontal, 2 vertical passes
13	208 x 192 dpi	2 horizontal, 2 vertical passes
14,15,16	Not supported	

Note 1 Only modes 10 thorough 13 should be selected for horizontal graphics.

Example

Command	***Comment***
ESC * <10> <0> <0>	Set resolution to 100 x 96 dpi.
ESC h <1> <9> <0> <eight data bytes>	Send 8-bytes red pixels.
ESC h <2> <9> <0> <eight data bytes>	Send 8-bytes green pixels.
ESC h <3> <9> <0> <eight data bytes>	Send 8-bytes blue pixels.
LF	Send line feed to force print of any buffered data not yet printed.

Note 2 Graphic data is committed to paper when more than 12 dot rows have been transmitted to the printer. If less than 12 dot rows have been sent, they are not printed until the line is terminated (i.e. a line feed command is sent). To make graphics faster to send and smaller to store, several algorithms are included with the graphic command to compress the data.

Note 3 Although the printer compression algorithms are documented, it is recommended that our Windows' printer driver be used to generate a graphic image. Our Windows' printer driver selects the best compression method to use on a scan line by scan line basis. The print driver can be directed to print to file, creating a .prn file. When creating a .prn file, it is recommended that the Start/End Doc settings be cleared in the Start/End Doc tab of the printer properties page. After the .prn file is created, it can be read and sent to the printer by the host application.

Bit wise RLE In bit wise RLE compression, the Most Significant Bit (MSB) Compression of each data byte denotes if the compressed data represents one or zero bits. Bits zero through six indicate how many bits are represented as a one or zero. A 34 Hex (34H) represents 34H bits set to zero. A 97H represents 17H bits set to one.

ESC h <1> <5> <1> <34H> <97H> <8fH> <09H>Byte wise RLE
In byte wise RLE compression, data is represented in byte Compression pairs. The first byte is a count, and the second is the graphics data. The graphics data byte is repeated the number of times represented by the count byte. ESC h <1> <5> <8> <09H> <ffH> <02H> <55H> Where <09H> <ffH> means repeat ffH nine times and <02H> <55H> means repeat 55H two times.

Difference

In difference compression, data is represented in byte pairs. Compression The first byte is an index into the byte stream, as it would exist if sent in an uncompressed format. The second byte is the data that is different in the new scan line data. Think of compression mode as, “The scan line is the same as the previous except for the byte at a specific position.” ESC h <1> <5> <254> <03H> <d5H> <0bH> <51H> Where <03H> <d5H> means use the previously transmitted scan line data but change byte 3 to a d5H and change byte 11 (0bH) to a 51H. Same-as-previous Compression In same-as-previous compression, the command does not contain any graphics data. The command specifies that the printer is to use the previous scan line data for the current scan line. ESC h <1> <1> <255>

User Store (Graphic Save)

The POSjet™ 1000 Printer maintains a 16K (16384 bytes) section of flash memory to save user information. The information can be either macros or user-defined characters. These groups of data are indexed by name and may be called up at any time after they are stored. See the sections on Macros and User-defined Characters for definitions of these functions. For additional Information on Color Graphics See “Color Graphics” on page 212.

To allow the host application to maintain these groups of data, a series of user-store maintenance commands are available. As referenced earlier in this manual, the user can define a limited number of custom characters and define a macro. These character/macro definitions can also be saved in user store. However, only one character definition and one macro can be active at any time.

One macro and one user-defined character definition can be flagged to load and run at startup. If a flag is set, the printer will automatically process the macro and/or load the user-defined character set at initialization.

Because user store is intended to be loaded only a few times and then printed as part of normal operation, the programmer must take some care during the definition phase. The programmer must assume the responsibility to assure the 16K buffer size is not exceeded.

User store can save macros and user-defined character sets.

Defining Macros

Macros can be defined two ways. The first is by using the begin and end named macro commands. These commands start the recording process and automatically save the macro when it is complete. The macro data is not processed as it is sent to the printer.

Function **Begin named macro record**
ASCII [ESC] [US] b <Name..> <0>

Then send the data to be recorded. (The printer does not process the data).

Function **End name macro record**
ASCII [ESC] [US] e <Name..> <0>

The second way to define macros is to use [ESC] g commands to define the macro and then the save macro data command to save the data.

Function **Start macro record**
ASCII [ESC] g <1>

Then send the data to be recorded. (The printer will process and print the data).

Function	**Stop macro record**
ASCII	[ESC] g <2>

Then save the macro.

Function	**Save macro data**
ASCII	[ESC] [US] m <Name..>

Saving User-defined Characters. To save user-defined characters, first define the character set.

Function	**Define user-defined characters**
ASCII	[ESC] = <y> <c_1> <c_2> [x_1 d_1 … d(y *x* x_1)] … [xk d_1 … d(y *x* xk)]

Second, save the definition in the nonvolatile flash memory with the appropriate command.

Save the definition. Note the "Save user-defined characters" command saves all three character definitions.

Function	**Save user-defined characters**
ASCII	[ESC] [US] c <Name..> <0>

Third, load the character set or load and run the macro.

To restore the character definitions, issue a load item command with the name of the character set to be loaded.

Function	**Load item from user store**
ASCII	[ESC] [US] l <Name..> <0>

If the item referenced is a user-defined character set, it is loaded into the current definition. If it is a macro, it is loaded into the macro buffer. It is not processed or printed.

To help maintain the user-store area, the following commands can be used.

Function	**Flag as a start-up macro**
ASCII	[ESC] [US] s <Name..> <0>

The [ESC] [US] s <Name..> <0> command flags the referenced item to be processed at startup. No more than one user character definition and user data item may be flagged.

Function	**Remove item from user store**
ASCII	[ESC] [US] e <Name..> <0>

The [ESC] [US] e <Name..> <0> command removes an item from user store and frees up its space.

Function	**Flush information from user store**
ASCII	[ESC] [US] f ALL <0>

Description The [ESC] [US] f ALL <0> command clears all of the information to the user store and frees the data space.

Function	**Report on user store**
ASCII	ESC] [US] q <0>

Description The [ESC] [US] q <0> prints or returns information about the contents of and available space in user store.

Note 1 A configuration option is available that locks the user-store data. The configuration option prevents the occurrence of new user-store data operation until the lock is manually reset and accidental deletion of the saved information. The user-defined character buffer and/or user data buffer may be redefined and used but cannot be stored.

User-Store Commands

Function	**Begin named macro record**
ASCII	[ESC] [US] b <Name..> <0>
Hexadecimal	1BH 1FH 62H
Decimal	<27> <31> <98>
IPCL	&%UB <Name..> <0>
EPOS	none

Description The [ESC] [US] b <Name..> <0> command erases the current macro, initializes the macro buffer structure, and redirects the following data to the macro buffer. It uses the <Name..> field as a reference. If the name already exists in the flash user store, the command is ignored. The command must be followed by the "End name macro record" command with the same name. If the data that follows is larger than the macro buffer (about 16K), the macro definition is terminated without saving any data.

Function	**End named macro record**
ASCII	[ESC] [US] e <Name..> <0>
Hexadecimal	1BH 1FH 65H
Decimal	<27> <31> <101>
IPCL	&%UG <Name..> <0>
EPOS	none

Description The [ESC] [US] e <Name..> <0> command ends the macro record operation and saves the macro to flash. It uses the <Name..> field to verify the command end and must match the "Begin named macro record" command. If the name already exists in the flash user store or the macro memory is exceeded, the command is valid, and the <Name..> field prints. If there is not enough room in the flash user store for the macro, the save is not performed, but the macro buffer is valid.

Function	**Save macro data in user store**
ASCII	[ESC] [US] m <Name..> <0>
Hexadecimal	1BH 1FH 6DH
Decimal	<27> <31> <109>
IPCL	&%UM <Name..> <0>
EPOS	[GS] -…<Name..> <0> is from one to 15 characters and must be null terminated.

Description The [ESC] [US] m <Name..> <0> command saves the current macro buffer structure into the flash user-store area. It uses the <Name..> field as a reference name. If the name already exists in the flash user store, the command does not store the data.

Function	**Save user-defined characters**
ASCII	[ESC] [US] c <Name..> <0>
Hexadecimal	1BH 1FH 63H
Decimal	<27> <31> <99>
IPCL	&%UC <Name..><0>
EPOS	[GS] 6<Name..> <0> is from one to 15 characters and must be null terminated.

Description The [ESC] [US] c <Name..> <0> command saves the current user-defined character structure in the flash user-save storage area. It uses the<Name..> field as a reference. If the name already exists in the flash user store, the command will not store the data.

Function	**Load item from user store**
ASCII	[ESC] [US] l <Name..> <0>
Hexadecimal	1BH 1FH 6CH
Decimal	<27> <31> <108>
IPCL	&%UL <Name..> <0>
EPOS	[GS] 0<Name..> <0> is from one to 15 characters and must be null terminated.

Description The [ESC] [US] l <Name..> <0> command loads the referenced item into the appropriate structure. If the item referenced is a user-defined character set, it is loaded into the current user-character definition, which does not affect the active state of user-defined characters. If it is a macro, it is loaded into the macro buffer, but it is not inserted into the data stream. [ESC] g <0> inserts the macro buffer into the data stream. If the named item does not exist, the command does nothing.

Function	**Run macro data from user store**
ASCII	[ESC] [US] r <Name..> <0>
Hexadecimal	1BH 1FH 72H
Decimal	<27> <31> <114>
IPCL	&%UR <Name..> <0>
EPOS	[GS] 0<Name..> <0> is from one to 15 characters and must be null terminated.
Description	The [ESC] [US] r <Name..> <0> command loads the referenced macro into the macro buffer. The macro buffer is then inserted into the data stream. If the named item does not exist or is not a macro, nothing happens.

Function	**Flag item as a start-up macro**
ASCII	[ESC] [US] s <Name..> <0>
Hexadecimal	1BH 1FH 6DH
Decimal	<27> <31> <109>
IPCL	&%US <Name..> <0>
EPOS	[GS] 0<Name..> <0> is from one to 15 characters and must be null erminated.
Description	The [ESC] [US] s <Name..> <0> command flags the referenced item to `be processed at startup. Only one user character definition and one macro may be flagged to run at startup.
Note	If a character definition is loaded at startup, it is automatically made active.

Function	**Delete item from user store**
ASCII	[ESC] [US] d <Name..> <0>
Hexadecimal	1BH 1FH 64H
Decimal	<27> <31> <100>
IPCL	&%UD <Name..> <0>
EPOS	[GS] 1 <Name..> <0> is from one to 15 characters and must be null terminated.

Description The [ESC] [US] d <Name..> <0> command removes an item from user store and frees up space. If the item does not exist, the command does nothing.

Function	**Flush information from user store**
ASCII	[ESC] [US] f ALL <0>
Hexadecimal	1BH 1FH 66H 00H
Decimal	<27> <31> <102> <0>
IPCL	&%UF
EPOS	[GS] 5

Description The [ESC] [US] f ALL <0> command clears all entries in user store and frees the data space. It must have the name, "ALL" (in uppercase) attached.

Function	**Report on user store**
ASCII	[ESC] [US] q <Name..> <0>
Hexadecimal	1BH 1FH 72H
Decimal	<27> <31> <114>
IPCL	&%UQ <Name..> <0>
EPOS	[GS] 3

Description The [ESC] [US] q <Name..> <0> command prints a status report. The file name is ignored and may be omitted. The NUL must be present. The intention of the command is to aid in macro development.

Note 1 The report is also printed as part of the configuration report.

User Macros

The user macro feature works by inserting the macro data buffer into the printer data stream when the print user-store data command is encountered.

Macros can be any data normally sent to the printer including graphics. (Note: user-store maintenance and inquire commands may not be included in the macro definitions.) The printer stores macro data in a RAM-based storage buffer as it is received and processed. The storage buffer may then be saved to a flash-based user store or inserted into the print data stream. If a macro is recalled from user store, it is expanded into the macro buffer and replaces whatever is currently there.

Programming considerations

The flash (nonvolatile) memory has a limited number of write cycle operations. Consequently, the number of saves should be limited. The buffer should not be saved on a transaction by transaction basis. Once a day should be the limit.

The buffer is initially about 16K[12] bytes long. All commands[13] and print data are placed in the buffer and must be included in the size limits. The printer does not indicate when the buffer is full. The application must make sure that the buffer is not overfilled. The printer simply stops saving information when it is full. As the buffer fills, the input data is printed normally. The effect of the macro start command is to clear the buffer and to start to save the input data. The macro stop command stops saving data and initializes internal pointers for the next print. To store the data in the nonvolatile flash, it must be named and saved by one of the user-store save commands.

When the macro buffer is inserted into the data stream, configuration commands (like font or pitch changes) remain in effect after the macro is processed. Illegal commands are placed in the buffer and take up space.

Horizontal color graphics should be sent to the printer compressed. If the data is not compressed, it is saved in the macro buffer. If the buffer is saved into the user-store nonvolatile flash, there must be enough room in the user store for all of the data. As user-store space is used, the macro buffer will be larger than the available space in user store. Only the used space is saved, but it is possible to define a macro that does not fit in the remaining user-store space.

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12 The actual buffer is smaller because of the overhead.

13 IPCL commands are converted by the printer into an equivalent [ESC] code and then placed in the save buffer. The equivalent [ESC] code should be used to calculate the size of the save buffer data.

Function	**Process user macro**
ASCII	[ESC] g <0>
Hexadecimal	1BH 67H 00H
Decimal	<27> <103> <0>
IPCL	&%GP
EPOS	[ESC] g <0>

Description The [ESC] g <0> command prints the user-store data buffer.

Function	**Start macro record**
ASCII	[ESC] g <1>
Hexadecimal	1BH 67H 01H
Decimal	<27> <103> <1>
IPCL	&%GS
EPOS	ESC] g <1>

Description The [ESC] g <1> command clears the user-store data buffer and begins recording data. The next 2000 bytes (including characters and commands) are recorded.

Function	**Stop macro record**
ASCII	[ESC] g <2>
Hexadecimal	1BH 67H 02H
Decimal	<27> <103> <2>
IPCL	&%GE
EPOS	[ESC] g <2>

Description The [ESC] g <2> command stops recording user-store data information. The buffer is not saved into the nonvolatile memory.

Function	**Stop macro record and save**
ASCII	[ESC] g <3>
Hexadecimal	1BH 67H 03H
Decimal	<27> <103> <3>
IPCL	&%GW
EPOS	[ESC] g <3>

Description The [ESC] g <3> command stops recording graphic save information. The buffer is saved into the user-store nonvolatile memory under the name, "ESCg3_Save"

Note 1 The [ESC] g <3> command is supplied for compatibility with the Series 80PLUS and 90PLUS Printers.

Bar Codes

The POSjet™ 1000 Printer supports the ability to print bar codes. The printer offers a number of formats as defined below. The host does not need to form the graphic image for these bar codes. The host need only send the printer the information to be bar coded and a graphic is generated by the printer. In some cases, a check character is required by the format. In most cases, the printer generates the check character and inserts it in the format.

The printer uses internal graphic modes to form bar code images, and the images are adjusted for ink bleed. In general, the bar codes generated by sending graphic data to the printer are not as readable as the graphics the printer generates. Bar codes are printed at a 208 x 192 resolution.

Function	**Print bar code**
ASCII	[ESC] b <n> {information} [ETX]
Hexadecimal	1BH 62H <n> ... 03H
Decimal	<27> <98> <n> ... <3>
IPCL	&%25 ... [CR] Interleaved 2 of 5 &%39 ... [CR] Code 39 &%12 ... [CR] Code 128 &%UP ... [CR] UPC A &%UE ... [CR] UPC E &%EA .. [CR] EAN-13 &%E8 ... [CR] EAN-8 &%93...[CR] Code 93
EPOS	[ESC] b <n> or [GS] k <n>

Description The [ESC] b <n> {information} [ETX] command prints information as a bar code. The bar code is centered on the print zone.

Where n =		
0	Interleaved 2 of 5	Numeric (0-9) only; must be even number of digits
1	Code 39	26 uppercase letters (A-Z); 10 digits (0-9)
2	Code 128	Three sets of 106 different characters
3	UPC A	Numeric (0-9) only; 11 digits
4	EAN-13	Numeric (0-9) only; 12 digits
5	UPC E	Numeric (0-9) only; 11 digits
6	EAN-8	Numeric (0-9) only; 6 digits
7	Code 93	26 letters; 10 digits (0-9); and 7 special characters
8	Codabar	10 digits (0-9); 4 start/stop characters, A, B, C, and D; and 6 special characters.

Interleaved 2 of 5

Inteleaved 2 of 5 is a high-density, self-checking, continuous, numeric bar code. It is mainly used where fixed-length numeric fields are required. The data field must be an even number of characters. If an odd data field is sent to the POSjet™ 1000 Printer, it will be zero padded. Due to space limitations, only 20 characters can be printed. (Note: Interleaved 2 of 5 does not read well in fast mode.)

Code 39

Code 39 is an alphanumeric bar code. It is a discrete, self-checking, variable-length code. The printer prints the complete data field. Due to space limitations, only ten characters can be printed. If illegal characters are passed to the printer, they are converted to legal codes. (For example, a → A.)

Code 128

Code 128 is an alphanumeric bar code. It is a high-density, variable-length, continuous code that employs multiple element widths. Code 128 has three possible start codes.
The start code defines the code set, Code A, B, or C. The first character in the data field defines the Code Set: Start Code A = <135>; Code B = <136>; and Code C = <137>. The printer prints the complete data field. Due to space limitations, only ten characters can be printed. The check digit is generated by the printer. Code 128 Note: The 'A' space is defined as a <0>, which makes programming difficult and causes control character conflicts for the printer. To solve the problem, the POSjet™ 1000 Printer subtracts 32 from all characters that are to be included in the bar code. In the Code 128 definition, an 'A' is <33>; however, the printer converts an ASCII 'A' (<65>) to a <33> internally. This sets Code 128C and the start codes off by 32.

UPC A

UPC A is a fixed-length, numeric, continuous code that employs four element widths. The printer supports Universal Product Code Version A, E, EAN-8, and EAN-13. Version A encodes 11 digits. Typically, the UPC A format starts with a number system digit, five-digit manufacturer's code, five-digit product code, and a check digit. The printer makes no assumptions about any of the codes except the check digit. The printer prints an UPC bar code with the 11 digits sent to it and generates the check digit. If fewer than 11 digits are sent, the remaining digits will be zeros. The printer prints an UPC that is about 130% the size of the UPC nominal standard, which provides optimal readability.

UPC E

UPC E is a zero suppression version of UPC. The printer requires that the first digit is zero for number system zero. If it is not zero, the bar code is not printed. The printer does the compression based on the compression rules for UPC E, prints an UPC bar code based on the 11 digits sent to it, and generates the check digit. If fewer than 11 digits are sent, the remaining digits will be zeros. The printer prints an UPC that is about 130% the size of the UPC nominal standard, which provides optimal readability.

EAN-13

EAN-13 is a fixed-length, numeric, continuous code that employs four element widths. The printer supports EAN-13, which is a superset of UPC that encodes 12 digits. Typically, the format starts with a number set digit, which defines how the next six digits are encoded. The next five digits have fixed encoding. The last is a check digit. The printer prints an EAN-13 bar code with the 12 digits sent to it and generates the check digit. If fewer than 12 digits are sent, the remaining digits will be zeros. The printer prints an EAN-13 bar code that is about 130% the size of the nominal standard, which provides optimal readability.

EAN-8

EAN-8 is a fixed-length, numeric, continuous code that employs four element widths. The printer supports EAN-8, which is a superset of UPC that encodes seven digits. The printer prints an EAN-8 bar code with the seven digits sent to it and generates the check digit. If fewer than seven digits are sent, the remaining digits will be zeros. The printer prints an EAN-8 bar code that is about 130% the size of the nominal standard, which provides optimal readability.

Code 93

Code 93 is a variable-length, alphanumeric bar code. The complete data field is printed by the printer. Due to space limitations, only 12 characters can be printed.

Codabar

Codabar is a variable-length format, primarily used for numeric symbols. It offers 16 data characters, including the numeric digits zero through nine, and -, $, :, /, ., and +. Four unique start/stop characters, designated A, B, C, and D, are also available. Due to space limitations, only 12 characters can be printed.

Note 1 A [CR] may also be used in place of the [ETX] to end the bar code data field.

Note 2 Only information that is usable in a particular bar code will be printed.

Function	**Set bar code height**
ASCII	[ESC] [EM] B <n>
Hexadecimal	1BH 19H 42H <n> of digits
Decimal	<27> <25> <66> <n>
IPCL	&%BH <m_1> <m_2>
EPOS	[GS] h <n>

Description The [ESC] [EM] B <n> command sets the bar code height and speed where <n> is the number of print passes and <m> is the speed.

Each pass is about 0.11 inch high. When n = <0>, the printer returns to the default value of four passes. For UPC, the default value is seven. Any value from zero to nine may be specified.

Function	**Set bar code justification, human readable interpretation (HRI) character print mode, and print direction**
ASCII	[ESC] [EM] J <n>
Hexadecimal	1BH 19H 4AH <n>
Decimal	<27> <25> <74> <n>
IPCL	&%BJ <m_1> <m_2>
EPOS	none The power on default is center justified with HRI characters not printed.

Description The [ESC] [EM] J <n> command selects the operation of the bar code justification, HRI characters, and print direction.

Where n bits	**n**	**IPCL**	**76543210**	
			------xx	Justified
	0	00	------00	Left
	1	01	------01	Center
	2	02	------10	Right
			--xx----	HRI characters
	0	00	--00----	Not printed
	16	16	--01----	Printed above the bar code
	32	32	--10----	Printed below the bar code
	48	48	--11----	Printed above and below the bar code
			-x------	Vertical print mode
	0	00	-0------	Bar code printed in horizontal direction (default)
	64	64	-1------	Bar code printed in vertical direction

Note 1 The [ESC] [EM] J <n> command only affects bar code printing.

Miscellaneous Control

Function	**Disable paper out sensor**
ASCII	[ESC] 8
Hexadecimal	1BH 38H
Decimal	<27> <56>
IPCL	&%PF
EPOS	none

Description The [ESC] 8 command temporally disables the paper out sensor. The printer does not stop printing or go off-line when it senses it is out of paper. The inquire commands still return paper out status.

Function	**Enable paper out sensor**
ASCII	[ESC] 9
Hexadecimal	1BH 39H
Decimal	<27> <57>
IPCL	&%PO
EPOS	none

Description The [ESC] 9 command enables paper sensing and is intended to reverse the effect of the disable paper out sensor command. If the printer is out of paper when the command is issued, it goes off-line.

Function	**Set left/right print margins**
ASCII	[ESC] X <n_1> <n_2>
Hexadecimal	1BH 58H <n_1> <n_2>
Decimal	<27> <88> <n_1> <n_2>
IPCL	none
EPOS	[ESC] l, [ESC] Q

Description The [ESC] X <n_1> <n_2> command sets left and right print margins in characters from the home position. Where n_1 = left margin and n_2 = right margin, the absolute position depends on the current print pitch. If the left and right margins are set to the right of the current horizontal position, the new margins become valid in the same line. If the left margin is set to the left of the current horizontal position and the right margin set to the right of the current horizontal position, the right margin setting becomes valid in the same line, but the left margin setting becomes valid in the next line. When the left and right margins are set to the left of the current horizontal position, both left and right margin settings appear to become valid in the next line because an auto-CR is performed by the subsequent data.

Function	**Clear print buffer**
ASCII	[CAN]
Hexadecimal	18H
Decimal	<24>
IPCL	&%RP
EPOS	[CAN]

Description The [CAN] command clears the print buffer and any un-printed information in the printer received before it. If the input buffer is not being processed because the printer is out of paper or a form is not inserted, the [CAN] command will not be processed until after the error is cleared. The [CAN] command does not restore default conditions. It only clears the print buffer.

Function	**Query marker**
ASCII	[ESC] q <n>
Hexadecimal	1BH 71H <n>
Decimal	<27> <113> <n>
IPCL	none
EPOS	none

Function The [ESC] q <n> command returns a status to the host when it is processed.

Response	Serial/Parallel, IEEE 1284	Parallel, non-IEEE 1284
	[SOH] <n>…	Not supported via PE

Description The [ESC] q <n> command may be placed in the print data and, when processed by the printer, will return a progress status marker. The value of <n> can be any 8-bit value. It is returned to the host unaltered. The intent is for it to be a sequence number. The command can be used to track the print progress of the printer or verify that data has been printed.

Note 1 The [ESC] q <n> command is a line terminator that causes the printer to print all previous data. If a normal line terminator like a [CR] is not supplied, right justify and auto-center do not function correctly. All data is left justified. [ESC] q does not perform a [CR] or [LF] function.

Function	**Open cash drawer**
ASCII	[ESC] x <n>
Hexadecimal	1BH 78H <n>
Decimal	<27> <120> <n>
IPCL	&%D1 (Cash Drawer 1) &%D2 (Cash Drawer 2)
EPOS	[ESC] p

Description The [ESC] x <n> command charges the cash drawer, <n>, for 150 ms.

Where <n> = <1> (01H) or 1 (31H) for Cash Drawer 1
<2> (02H) or 2 (32H) for Cash Drawer 2

The time period that drawer is activated can be changed in the configuration menu. Activation time ranges from 25 ms to 250 ms.

Note 1 Cash drawer open commands are processed as part of print data. They are not immediate commands and are not processed until found in the input buffer by the print processor.

Note 2 Cash Drawer 2 is factory configurable in one of two modes. Either pin 2 or 3 is active depending on an internal jumper setting. The factory default is pin 3. Cash Drawer 1 is always on pin 2.
The cash drawer status is defined as an open circuit for drawer closed.

Function	**Perform Auto Cut**
ASCII	[ESC] v
Hexadecimal	1BH 76H <n>
Decimal	<27><118>
IPCL	&%FC &%PC
EPOS	[ESC] I or [ESC] m

Description The [ESC] v command operated the auto cutter.

Note 1 The auto cutter is optional. If the auto cutter is not installed this command will be ignored.

Function	**Audio alert**
ASCII	[BEL]
Hexadecimal	07H
Decimal	<7>
IPCL	&%BL
EPOS	[BEL]
Function	When enabled, the [BEL] command starts the audio alert sequence.
Description	The default is a single sound, lasting the period of time defined by the audio alert setting. If the audio alert is off, it does not function.

Function	**Configure audio alert**
ASCII	[ESC] [BEL] <n_1> <n_2> <n_3>
Hexadecimal	1BH 07H <n_1> <n_2> <n_3>
Decimal	<27> <7> <n_1> <n_2> <n_3>
IPCL	None
EPOS	None
Function	The [ESC] [BEL] <n_1> <n_2> <n_3> command alters the way the audio alert sounds.
Description	The default is a single sound lasting the period of time defined by the audio alert setting. The [ESC] [BEL] <n_1> <n_2> <n_3> command allows the sound to be altered.

Where **<n_1>** is the number of alert cycles
<n_2> is the on time of the alert cycle in ten Ms intervals
<n_3> is the off time of the alert cycle in ten Ms intervals

Function	**Enable print suppress and data pass through**
ASCII	[ESC] < <n>
Hexadecimal	1BH 3CH <n>
Decimal	<27> <60> <n>
IPCL	&%PT <n>
EPOS	[ESC] = <n>

Description The [ESC] < <n> command provides print suppress and data pass through features.

Where	Bit 0	Printer select
	Bit 1	Pass through On
	Bits 2 - 7	Undefined

If Bit 0 is clear, the printer stops processing data. If Bit 1 is set, the data is passed through the printer and sent out on the serial port.

Note 1 The pass through command is processed as part of print data. It is not processed until it is found in the input buffer by the print processor. It is not an immediate command. The printer must be on-line and ready to activate the command.

Note 2 If the printer is configured for parallel operation, the data is still pass through on the serial port. In most cases, the serial port, however, is not connected.

Note 3 The operation of the command can be altered by the print suppress configuration and requires that the pass through and print suppress functions be enabled in the configuration menu.

Note 4 When Series 50 Printer compatibility is being used, these commands do not function. Series 50 Printer pass through must be used.

Note 5 Multi-drop is operational during suppress and pass through. If a multi-drop address is present in the pass through data, it is processed.

Function	**Set control feature commands**
ASCII	[ESC] y <n>
Hexadecimal	1BH 79H <n>
Decimal	<27> <121> <n>
IPCL	&%Y0-9 or &%YX <m_1> <m_2> <m_3> (for numbers greater than nine)
EPOS	[ESC] y <n>

Where n

0	Reinitializes the printer and forces Citizen mode
1	Reinitializes the printer and forces Star mode
2	Reinitializes the printer and forces POSjet™ 1000 mode
3	Reinitializes the printer and forces extended EPOS mode
4	Disables IPCL commands
5	Enables IPCL commands (Note: Once IPCL commands are disabled, the command will not be a valid IPCL code.)
6	Disables inquire processing (All command preprocessing is disabled.)
7	Enables inquire processing
8	Enables extended diagnostics
9, 10	Not used
11	Overlays the current character chart with Group 2 OCR MA Characters
12	Replaces the OCR characters with normal characters
13	Not used
14	Forces head maintenance
15, 16	Not used
17	Requests the printer to enter remote standby mode
18	Requests the printer to exit remote standby mode
19-255	Not used

Description The [ESC] y <n> command enables and disables command set features. It is possible that the IPCL commands will interfere with print data. If this occurs, the IPCL can be disabled with an [ESC] y <4> command.

Note 1 [ESC] y <0>, <1>, <2>, and <3> allow the printer to switch between emulation modes. When the switch takes place, the current print buffer is printed, and the printer reinitializes. These commands do not permanently change the configuration. A power on reset restores the mode that was configured in menu mode. A reset by command or from the INIT pin does not restore the mode.

Note 2 [ESC] y <6> and <7> enable and disable the inquire process. These commands are not processed as they are received, but are buffered then processed. The buffering process allows inquire commands sent after a disable to be answered. In addition, inquires sent after an enable may not be answered. (See additional notes 3 and 4 on the next page).

Note 3 The printer has a resident OCR-MA font. It is defined and mapped per ANSI X3.111-1986. Once mapped into a code page, it can be removed by issuing an [ESC] y <12> command or a code-page select command.

Note 4 In EPOS mode, the [ESC] y command is active.

Function	**Enable extended diagnostics**
ASCII	[ESC] ~ <n>
Hexadecimal	1BH 7EH <n>
Decimal	<27> <126> <n>
IPCL	none
EPOS	[ESC] ~ <n>

Description The [ESC] ~ <n> commands are extended diagnostics commands. They must all be preceded with an enabling command. These commands are not intended to be used by the end user.

Note 1 The programmer should make sure that no command follows the [ESC] ~ <n> sequence in the application. The extended diagnostics commands may affect the print quality and performance of the printer. In some cases, the commands may degrade the performance of the print cartridge or mechanism. Documentation is provided here to assure that you *do not* use the [ESC] ~ <n> command.

Function	**Enable dynamic response**
ASCII	[ESC] w <n>
Hexadecimal	1BH 77H <n>
Decimal	<27> <119> <n>
IPCL	none
EPOS	[GS] a <n>

Where n Defines the features that cause dynamic responses

Where Bit			
	0	Cash Drawer 0	ACK/NAK <1>
	1	Cash Drawer 1	ACK/NAK <2>
	2	Paper low status	ACK/NAK <3>
	3	Paper out status	ACK/NAK <4>
	4	0	
	5	0	
	6	0	
	7	Cover status	ACK/NAK <8>

Description Dynamic status can be used to allow the host to sense status changes without sending repeated inquire commands. The operation of the dynamic response varies depending on the configuration of the printer. If the printer is configured for serial or parallel, IEEE 1284 operation, more than one status can be sensed because the printer responds to status changes as if an inquire were issued. In parallel mode, only one status should be requested. If more than one bit is active, the resulting status on the PE signal is not defined.

Note Power up default is paper out on PE signal.

Function	**Begin multi-drop control**
ASCII	[SOH] <n>
Hexadecimal	01H <n>
Decimal	<1> <n>
IPCL	none

Where <n> is the printer address. Addresses of A, B, or C are configurable.

Description The printer must be addressed in multi-drop mode. [SOH] <n> is the addressing command. If the printer is configured with an address of 'A,' it operates when addressed. When any other address is sent to the printer, it enters print suppress mode. An address of 'Z' is n universal address that activates the printer.

Series 50 Compatibility Commands

To allow the POSjet™ 1000 Printer to replace the Series 50 Printer without affecting the Series 50 application, the most popular Series 50 emulation modes are provided. The Series 50 modes should only be used if you are replacing a Series 50 Printer and cannot modify the application to use the standard POSjet™ 1000 commands.

A number of items are different with the POSjet™ 1000 emulation, including the processing of IPCL commands. The Series 50 IPCL processor did not deal with command parameters by translating ASCII digits into binary field. When a POSjet™ 1000 Printer is in Series 50 mode, it behaves as the Series 50 Printer does.

The primary changes to the standard POSjet™ 1000 emulation are the removal of commands not present on the Series 50 Printer and the addition of the following commands which are only present on the Series 50 Printer. Refer to the Series 50 Programmer's Guide for documentation and additional commands.

Function	**Set extended Series 50 cash drawer command**
ASCII [BS]	
Hexadecimal	08H
Decimal	<8>
Description	The [BS] command opens Cash Drawer 2

Function	**Set extended Series 50 cash drawer command**
ASCII [BEL]	
Hexadecimal	07H
Decimal	<7>
Description	The [BEL] command opens Cash Drawer 1

Function	**Set extended Series 50 cash drawer command**
ASCII [ESC] +	
Hexadecimal	1BH 2BH
Decimal	<27> <43>
Description	The [ESC] + command opens Cash Drawer 1

Function	**Set extended Series 50 pass through**
ASCII	[ESC] # or [ESC] d or [ESC] [RS] and [ESC] ”
Hexadecimal	1BH 23H or 1BH 64H or 1BH 1EH and 1BH 22H
Decimal	<27> <35> or <27> <100> or <27> <30> and <27> <34>
Description	[ESC] # or [ESC] d turn on pass through, and [ESC] [RS] or [ESC] ” turn off pass through. These commands require that the pass through function be enabled in the configuration menu.

Printer Status Set and Inquire

The POSjet™ 1000 Printer is designed for use as part of an automated system where the host computer makes every attempt to correct problems with the printer. In addition, the host application requires that it be able to obtain more information from the printer than is typical of normal computer printers. For example, a normal computer printer does not have cash drawers, such additional features require that the standard printer protocol be extended to deal with the added features of a point-of-sale (POS) printer.

All inquire commands require a response from the printer. Consequently, parallel, IEEE 1284 bidirectional communications or bidirectional serial operation is required. In all cases, inquire commands are responded to by an acknowledged (ACK) or a not acknowledged (NAK) and then the command ID, which allows the host application to make multiple requests and receive identifiable responses.

Serial Mode Inquire

All inquire (ENQ) commands require a response from the printer. During serial operation, all inquire commands are responded to by an acknowledged (ACK) or not acknowledged (NAK), the command ID, and in some cases status.

The serial ACK or NAK responses are always uniform and followed with a command ID, which makes the design of the host application easier because the response can be identified.

The printer always accepts serial data even when it is off-line. It is also possible to send inquire commands to the printer when it is off-line. Because inquire commands are processed before they go into the buffer, the printer responds even when it is busy printing.

In serial mode, it is desirable that the response to an inquiry be received by the host before another inquire command is issued to the printer. When the printer receives an inquiry, it generates a response. If inquiries are sent to the printer too quickly, the printer spends all of its time responding and does not have time to print.

IEEE 1284 Mode Inquire

In parallel, IEEE 1284 mode, status information can be returned to the host. After the host makes an inquire request, it activates IEEE 1284 mode 0 reverse channel and waits for a response from the printer. The response to the inquire is identical to serial mode.

The printer always accepts IEEE 1284 reverse-channel requests but does not accept inquire commands when off-line. It is possible to obtain status when off-line by placing the printer in dynamic response mode before the printer goes off-line. The IEEE 1284 reverse channel responds to status changes even when the printer is off-line. It is also possible to configure the printer, so it does not go off-line in most cases. Power off, paper out, and faults always generate off-line status.

Dynamic Response Mode

Dynamic status, [ESC] w <n>, can be used to allow the host to sense status changes without sending repeated inquire commands. The dynamic response operation varies depending on the configuration of the printer. If the printer is configured for serial or IEEE 1284 operation, more than one status can be sensed because the printer responds to status changes as if an inquire were issued. In parallel mode, only one status should be requested. If more than one bit is active, the resulting status on the PE signal is not defined. The response to dynamic status is the same as an inquire command. That is, if cash drawer status is to be sensed, the ACK/NAK is the same as for inquire commands.

Inquire Commands

Function	**Inquire printer status**
ASCII	[ENQ] <n>
Hexadecimal	05H <n>
Decimal	<5> <n>
IPCL	none
EPOS	[GS] r or [DLE] [ENQ] or [DLE] [EOT]
Description	The [ENQ] <n> command inquires about the printer's status and returns a result.
Note 1	When the printer is off-line, inquires may not be accepted

Function	**Inquire Cash Drawer 1 status**
ASCII	[ENQ] <1>
Hexadecimal	05H 01H
Decimal	<5> <1>
Function	Cash Drawer 1 Status
Response	ACK <1> (06H 01H) Cash Drawer 1 is closed. NAK <1> (15H 01H) Cash Drawer 1 is open. Cash drawer status is defined as open circuit being drawer closed.

Function	**Inquire receipt paper low status**	
ASCII	[ENQ] <3>	
Hexadecimal	05H 03H	
Decimal	<5> <3>	
Function	Receipt paper low	
Response	ACK <3> (06H 03H)	Receipt paper is present.
	NAK <3> (15H 03H)	Receipt paper is low.

Function	**Inquire receipt paper out status**	
ASCII	[ENQ] <4>	
Hexadecimal	05H 04H	
Decimal	<5> <4>	
Function	Receipt paper exhausted	
Response	ACK <4> (06H 04H)	Receipt paper is present
	NAK <4> (15H 04H)	Receipt paper is exhausted

Function	**Inquire cover open status**	
ASCII	[ENQ] <8>	
Hexadecimal	05H 08H	
Decimal	<5> <8>	
Function	Cover open/closed status	
Response	ACK <8> (06H 08H)	The cover is closed
	NAK <8> (15H 08H)	The cover is open

Function	**Is the buffer empty? Clear the IEEE 1284 buffer.**	
ASCII	[ENQ] <9>	
Hexadecimal	05H 09H	
Decimal	<5> <9>	
Function	The [ENQ] <9> command allows the host to know when the print buffer is empty. If IEEE 1284 is active, the command also clears the response buffer.	
Response	ACK <9> (06H 09H)	The buffer is empty.
	NAK <9> (15H 09H)	The buffer is not empty.

Function	**Request printer reset**
ASCII	[ENQ] <10>
Hexadecimal	05H 0AH
Decimal	<5> <10>
Function	Reset printer
Response	Serial Parallel ACK <10> (06H 0AH) No response The command was accepted. NAK <10> (15H 0AH) The command was rejected.

Description The ENQ <10>, EPOS DLE ENQ <n> commands and the INIT pin all have the same effect and are referred to as reset commands. To prevent data loss, the printer tries to finish printing the buffered data. When operator intervention with the printer is required for any reason, data loss results. The reset operation is saved until the printer goes idle. In the case of a slip request command or any command that waits for the operator, the printer is idle. If the printer is idle and a reset command is received or pending, the printer resets, and the buffer clears. If the host resets an operator intervention operation, any remaining buffered data is cleared.

When the printer receives a reset command, the printer goes off-line and/or busy until the reset completes. In serial mode, the printer may have information in its high-speed buffer that was received after the reset command but before the reset was processed. If the host application continues to send information to the printer after a reset command, some of that information may be processed before the reset is processed. In parallel mode, the printer goes busy after the reset is received but before the next byte is accepted. The printer accepts an [ENQ] <10> in parallel mode. It, however, is not acknowledged. If both the serial and parallel ports are active, the serial reset is not acknowledged either because the reset operation removes the parallel response. In IEEE 1284 mode, the response buffer is cleared by a reset command, which prevents responses in IEEE 1284 mode as well.

Note 1 If reset inhibit is set in the configuration menu, the command is ignored.

Function	**Inquire power cycle status**
ASCII	[ENQ] <11>
Hexadecimal	05H 0BH
Decimal	<5> <11>
Function	Has the printer been power cycled since the last request?
Response	ACK <11> (06H 0BH) Printer has been power cycled since the last [ENQ] <11> NAK <5> (15H 0BH) Printer has not power cycled since the last [ENQ] <11>
Description	The first time after a rese, the command returns [ACK] <11>, after that the command returns [NAK] <11>. The command allows the application to determine if the printer has been power cycled and needs to be reinitialized. The [ENQ] <10> command and the INIT signal on the parallel port both cause the printer to return power up status.

Function	**Inquire printer state**
ASCII	[ENQ] <15>
Hexadecimal	05H 11H
Decimal	<5> <15>
Function	The [ENQ] <15> command returns the current printer state
Note	[ENQ] <17> also returns the current printer state, but it should not be used as it conflicts with XON/XOFF flow control.
Response	[ACK] <15> <n> <r_1> <r_2>…

Where <15> is the echo of the command ID.

<n> is the number of return bytes + 40 (28H)
(to prevent confusion with XON/XOFF).

<r_1>: bit 0 = 1 always
bit 1 = Cover is closed.
bit 2 = Receipt paper is out.
bit 3 = 0
bit 4 = In error state (Waiting for error to be cleared)
bit 5 = 0
bit 6 = 1 always
bit 7 = 0 always

<r_2>: bit 0 - 5 =
bit 6 = 1 always
bit 7 = 0 always

Function	**Inquire all printer status**
ASCII	[ENQ] <20>
Hexadecimal	05H 14H
Decimal	<5> <20>
Function	The [ENQ] <20> command returns all status flags
Response	[ACK] <20> <n> <r_1> <r_2>…

Where <20> is the echo of command ID.

<n> is the number of return bytes + 40 (28H) (to prevent confusion with XON/XOFF).

<r_1>: bit 0 = Cash Drawer 1 is open.
bit 1 = Cash Drawer 2 is open
bit 2 = Receipt paper is out.
bit 3 = 0
bit 4 = Receipt paper error occurred. (low or out)
bit 5 = 0
bit 6 = 1 always
bit 7 = 0 always

<r_2>: bit 0 = 1 always
bit 1 = Cover is closed.
bit 2 = Buffer is empty.
bit 3 = Printer has been power cycled, which does not affect the state of the power-cycled flag. (Use [ENQ] <11> to reset.)
bit 4 = Printer is waiting in an error mode.
bit 5 = 0
bit 6 = 1 always
bit 7 = 0 always

<r_3>: bit 0 = 1 always (Receipt Station)
bit 1 = 0
bit 2 = 0
bit 3 = 0
bit 4 = Undefined
bit 5 = Printer is blocking print (Cover is open or out of paper.)
bit 6 = 1 always
bit 7 = 0 always

<r_4>: bit 0 = Printer supports receipts.
bit 1 = Printer supports inserted forms.
bit 2 = Printer supports multiple colors
bit 3 = Printer supports cutter.
bit 4 = Printer supports partial cuts.
bit 5 = 0
bit 6 = 1 always
bit 7 = 0 always

<r_5>: Percentage of ink remaining on Head 1 (0-100) + 40 (28H)
<r_6>: Percentage of ink remaining on Head 2 (0-100) + 40 (28H)
<r_7>: Current multihead alignment (0-16, 8 = 0 offset)

Function	**Inquire printer ID**
ASCII	[ENQ] <21>
Hexadecimal	05H 15H
Decimal	<5> <21>
Function	The [ENQ] <21> command returns the printer IEEE 1284 ID string.
Response	[ACK] <21> <n> {ID string}

Where **<21>** is the echo of the command ID and <n> is the number of return bytes in the ID string {ID string} is the IEEE ID return string, which follows:

MFG:Ithaca-Periph.;
CMD:PJ1000CL,IPCL;
CLS:PRINTER;
MDL:1000 PcOS;
DES:Ithaca-Peripherals POSjet™ 1000;
REV:PE1200-01.16
OPTS:$20xy
Where x is a bit field defined as follows:
bit 0 = 1 Red pen support
bit 1 = 1 Green pen support
bit 2 = 1 Blue pen support
bit 3 = Always 0
bit 4 = Always 1
bit 5 = Always 1
bit 6 = Always 0
bit 7 = Always 0

and y is a bit field defined as follows:

bit 0 = 0
bit 1 = Knife is installed.
bit 2 = 0
bit 3 = Always 0
bit 4 = Always 1
bit 5 = Always 1
bit 6 = Always 0
bit 7 = Always 0

Function	**Inquire user-store status**
ASCII	[ENQ] <23>
Hexadecimal	05H 17H
Decimal	<5> <23>
Function	The [ENQ] <23> command reports on the user-store status.
Response	[ACK] <23> <Report> <0> Not supported via PE

Where <23> is the echo of command ID. The report is a null terminated string with the following format:

12345[CR][LF] (Free user store)
12345 Type Name…[CR][LF] (First entry) etc.
12345 Type Name…[CR][LF] (Last entry) <0>

Type The type field describes the type of information.
M = macro
C = character definition

Control Codes Summary by Code

ASCII Command	Hex	IPCL Equivalent Code	Description	Page
[NUL]	00		Null	
[BEL]	07H	&%BL	Audio alert.	91
[BS]	08H	&%BS	IBack space.	34
[CAN]	18H	&%RP	Clear print buffer.	90
[CR]	0DH	&%CR	Carriage return.	33
[DC2]	12H	&%F3	Begin 10 cpi character pitch.	41
[DC4]	14H	&%MN	Cancel one-line double-wide print.	58
[FF]	0CH	&%FF	Form feed.	39
[HT]	09H	&%HT	Horizontal tab.	34
[LF]	0AH	&%LF	Line feed.	33
[SI]	0FH	&%F1	Begin 17 cpi character pitch.	41
[SO]	0EH	&%MW	Begin one-line double-wide print.	57
[SOH] <n>	01H	none	Begin multidrop control.	96
[VT]	0BH	&%VT	Vertical tab.	38
[ENQ] <n>	05H	none	Inquire status. (Refer to command descriptions.)	99
[ESC] [BEL] <n_1> <n_2> <n_3>	1BH,07H	none	Configure audio alert.	92
[ESC] [EM] B <n>	1BH,19H, 42H	&%BH <m_1><m_2>	Set bar code height. n=0 Restore defaults n=1 - 9 Number of passes (0.11 inch per pass)	88
[ESC] [EM] J <n>	1BH,19H, 4AH	&%BJ<m_1><m_2>	Set bar code justification, HRI print mode, and print direction.	88
[ESC] [US] b <Name..> <0>	1BH,1FH, 62H	&%UB <Name..> <0>	Begin named macro record.	79
[ESC] [US] c <Name..> <0>	1BH,1FH, 63H	&%UC <Name..> <0>	Save user-defined characters.	80
[ESC] [US] d <Name..> <0>	1BH,1FH, 64H	&%UD <Name..> <0>	Delete item from user store.	82
[ESC] [US] e <Name..> <0>	1BH,1FH, 65H	&%UG <Name..> <0>	End named macro record.	79
[ESC] [US] f ALL <0>	1BH,1FH, 66H,00H	&%UF	Flush information from user store.	82
[ESC] [US] l <Name..> <0>	1BH,1FH, 6CH	&%UL <Name..> <0>	Load item from user store.	80
[ESC] [US] m <Name..> <0>	1BH,1FH, 6DH	&%UM <Name..> <0>	Save macro data in user store.	80

ASCII Command	Hex	IPCL Equivalent Code	Description	Page
[ESC] [US] q <Name..> <0>	1BH,1FH, 72H	&%UQ <Name..> <0>	Report on user store.	82
[ESC] [US] r <Name..> <0>	1BH,1FH, 72H	&%UR <Name..> <0>	Run macro data from user store.	81
[ESC] [US] s <Name..> <0>	1BH,1FH, 6DH	&%US <Name..> <0>	Flag item as a start-up macro.	81
[ESC] :	1BH,3AH	&%F2	Begin 12 cpi character pitch.	41
[ESC] # <0>	1BH,23H, 00H	&%QT	Begin 12 x 12 draft print.	44
[ESC] $	1BH,24H	none	Cancel user-defined characters.	54
[ESC] % G	1BH,25H, 47H	&%MI	Begin italics.	62
[ESC] % H	1BH,25H, 48H	&%CI	End italics.	62
[ESC] * <m> <0> <0>	1BH,2AH		Set horizontal graphic mode.	74
[ESC] * <m> <n_1> <n_2>	1BH,2AH	none	Print graphics in mode <m>.	70
[ESC] ! <n>	1BH,21H	&%CS <n>	Select international character set.	47
[ESC] - <n>	1BH,2DH	&%CU {n=0} &%MU {n=1}	Underline mode. n = 0 End n = 1 Begin	60
[ESC] = <y> <c_1> <c_2>…	1BH,3DH	none	Define user-defined characters.	53
[ESC] 0	1BH,30H	&%ST	Set 1/8-inch line spacing.	36
[ESC] 1	1BH,31H	&%SG	Set 7/72-inch line spacing.	37
[ESC] 2	1BH,32H	none	Begin variable line spacing. (Enable [ESC] A <n>).	37
[ESC] 3 <n>	1BH,33H	&%SV <m_1> <m_2> <m_3>	Set variable line spacing to n/216 inch.	36
[ESC] 4	1BH,34H	&%TF	Set top of form.	39
[ESC] 5 <n>	1BH,35H	&%CA {n=0} &%MA {n=1}	Auto line feed. n=0 End n=1 Begin	40
[ESC] 8	1BH,38H	&%PF	Disable paper out sensor.	89
[ESC] 9	1BH,39H	&%PO	Enable paper out sensor.	89
[ESC] < <n>	1BH,3CH	&%PT <n>	Print suppress and data pass through.	93
[ESC] > <n>	1BH,3EH	none	User-defined characters.	54
[ESC] ? <m><n>	1BH,3FH	none	Reassign graphic mode.	71
[ESC] @	1BH,40H		Initialize printer.	

ASCII Command	Hex	IPCL Equivalent Code	Description	Page
[ESC] A <n>	1BH,41H	none	Set variable line spacing to n/72 inch.	37
[ESC] B <n_1> <n_2> <n_3>...<n_i> 0	1BH,42H	none	Set vertical tab stops.	38
[ESC] C <n>	1BH,43H	&%SL <m_1> <m_2>	Set form length in lines.	39
[ESC] C [NUL] <n>	1BH,43H	&%SI <m_1> <m_2>	Set form length in inches.	40
[ESC] D <n_1> <n_2> ... <n_i> <0>	1BH,44H	none	Set horizontal tab stops.	34
[ESC] E	1BH,45H	&%MM	Begin emphasized print.	61
[ESC] F	1BH,46H	&%CM	End emphasized print.	61
[ESC] G	1BH,47H	&%ME	Begin enhanced print.	60
[ESC] H	1BH,48H	&%CE	End enhanced print.	60
[ESC] I <n>	1BH,49H	&%QT {n=0} &%QU {n=1} &%QL {n=2} &%QS {n=3}	Select print quality mode. n=0 Draft (12 x 12) n=1 Large draft (12 x 14) n=2 NLQ (24 x 16) n=3 NLQ (24 x 16) n=4-7 Repeats 0-3	44
[ESC] J <n>	1BH,4AH	&%FM <m_1> <m_2> <m_3>	Perform a fine line feed.	36
[ESC] K <n_1> <n_2>	1BH,4BH	none	Print single-density graphics. <n_1>=0...255 <n_2>=0…3 len=<n_1> + 256 * <n_2>	68
[ESC] L <n_1> <n_2>	1BH,4CH	none	Print half-speed double-density graphics.	69
[ESC] P <n>	1BH,50H	&%RI &%RF &%RN	Rotated font. (See command description).	45
[ESC] R	1BH,52H	&%HV	Reset horizontal and vertical tab stops.	35
[ESC] S <0>	1BH,53H, 00H	&%SP	Select superscript.	61
[ESC] S <1>	1BH,53H, 01H	&%SB	Select subscript.	61

ASCII Command	Hex	IPCL Equivalent Code	Description	Page
[ESC] [SI]	1BH,0FH	&%F4	Begin 24 cpi character pitch.	41
[ESC] T	1BH,54H	&%SE	End superscript or subscript.	62
[ESC] U <n>	1BH,55H	&%GU {n=1} &%GB {n=0}	Select bidirectional or unidirectional print. n=0 Bidirectional n=1 Unidirectional	71
[ESC] V <n>	1BH,56H	none	Set intercharacter spacing.	43
[ESC] W <n>	1BH,57H	&%FS {n=0} &%FD {n=1} &%FH {n=3}	Multiline double-wide double-high mode. n=0 Standard mode n=1 Double-wide n=2 Double-high 3 = Both	58
[ESC] X <n_1><n_2>	1BH,58H	none	Set left/right margins. n_1 = Left margin n_2 = Right margin	89
[ESC] Y <n_1> <n_2>	1BH,59H	none	Print full-speed double-density graphics.	69
[ESC] Z <n_1> <n_2>	1BH,5AH	none	Print quad-density graphics.	69
[ESC] [@ ...	1BH,5BH, 40H…	&%DH &%SH	Set print style. (See command description.)	59
[ESC] [C <n>	1BH,5BH, 43H	&%EU	Insert Euro character.	51
[ESC] [P <n>	1BH,5BH, 50H	&%F<n>	Set character pitch.	42
[ESC] [S …	1BH,5BH, 53H…		Redefine character set.	52
[ESC] [T <n_h> <n_l>	1BH,5BH, 54H	&%CP <m_1> <m_2> <m_3> <m_4>	Select character code page.	49
[ESC]]	1BH,5DH	&%LR	Reverse line feed.	40
[ESC] ^ <n>	1BH,5EH	&%CC <m_1> <m_2> <m_3>	Print control character.	51
[ESC] _ <n>	1BH,5FH	&%CO {n=0} &%MO {n=1}	Enable/Disable overscore. n=0 End n=1 Begin	60

ASCII Command	Hex	IPCL Equivalent Code	Description	Page
[ESC] a <n>	1BH,61H	&%JR {n=2} &%JC {n=1} &%JL {n=0}	Set justification. n=0 Left n=1 Center n=2 Right n=8 Left (No line feed) n=9 Center (No line feed) n=10 Right (No line feed)	35
[ESC] b <n> ... [ETX]	1BH,62H	&%25 {n=0} &%39 {n=1} &%12 {n=2} &%UP {n=3} &%EA {n=4} &%UE {n=5} &%E8 {n=6} &%93 {n=7}	Print bar code. n=0 Interleave 2 of 5 n=1 Code 39 n=2 Code 128 n=3 UPC A n=4 EAN-13 n=5 UPC E n=6 EAN-8 n= 7 Code 93 n = 8 Codabar	85
[ESC] c <n>	1BH,63H	&%CL <m_1>	Select color.	57
[ESC] d <n>	1BH,64H	&%FL <m_1> <m_2>	Feed <n> lines at current spacing.	38
[ESC] g <0>	1BH,67H, 00H	&%GP	Process user macro.	84
[ESC] g <1>	1BH,67H, 01H	&%GS	Start macro record.	84
[ESC] g <2>	1BH,67H, 02H	&%GE	Stop macro record.	84
[ESC] g <3>	1BH, 67H, 03H	&%GW	Stop macro record and save.	84
[ESC] h <color> <length> <format> <data>	1BH,68H	none	Process horizontal graphics data.	73
[ESC] n <n_1> <n_2>	1BH,6EH	&%HP<m_1> <m_2> <m_3>	Set horizontal position.	35
[ESC] p <n>	1BH,70H	&%PE <m_1> <m_2>	Enable paper error mode operation.	
[ESC] q <n>	1BH,71H	none	Query marker.	90
[ESC] r <n>	1BH,72H	&%RX	Begin rotated print. (See Rotated Print Summary on page 65.)	64
[ESC] s <n>	1BH,73H	&%RL <m_1> <m_2> <m_3>	Set rotated print line length.	67
[ESC] u <n_1> …	1BH,75H	none	Set rotated print line spacing.	67
[ESC] v	1BH,76H	&%FC	Cycle receipt cutter.	

ASCII Command	Hex Code	IPCL Equivalent Code	Description	Page
[ESC] w <n>	1BH,77H	none	Enable dynamic response.	96
[ESC] x <n>	1BH,78H	&%D1 {n=1} &%D2 {n=2}	Open cash drawer. n=1 Cash Drawer 1 n=2 Cash Drawer 2	91
[ESC] y <11>	1BH,79H, 0BH	&%YX011	Enable OCR characters.	55
[ESC] y <12>	1BH,79H, 0CH	&%YX012	Disable OCR characters.	34
[ESC] y <n>	1BH,79H	&%Y0 - 9 or &%YX<m_1><m_2><m_3> (for numbers >9)	Set control feature commands. (See command description.)	94
[ESC] ~ <n>	1BH,7EH	none	Enable extended diagnostics.	95

EPOS Codes

The EPOS codes that are supported by the POSjet™ 1000 Printer are listed in this section. TransAct Technologies, Inc. has no control over how Epson extends or changes these control codes. TransAct Technologies, Inc. makes no guarantees as to the operation of our printer when it replaces an Epson printer. The TM200 and EPOS emulations are intended to make it as easy as possible to replace an Epson printer with a POSjet™ 1000 Printer.

The POSjet™ 1000 Printer provides two Epson emulations. The first emulation is as close as possible to the TM200 Printer and tries to make the POSjet™ 1000 Printer a drop in replacement. However, when the POSjet™ 1000 Printer is in Epson TM200 emulation mode, it is subject to the same limitations as a TM200 Printer.

The second Epson emulation is EPOS mode. It extends and enhances the TM200 emulation to remove some of the restrictions and give access to some of the POSjet™ 1000 Printer features not addressed by the TM200. It is intended that the standard Ithaca PcOS emulation be used for new applications.

The following section lists all TM200 and EPOS commands that are processed. They are as close as possible to Epson's definitions. The user must remember that the POSjet™ 1000 EPOS emulation, unlike the TM200 emulation, is not designed as a drop in replacement for an Epson printer. The POSjet™ 1000 Printer is designed to bring new and unique features and functionalities to a point-of-sale receipt printer. These features are not always compatible with Epson printers. Not all features of POSjet™ 1000 Printers can be supported by EPOS. In particular, the ability to print color graphics is not supported. Epson has not yet defined any way to print color graphics.

EPOS Deviations

Several differences exist between the POSjet™ 1000 and Epson printers. The POSjet™ 1000 Printer and TM200 have fundamentally different print technology. The dot pitch and cell size of the printers also vary. The POSjet™ 1000 Printer tries to duplicate the TM200 functionality, but it is not always possible. For example, the downloaded characters print smaller on a POSjet™ 1000 Printer than a TM200.

Real-time Status

The POSjet™ 1000 Printer is available in serial and parallel versions. Epson supports parallel operation but does it through a parallel to serial interface. Consequently, the response times for the POSjet™ 1000 Printer are generally faster. The POSjet™ 1000 Printer implements the IEEE 1284 nibble-mode standard. If an application requires real-time status from the printer, the IEEE 1284 bidirectional protocol must be used. Epson supports the IEEE 1284 byte-mode standard but seems to have errors in the nibble mode. The POSjet™ 1000 Printer does not support byte mode. If the POSjet™ 1000 Printer is used in an IEEE 1284 compliant system, byte mode should be an extension and the default should be nibble mode.

The POSjet™ 1000 Printer supports real-time status. The EPOS real-time status commands [DLE] [ENQ] and [DLE] [EOT] are processed by the printer. The printer supports all the response bit fields as defined by the TM200 Printer. See the descriptions below. The POSjet™ 1000 Printer looks at and evaluates all commands as they are received and does not respond to [DLE] [ENQ] or [DLE] [EOT] commands that happen to be embedded in graphics or other commands. (Refer to the buffer and preprocessor descriptions in later sections.)

Supported TM-200 Commands

Print and Feed Commands			
Command		Name	Page
LF	0AH	Print and line feed.	120
CR	0DH	Print and carriage return.	120
ESC d	1BH,64H	Print and feed <n> lines.	120
ESC e	1BH,65H	Print and reverse feed <n> lines.	121
ESC J	1BH,4AH	Print and feed paper <n> vertical units.	121
ESC K	1BH,4BH	Print and reverse feed [<n> x (1/144)] inches.	121
Line Spacing Commands			
Command		Name	Page
ESC 2	1BH,32H	Select default line spacing, 1/6 lpi.	122
ESC 3	1BH,33H	Set line spacing.	122
Character Commands			
Command		Name	Page
ESC SP	1BH,20H	Set right-side character spacing.	122
ESC %	1BH,25H	Select/cancel user-defined character sets.	123
ESC &	1BH,26H	Define user-defined characters.	123
ESC ?	1BH,3FH	Cancel user-defined characters.	124
ESC R	1BH,52H	Select an international character set.	
ESC [T	1BH,5BH, 54H	Select character code table.	126
ESC r	1BH,72H	Select color.	128
ESC t	1BH,74H	Select character code table.	129
ESC !	1BH,21H	Select print mode(s).	130
ESC -	1BH,2DH	Turn underline mode on/off.	130
ESC E	1BH,45H	Turn emphasized mode on/off.	130
ESC G	1BH,47H	Turn double-strike mode on/off.	131
ESC {	1BH,7BH	Turn upside-down printing mode on/off.	131
Panel Button Commands			
Command		Name	Page
ESC c 5	1BH,63H, 35H	Enable/disable panel buttons.	133

Supported TM-200 Commands

Paper Sensor Commands			
Command		**Name**	**Page**
ESC c 4	1BH,63H, 34H	Select paper sensor(s) to stop printing.	134
ESC c 3	1BH,63H, 33H	Select paper sensor(s) to output paper end signals.	135
Print Position Commands			
Command		**Name**	**Page**
ESC a	1BH,61H	Select justification.	136
HT	09H	Set horizontal tab positions.	137
ESC D	1BH,44H	Set horizontal tab positions.	137
ESC U	1BH,55H	Turn unidirectional printing mode on/off.	138
ESC <	1BH,3CH	Return home.	139
Bit-image Command			
Command		**Name**	**Page**
ESC *	1BH,2AH	Select bit-image mode.	140
Status Command			
Command		**Name**	**Page**
GS a	1DH,61H	Enable/disable Automatic Status Back (ASB).	141
GS r	1DH,72H	Transmit status.	144
DLE EOT	10H,04H	Transmit real-time status.	145
Mechanism Control Commands			
Command		**Name**	**Page**
GS V	1DH,56H	Select cut mode and cut paper.	151
Miscellaneous Commands			
Command		**Name**	**Page**
ESC @	1BH,40H	Initialize printer.	152
GS I	1DH,49H	Transmit printer ID.	152
ESC p	1BH,70H	Generate pulse.	153
ESC =	1BH,3DH	Select peripheral device status.	153
DLE ENQ	10H,05H	Query real-time request to printer.	154
GS z	1DH,7AH	Set on-line recovery wait time.	154
ESC y	1BH,79H	Set control feature commands.	161
ESC ~	1BH,7EH	Set extended diagnostics.	161
ESC ‘	1BH,27H	Copy user-defined storage buffers.	154

TM200 Restrictions

The following commands are effective only when 40 bytes is selected as the receive buffer size. The size of the receive buffer is selected by the DIP switches.

Command	Name
HT	Set horizontal tab.
ESC %	Select/cancel user-defined character set.
ESC &	Define user-defined characters.
ESC ?	Cancel user-defined characters.
ESC D	Set horizontal tab positions.

Table 22 TM200 Restrictions

The functions of the following commands are different, depending on the Epson printer model. O indicates supported commands, and X indicates unsupported (ignored) commands.

Model	TM-U200B	TM-U200PB	TM-U200D	TM-U200PD
ESC c 3	X	O	X	O
GS V (1)	O	O	X	X
GS V (2)	O	O	Only paper feed is executed.	Only paper feed is executed.

Table 23 Command Support for Various Epson Printers

The POSjet™ 1000 processes these commands based on the printer options installed.

Supported EPOS Commands

Print and Feed Commands			
Command		**Name**	**Page**
LF	0AH	Print and line feed.	120
CR	0DH	Print and carriage return.	120
ESC d	1BH,64H	Print and feed <n> lines.	120
ESC e	1BH,65H	Print and reverse feed <n> lines.	121
ESC J	1BH,4AH	Print and feed paper <n> vertical units.	121
ESC K	1BH,4BH	Print and reverse feed [<n> x (1/144)] inches.	121
ESC j	1BH,6AH	Print and reverse feed.	121
Line Spacing Command			
Command		**Name**	**Page**
ESC 2	1BH,32H	Select default line spacing, 1/6 lpi.	122
ESC 3	1BH,33H	Set line spacing.	122
Character Commands			
Command		**Name**	**Page**
ESC SP	1BH,20H	Set right-side character spacing.	122
ESC %	1BH,25H	Select/cancel user-defined character sets.	123
ESC &	1BH,26H	Define user-defined characters.	123
ESC ?	1BH,3FH	Cancel user-defined characters.	124
ESC R	1BH,52H	Select an international character set.	124
ESC [T	1BH,5BH, 54H	Select character code table.	126
ESC ^	1BH,5EH	Print control character.	128
GS #	1DH,23H	Insert Euro character.	128
ESC r	1BH,72H	Select color.	128
ESC t	1BH,74H	Select character code table.	129
ESC !	1BH,21H	Select print mode(s).	130
ESC -	1BH,2DH	Turn on/off underline mode.	130
ESC G	1BH,47H	Turn on/off double-strike mode.	131
ESC {	1BH,7BH	Turn on/off upside-down printing mode.	131
ESC V	1BH,56H	Turn on/off 90° rotation mode.	131
GS !	1DH,21H	Set character size.	132
ESC 4	1BH,34H	Set italics mode.	132
ESC 5	1BH,35H	Reset italics mode.	132
Panel Button Commands			
Command		**Name**	**Page**
ESC c 5	1BH,63H, 35H	Enable/disable panel buttons.	133

Supported EPOS Commands

Paper Sensor Commands			
Command		Name	Page
ESC c 4	1BH,63H, 34H	Select paper sensor(s) to stop printing.	134
ESC c 3	1BH,63H, 33H	Select paper sensor(s) to output paper end signals.	135
Print Position Commands			
Command		Name	Page
ESC $	1BH,24H	Set absolute print position.	136
ESC \	1BH,5CH	Set relative print position.	136
ESC a	1BH,61H	Select justification.	136
BS	08H	Set back space.	137
HT	09H	Set horizontal tab positions.	137
ESC D	1BH,44H	Set horizontal tab positions.	137
GS L	1DH,4CH	Set left margin.	138
GS W	1DH,57H	Set printing width.	138
ESC U	1BH,55H	Turn on/off unidirectional printing mode.	138
ESC l	1DH,6CH	Set left margin.	139
ESC Q	1BH,51H	Set right margin in characters.	139
ESC <	1BH,3CH	Return home.	139
Bit-image Commands			
Command		Name	Page
ESC *	1BH,2AH	Select bit-image mode.	140
Status Commands			
Command		Name	Page
GS a	1DH,61H	Enable/Disable Automatic Status Back (ASB).	141
GS r	1DH,72H	Transmit status.	144
DLE EOT	10H,04H	Transmit real-time status.	145

Supported EPOS Commands

Bar Code Commands			
Command		**Name**	**Page**
GS h	1DH,68H	Set bar code height.	148
GS k	1DH,6BH	Print bar code.	148
GS H	1DH,48H	Select printing position of HRI characters.	150
GS f	1DH,66H	Select font HRI characters.	150
Mechanism Control Commands			
Command		**Name**	**Page**
GS V	1DH,56H	Select cut mode and cut paper.	151
ESC i	1BH,69H	Set partial knife cut.	151
ESC m	1BH,69H	Set partial knife cut.	151
BEL	07H	Sound buzzer.	151
ESC BEL	1BH,07H	Sound buzzer.	151
Miscellaneous Commands			
Command		**Name**	**Page**
GS P	1DH,50H	Set horizontal and vertical motion units.	152
ESC @	1BH,40H	Initialize printer.	152
GS I	1DH,49H	Transmit printer ID.	152
ESC p	1BH,70H	Generate pulse.	153
ESC =	1BH,3DH	Select peripheral device status.	153
DLE ENQ	10H,05H	Send real-time request to printer.	154
ESC y	1BH,79H	Set control feature commands.	161
ESC ~	1BH,7EH	Set extended diagnostics.	161
ESC ‘	1BH,27H	Copy user-defined storage buffers.	154
Macro Function Commands			
Command		**Name**	**Page**
GS :	1DH,3AH	Start/end macro definition.	155
GS ^ r t m	1DH,5EH	Execute macro.	155
GS _	1DH,5FH	Delete start-up macro definition.	156
User-defined Memory Commands			
Command		**Name**	**Page**
GS - <Name> …	1DH,2DH, <Name> …	Define user-defined bit image.	156
GS 0 <Name> …	1DH,30H, <Name> …	Print user-defined bit image.	158
GS 1 <Name> …	1DH,31H, <Name> …	Erase single entry from nonvolatile memory.	158
GS 5	1DH,35H	Erase all entries from nonvolatile memory.	158
GS *	1DH,2AH	Define single user-defined bit-image.	159
GS /	1DH,2FH	Print single user-defined bit-image.	160
GS 6	1DH,36H	Save user-defined character set.	160
GS 7	1DH,37H	Select user-defined character set.	160
GS 3	1DH,33H	Query nonvolatile memory pool information.	160

TM200 and EPOS Command Descriptions

The TM200 and EPOS emulations are grouped together. The TM200 emulation is a subset of the EPOS emulation. The EPOS only commands are noted.

Print and Feed Commands

Function	**Print and line feed**
ASCII	[LF]
Hexadecimal	0AH
Decimal	<10>
Description	The [LF] command prints the data in the print buffer and feeds one line. The amount of paper fed per line is based on the value set using the line spacing command. The default setting is 1/6 inch.

Function	**Print and carriage return**
ASCII	[CR]
Hexadecimal	0DH
Decimal	<13>
Description	When auto line feed is enabled, [CR] functions in the same way as [LF]. When auto line feed is disabled, [CR] prints the data in the print buffer and does not feed the paper.

Function	**Print and feed <n> lines**
ASCII	[ESC] d <n>
Hexadecimal	1BH 64H <n>
Decimal	<27> <100> <n>
Range	$0 \leq n \leq 255$
Description	The [ESC] d <n> command prints the data in the print buffer and feeds <n> lines. The amount of paper fed per line is based on the value set using the line spacing command. The maximum paper feed amount is 40 inches. The default setting of the paper feed amount is 1/6 inch.

Function	**Print and reverse feed<n> lines**
ASCII	[ESC] e <n>
Hexadecimal	1BH 65H <n>
Decimal	<27> <101> <n>
Range	0 ≤ n ≤ 255

Description The [ESC] e <n> command prints the data in the print buffer and feeds <n> lines in the reverse direction. The amount of paper fed per line is based on the value set using the line spacing command. The maximum reverse paper feed amount is 48/144 inch. The default setting of the paper feed amount is 1/6 inch.

Function	**Print and feed paper**
ASCII	[ESC] J <n>
Hexadecimal	1BH 4AH <n>
Decimal	<27> <74> <n>
Range	0 ≤ n ≤ 255

Description The [ESC] J <n> command prints the data in the print buffer and feeds the paper [n x (1/144)] inches, which means that the printer can feed the paper in half-dot units. The command is used to temporarily feed a specific length without changing the line spacing set by other commands.

Function	**Print and reverse feed <n> lines**
ASCII	[ESC] K <n>
Hexadecimal	1BH 4BH <n>
Decimal	<27> <75> <n>
Range	0 ≤ n ≤ 48

Description The [ESC] K <n> command prints the data in the print buffer and feeds the paper [<n> x (1/144)] inches in the reverse direction. Consequently, the printer can feed the paper in half-dot units in the reverse direction. The command is used to temporarily feed a specific length without changing the line spacing set by other commands.

Function	**Print and reverse feed EPOS ONLY**
ASCII	[ESC] j
Hexadecimal	1BH 6AH
Decimal	<27> <106>
Range	0 ≤ n ≤ 48

Description The [ESC] j command prints the data in the print buffer and feeds the paper one line in reverse.

Line Spacing Commands

Function	**Select default line spacing**
ASCII	[ESC] 2
Hexadecimal	1BH 32H
Decimal	<27> <50>

Description The [ESC] 2 command sets the line spacing to 1/6 inch, which is equivalent to 12 dots.

Function	**Set line spacing**
ASCII	[ESC] 3 <n>
Hexadecimal	1BH 33H <n>
Decimal	<27> <51> <n>
Range	$0 \leq n \leq 255$

Description The [ESC] 3 <n> command sets the line spacing to [<n> x (1/144)] inches. The default setting of the paper feed amount is 1/6 inch (<n> = 24). The line spacing can be set in half-dot units.

Character Commands

Function	**Set right-side character spacing**
ASCII	[ESC] SP <n>
Hexadecimal	1BH 20H <n>
Decimal	<27> <32> <n>
Range	$0 \leq n \leq 255$

Description The [ESC] SP <n> sets the right-side character spacing in [<n> x (1/160)] inches. It is used to change the spacing between characters. The default right-side character spacing is set to zero. (<n> = 0). Right-side character spacing can be set in half-dot units.

Function	**Select/cancel user-defined character set**
ASCII	[ESC] % <n>
Hexadecimal	1BH 25H <n>
Decimal	<27> <37> <n>
Range	$0 \le n \le 255$

Description The [ESC] % <n> command selects or cancels the user-defined character set. When the least significant bit (LSB) of <n> is one, the user-defined character set is selected. When <n> is zero, the internal character set is selected, which is the default setting.

Note 1 In TM200 mode, the command only functions if the buffer is set to 40 characters.

Function	**Define user-defined characters**
ASCII	[ESC] & <y> <c_1> <c_2> [x_1 d_1 … d(y *x* x_1)] … [x_k d_1 … d(y *x* x_k)]
Hexadecimal	1BH 26H y c_1 c_2 [x_1 d_1 … d(y *x* x_1)] … [x_k d_1 … d(y *x* x_k)]
Decimal	<27> <38> y c_1 c_2 [x_1 d_1 … d(y *x* x_1)] … [x_k d_1 … d(y *x* x_k)]
Range	y = 2 $32 \le c_1 \le c_2 \le 126$ $0 \le x \le 12$ (9 x 9 font) $0 \le x \le 9$ (7 x 9 font) $0 \le d_1 \ldots d(y\ x\ x) \le 255$

Description The [ESC] & <y> <c_1> <c_2> [x_1 d_1 … d(y *x* x_1)] … [x_k d_1 … d(y *x* x_k)] command defines user-defined characters from character code <c_1> to <c_2>. <y> and <x> are the configurations of user-defined characters. <y> specifies the number of bytes in the vertical direction. <x> specifies the number of bytes in the horizontal direction. Character codes ranging from ASCII code 20H (32) to 7EH (126) can be defined by <c_1> and <c_2>. Up to 19 user-defined characters can be defined. Data (<d>) specifies a bit printed to one and not printed to zero. At the default, user-defined characters are not defined, and the internal character set is printed. Once the user-defined characters have been defined, they are available until [ESC] @ or [ESC] ? is executed; the user-defined characters are redefined; the power is turned off; or the printer is reset.

Note 1 In TM200 mode, the buffer must be set to 40 characters or the command will not function.

Function	**Cancel user-defined characters**
ASCII	[ESC] ? <n>
Hexadecimal	1BH 3FH <n>
Decimal	<27> <63> <n>
Range	32 ≤ n ≤ 126

Description The [ESC] ? <n> command cancels the user-defined characters defined for character code <n>. After the user-defined characters are canceled, the internal character set is printed.

Note 1 In TM200 mode, the buffer must be set to 40 characters or the command will not function.

Function	**Select an international character set**
ASCII	ESC R <n>
Hexadecimal	1BH 52H <n>
Decimal	<27> <82> <n>
Range	0 ≤ n ≤ 74
Default	<n> = 0

Description The ESC R <n> command selects an international character set, <n>, from the following table.

International Character Sets

Country	Epson ID	Country	Epson ID
ASCII	0	Greek 437	38
French	1	Greek 928	39
German	2	Greek 437 CYPRUS	41
British	3	ECMA-94	42
Danish I	4	Canada French	43
Swedish I	5	Cyrillic I-855	44
Italian	6	Cyrillic II-866	45
Spanish I	7	East Europe Latin II-852	46
Japanese	8	Greek 869	47
Norwegian	9	Windows East Europe	49
Danish II	10	Windows Greek	50
Spanish II	11	Latin 5 (Windows Turkey)	51
Latin American	12	Windows Cyrillic	52
French Canadian	13	Hungarian CWI	54
Dutch	14	Kamenicky (MJK)	55
Swedish II	15	ISO Latin 4 (8859/4)	56
Swedish III	16	Turkey_857	57
Swedish IV	17	Roman-8	58
Turkish	18	Hebrew NC (862)	60
Swiss I	19	Hebrew OC	61
Swiss II	20	Windows Hebrew	62
Cyrillic II-866	21	KBL- Lithuanian	63
Polska Mazovia	22	Publisher	64
ISO Latin 2	23	Ukrainian	66
Serbo Croatic I	24	ISO Latin 6 (8859/10)	67
Serbo Croatic II	25	Windows Baltic	68
Multilingual	26	Cyrillic-Latvian	69
Norway	27	Bulgarian	72
Portugal	28	Icelandic-861	73
Turkey	29	Baltic 774	74

Table 24 International Character Sets

Function	**Select character code table**	**EPOS ONLY**
ASCII	ESC [T <n_h> <n_l>	
Hexadecimal	1BH 5BH 54H <n_h> <n_l>	
Decimal	<27> <91> <84> <n_h> <n_l>	
Default	<n_h> = 1 <n_l> = 181 (Code Page 437)	

Description The ESC [T <n_h> <n_l> command selects a code page, <n>, from the character code table.

Code Page	Country	Decimal <n_h> <n_l>	Hex <n_h> <n_l>
64	USA (Slashed 0)	64	0H,040H
65	USA (Unslashed 0)	0,65	0H,041H
66	British	0,66	0H,042H
67	German	0,67	0H,043H
68	French	0,68	0H,044H
69	Swedish I	0,69	0H,045H
70	Danish	0,70	0H,046H
71	Norwegian	0,71	0H,047H
72	Dutch	0,72	0H,048H
73	Italian	0,73	0H,049H
74	French Canadian	0,74	0H,04AH
75	Spanish	0,75	0H,04BH
76	Swedish II	0,76	0H,04CH
77	Swedish III	0,77	0H,04DH
78	Swedish IV	0,78	0H,04EH
79	Turkish	0,79	0H,04FH
80	Swiss I	0,80	0H,050H
81	Swiss II	0,81	0H,051H
91	Welsh	0,91	0H,05BH
437	USA	1,181	1H,0B5H
774	Baltic 774	3,6	3H,006H
850	Multilingual	3,82	3H,052H
852	East Europe Latin II-852	3,84	3H,054H
855	Cyrillic I-855	3,87	3H,057H
857	Turkey 857	3,89	3H,059H
858	Multilingual Euro	3,90	3H,05AH
860	Portugal	3,92	3H,05CH
861	Icelandic-861	3,93	3H,05DH
862	Hebrew NC (862)	3,94	3H,05EH
863	Canada French	3,95	3H,05FH
865	Norway	3,97	3H,061H

Code Page	Country	Decimal <n_h> <n_l>	Hex <n_h> <n_l>
866	Cyrillic II-866	3,98	3H,062H
869	Greek 869	3,101	3H,065H
874	Thailand	3,106	3H,06AH
895	Kamenicky (MJK)	3,127	3H,07FH
1008	Greek 437	3,240	3H,0F0H
1009	Greek 928	3,241	3H,0F1H
1011	Greek 437 CYPRUS	3,243	3H,0F3H
1012	Turkey	3,244	3H,0F4H
1013	Cyrillic II-866	3,245	3H,0F5H
1014	Polska Mazovia	3,246	3H,0F6H
1015	ISO Latin 2	3,247	3H,0F7H
1016	Serbo Croatic I	3,248	3H,0F8H
1017	Serbo Croatic II	3,249	3H,0F9H
1018	ECMA-94	3,250	3H,0FAH
1019	Windows East Europe	3,251	3H,0FBH
1020	Windows Greek	3,252	3H,0FCH
1021	Latin 5 (Windows Turkey)	3,253	3H,0FDH
1022	Windows Cyrillic	3,254	3H,0FEH
1024	Hungarian CWI	4,0	4H,000H
1026	ISO Latin 4 (8859/4)	4,2	4H,002H
1027	Ukrainian	4,3	4H,003H
1028	Roman-8	4,4	4H,004H
1029	ISO Latin 6 (8859/10)	4,5	4H,005H
1030	Hebrew NC (862)	4,6	4H,006H
1031	Hebrew OC	4,7	4H,007H
1032	Windows Hebrew	4,8	4H.008H
1033	KBL- Lithuanian	4,9	4H,009H
1034	Windows Baltic	4,10	4H,00AH
1035	Cyrillic-Latvian	4,11	4H,00BH
1072	Bulgarian	4,48	4H,030H

Table 25 Character Code Pages

Function	**Print control character EPOS ONLY**
ASCII	[ESC] ^ <n>
Hexadecimal	1BH 5EH <n>
Decimal	<27> <94> <n>
Range	0 ≤ n ≤ 255

Description The [ESC] ^ <n> command allows characters from zero to 31 codes to be printed. During normal operation, characters from zero to 31 are control characters. Control code translation is turned off for the following character.

Function	**Insert Euro character EPOS ONLY**
ASCII	GS # <n>
Hexadecimal	1DH 23H <n>
Decimal	<29> <35> <n>

Description The GS # <n> command allows an application to replace any character in the currently active character set with the Euro character. The character to be replaced is defined by <n>. For example, if the currently active character set is CP 850 (multilingual) and the 0D5H character is to be the Euro character, 1DH 23H replaces the character at 0D5H with the Euro symbol.

Function	**Turn color mode on/off**
ASCII	[ESC] r <n>
Hexadecimal	1BH 72H <n>
Decimal	<27> <114> <n>
Range	<n> = 0, 1, 48, 49

Description The [ESC] r <n> command turns on or off color mode. When <n> = 1 or 49, color mode is turned on, and when <n> = 0 or 48, color mode is turned off. The default setting is <n> = 0.

Function	**Select character code table**
ASCII	[ESC] t <n>
Hexadecimal	1BH 74H <n>
Decimal	<27> <116> <n>
Range	0 ≤ n ≤ 5; <n> = 254, 255

Description The [ESC] t <n> command selects a page, <n>, from the character code table as follows. The alphanumeric characters (20H to 7FH) are the same for each page. The graphic characters (80H to FFH) are different for each page. The default setting is page 0.

<n>	Character Code Table
0	Page 0 [PC437 (U.S.A. and Standard Europe)]
1	Page 1 [PC850 (Multilingual)]
2	Page 2 [PC850 (Multilingual)]
3	Page 3 [PC860 (Portuguese)]
4	Page 4 [PC863 (Canadian-French)]
5	Page 5 [PC865 (Nordic)]
255	Page 255 [Space page]

Table 26 Character Code Table

Function	**Select print mode(s)**
ASCII	[ESC] ! <n>
Hexadecimal	1BH 21H <n>
Decimal	<27> <33> <n>
Range	0 ≤ n ≤ 255

Description The [ESC] ! <n> command selects print modes using <n> as follows. The default character font is 7 x 9. The defaults for the other print modes are set to <n> = 1.

Bit	Off/On	Hexadecimal	Decimal	Function
0	Off	00H	<0>	Select 9 x 9 character font.
	On	01H	<1>	Select 7 x 9 character font.
1,2	-	-	-	Undefined
3	Off	00H	<0>	Emphasized mode is not selected.
	On	08H	<8>	Emphasized mode is selected.
4	Off	00H	<0>	Double-height mode is not selected.
	On	10H	<16>	Double-height mode is selected.
5	Off	00H	<0>	Double-wide mode is not selected.
	On	20H	<32>	Double-wide mode is selected.
6	-	-	-	Undefined
7	Off	00H	<0>	Underline mode is not selected.
	On	80H	<128>	Underline mode is selected.

Table 27 Print Modes

Function	**Turn on/off underline mode**
ASCII	[ESC] - <n>
Hexadecimal	1BH 2DH <n>
Decimal	<27> <45> <n>
Range	<n> = 0, 1, 48, 49

Description The [ESC] - <n> command turns on or off underline mode. When <n> = 1 or 49, underline mode is turned on, and when <n> = 0 or 48, underline mode is turned off. The default setting is <n> = 0.

Function	**Turn on/off emphasized mode**
ASCII	[ESC] E <n>
Hexadecimal	1BH 45H <n>
Decimal	<27> <69> <n>
Range	0 ≤ n ≤ 255

Description The [ESC] E <n> command turns on or off emphasized mode. When the least significant bit (LSB) of <n> = 1, emphasized mode is turned on; when it is 0, emphasized mode is turned off. The default setting is <n> = 0. Emphasized and double-strike printing appear the same.

Function	**Turn on/off double-strike mode**
ASCII	[ESC] G <n>
Hexadecimal	1BH 47H <n>
Decimal	<27> <71> <n>
Range	0 ≤ n ≤ 255

Description The [ESC] G <n> command turns on or off double-strike mode. When the least significant bit (LSB) of <n> = 1, double-strike mode is turned on; when it is 0, double-strike mode is turned off. The default setting is <n> = 0. Double-strike and emphasized printing appear the same.

Function	**Turn on/off upside-down print mode**
ASCII	[ESC] { <n>
Hexadecimal	1BH 7BH <n>
Decimal	<27> <123> <n>
Range	0 ≤ n ≤ 255

Description The [ESC] { <n> turns on or off upside-down printing mode. When the least significant bit of <n> = 1, upside-down printing mode is turned on; when it is 0, upside-down printing mode is turned off. The default setting is <n> = 0. When upside-down mode is turned on, the printer prints 180° rotated characters from right to left. The line printing order is not reversed, so the order of the data transmitted is important. The command is enabled only when input at the beginning of a line.

Function	**Turn on/off 90° rotation mode EPOS ONLY**
ASCII	ESC V <n>
Hexadecimal	1BH 56H <n>
Decimal	<27> <86> <n>
Range	<n> = 0, 1, 2, 48, 49, 50

Description The ESC V <n> command turns on/off 90° clockwise rotation mode. The command is only enabled in standard mode. In page mode, an internal flag is activated, and the command is enabled when the printer returns to standard mode.

<n>	Function
0, 48	Turns off all rotation modes
1, 49	Turns on 90° clockwise rotation mode
2, 50	Turns on 90° counterclockwise rotation mode

Table 28 Rotation Modes

Function	**Set character size**	**EPOS ONLY**
ASCII	GS ! <n>	
Hexadecimal	1DH 21H <n>	
Decimal	<29> <33> <n>	

Description The GS ! <n> command sets the horizontal and vertical scaling. The upper nibble is the horizontal scale, and the lower nibble is the vertical scale. The minimum size is x1, and the maximum size is x8.

Where <n> =

`xxxx0000`	Vertical scale 1
`xxxx0001`	Vertical scale 2
`xxxx0111`	Vertical scale 8
`0000xxxx`	Horizontal scale 1
`0001xxxx`	Horizontal scale 2
`0111xxxx`	Horizontal scale 8

Function	**Begin italics**	**EPOS ONLY**
ASCII	[ESC] 4	
Hexadecimal	1BH 34H	
Decimal	<27> <52>	

Description The [ESC] 4 command begins italics print mode.

Note 1 Italics are not available in all print modes.

Function	**End italics**	**EPOS ONLY**
ASCII	[ESC] 5	
Hexadecimal	1BH 35H	
Decimal	<27> <53>	

Description The [ESC] 5 command ends italics print mode.

Panel Button Commands

Function	**Enable/disable paper feed**
ASCII	[ESC] c 5 <n>
Hexadecimal	1BH 63H 35H <n>
Decimal	<27> <99> <53> <n>
Range	0 ≤ n ≤ 255

Description The [ESC] c 5 <n> command enables or disables the LINE FEED button. When the least significant bit (LSB) of <n> = one, the LINE FEED button is disabled; when it is zero, the button is enabled. To prevent problems caused by accidentally pressing the LINE FEED button, use the command to disable it. The LINE FEED button is temporarily enabled, regardless of how the command is set during the wait time set by the [GS] z 0 command for paper insertion and during the recovery confirmation time.

Paper Sensor Commands

Function	**Select paper sensor(s) to stop printing**
ASCII	[ESC] c 4 <n>
Hexadecimal	1BH 63H 34H <n>
Decimal	<27> <99> <52> <n>
Range	0 ≤ n ≤ 255

Description The [ESC] c 4 <n> command selects the sensor that tells the printer to stop printing when out of paper. The default setting occurs when all paper sensors are disabled. (<n> = 0). Bits 0 and 1 indicate the same sensor. If one of the bits is enabled, the paper roll near-end sensor is selected to stop printing. When the paper roll near-end sensor is enabled and the sensor detects a near-end condition during printing, the printer completes the current job then automatically goes off-line. Replacing a new paper roll restarts the printing. When the paper roll near-end sensor is disabled and a paper near-end condition is detected during printing, the paper out LED comes on, but the printer continues to print.

<n> is defined as follows:

Bit	On/Off	Hexadecimal	Decimal	Function
	Off	00H	<0>	Paper roll near-end sensor disabled
	On	01H,02H,03H	<1>,<2>,<3>	Paper roll near-end sensor enabled
7	-	00H	<0>	Undefined

Table 29 Paper Sensor Commands

Function	**Select paper sensor(s) to output paper-end signals**
ASCII	[ESC] c 3 <n>
Hexadecimal	1BH 63H 33H <n>
Decimal	<27> <99> <51> <n>
Range	0 ≤ n ≤ 255

Description The [ESC] c 3 <n> command selects the paper sensor that outputs a paper-end signal to the parallel interface when a paper-end is detected. The default setting is when all sensors are enabled. (<n> = 15). It is possible to select multiple sensors to output signals. If any of the sensors detect a paper end, the paper end signal is output. The command is only available with a parallel interface. The paper-end sensor is an option. If the sensor is not equipped, the settings of bits 0 and 1 of the command are not effective.

Bit	On/Off	Hexadecimal	Decimal	Function
0	Off	00H	<0>	Paper roll near-end sensor disabled
	On	01H	<1>	Paper roll near-end sensor enabled
1	Off	00H	<0>	Paper roll near-end sensor disabled
	On	02H	<2>	Paper roll near-end sensor enabled
2	Off	00H	<0>	Paper roll end sensor disabled
	On	04H	<4>	Paper roll end sensor enabled
3	Off	00H	<0>	Paper roll end sensor disabled
	On	08H	<8>	Paper roll end sensor enabled
4-7	-	-	-	Undefined

Table 30 Paper Sensor Commands

Print Position Commands

Function	**Set absolute print position**	**EPOS ONLY**
ASCII	[ESC] $ <n_l> <n_h>	
Hexadecimal	1BH 24H <n_l> <n_h>	
Decimal	<27> <36> <n_l> <n_h>	
Range	$0 \le n_l \le 255$ $0 \le n_h \le 255$	

Description The ESC $ <n_l> <n_h> command sets the print starting position from the beginning of the line.

Function	**Set relative print position**	**EPOS ONLY**
ASCII	[ESC] \ <n_l> <n_h>	
Hexadecimal	1BH 5CH <n_l> <n_h>	
Decimal	<27> <92> <n_l> <n_h>	
Range	$0 \le n_l \le 255$ $0 \le n_h \le 255$	

Description The [ESC] \ <n_l> <n_h> command sets the print starting position based on the current position and the distance from the current position to [(n_l + n_h × 256) × horizontal unit]. When standard mode is selected, the horizontal motion unit set by GS P is used. When page mode is selected, the horizontal or vertical motion unit set by GS P is used for the print direction set by ESC T.

Function	**Select justification**
ASCII	[ESC] a <n>
Hexadecimal	1BH 61H <n>
Decimal	<27> <97> <n>
Range	$0 \le n \le 2$ $48 \le n \le 50$

Description The [ESC] a <n> command aligns all the data in one line to a specified position. Left justification is selected when <n> = 0 or 48, centering is selected when <n> = 2 or 50. The default setting is left justification. (<n> = 0). The command is enabled only when input at the beginning of a line.

Function	**Set back space EPOS ONLY**
ASCII	[BS]
Hexadecimal	08H
Decimal	<8>

Description The [BS] command moves the print buffer one character width to the left. The pointer position cannot be moved to the left of the left margin. [BS] does not cause the buffer to be printed; the following data is OR'ed with the previous data.

Function	**Set horizontal tab**
ASCII	[HT]
Hexadecimal	9H
Decimal	<10>

Description The [HT] command moves the print position to the next horizontal tab position. The command is used to align character columns. The command is ignored unless another horizontal tab position has been set.

Note 1 In TM200 mode, the buffer must be set to 40 characters.

Function	**Set horizontal tab positions**
ASCII	[ESC] D $<n_1>$ … $<n_k>$ NUL
Hexadecimal	1BH 44H $<n_1>$ … $<n_k>$ 00
Decimal	<27> <68> $<n_1>$ … $<n_k>$ <0>
Range	$1 \le n \le 255$ $0 \le k \le 32$

Description The [ESC] D $<n_1>$ … $<n_k>$ NUL command sets the horizontal tab positions. <n> specifies the column number for setting a horizontal tab position. The command deletes any previously set horizontal tab positions. Up to 32 tab positions can be set. The default tab positions are at intervals of eight characters for 7 x 9 font.

Note 1 In TM200 mode, the buffer must be set to 40 characters.

Function	**Set left margin EPOS ONLY**
ASCII	GS L <n_l> <n_h>
Hexadecimal	1DH 4CH <n_l> <n_h>
Decimal	<29> <76> <n_l> <n_h>
Range	$0 \le n_l \le 255$ $0 \le n_h \le 255$

Description The GS L <n_l> <n_h> command sets the left margin using n_l and n_h. The left margin is set to $[(n_l + n_h \times 256) \times$ horizontal motion unit$)]$ from the beginning of the line. In standard mode, the command is enabled only when input at the beginning of a line. In page mode, an internal flag is activated, and the command is enabled when the printer returns to standard mode.

Function	**Set printing area width EPOS ONLY**
ASCII	GS W <n_l> <n_h>
Hexadecimal	1DH 57H <n_l> <n_h>
Decimal	<29> <87> <n_l> <n_h>
Range	$0 \le n_l \le 255$ $0 \le n_h \le 255$

Description The printing area width is set to $[(n_l + n_h \times 256) \times$ horizontal motion unit$)]$ from the left margin. In standard mode, the command is enabled only when input at the beginning of a line. In page mode, an internal flag is activated, and the command is enabled when the printer returns to standard mode.

Function	**Turn on/off unidirectional printing mode**
ASCII	[ESC] U <n>
Hexadecimal	1BH 55H <n>
Decimal	<27> <85> <n>
Range	$0 \le n \le 255$

Description The [ESC] U <n> command turns on/off unidirectional printing mode. When the least significant bit (LSB) of <n> = 1, unidirectional printing is turned on. When LSB = 0, unidirectional printing is turned off, and bidirectional printing is turned on. Unidirectional printing can be turned on when printing double-high characters to ensure that the top and bottom of the characters are aligned. <n> = 0 is the default setting.

Function	**Set left margin EPOS ONLY**
ASCII	[ESC] l <n>
Hexadecimal	1DH 6CH <n>
Decimal	<29> <108> <n>
Range	0 ≤ n ≤ 255

Description The [ESC] 1 <n> command sets the left margin using <n>. The left margin is set to <n> characters from the beginning of the line.

Function	**Set right margin EPOS ONLY**
ASCII	[ESC] Q <n>
Hexadecimal	1BH 51H <n>
Decimal	<29> <81> <n>
Range	0 ≤ n ≤ 255

Description The [ESC] Q <n> command sets the right margin using <n>. The right margin is set to <n> characters from the beginning of the line.

Function	**Return home**
ASCII	[ESC] <
Hexadecimal	1BH 3CH
Decimal	<27> <60>

Description The [ESC] < command moves the print head to the home position.

Bit-Image Commands

Function	**Select bit-image mode**
ASCII	[ESC] * <m> <n_l> <n_h> <d_l> … <d_k>
Hexadecimal	1BH 2AH <m> <n_l> <n_h> <d_l> … <d_k>
Decimal	<27> <42> <m> <n_l> <n_h> <d_l> … <d_k>
Range	<m> = 0, 1 $0 \le n_l \le 255$ $0 \le n_h \le 3$ $0 \le d \le 255$ $k = n_l + n_h \times 256$

Description [ESC] * <m> <n_l> <n_h> <d_l> … <d_k> command selects a bit-image mode using <m> for the number of dots specified by ($n_l + n_h$ x 256). <d> indicates the bit image data. Set a bit to one to print a dot, or set a bit to zero to not print a dot. Use the command to print a predefined picture or logo. The modes selectable by <m> are listed below.

<m>	Mode	Vertical Direction		Horizontal Direction	
		Dot Density	Number of Dots	Dot Density	Number of Dots
0	8-dot single density	72 dpi	8	80 dpi	200
1	8-dot double density	72 dpi	8	160 dpi	400

Table 31 Print Density Selection

Status Commands

Function	**Enable/disable Automatic Status Back (ASB)**
ASCII	[GS] a <n>
Hexadecimal	1DH 61H <n>
Decimal	<29> <97> <n>
Range	0 ≤ n ≤ 255

Description The [GS] a <n> command selects a status for ASB transmission. ASB is enabled if any status item is selected. The printer automatically transmits a 4-byte status message whenever the status changes. Multiple status items can be enabled or disabled. When <n> = 0, ASB is disabled.

The default depends on the DIP switch settings (<n> = 0 or 2). When the printer is disabled by the [ESC] = command and ASB is enabled, the printer transmits a 4-byte status message every time the status changes. If the printer goes off-line due to a paper-end condition, bit 0 of the second byte (waiting for on-line recovery) is on from the time the paper roll is inserted until the time the printer goes on-line. See the [GS] z 0 command for details of on-line recovery wait time.

The paper roll near-end sensor is an option. If the printer is not equipped with the paper near-end sensor, bits 0 and 1 of the third byte are always on, with paper adequate status. Bit 3 of the second byte is always, "No error." The status items are selected using <n> as follows:

Bit	Off/On	Hex	Decimal	Status for Automatic Status Back (ASB)
0	Off	00H	<0>	Drawer kick-out connector pin 3 status disabled
	On	01H	<1>	Drawer kick-out connector pin 3 status enabled
1	Off	00H	<0>	On-line/off-line disabled
	On	02H	<2>	On-line/off-line enabled
2	Off	00H	<0>	Error status disabled
	On	04H	<4>	Error status enabled
3	Off	00H	<0>	Paper roll sensor status disabled
	On	08H	<8>	Paper roll sensor status enabled
-	-	-	-	Undefined

Table 32 Automatic Status Back (ASB) Values for <n>

Bit	Off/On	Hex	Decimal	Status for Automatic Status Back (ASB)
0	Off	00H	<0>	Not used; fixed to Off
1	Off	00H	<0>	Not used; fixed to Off
2	Off	00H	<0>	Drawer kick-out connector pin 3 low
	On	04H	<4>	Drawer kick-out connector pin 3 high
3	Off	00H	<0>	On-line
	On	08H	<8>	Off-line
4	On	10H	<16>	Not used; fixed to On
5	-	-	-	Undefined
6	Off	00H	<0>	Paper is not being fed by the LINE FEED button.
	On	40H	<64>	Paper is being fed by the line feed button.
	Off	00H	<0>	Not used; fixed to Off

Table 33 Automatic Status Back (ASB) First Byte (Printer Information)

Bit	Off/On	Hex	Decimal	Status for Automatic Status Back (ASB)
0	Off	00H	<0>	Not waiting for on-line recovery
	On	01H	<1>	Waiting for on-line recovery
1	-	-	-	Undefined
2	Off	00H	<0>	No mechanical error
	On	04H	<4>	Mechanical error occurred
3	Off	00H	<0>	No autocutter error
	On	08H	<8>	Autocutter error occurred
4	Off	00H	<0>	Not used; fixed to off
5	Off	00H	<0>	No unrecoverable error
	On	20H	<32>	Unrecoverable error occurred
6	Off	00H	<0>	No temporary abnormality of the print head temperature (high temperature)
	On	40H	<64>	Temporary abnormality of the print head temperature (high temperature) occurred
	Off	00H	<0>	Not used; fixed to Off

Table 34 Automatic Status Back (ASB) Second Byte (Error Information)

Bit	Off/On	Hex	Decimal	Status for Automatic Status Back (ASB)
0,1	Off	00H	<0>	Paper near-end sensor: paper adequate
	On	(03H)	(3)	Paper near-end sensor: paper near end
2,3	Off	00H	<0>	Paper end sensor: paper present
	On	0CH	<12>	Paper end sensor: paper not present
4	Off	00H	<0>	Not used; fixed to Off
5,6	-	-	-	Undefined
7	Off	00H	<0>	Not used; fixed to Off

Table 35 Automatic Status Back (ASB) Third Byte (Paper Sensor Information)

Bit	Off/On	Hex	Decimal	Status for Automatic Status Back (ASB)
0-3	-	-	-	Undefined
4	Off	00H	<0>	Not used; fixed to Off
5,6	-	-	-	Undefined
7	Off	00H	<0>	Not used; fixed to Off

Table 36 Automatic Status Back (ASB) Fourth Byte (Paper Sensor Information)

Function	**Transmit status**
ASCII	[GS] r <n>
Hexadecimal	1DH 72H <n>
Decimal	<29> <114> <n>
Range	1 ≤ n ≤ 2 49 ≤ n ≤ 50

Description The [GS] r <n> command transmits the status specified by <n> as follows: paper sensor status as one byte of data when <n> = 1 or 49, and drawer kick-out connector status when <n> = 2 or 50. The paper present status of bits 2 and 3 for the paper sensor status is not transmitted because the printer goes off-line when a paper-end is detected by the paper-end sensor. The paper roll near-end sensor is an option. If the sensor is not installed, bits 0 and 1 for the paper sensor status are always in the "Paper adequate" status.

Bit	Off/On	Hex	Decimal	Status
0,1	Off	00H	<0>	Paper near-end sensor: paper adequate
	On	(03H)	(3)	Paper near-end sensor: paper near end
2,3	Off	00H	<0>	Paper end sensor: paper present
	On	0CH	<12>	Paper end sensor: paper not present
4	Off	00H	<0>	Not used; fixed to Off
5,6	-	-	-	Undefined
7	Off	00H	<0>	Not used; fixed to Off

Table 37 Paper Sensor Status (<n> = 1, 49)

Bit	Off/On	Hex	Decimal	Status
0	Off	00H	<0>	Drawer kick-out connector pin 3 low
	On	01H	<1>	Drawer kick-out connector pin 3 high
1-3	-	-	-	Undefined
4	Off	00H	<0>	Not used; fixed to Off
5,6	-	-	-	Undefined
7	Off	00H	<0>	Not used; fixed to Off

Table 38 Drawer Kick-out Connector Status (<n> = 2, 50)

Function	**Transmit real-time status**
ASCII	[DLE] EOT <n>
Hexadecimal	10H 04H <n>
Decimal	<16> <4> <n>
Range	1 ≤ n ≤ 4

Description The [DLE] EOT <n> command transmits the specified status in real time. The command is executed if the printer is off-line, the print buffer is full, or an error occurs. If the printer goes off-line due to a paper-end condition, bit 5 of the printer status (waiting for on-line recovery) is on from the time the paper roll is inserted to the time the printer goes on-line. See the [GS] z 0 command for details of the on-line recovery wait time. The paper roll near-end sensor is an option. If the printer does not have a paper near-end sensor, bits 2 and 3 of the paper roll sensor status will always be "Paper adequate." Bit 3 of the second byte is always "No error occurred."

<n>	Function
1	Transmit printer status
2	Transmit off-line status
3	Transmit error status
4	Transmit paper roll sensor status

Table 39 Values for the Status Function, <n>

Bit	Off/On	Hexl	Decimal	Status
0	Off	00H	<0>	Not used; fixed to off
1	On	02H	<2>	Not used; fixed to on
2	Off	00H	<0>	Drawer kick-out connector pin 3 low
	On	04H	<4>	Drawer kick out connector pin 3 high
3	Off	00H	<0>	On-line
	On	08H	<8>	Off-line
4	On	10H	<16>	Not used; fixed to on
5	Off	00H	<0>	Not waiting for on-line recovery
	On	20H	<32>	Waiting for on-line recovery
6	-	-	-	Undefined
7	Off	00H	<0>	Not used; fixed to off

Table 40 Printer Status (<n> = 1)

Bit	Off/On	Hexl	Decimal	Status
0	Off	00H	<0>	Not used; fixed to off
1	On	02H	<2>	Not used; fixed to on
2	-	-	-	Undefined
3	Off	00H	<0>	Paper is not being fed by the LINE FEED button.
	On	08H	<8>	Paper is being fed by the line feed button.
4	On	10H	<16>	Not used; fixed to on
5	Off	00H	<0>	No paper-end stop
	On	20H	<32>	Printing stops due to paper-end
6	Off	00H	<0>	No error
	On	40H	<64>	Error occurs
7	Off	00H	<0>	Not used; fixed to off

Table 41 Off-line Status (<n> = 2)

Bit	Off/On	Hex	Decimal	Status
0	Off	00H	<0>	Not used; fixed to off
1	On	02H	<2>	Not used; fixed to on
2	Off	00H	<0>	No mechanical error
	On	04H	<4>	Mechanical error occurred
3	Off	00H	<0>	No autocutter error
	On	08H	<8>	Autocutter error occurred
4	On	10H	<16>	Not used; fixed to on
5	Off	00H	<0>	Unrecoverable error occurred
	On	20H	<32>	Recoverable error occurred
6	Off	00H	<0>	No temporary abnormality of the print headtemperature (high temperature)
	On	40H	<64>	Temporary abnormality of the print head temperature (high temperature) occurred
7	Off	00H	<0>	Not used; fixed to off

Table 42 Error Status (<n> = 3)

Bit	Off/On	Hex	Decimal	Status
0	Off	00H	<0>	Not used; fixed to off
1	On	02H	<2>	Not used; fixed to on
2,3	Off	00H	<0>	Paper near-end sensor: paper adequate
	On	(0CH)	(<12>)	Paper near-end sensor: paper near end
4	On	10H	<16>	Not used; fixed to on
5,6	Off	00H	<0>	Paper end sensor: paper adequate
	On	60H	<96>	Paper end sensor: paper not present
7	Off	00H	<0>	Not used; fixed to off

Table 43 Paper Roll Sensor Status (<n> = 4)

Bar Code Commands

Function	**Set bar code height EPOS ONLY**
ASCII	GS h <n>
Hexadecimal	1DH 68H <n>
Decimal	<29> <104> <n>
Range	1 ≤ n ≤ 255
Default	0.90 inch high

Description The GS h <n> command sets the height of the bar code. The bar code height is set to n/180 inch.

Function	**Print bar code EPOS ONLY**
[1]ASCII	GS k <m> <d_l> … <d_k> NUL
Hexadecimal	1DH 6BH <m> <d_l> … <d_k> 00
Decimal	<29> <107> <m> <d_l> … <d_k> 0
[2]ASCII	GS k <m> <n> <d_l> … <d_n>
Hexadecimal	1DH 6BH <m> <n> <d_l> … <d_n>
Decimal	<29> <107> <m> <n> <d_l> … <d_n>
Range	[1] 0 ≤ m ≤ 6 (k and d depend on the bar code system used.) [2] 65 ≤ m ≤ 73 (n and d depend on the bar code system used.)

Description The GS k <m> <d_l> … <d_k> NUL command selects a bar code system and prints the bar code.

<m>		Bar Code System	Number of Characters	Remarks
1	0	UPC A	11 ≤ k ≤ 12	48 ≤ d ≤ 57
1	1	UPC E	11 ≤ k ≤ 12	48 ≤ d ≤ 57
1	2	JAN-13 (EAN-13)	12 ≤ k ≤ 13	48 ≤ d ≤ 57
1	3	JAN-8 (EAN-8)	7 ≤ k ≤ 8	48 ≤ d ≤ 57
1	4	Code 39	1 ≤ k	48 ≤ d ≤ 57, 65 ≤ d ≤ 90 d = 32, 36, 37, 43, 45, 46, 47
1	5	ITF	1 ≤ k (even number)	48 ≤ d ≤ 57
1	6	Codabar	1 ≤ k	48 ≤ d ≤ 57, 65 ≤ d ≤ 68 d = 32, 36, 37, 43, 45, 46, 47, 58
2	65	UPC A	11 ≤ k ≤ 12	48 ≤ d ≤ 57
2	66	UPC E	11 ≤ k ≤ 12	48 ≤ d ≤ 57
2	67	JAN-13 (EAN-13)	12 ≤ k ≤ 13	48 ≤ d ≤ 57
2	68	JAN-8 (EAN-8)	7 ≤ k ≤ 8	48 ≤ d ≤ 57
2	69	Code 39	1 ≤ n ≤ 255	48 ≤ d ≤ 57, 65 ≤ d ≤ 90 d = 32, 36, 37, 43, 45, 46, 47
2	70	ITF	1 ≤ n ≤ 255 (even number)	48 ≤ d ≤ 57

<m>		Bar Code System	Number of Characters	Remarks
2	71	Codabar	1 ≤ n ≤ 255	48 ≤ d ≤ 57, 65 ≤ d ≤ 68 d = 32, 36, 37, 43, 45, 46, 47, 58
2	72	Code 93	1 ≤ n ≤ 255	0 ≤ d ≤ 127
2	73	Code 128	2 ≤ n ≤ 255	0 ≤ d ≤ 127

Table 44 Bar Code System Based on <m>

[Description for [1]] <d> indicates the character code to be printed.
A null (00 Hex) character ends the bar code definition.

[Description for [2]] <n> indicates the number of bytes of bar code data to be processed immediately following <n>.
<d> indicates the character code to be printed.

The following apply to both **GS k <m> <d_l> … <d_k> NUL**
GS k <m> <n> <d_l> … <d_n>:

1. If the horizontal width exceeds the printing area, the printer only feeds the paper.
2. These commands feed as much paper as necessary to print the bar code according to the GS h command.
3. These commands are enabled only when no data exists in the print buffer. When data does exist in the print buffer, the printer processes the data following <m> as normal data.
4. After printing a bar code, the print position is set at the beginning of the line.
5. These commands are not effected by print modes (emphasized, underline, character size, etc.), except for upside-down mode.

Function	**Select printing position of HRI characters**	**EPOS ONLY**
ASCII	GS H <n>	
Hexadecimal	1DH 48H <n>	
Decimal	<29> <72> <n>	
Range	0 ≤ n ≤ 3, 48 ≤ n ≤ 51	

Description The GS H <n> command selects the printing position of HRI (Human Readable Interpretation) characters when printing a bar code. <n> selects the printing position as follows.

<n>	Printing position
0, 48	Not printed
1, 49	Above bar code
2, 50	Below bar code
3, 51	Both above and below the bar code

Table 45 Printing Position of HRI Characters

Function	**Select font for HRI characters**	**EPOS ONLY**
ASCII	GS f <n>	
Hexadecimal	1DH 66H <n>	
Decimal	<29> <102> <n>	
Range	<n> = 0, 1, 48, 49	

Description The GS f <n> command selects a font for the HRI (Human Readable Interpretation) characters used when printing a bar code. <n> selects a font from the following table.

<n>	Font
0, 48	Font A (14 x 12)
1, 49	Font B (12 x 12)

Table 46 Font for Human Readable Interpretation (HRI) Characters

Mechanism Control Commands

Function	**Select cut mode and cut paper**
ASCII	[GS] V <m> <n>
Hexadecimal	1DH 56H <m> <n>
Decimal	<29> <86> <m> <n>

Description When <m> = 1 or 49, <n> is not used and a partial cut is performed. When <m> = 66, [GS] V <m> <n> executes a partial cut (one point left uncut) after paper is fed [cutting position (<n> x approximately 1/144 inch)]. When using the command, there is a gap between the auto-cutter position and the print position. The [GS] V <m> <n> command is only effective when input at the beginning of a line. The [GS] V <m> <n> command executes paper feeding to the manual cutting position.

Function	**Partial knife cut EPOS ONLY**
ASCII	[ESC] i
Hexadecimal	1BH 69H
Decimal	<27> <105>

Description The [ESC] i command performs a partial knife cut.

Function	**Perform a partial knife cut EPOS ONLY**
ASCII	[ESC] m
Hexadecimal	1BH 6DH
Decimal	<27> <109>

Description The [ESC] m command performs a partial knife cut.

Function	**Sound buzzer EPOS ONLY**
ASCII	[BEL]
Hexadecimal	07H
Decimal	<07>

Description The [BEL] command sounds the internal buzzer, if equipped.

Function	**Sound buzzer EPOS ONLY**
ASCII	[ESC] BEL
Hexadecimal	1BH 07H
Decimal	<27> <07>

Description The [ESC] BEL command sounds the internal buzzer, if equipped.

Miscellaneous Commands

Function	**Set horizontal and vertical motion units**	**EPOS ONLY**
ASCII	[GS] P x y	
Hexadecimal	1DH 50H x y	
Decimal	<29> <80> x y	
Range	$0 \le x \le 255$	
Default	x = 180, y = 360	

Description The GS P x y command sets the horizontal and vertical motion units to 1/x inches and 1/y inches, respectively. When x and y are set to zero, the default setting of each value is used.

Function	**Initialize the printer**
ASCII	[ESC] @
Hexadecimal	1BH 40H
Decimal	<27> <64>

Description The [ESC] @ command initializes the printer. All settings, including character font and line spacing, are canceled.

Function	**Transmit printer ID**
ASCII	[GS] I <n>
Hexadecimal	1DH 49H <n>
Decimal	<29> <73> <n>
Range	$1 \le n \le 3$ $49 \le n \le 51$

Description The [GS] I <n> command transmits the printer ID specified by <n> below. Each printer ID consists of one byte of data.

<n>	Printer ID	Hex ID
1,49	Printer model ID	0DH
2,50	Type ID	00H or 02H
3,51	ROM version ID	Refer to current ROM version.

Table 47 Printer ID

Bit	Off/On	Hex	Decimal	Function
0	Off	00H	<0>	No two-byte character code
1	Off	00H	<0>	Not autocutter equipped
	On	02H	<2>	Autocutter equipped
2,3	-	-	-	Undefined
4	Off	00H	<0>	Not used; fixed to off
5,6	-	-	-	Undefined
7	Off	00H	<0>	Not used; fixed to off

Table 48 Type ID (<n> = 2 or 50)

Function	**Generate pulse**
ASCII	[ESC] p <m> <t_1> <t_2>
Hexadecimal	1BH 70H <m> <t_1> <t_2>
Decimal	<27> <112> <m> <t_1> <t_2>
Range	<m> = 0, 1, 48, 49 0 ≤ t1 ≤ 255 0 ≤ t2 ≤ 255

Description The [ESC] p <m> <t_1> <t_2> command sends a pulse (on time = <t_1> x 2 msec) to the specified connector pin. When <m> = 1 or 48, the pulse is sent to drawer-kick-out connector pin 2. When <m> = 0 or 48, the pulse is sent to drawer-kick-out connector pin 2; when <m> = 1 or 49, the pulse is sent to drawer-kick-out connector pin 5.

Function	**Select peripheral device status**
ASCII	[ESC] = <n>
Hexadecimal	1BH 3DH <n>
Decimal	<27> <61> <n>
Range	1 ≤ n ≤ 3

Description The [ESC] = <n> command selects the device to which the host computer sends data, based on the value of <n> listed below.

Bit	Off/On	Hex	Decimal	Function
0	Off	00H	<0>	Printer disabled
	On	01H	<1>	Printer enabled
1	Off	00H	<0>	Customer display disabled
	On	02H	<2>	Customer display enabled
2-7	-	-	-	Undefined

Table 49 Peripheral Device Bit Definitions

Note 1 In TM200 mode, the value of <n> must be <2> to enable the display, and <1> to enable the printer. This does not match the Epson documentation, but is how the TM200 works. The POSjet™ 1000 Printer matches the TM200 in TM200 mode. In EPOS mode, you may do both.

Function	**Real-time request to printer**
ASCII	[DLE] ENQ <n>
Hexadecimal	10H 05H <n>
Decimal	<16> <5> <n>
Range	<n> = 0, 2

Description The [DLE] ENQ <n> command responds to a request from the host computer specified by <n> as shown below. The command is also executed when the printer is disabled. When the printer stops printing due to a paper-end condition, <n> = 0 is only effective when the printer is waiting for on-line recovery from the time the paper roll is inserted to the time the printer goes on-line. The on-line recovery wait time is confirmed by the printer status of ASB or the [DLE] EOT command. <n> = 2 is only effective when a recoverable error occurs. The printer can recover from an error without turning off the power. Whether an error occurs or not can be confirmed by the ASB status or the error status of the [DLE] EOT command.

Where <n>

0	Recovers to on-line
2	Recovers from an error after clearing the receive and print buffers

Function	**Set on-line recovery wait time TM200 ONLY**
ASCII	[GS] z 0 <t_1> <t_2>
Hexadecimal	1DH 7AH 30H <t_1> <t_2>
Decimal	<29> <122> <48> <t_1> <t_2>
Range	$0 \le t1 \le 255$ $0 \le t2 \le 255$

Description The [GS] z 0 <t_1> <t_2> command is not used by the POSjet™ 1000 Printer. When the cover is closed, the printer returns to full operation immediately. The LINE FEED button does not need to be pressed to resume operation after a paper change. The application may send the [GS] z 0 <t_1> <t_2> command to the printer, but it will be ignored.

Function	**Copy user-defined storage buffers**
ASCII	[ESC] ‘ <n>
Hexadecimal	1BH 27H <n>
Decimal	<27> <39> <n>

Description The [ESC] ‘ <n> command copies data between the user-defined RAM buffer and the nonvolatile flash buffer. If <n> = 0, the command saves user-defined characters and graphics to predefined user-store locations. If <n> = 1, the command retrieves both user-defined characters and graphics from user store.

Macro Function Commands

Function	**Start/end macro definition** **EPOS ONLY**
ASCII	[GS] :
Hexadecimal	1DH 3AH
Decimal	<29> <58>

Description The [GS] : command starts or ends macro definition. Macro definition starts when the command is received during normal operation and ends when it is received during the macro definition. The macro definition can contain up to 2048 bytes. If the definition exceeds 2048 bytes, the excess data will not be stored.

Function	**Execute macro EPOS ONLY**
ASCII	GS ^ r t m
Hexadecimal	1DH 5EH r t m
Decimal	<29> <94> r t m
Range	0 ≤ r ≤ 255 0 ≤ t ≤ 255 m = See below

Description The GS ^ r t m command executes a macro definition. The r specifies the number of times to execute the macro. When Bit 1 of m is set, r is ignored, and the macro is executed infinitely. t specifies the waiting time for executing the macro; it is t × 100 msec for every macro execution. m specifies macro executing mode. When the LSB of m = 0, the macro executes r times continuously with the interval specified by t.

When the LSB of m = 1, the printer remains idle and waits for the LINE FEED button to be pressed (after waiting for the period specified by t). After the button is pressed, the printer executes the macro once. The printer repeats the operation r times. When Bit 5 of m is set, the current macro definition is saved into the printer's nonvolatile flash memory as a start-up macro without executing it. The macro definition is executed upon power-up using the parameters specified by the GS ^ r t m command. If the printer is powered-up into self-test mode, the macro definition will not be executed. A saved macro definition can be deleted with the GS _ command.

Bit	Off/On	Hexl	Decimal	Function
0	Off	00	0	Macro executes r times continuously with the interval specified by t.
	On	01	1	LINE FEED button controlled operation with time interval t
1-4	-	-	-	Undefined
5	On	20	32	Value given by r is ignored and macro is run infinitely.
6	On	40	64	Save start-up macro definition to flash memory without executing
7	-	-	-	Undefined

Table 50 Macro Control Bit Definitions

Function **Delete start-up macro definition** **EPOS ONLY**
ASCII GS _
Hexadecimal 1DH 5FH
Decimal <29> <95>

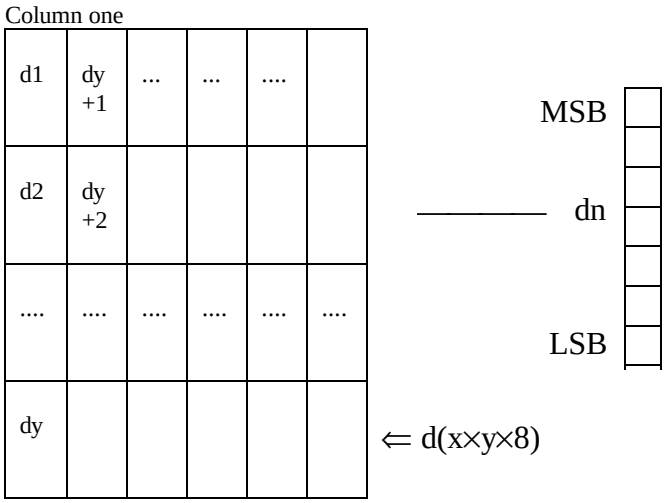
Description The GS _ command deletes a start-up macro definition previously created by the GS ^ command. If a start-up macro was not previously defined, the command will be ignored.

User-defined Memory Commands

Function **Define user-defined bit image** **EPOS ONLY**
ASCII GS - <Name..> <0> x y d_1 … d(x *x* y *x* 8)
Hexadecimal 1DH 2DH <Name..> <0> x y d_1 … d(x *x* y *x* 8)
Decimal <29> <45> <Name..> <0> x y d_1 … d(x *x* y *x* 8)
Range $1 \le x \le 255$
$1 \le y \le 255$
$0 \le d \le 255$
<Name> = a 15-byte maximum length name to identify the image

Description GS - defines a bit-image for storage in the nonvolatile memory pool. The printer maintains an area of flash memory specifically designated for multiple bit-image storage. The area can contain as many bit-images as its size permits. (A printout of the amount of nonvolatile memory remaining can be obtained by performing a printer self test.) Each image is uniquely identified by the name given to it by the <Name> parameter. The name of the bit-image can be from one to 15 bytes long and contain any alphanumeric characters as well as spaces. The format of the bit-image is identical to that defined by the GS * command. The GS-command must be entered in standard mode only at the beginning of a print line. Any image may be up to 2048 bytes long. If the size of the image is larger than the space remaining in the nonvolatile buffer, the image will not be saved. When the last byte of bit-image data is received and there is ample space

in the nonvolatile buffer for the bit-image, the bit image will be saved. The following basic example demonstrates how to define an 8-bit x 8-bit block with the name “MY IMAGE”: A representation of the format of a downloaded bit-image is depicted below.




```
PRINT #1, CHR$(29),CHR$(45),                                   REM Enter the GS command
PRINT #1, ”MY IMAGE”,CHR$(0);                                  REM Define the image name
PRINT #1, CHR$(1),CHR$(1);                                     REM Image size (8 x 8 bits)
PRINT #1, CHR$(255),CHR$(255),CHR$(255),CHR$(255);             REM Send 8 bytes of image
PRINT #1, CHR$(255),CHR$(255),CHR$(255),CHR$(255)              REM data
```

Function	**Print user-defined bit image EPOS ONLY**
ASCII	GS 0 <Name..> <0>
Hexadecimal	1DH 30H <Name..> 0H
Decimal	<29> <48> <Name..> <0>
Range	<Name..> = a 15-byte maximum length name to identify the image.

Description GS 0 prints a bit-image from storage in the nonvolatile memory pool. The name of the bit-image can be from one to 15 bytes long and contain any alphanumeric characters as well as spaces. GS searches the nonvolatile memory pool for the first occurrence of the image identified by <Name..>. If the image is found, it will be printed. If the image cannot be found, the command will be ignored. The following basic example demonstrates how to print the stored bit-image named "MY IMAGE":

```
PRINT #1    CHR$(29), CHR$(48)          REM Enter the GS 0 command
PRINT #1    "MY IMAGE", CHR$(0)         REM Enter the image name
```

Function	**Erase single entry from nonvolatile memory EPOS ONLY**
ASCII	GS 1 <Name..> <0>
Hexadecimal	1DH 31H <Name..> 0H
Decimal	<29> <49> <Name..> <0>
Range	<Name> = a 15-byte maximum alphanumeric name to identify the image

Description GS 1 deletes a single entry (bit-image or character set) from storage in the nonvolatile memory pool.

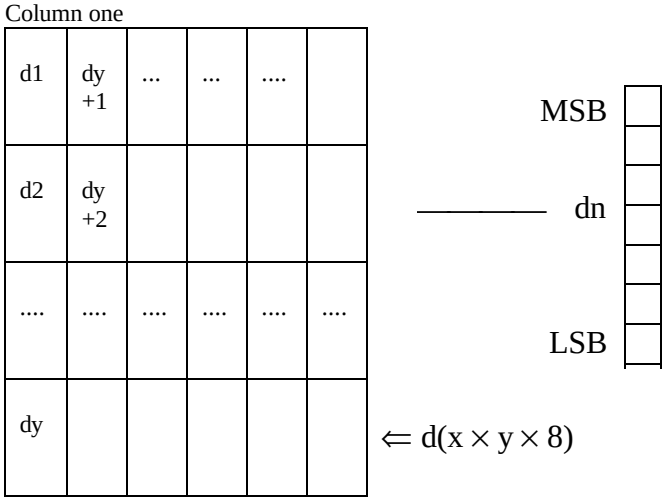
Function	**Erase all entries from nonvolatile memory EPOS ONLY**
ASCII	GS 5
Hexadecimal	1DH 35H
Decimal	<29> <53>

Description GS 5 erases the entire contents of the nonvolatile memory pool and frees up the memory for new entries.

Note 1 No protection for the GS 5 command exists. All user store will be erased!

Function	**Define single user-defined bit-image**	**EPOS ONLY**
ASCII	GS * x y d_1 … d(x *x* y *x* 8)	
Hexadecimal	1DH 2AH x y d_1 … d(x *x* y *x* 8)	
Decimal	<29> <42> x y d_1 … d(x *x* y *x* 8)	
Range	$1 \le x \le 255$ $1 \le y \le 48$ $0 \le d \le 255$	

Description The GS * x y d_1 … d(x *x* y *x* 8) command defines a single downloaded bit-image using the number of dots specified by x and y in the RAM buffer area (volatile memory). The number of dots in the horizontal direction is x *x* 8. The number of dots in the vertical direction is y *x* 8. If (x *x* y *x* 8) exceeds the size of the buffer, the image is truncated. d indicates bit-image data and specifies a bit printed to one and not printed to zero. After a downloaded bit-image is defined, it may be saved to the nonvolatile flash storage buffer using the ESC ‘ command where it remains indefinitely. Otherwise, the image remains in the RAM buffer where it is available until ESC @ or ESC & is executed; the power is turned off; or the printer is reset. A representation of the format of a downloaded bit-image is depicted below.



Function	**Print single user-defined bit-image**	**EPOS ONLY**
ASCII	GS / <m>	
Hexadecimal	1DH 2FH <m>	
Decimal	<29> <47> <m>	

Description The GS / <m> command prints a downloaded or stored bit-image using the mode specified by <m>. <m> selects a mode from the table below.

Hex	Decimal	Mode	Vertical Dot Density (dpi)	Horizontal Dot Density (dpi)
00	0	Normal	203	203
01	1	Double-wide	203	101
02	2	Double-high	101	203
03	3	Quadruple	101	101

Table 51 User-defined Bit-image Resolutions

Function	**Save user-defined character set**	**EPOS ONLY**
ASCII	GS 6 <Name..> <0>	
Hexadecimal	1DH 36H <Name..> 0H	
Decimal	<29> <54> <Name..> <0>	
Range	<Name> = a 15-byte maximum alphanumeric name to identify the image.	

Description GS 6 <Name..> <0> saves the current character set created by the [ESC] & command to the nonvolatile memory pool. If no character set has been defined, the command stores an empty definition structure.

Function	**Select user-defined character set**	**EPOS ONLY**
ASCII	GS 7 <Name..> <0>	
Hexadecimal	1DH 37H <Name..> 0H	
Decimal	<29> <55> <Name..> <0>	
Range	<Name..> = a 15-byte maximum alphanumeric name to identify the image.	

Description GS 7 <Name..> <0> selects a previously saved user-defined character set. If the character set does not exist, the command is ignored.

Function	**Query nonvolatile memory pool information**	**EPOS ONLY**
ASCII	GS 3	
Hexadecimal	1DH 33H	
Decimal	<29> <51>	

Description The GS 3 command prints a summary of the user-store usage. It is intended to help with the generation and maintenance of user store.

Note 1 The report is printed as part of the configuration report.

Ithaca Specific Commands

Function	**Control feature commands**
ASCII	[ESC] y <n>
Hexadecimal	1BH 79H <n>
Decimal	<27> <121> <n>

Description The [ESC] y <n> command is the same as the POSjet™ 1000 standard mode command. It is not intended for use by the user in EPOS mode. It is present to allow remote diagnostics to force the printer into specific modes and enable extended diagnostics.

Function	**Enable extended diagnostics**
ASCII	[ESC] ~ <n>
Hexadecimal	1BH 7EH <n>
Decimal	<27> <126> <n>

Description The [ESC] ~ <n> commands are extended diagnostics commands. They must be preceded with an enabling command. These commands are not intended to be used by the end user.

Star Codes

The following section lists the Star codes that are supported by the POSjet™ 1000 Printer. They are as close as possible to a Star printer. TransAct Technologies, Inc. has no control over how Star extends or changes these control codes and makes no guarantees as to the operation of its printer when it replaces a Star printer. The Star emulation is intended to make it as easy as possible to replace a Star printer with a POSjet™ 1000 Printer, but the user must remember that the POSjet™ 1000 Printer is not designed as a drop in replacement for a Star printer. If possible, the application should be changed to take advantage of the additional features in the standard POSjet™ 1000 emulation.

Star Command Summary

For field definitions, please refer to the Star Dot Matrix Printer Programmer's Manual. The following is a list of supported Star commands.

Control Codes Used for Character Setting		
ASCII Command	**Hex Code**	**Description**
[ESC] R <n>	1BH,52H	Select international character set.
[ESC] 6	1BH,36H	Select IBM character set #2.
[ESC] 7	1BH,37H	Select IBM character set #1.
[ESC] M	1BH,4DH	Select 7 x 9 half-dot font.
[ESC] P	1BH,50H	Select 5 x 9 (2 pulses + 1 dot) font.
[ESC] :	1BH,3AH	Select 5 x 9 (3 pulses + 1 dot) font.
[SO]	0EH	Select expanded character mode.
[DC4]	14H	Cancel expanded character mode.
[ESC] W <1>	1BH,57H,31H	Select expanded character mode.
[ESC] W <0>	1BH,57H,30H	Cancel expanded character mode.
[ESC] E	1BH,45H	Select emphasized print mode.
[ESC] F	1BH,46H	Cancel emphasized print mode.
[ESC] - 1	1BH,2DH,31H	Select underline mode.
[ESC] - <1>	1BH,2DH,01H	Select underline mode.
[ESC] - 0	1BH,2DH,30H	Cancel underline mode.
[ESC] - <0>	1BH,2DH,00H	Cancel underline mode.
[ESC] _ 1	1BH,5FH,31H	Select overscore mode.
[ESC] _ <1>	1BH,5FH,01H	Select overscore mode.
[ESC] _ 0	1BH,5FH,30H	Cancel overscore mode.
[ESC] _ <0>	1BH,5FH,00H	Cancel overscore mode.
[ESC] 4	1BH,34H	Select highlighted print mode.
[ESC] 5	1BH,35H	Cancel highlighted print mode.
[SI]	0FH	Select inverted print mode.
[DC2]	12H	Cancel inverted print mode.

Control Codes Used for Line Spacing		
ASCII Command	**Hex Code**	**Description**
[LF]	0AH	Set line feed.
[CR]	0DH	Set line feed (same as LF).
[ESC] z 1	1BH,7AH,31H	Set 1/6-inch line feed.
[ESC] z <1>	1BH,7AH,01H	Set 1/6-inch line feed.
[ESC] 0	1BH,30H	Set 1/8-inch line feed.
[ESC] a <n>	1BH,61H	Feed paper <n> lines.
Control Codes Used for Page Layout		
ASCII Command	**Hex Code**	**Description**
[FF]	0CH	Set page feed (form feed).
[ESC] C <n>	1BH,43H	Set page length at <n> lines.
[ESC] C <0> <n>	1BH,43H,00H	Set page length at <n> inches.
[ESC] B <n_1> <n_2>	1BH,42H	Set vertical tab positions.
[VT]	0BH	Execute vertical tab.
[ESC] N <n>	1BH,4EH	Set bottom margin.
[ESC] O	1BH,4FH	Cancel bottom margin.
[ESC] l <n>	1BH,6CH	Set left margin.
[ESC] Q <n>	1BH,51H	Set right margin.
[ESC] D <n_1> <n_2>	1BH,44H,<n_1>,<n_2>	Set horizontal tab position.
[HT]	09H	Execute horizontal tab.
Control Codes Used for Graphic Printing		
ASCII Command	**Hex Code**	**Description**
[ESC] 1	1BH,31H	Set 7/72-inch line feed.
[ESC] A <n>	1BH,41H	Define n/72-inch line feed.
[ESC] 2	1BH,32H	Set n/72-inch line feed.
[ESC] J <n>	1BH,4AH	Set one time line feed of n/72 inch.
[ESC] z 0	1BH,7AH,30H	Set 1/12-inch line feed.
[ESC] z <0>	1BH,7AH,00H	Set 1/12-inch line feed.
[ESC] 3 <n>	1BH,33H	Set n/216-inch line feed simulation.
[ESC] y <n>	1BH,79H	Set n/144-inch line feed.
[ESC] K <n_1> <0>	1BH,4BH,<n_1>,00H	8-dot single density bit image.
[ESC] L <n_1> <n_2>	1BH,4CH,<n_1>,<n>	8-dot double density bit image.
[ESC] h 1	1BH,68H,31H	Select vertical expanded character mode.
[ESC] h <1>	1BH,68H,01H	Select vertical expanded character mode.
[ESC] h 0	1BH,68H,30H	Cancel vertical expanded character mode.
[ESC] h <0>	1BH,68H,00H	Cancel vertical expanded character mode.

Control Codes Used for Download Characters		
ASCII Command	**Hex Code**	**Description**
[ESC] & <0> <n_1> <n_2>	1BH,26H,00H, <n_1>,<n_2>	Define download characters.
[ESC] % 1	1BH,25H,31H	Enable the download character set.
[ESC] % <1>	1BH,25H,01H	Enable the download character set.
[ESC] % 0	1BH,25H,30H	Disable the download character set.
[ESC] % <0>	1BH,25H,00H	Disable the download character set.
Control Codes Used for Peripheral Units		
ASCII Command	**Hex Code**	**Description**
[ESC] [BEL] <n_1> <n_2>	1BH,07H,<n_1>,<n>	Adjust drive pulse width for peripheral unit 1.
[BEL]	07H	Defer drive command for peripheral unit 1.
[FS]	1CH	Immediate drive for peripheral unit 1.
[SUB]	1AH	Immediate drive for peripheral unit 2.
[EM]	19H	Immediate drive for peripheral unit 1.
Other Control Codes		
ASCII Command	**Hex Code**	**Description**
[RS]	1EH	Sound buzzer.
[CAN]	18H	Cancel print data in buffer and initialize printer.
[DC3]	13H	Set deselect mode.
[DC1]	11H	Set select mode.
[ESC] U 1	1BH,55H,31H	Select unidirectional print mode.
[ESC] U <1>	1BH,55H,01H	Select unidirectional print mode.
[ESC] U 0	1BH,55H,30H	Select bidirectional print mode.
[ESC] U <0>	1BH,55H,00H	Select bidirectional print mode.
[ESC] @	1BH,40H	Initialize printer.
[ENQ]	05H	Inquire printer status.
[STX]	02H	Enter STX-ETX mode.
[ETX]	03H	Terminate STX-ETX mode.
[ESC] b <n_1> <n_2> <n_3><n_4> d 1 … [RS]	1BH,62H,n_1,n_2,n_3,n_4 ,d 1…1EH	Select bar code printing.
[ESC] d 0	1BH,64H,30H	Trigger autocutter drive.
[ESC] d <0>	1BH,64H,00H	Trigger autocutter drive.
[ESC] d 1	1BH,64H,31H	Trigger autocutter drive.
[ESC] d <1>	1BH,64H,01H	Trigger autocutter drive.
[GS] …[LF]	1DH…0AH	Select character validation.

Citizen Codes

The following section lists the Citizen codes that are supported by the POSjet™ 1000 Printer. They are as close as possible to a Citizen printer. TransAct Technologies, Inc. has no control over how Citizen extends or changes these control codes and makes no guarantees as to the operation of its printer when it replaces a Citizen printer. The Citizen emulation is intended to make it as easy as possible to replace a Citizen printer with a POSjet™ 1000 Printer, but the user must remember that the POSjet™ 1000 Printer is not designed as a drop in replacement for a Citizen printer. If possible, the application should be changed to take advantage of the additional features in the standard POSjet™ 1000 emulation.

Citizen Command Summary

For field definitions, please refer to the *Citizen User's Manual for Mini Dot Matrix Printer*. The following is a list of the supported Citizen commands.

ASCII Command	Hex Code	Description
[FF] <n>	0CH,<n>	Set <n> lines paper feed.
[SO]	0EH	Set enlarged character.
[SI]	0FH	Set normal character.
[LF]	0AH	Set paper feed.
[CR]	0DH	Set print.
[DC1]	11H	Enter initial set command.
[DC2]	12H	Set inverted character(s).
[DC3]	13H	Set print color to red.
[CAN]	18H	Cancel print data in buffer and initialize printer.
[ESC] P 0	1BH,50H,00H	Trigger a full paper cut.
[ESC] P 1	1BH,50H,01H	Trigger a partial paper cut.
[ESC] - <n>	1BH,2DH,<n>	Select underline mode.
[ESC] * <n_1> <n_2>	1BH,2AH,<n_1>,<n_2>	Select a graphic command.
[ESC] 1	1BH,31H	Set 1/9-inch paper feed.
[ESC] 2	1BH,32H	Set 2/9-inch paper feed.
[ESC] C <n>	1BH,43H,<n>	Set page length.
[ESC] f 1	1BH,66H,01H	Set form feed.
[ESC] N <n>	1BH,4EH,<n>	Set <n> line skip perforation.
[ESC] O	1BH,4FH	Skip perforation cancel command.
[RS]	1EH	Sound the buzzer.
[SUB]	1AH	Trigger second drawer drive.
[FS]	1CH	Trigger first drawer quick drive.
[ESC] [BEL] <n_1> <n_2>	1BH,07H,<n_1>,<n_2>	Set drive pulse setting for the first drawer.
[BEL]	7H	Trigger first drawer drive.

Chapter 7:

Operator Panel Controls

Keypad Overview

The keypad contains two buttons and five (LED) indicator lights. Although not located on the keypad, the third button is the Power button. The Power button is located on the front-face of the printer's cabinet.

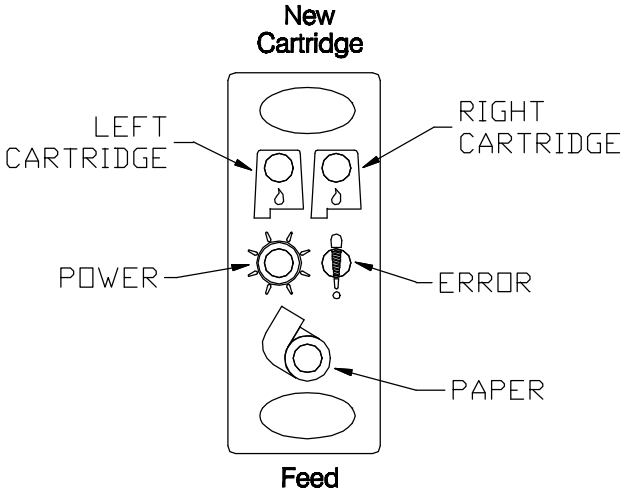


Figure 9 Keypad layout

POSjet™ 1000 Buttons

Three buttons are located on the POSjet™ and can be used to perform functions like self-testing, configuration, and to monitor printer status. The three buttons are:

Power	**Located on front face of the printer's cabinet**
New Cartridge	**Located on top portion of printer's keypad**
Line Feed	**Located on bottom portion of printer's keypad**

Power Button

The POSjet™ 1000 has been designed to remain connected to an AC power source. Because of this, the power button is used to alternately switch the printer between standby and operation modes. When pressed, the power button does not disconnect power to the printer. The printer is truly off only when the AC power supply is disconnected. Using the power button to enter standby mode will make the printer appear to be off. You will notice that none of the keypad's indicator lights will be on. When the printer enters operation mode, the green power indicator light will be activated. The operational state of the POSjet™ can be determined by looking at the power indicator light (LED). Refer to the

keypad layout diagram on page 171 for a more information regarding the power indicator light's location.

Using the Power Button

Optimal Ink Cartridge Performance

In order to take full advantage of the POSjet™ 1000's ink cartridge management capabilities, the printer should always be placed in standby mode before removing the AC power connection. Use the POWER Button to turn the printer on and off. TransAct strongly recommends that the printer should always remain connected to a power source. When the printer is turned on the power indicator light will change to green. The operational state of the POSjet™ can be determined by looking at the power indicator light (LED). If the AC power source is disconnected without first entering standby mode, the cartridge(s) life span may be degraded by drying ink on the metallic connector surface. Leaving the printer without AC power for extended periods of time (120 hrs. or more), will allow residual ink to plug the print nozzles. The POSjet™ has been designed to minimize the amount of ink drying by integrating a print nozzle wiper blade system with the functionality of the power button. Using the POWER button to alternate between low power standby mode and operational mode automatically initiates the nozzle wiping system, thus ensuring the longevity of your ink cartridges. Additionally, standby mode also prepares various printer components for periods of inactivity, placing each in positions that are most easily accessed if maintenance is required. A remote stand by feature is available; the printer can be placed in standby mode by the application.

Line Feed Button

The LINE FEED Button feeds paper through the printer. By pressing the LINE FEED Button momentarily, the paper will be forwarded one line at a time. Pressing and holding the LINE FEED Button will make the printer forward paper continuously until the button is released.

New Cartridge Button

The NEW CARTRIDGE button has been designed to work with the two *Cartridge Indicator Lights (LED)*, in a way that allows an operator to monitor and replace cartridges as ink levels become low. Operator's will receive input from the indicator lights and will then use the NEW CARTRIDGE button to communicate to the printer when making the desired changes.

Although the NEW CARTRIDGE button functions primarily as a means for an operator to communicate ink cartridge changes to the printer, it is also used to perform a variety of other functions.

Using the New Cartridge Button

Cartridge Status Monitoring

As ink is used from the cartridge(s) it is monitored by the printer. When ink is low, the indicator light for the left or right cartridge will show a orange light. After replacing the

low cartridge(s), pressing the NEW CARTRIDGE button will remove the ink low warning light on the indicators. Pressing the NEW CARTRIDGE button without changing the cartridge will not remove the ink low warning but will still print the ink status. If the cartridge is replaced with a used cartridge, the NEW CARTRIDGE button should not be pressed. The cartridge low indicator will continue to be displayed until a new (full) cartridge is installed and the NEW CARTRIDGE button is pressed.

Ink Cartridge Installation Specifics and Recommendations

When replacing the ink cartridge(s), several situations should be considered. Improper use of the NEW CARTRIDGE Button will have potential to reduce the ink cartridge's life-span and/or produce inadequate printing results.

- After replacing the low cartridge(s) with the new cartridge(s), pressing the NEW CARTRIDGE button will remove the ink low warning light on the indicators.

- Pressing the NEW CARTRIDGE button without changing the cartridge will not remove the ink low warning but will still print the ink status.

- If a cartridge is replaced with a used cartridge, the NEW CARTRIDGE button SHOULD NOT BE PRESSED. The cartridge low indicator will continue to be displayed until a new (full) cartridge is installed and the NEW CARTRIDGE button is pressed.

- Using used cartridges will negate the printer's ability to monitor ink consumption rates effectively. If the NEW CARTRIDGE button is pressed with a newly inserted used cartridge in place, the printer will reset the ink level counter. Due to undetermined ink levels in the used cartridge, the printer's counter will not be able to define the amount that the cartridge is actually holding.

- TransAct does not recommend replacing a spent cartridge with anything but a new ink cartridge that is approved and compatible with the POSjet™ 1000. TransAct recommends that used cartridges be discarded immediately after they are removed from the printer. Always replace with new ink cartridges.

Using the New Cartridge Button in Self-Test Mode

Placing the POSjet™ in Self-Test Mode

The NEW CARTRIDGE button may be used to enter the POSjet™'s self-test mode. To place the POSjet™ in self-test mode first be sure that a paper roll is loaded and that the power button is on. Next, press the POWER button to turn the printer off. The power indicator light will be off. Press and hold the NEW CARTRIDGE button while pressing the POWER button to turn power back on to the printer. Continue to hold until the orange error indicator light begins to blink. Let go of the NEW CARTRIDGE button.

Current Test option is displayed. in this area. Pressing and holding the NEW CARTRIDGE button will allow you to access different option test options.

Be careful not to hold the button too long. Doing so will let you cycle through the test options quickly. This could make it easy to go too far down the list of options.

To actually perform the desired test, press and release the NEW CARTRIDGE button.

Always look in this area on the receipt for directions on how to use the ***NEW CARTRIDGE*** *button to access the different testing options.*

The following categories are a list of the tests available on the POSjet™ 1000 printer.

TEST-Receipt	TEST-Burn-in
TEST-Graphics	TEST-Bar Codes
TEST-Print Specs	TEST-Rolling ASCII
TEST-Pyramid	

Using New Cartridge Button in Self-Test Mode

Test options can be accessed sequentially by using the "NEW CARTRIDGE" button.

1. Press and hold the NEW CARTRIDGE button until the name of the desired test option prints. (you are now ready to perform the specific option that just printed.)

2. To perform the selected test, press and release the NEW CARTRIDGE button.

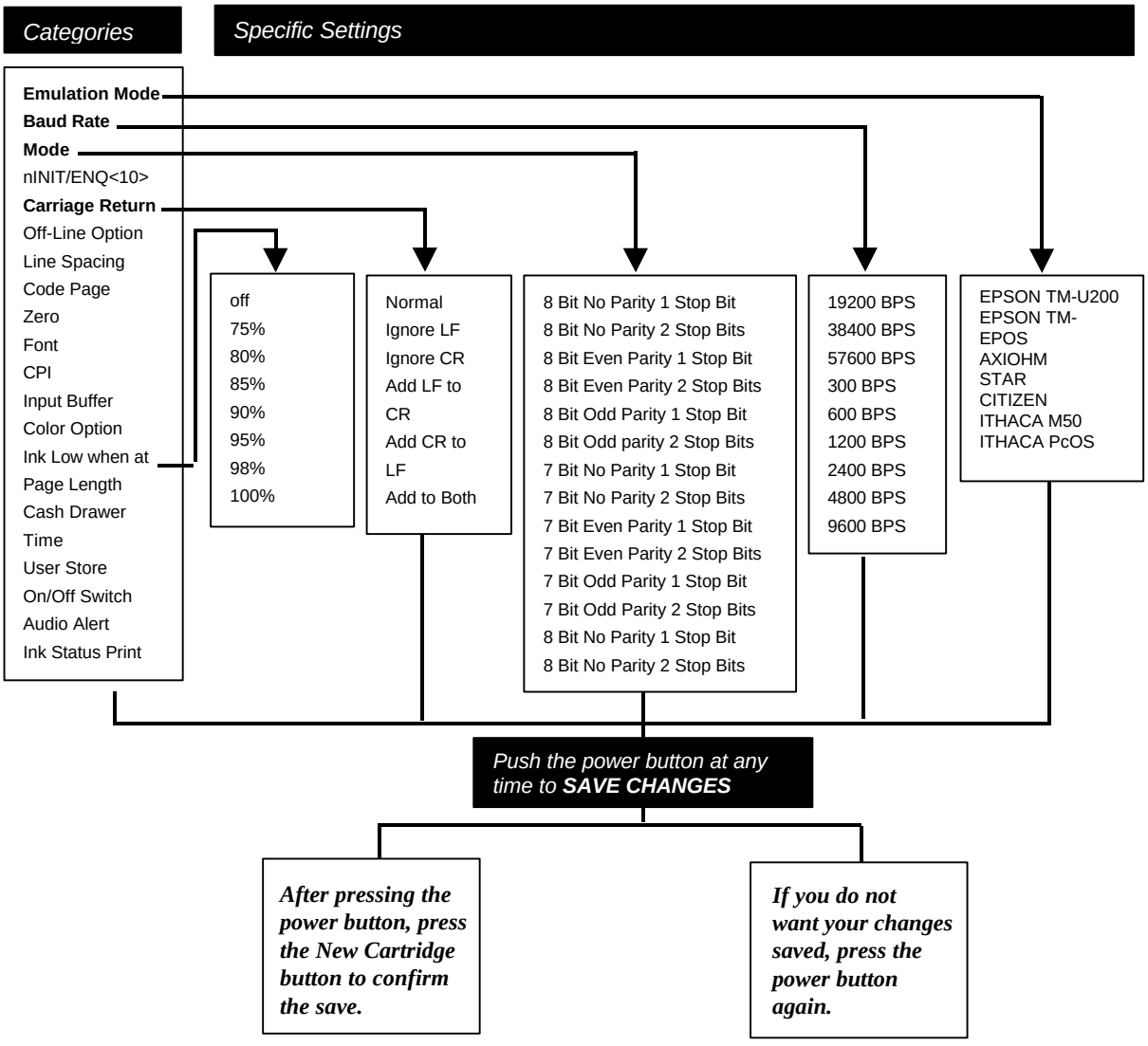
Exiting Self-Test Mode

You can exit the self-test mode at anytime by pressing the power button on the front of the printer.

Using New Cartridge Button to Change POSjet™ Configurations

The NEW CARTRIDGE button may be used to select configuration settings, change those settings, navigate through the configuration menu, and save your specific configuration changes. Repeatedly pressing the NEW CARTRIDGE button will allow you to select the desired configuration category. When you arrive at the desired configuration category, press and hold the NEW CARTRIDGE button to select or update the specific settings.

The following diagram provides a visual representation of how to navigate within the configuration menu system. As seen below, the menu items are listed for the Emulation Mode and Baud Rate categories for a Serial printer. These two categories show how the NEW CARTRIDGE button makes it possible to navigate through the POSjet™ 1000's menu system, select categories, change specific settings, and save those updated settings. Although only a few categories are shown, all categories have been organized similar to these, and are accessed the same way by using the NEW CARTRIDGE button.



Indicator Lights (LED)

The five POSjet™ indicator lights are:

Power LED	***Indicates printer activity and non-recoverable errors***
Error LED	***Indicates problems and probability of recovery***
Paper LED	***Indicates paper status (paper low)***
Left Cartridge LED	***Indicates ink levels of left cartridge***
Right Cartridge LED	***Indicates ink levels of right ink cartridge***

Power Indicator (LED)

The power indicator lets the user know that the printer is in operation mode. If the POWER indicator blinks in conjunction with the error indicator, the printer is experiencing a non-recoverable error. See the fault indicators below. If it blinks with no error indicator, the printer is being held in reset by the host.

Error Indicator (LED)

The error indicator lets the user know that the printer is experiencing a problem. If the POWER indicator is lit (not blinking), the error is generally recoverable without data loss. If the POWER indicator is blinking, a non-recoverable error has occurred. See fault indicators below. If the error is not operator recoverable, a power cycle may correct the problem. If a power cycle does not correct the fault, the printer must be serviced.

Paper Indicator (LED)

The paper indicator signals the paper status. If the printer is equipped with a paper low option, the paper indicator will blink when the paper is low. The low sensor is adjustable, and the amount of paper remaining is dependent on the adjustment. If the paper indicator is lit with the error indicator, the printer is out of paper. The printer stops printing and waits for the paper to be changed.

Cartridge Indicators (LED - left and right)

The printer has two print cartridge indicators that signal the print cartridge status. The right indicator is for the right cartridge and the left indicator for the left cartridge. If the printer is a single color printer, the left cartridge indicator is used. In most cases, the left cartridge is black, and the right is a highlight color.

Cartridge is low on ink (1 Blink, pause) ___ _____ _____
Cartridge has been removed (Blinking, error) ___ ___ ___ ___ ___ ___ ___ ___

Note 1 If both heads are low, the NEW CARTRIDGE button only needs to be pressed once; however, both heads must be changed.

Understanding Fault Indicators

The error indicator is the primary fault indicator. It is always on or blinking if a fault has occurred.

Three types of faults exist

Fully-recoverable faults	***paper out or cover open***
Semi-recoverable faults	***head jam***
Non-recoverable faults	***component failure***

Fully-recoverable and Status

A fully-recoverable error will restart printing exactly where it stopped when the error occurred. Printing will resume after error has been properly addressed. A *status recoverable* error is very similar to a *fully-recoverable* error. Additionally, status is used to display when the printer consumables may need replacing.

Semi-recoverable

A semi-recoverable error is determined by whether or not the printer has to be shut off and turned back on while attending to the problem. The amount of information lost is dependent on the type of error and the state of the information being processed.

Non-recoverable

A non-recoverable error produces information loss.

If during normal operation the error indicator is lit and the power indicator is blinking, a minor error occurred. The POWER indicator shows the error by blinking a pattern. Pressing the POWER button restarts the printer. Blink patterns are defined as follows.[14]

1 Blink **(1 blink, pause)**

2 Blink **(2 blinks, pause)**

3 Blink **(3 blinks pause)**

[14] The blink rate is effected by the data received. The faster the data, the faster the printer blinks.

Using Fault Indicators to Determine Ink Cartridge Status

Light Indicator Sequences: Use this table to determine the status of the cartridges.	Keypad Indicator Status				
	Power LED	Error LED	Paper LED	Left Cartridge LED	Right Cartridge LED
Right Cartridge Low	ON	OFF	OFF	OFF	1 Blink
Left Cartridge Low	ON	OFF	OFF	1 Blink	OFF
Both Cartridges Low	ON	OFF	OFF	1 Blink	1 Blink
Left Cartridge Removed	ON	ON	OFF	ON	OFF
Right Cartridge Removed	ON	ON	OFF	OFF	ON

Table 52 Table x indicator lights and ink cartridge status

Error Indicator Chart

The following information will assist you in determining specific problems and the respective error light sequences that have been integrated into the POSjet™'s keypad. These error messages have been built to help you see when the printer needs general maintenance as well as determine if the problem is one that may produce information loss. This table also displays the extent to which errors will affect the recoverability of information being processed at the time when printing was disrupted.

General problems: *Use this table to determine problem type.*						
Error Type	Recovery	Power LED	Error LED	Paper LED	Left Cartridge	Right Cartridge
Cover Open	Full	ON	ON	Off	Off	Off
Out of Paper	Full	ON	ON	ON	Off	Off
Paper Low	Status	ON	OFF	Blink	Off	Off
Right Cartridge Low	Status	ON	OFF	OFF	OFF	1 Blink
Left Cartridge Low	Status	ON	OFF	OFF	1 Blink	OFF
Both Cartridges Low	Status	ON	OFF	OFF	1 Blink	1 Blink
Left Cartridge Removed	Full	ON	ON	OFF	ON	OFF
Right Cartridge Removed	Full	ON	ON	OFF	OFF	ON

Serious problems: *Contact Technical Support for assistance.* (877) 7ithaca or (607) 257-8901						
Error Type	Recovery	Power LED	Error LED	Paper LED	Left Cartridge	Right Cartridge
Carriage Jam	Semi	1 Blink	ON	OFF	OFF	OFF
Configuration Error	Semi	2 Blinks	ON	OFF	OFF	OFF
Statistics Update Error	Semi	3 Blinks	ON	OFF	OFF	OFF
Internal Software Error	Semi	4 Blinks	ON	OFF	OFF	OFF
Knife Jam	Semi	5 Blinks	ON	OFF	OFF	OFF
User Store Defective	Semi	6 Blinks	ON	OFF	OFF	OFF
Flash Write Error	Semi	7 Blinks	ON	OFF	OFF	OFF

Table 53 Error Indicator Chart

Chapter 8:

Printer Self Tests

The POSjet™ 1000 Printer contains several levels of self-test features. At power on, the printer runs Level 0 diagnostics which check the printer's operation. After Level 0 diagnostics, the printer checks the keypad and enters normal operation or extended tests.

Level 0 Diagnostics

Level 0 diagnostics always and only run at power up. They are not run as part of standby recovery. Level 0 diagnostics perform the following tasks:

Cold Power On

1. **Basic System Integrity**
2. **Vector Integrity**
3. **RAM Test**
4. **Flash Boot Loader Integrity**
5. **Flash Firmware Integrity**
6. **Start Normal Firmware**
7. **Verify Configuration Integrity**
8. **Interface Adapter Configuration**
9. **User-store Integrity**
10. **Start Kernel, Verify Multitasking, Start Tasks**
11. Once the kernel is running, the following tests must pass to allow operation. However, if any test fails (except the knife home test), the remaining tests will generate recoverable faults and normal operation will start as soon as the fault is cleared. These tests are also run when operation is resumed from standby.
12. **Cartridge Integrity**
13. **Cover Closed Check**
14. **Knife Home (if installed)**
15. **Carriage Home**
16. **Schedule Cartridge Maintenance**
17. **Paper Present**
18. **Place Printer On-line, Start Normal Operation**

The flash test has two phases. The first phase determines that the boot loader is accurate, and the second verifies that the printer firmware is correct. All tests, up to and including the boot loader test, generate non-recoverable errors when they fail. The power must be removed from the printer, and the printer must be returned for service. If the boot loader is intact, but the main firmware is bad, the printer automatically enters boot loader mode. The firmware can then be reloaded into the printer.

Boot Loader Mode

The boot loader cannot be entered during normal operation. Boot loader mode can only be entered in one of two ways. One, when Level 0 Diagnostics finds that the firmware check CRC is bad, or two, manually. To manually enter the boot loader, hold the POWER button during power up. The error light comes on, and the power light blinks. At this time, the firmware boot file may be sent to the printer. Level 0 diagnostics are prevented from starting the firmware and boot load mode is forced to begin.

Extended Diagnostics

Extended diagnostics are entered after Level 0 diagnostics, are part of the firmware, and are activated in one of two ways. The first is by holding NEW CARTRIDGE and/or LINE FEED and applying power (Power On). The second is by holding NEW CARTRIDGE and/or LINE FEED and activating the POWER button from standby mode or Soft Power On.

Power Button	Cartridge Change	Line Feed	Test
Power On	Off	Off	Normal Operation
Power On	On	Off	Self Test Diagnostics
Power On	Off	On	Manual Configuration
Power On	On	On	Manual Emulation Set → Configuration
Soft Power On	Off	Off	Normal Operation
Soft Power On	On	Off	Color Alignment
Soft Power On	Off	On	Hex-dump Print
Soft Power On	On	On	Not Defined

Table 54 Extended Diagnostics

Self-Test Diagnostics

Self-test mode allows the printer to be tested to assure that it is working correctly. A number of tests may be run. Self-test is entered by holding the NEW CARTRIDGEbutton during initial power on.

Receipt Test

Receipt test prints a short receipt and is for the most part, a demonstration. It does, however, test the basic functions of the printer.

Graphic Test

Graphic test prints an example of graphics printing and is for the most part a demonstration. It does, however, test the basic functions of the printer.

Print Specification Test

Print specification test prints a short specification for the printer.

Alignment Test

Alignment test can be used to set the color alignment of the printer. It prints a test pattern and then allows the black and color cartridges to be aligned with each other. The NEW CARTRIDGE should be pressed (quickly) until the black and colored lines align. The lines appear as follows when aligned correctly:

```
|     |     |     |     |
|     |     |     |     |
```

Note: If the printer is not configured for two colors, the alignment test is not available.

Burn-in Test

Burn-in is used to test the printer in the production environment. It is a series of tests that ensure proper printer function. It is not intended for any other purpose.

Rolling ASCII Test

Rolling ASCII is also a test for the production environment. It is used to test the printer in continuous operation.

Hex-dump Mode

To enter hex-dump mode, press and hold the FEED button when resuming operation from standby mode. Enter standby mode by pressing and releasing the POWER button. Press and hold the FEED button while pressing and releasing the POWER button. Be sure to release the FEED button as soon as the carriage starts to move to prevent paper feeds.

Hex-dump mode is used to diagnose communication problems with the printer. As information is received by the printer, the information is converted to a Hex/ASCII format and printed. No translation is made, which means no commands are interpreted. All information is converted to Hex/ASCII and printed on the receipt tape. If a carriage return is sent to the printer, it is translated to 0D in the hexadecimal field and "." in the ASCII field.

The format follows.

```
54  68  69  73  20  69  73  20        This is
61  20  74  65  73  74  0D  0A        a test..
```

Several indications of printer and host communication problems can be deduced from hex dump mode. If the printer is printing all 3F "?" symbols, the parity or the number of bits is wrong. If the printer is printing some Hex 3F "?" signs when it should be printing other characters, either the parity, baud rate, or bit length setting is wrong. If the printer prints incorrect characters (like Hex C1 instead of Hex 41 "A"), it is set for 8-bit data, and the host is set for 7-bit. In most cases, the print problem can be traced to the host and printer being configured differently.

Chapter 9:

Feature Configuration

In some cases, features of the POSjet™ 1000 Printer can be deactivated through the configuration menu. For example, if a dual color printer is to be operated with only one print cartridge, turn off the dual color option, and all data will be sent to a single cartridge.

Manual Configuration

Hold the LINE FEED switch at power up. The printer writes the current configurations and totals. Press NEW CARTRIDGE quickly to scroll through the options. Press and hold the NEW CARTRIDGE button to change the option.

Press POWER to exit the configuration mode. The printer gives a configuration summary and asks if it is correct. Press NEW CARTRIDGE if it is and POWER if it is not.

Manual Emulation Set

To allow easy predefined configurations to be loaded, the printer contains an internal default configuration for each of the printer emulations. The internal default configuration allows a starting point when changing the emulation. To activate the manual emulation set, hold the NEW CARTRIDGE and LINE FEED switch at power up. Manual emulation set is the same as manual configuration only with more options. (Note that the additional options are only offered once.)

Remote Configuration

Remote configuration is provided for all printers. It is accessed through a series of extended diagnostic and configuration commands. The remote configuration program is responsible for controlling the feature.

Color Ready Configuration

The POSjet™ 1000 printer is available with a dual pen carriage but without the second pen installed. This printer is termed "Color Ready". It is configured as Black and no second pen and operates as a single pen printer. When the printer has the second pen installed, it should be reconfigured to be a color printer. This can be done through software, or with manual configuration.

There is an auto-sense feature that attempt to auto sense the presence of a second pen.

If the POSjet™ 1000 is configured for a dual carriage and a single cartridge auto-sense will be active. When the second color cartridge is installed and power is applied to the printer, the POSjet™ 1000 will sense the presence of the second cartridge during level 0 diagnostics. When the second pen is detected, the printer will configure itself as a dual pen printer and assume the second pen is red.

Note: This is only works by disconnecting and reconnecting the power cord. It will not work with the power button. This restriction allows the printer to continue to operate normally during typical power cycles and provide normal cartridge button operation.

This auto configuration process is limited because the pen color is not known. In addition, if the second pen is at some time not detected by level 0 diagnostics, the printer will revert back to single color mode.

Because this auto-sense process does not know the cartridge color, you should reconfigure the printer through software (on manually) and specifically set the color of the second cartridge.

Configurable Features

A number of the printer's features are configurable as part of an initial configuration, remote configuration, or manual configuration. The following table lists the configurable features.

General	Description and options	Preset Configuration
Emulation Mode	***The POSjet™ 1000 printer supports six basic printer emulation modes.***	
	POSjet™ 1000 PcOS	PcOS
	Epson TM200	TM200
	ESC/POS (Not model specific)	ESC/POS
	Star SP200 and SP2000	Star
	Citizen 3500 Series	Citizen
	Ithaca M50 IBM The Ithaca Series 50 printer uses several commands that are not supported by the current PcOS definitions. These commands, in some cases, have different functions in the POSjet™ 1000. If Ithaca M50 emulation is selected, the M50 commands are activated and the overlapping POSjet™ 1000 commands deactivated.	M50
Receive Buffer	***The input receive buffer can be configured to various sizes. The optimal size is dependent on the application. The options are from 40 bytes to 8K bytes.***	
	40	
	256	
	1024	TM200
	2048	
	4096	
	8192	
Graphic Save Locked	***Graphic save lock configuration locks the user-store buffers, so they cannot be deleted by the application.***	
	Enabled	
	Locked	
Lock On/Off Switch	***When the lock feature is functioning, the printer is prevented from being turned off by the On/Off switch.***	
	Enabled	
	Locked On	
Configuration Locked	***The configuration lock feature prevents the configuration from being altered manually. If enabled, the printer can only be configured with the configuration utility. (Note: locked configuration cannot be manually set.)***	
	Enabled	
	Locked	
Cash Drawer		
	Cash drawer fire time can be adjusted from 10 to 250 mS	250 m5.

General	Description	Preset Configuration
Color Options	***The color and presence of the second pen can be configured.***	
Pens and Colors		
	Black Only *(Single pen carriage)*	
	Black - Red	
	Black - Blue *(not yet available)*	
	Black-Green *(not yet available)*	
	Black - None *(Dual carriage no second pen)*	
Vertical Control		
Line Spacing	***The line spacing can be defaulted to 6 or 8 lines per inch (lpi).***	
	6 lpi	
	8 lpi	PcOS
Auto Line Feed/ Carriage Return	***An auto line feed feature can be set as a default where all [CR]'s have a [LF] added. In addition, a CR is added to a LF, and the CR or LF can be configured to be ignored.***	
	Normal CR/LF actions. Both are processed.	PcOS
	Ignore all LF characters	
	Ignore all CR characters	
	Add a LF to all CR characters	
	Add a CR to all LF characters	
	Add a CR to all LF characters, and add a LF to all CR characters	
Page Length	***The default page length can be set to various lengths from 2 to 60 lines. Page length configuration affects how the [FF] command operates.***	
	2 to 60 lines	40
Fonts		
Print Mode	***The default print mode can be set to 12 x 12 draft, 12 x 14 large draft, or 24 x 32 NLQ modes.***	
	12 x 12 draft	
	12 x 14 large draft	
	24 x 32 NLQ	

General	Description			Preset Configuration
Pitch	***The default print pitch can be set to 8, 10, 12, 15, 17.1, 20, or 24 characters per inch. (PcOS Only)***			
	8 cpi			
	10 cpi			
	12 cpi			
	15 cpi			
	17.1 cpi			PcOS
	20 cpi			
	24 cpi			
Code Sets	***The POSjet™ 1000 Printer supports the following code sets. The setting defines only the default printer mode. IBM specifies code pages differently than Epson. Any set can be selected as a default regardless of emulation. However, the selections through software are restricted by the emulation.***			
Code Pages	***IBM***	***Epson***	***Description***	
	64	-	ASCII (Slashed 0)	
	65	-	ASCII (Unslashed 0)	
	66	3	British	
	67	2	German	
	68	-	French	
	69	5	Swedish I	
	70	-	Danish	
	71	-	Norwegian	
	72	14	Dutch	
	73	-	Italian	
	74	13	French Canadian	
	75	-	Spanish	
	76	15	Swedish II	
	77	16	Swedish III	
	78	17	Swedish IV	
	79	18	Turkish	
	80	19	Swiss I	
	81	20	Swiss II	
	91	-	Welsh	
	437	0	USA	
	774	74	Baltic_774	
	850	26	Multilingual	

General	Description			Preset Configuration
Code Sets	852	46	East Europe Latin II - 852	
	855	44	Cyrillic I - 855	
	857	57	Turkey_857	
	858	-	Multilingual (Euro)	
	860	28	Portugal	
	861	73	Icelandic-861	
	862	60	Hebrew NC (862)	
	863	43	Canada French	
	865	27	Norway	
	866	21+45	Cyrillic II - 866	
	869	47	Greek_869	
	874	-	Thailand	
	895	55	Kamenicky (MJK)	
	1008	38	Greek_437	
	1009	39	Greek_928	
	1011	41	Greek_437 CYPRUS	
	1012	29	Turkey	
	1013	21+45	Cyrillic II - 866	
	1014	22	Polska Mazovia	
	1015	23	ISO Latin 2	
	1016	24	Serbo Croatic I	
	1017	25	Serbo Croatic II	
	1018	42	ECMA-94	
	1019	49	Windows East Europe	
	1020	50	Windows Greek	
	1021	51	Latin 5 (Windows Turkey)	
	1022	52	Windows Cyrillic	
	1024	54	Hungarian CWI	
	1026	56	ISO Latin 4(8859/4)	
	1027	66	Ukrainian	
	1028	58	Roman-8	
	1029	67	ISO Latin 6 (8859/10)	
	1030	60	Hebrew NC (862)	
	1031	61	Hebrew OC	
	1032	62	Windows Hebrew	
	1033	63	KBL-Lithuanian	
	1034	68	Windows Baltic	

General	Description			Preset Configuration
Code Sets	1035	69	Cyrillic-Latvian	
	1072	72	Bulgarian	
	-	1	French	
	-	4	Danish I	
	-	6	Italian	
	-	7	Spanish I	
	-	8	Japanese	
	-	9	Norwegian	
	-	10	Danish II	
	-	11	Spanish II	
	-	12	Latin American	
	-	254	Space	
	-	255	Space	
Zero Character	***The zero character can be configured to be unslashed or slashed in all character sets except IBM 64 and 65, which override the setting.***			
	Unslashed			
	Slashed			
Comm. Interface	***The POSjet™ 1000 auto configures the communication interface based on the adapter installed. A few options apply to both serial and parallel communication interfaces.***			
Off-line Mode	***Off-line mode defines when the printer informs the host that it is off line.***			
	Normal		The printer goes off-line when the buffer is full or the printer cannot print.	
	Buffer Full		The printer goes off-line only when the buffer is full. This mode requires that the host request printer status from the printer.	
Parallel Link Options	***The parallel option features define how the busy and acknowledge signals operate.***			
	Ack-while-Busy			
	Ack-in-Busy			
	Ack-after-Busy			
Parallel Port INIT Pin	***The parallel port INIT pin can be deactivated.***			
	Active			
	Inactive			

General	Description	Preset Configuration
Serial Interface Options		
Parity	The serial mode parity can be set to none, odd, or even.	
	None	
	Odd	
	Even	
Bit Data	***The serial bit format can be set to 8 or 7.***	
	8	
	7	
Error Character	***If a communications error occurs, an internal error is generated. The printer can be configured to ignore the data or print a "?"***	
	Enabled prints "?"	
	Disabled ignores the data	
Protocol	***The flow control protocol of the serial link can be set to Ready/Busy or XON/XOFF. Ready/Busy functions when XON/XOFF is selected.***	
	Ready/Busy	
	XON/XOFF	
Baud Rate	***The bit rate of the printer can be set. The same bit rate is used for send and receive.***	
	57600 BPS	
	38400 BPS	
	19200 BPS	
	9600 BPS	
	4800 BPS	
	2400 BPS	
	1200 BPS	
	600 BPS	
	300 BPS	
DTR/RTS Signal	***The serial port DTR and/or RTS signal can be configured to provide flow control. If DTR is configured as the flow control signal, it toggles to false when the buffer is full. RTS does not. When the cover is opened, both signals always toggle to false.***	
	Not Used *(Not valid unless in XON/XOFF Mode)*	
	DTR Flow	
	RTS Flow	
	RTS and DTR Flow	

General	Description	Preset Configuration
CTS Signal	***If active, a false CTS prevents the printer from sending any data to the host***	
	Not Used	
	Active	
DSR Signal	***If active, a false DSR signal prevents the printer from accepting any data.***	
	Not Used	
	Active	
Multidrop	***The multidrop feature is activated at power up when set to an address.***	
	Off	
	A Device	
	B Device	
	C Device	
Options		
Knife	***Specifies that the knife option is attached.***	
	Not present or disabled	
	Active	
Emulation Specific Options	Some emulators require that additional features be configured and that some features be configured in specific ways.	
Epson TM200 Print Zone	***The Epson TM 200 provides a wide print zone feature through switch settings.***	
	42 - 35 Character print zone	
	40 - 33 Character print zone	
Citizen Print Zone	***Several of the Citizen printers differ in print zone width. The POSjet™ 1000 provides three selections in Citizen mode.***	
	40 Character	
	28 Character	
	23 Character	
Pitch	Pitch is selectable only in the PcOS emulation. The default font selects the pitch in all others.	
Multidrop	Only available in PcOS emulation	
Color	Color is not available in M50 emulation	
Page Length	Not available in Epson or Star emulations	
Cash Drawer Time	Only available in PcOS emulation	

Table 55 Configurable Options

Chapter 10:

Communication Protocol and Print Buffers

The following figure illustrates the communication flow from host computer to printer and from printer to cash drawer.

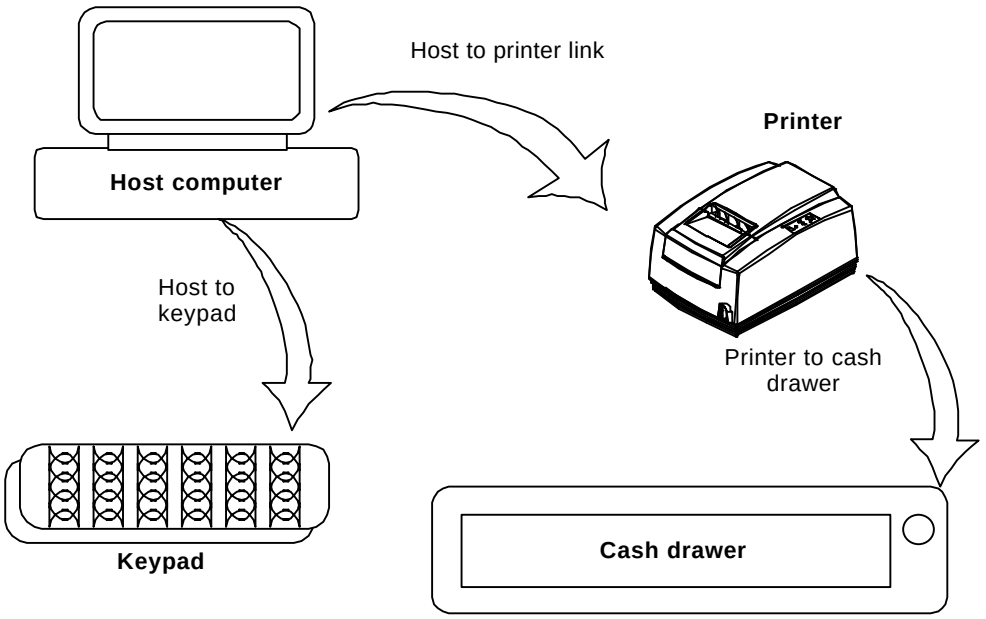


Figure 10 Typical POS System

For the host to printer communication link, the POSjet™ 1000 Printer supports serial or parallel communications. The serial and parallel ports both follow standards developed for the personal computer environment.

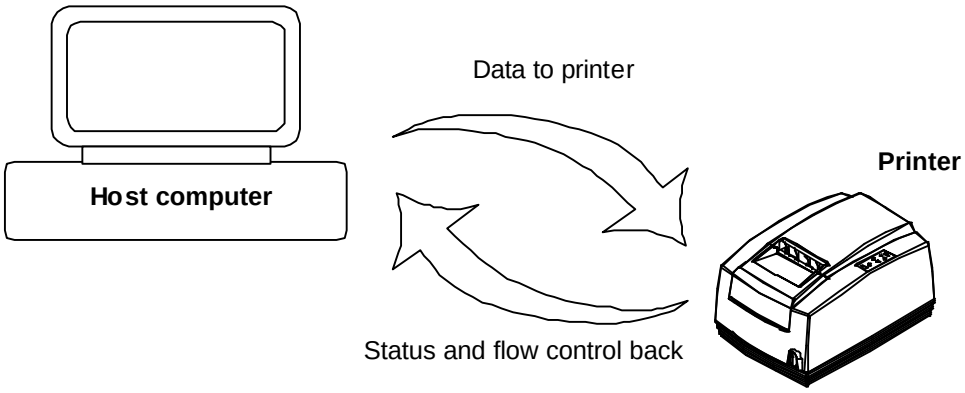


Figure 11 Host to Printer Link

In most cases, the host computer is capable of sending information to the printer much faster than the printer can print it. To prevent information from being lost, a flow control mechanism is provided. The mechanism is called the flow control protocol. The goal of the flow control protocol is to exchange as much information as possible as fast as possible without losing any data. The POSjet™ 1000 Printer supports three flow control protocols, two in serial mode and one in parallel.

From the printer's point of view, four basic functions are required of communications. All four are common to all three flow control protocols. There must be a communication driver, status inquire procedure, storage buffer, and print control mechanism that is using the data.

1. The communication port is either the serial port hardware or the parallel port hardware and the associated communication software driver.
2. A means for the host to bypass the buffer for status information, referred to here as an inquirer processor, is also required because the buffer offsets the printer in time from the host. (The printer is generally behind the host).
3. The storage print buffer is a software implemented, first-in first-out (FIFO) circular buffer. It stores information in an asynchronous fashion where information can be placed in it at any rate and retrieved from it at any rate, but the information order is not altered. All buffers have a finite size, and if information is put in faster than it is removed, the buffer will overflow. To avoid overflow, a flow control mechanism is required.
4. The print control mechanism is the remainder of the printer hardware and control software. It interprets control codes and operates the control panel, print head, and cash drawer interface.

The following figure illustrates the four basic parts of printer flow control.

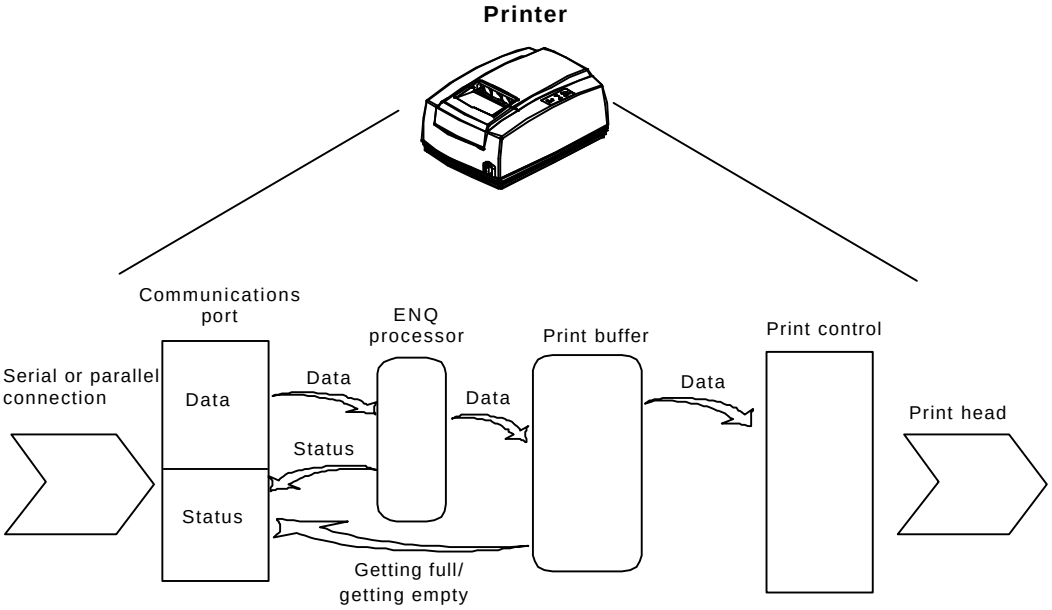


Figure 12 Printer Communications Buffer Flow

The communication port is either serial or parallel and is controlled by a software communication driver. The driver receives data and returns requested status. As information is received from the host, data is taken from the communication port hardware by the driver, preprocessed to look for status inquire commands, and placed in the buffer. When the buffer input function finds that the buffer is getting full, it notifies the communication driver to implement flow control. Flow control attempts to stop further information from being sent from the host.

The print control software takes information from the buffer, as it needs it and can use it. When the buffer output function finds that the buffer is getting low, it notifies the communication driver that the information flow can be resumed (if it was stopped) and allows more information to be placed in the buffer.

The POSjet™ 1000 Printer has a configurable input buffer. The printer can be configured to allow from 40 to 8000 bytes of input buffer. Consequently, up to 8000 characters (or control codes) can be sent to the printer before they are interpreted and printed. In effect, the host computer can get 8000 characters ahead of the printer. In all cases, the buffer resumes communications when it is half empty. For example, if the buffer is configured to be 2K, the printer will signal stop when 2048 bytes are in the buffer; resume will be signaled when 1024 bytes remain. Inquire commands are preprocessed, which means they are found in the input data stream and acted upon as they are received. The status returned is valid as of the time the command is received. This is termed real-time status even though inquire commands are preprocessed and still placed in the buffer. Real-time status assures that data is not lost when the inquire sequence is part of another command. However, the buffer may also be filled by inquire commands if the printer is waiting for some activity.

Parallel Port

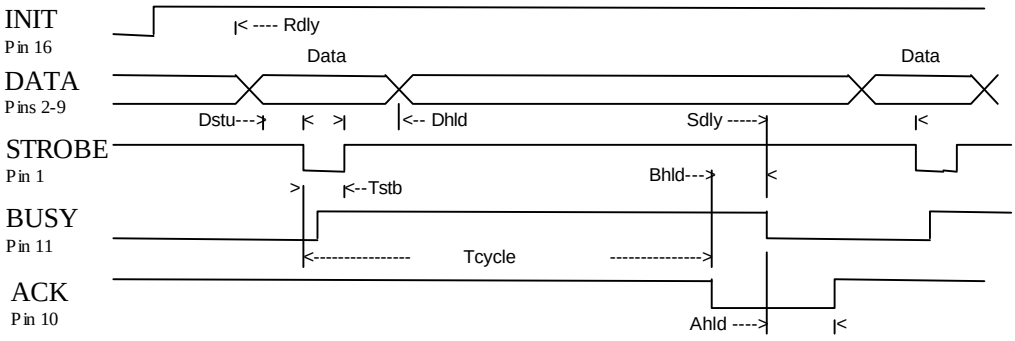
Parallel Port Protocol

The POSjet™ 1000 parallel port behaves just as any printer connected to a personal computer. The parallel interface accepts 8-bits of data from the host. The strobe signal from the host is used to indicate that data is available. When the printer sees the strobe signal and accepts the data, it asserts a busy signal. The busy signal indicates to the host that the printer has accepted the data and is working on it. After the printer absorbs the data and is ready to accept another byte, the printer asserts acknowledged (ACK), negates busy, and then finally negates ACK.

The host computer should meet the following parallel-port specifications and timing. In a standard personal computer, the strobe signal is generated by software writes to the parallel-port control port, which is typically done in the bios or some parallel-port driver. As personal computers become faster, it is up to the software to assure that the strobe signal does not get too narrow. One microsecond is the minimum pulse width that should be sent down a cable. Shorter pulse widths (500 nanoseconds) will be accepted by the printer. The cable can introduce significant signal degeneration and skew.

The data must be valid before the strobe signal is asserted and remain so until the strobe is removed. A 500 nanosecond setup and hold time is required by the printer.

The following chart illustrates parallel-port timing.



Rdly Approx. 2 seconds
Dstu 500 nS (Min)
Dhld 500 nS (Min)
Tstb 1 uS (Min)

Bhld Approx. 5 uS
Ahld Approx. 5 uS
Sdly 3 uS (Min)
Tcycle 200 - 280 uS Typ.

Figure 13 Parallel-port Data Timing

To implement flow control, the busy signal is asserted by the printer outside the normal data-transfer sequence. The busy signal has several uses, but it always indicates that the printer cannot accept information. The busy signal may happen at any time and may not adhere to the above timing chart in all cases. It is up to the host's parallel-port driver to handle all possible busy states. It is important that the host driver does not hang up if it takes some time for an acknowledged (ACK) response to a strobe signal. Standard personal computer parallel-port hardware implements an interrupt on the ACK signal to make flow control easier.

Some systems may wish to change the details of how the strobe, busy, and acknowledged signals interact. The parallel-port option features define how the strobe, busy, and acknowledged signals operate. In normal mode, the printer follows the standard (Centronics) parallel-port conventions. With Options 1 and 3, the acknowledged and busy signals change simultaneously, which is sometimes referred to as ack-after-busy. Options 2 and 3 force busy high on the rising edge of the strobe, which is sometimes referred to as busy-while-strobe timing. In all cases, the data is latched on the rising edge of the strobe. In most cases, the normal timing mode gives the best results.

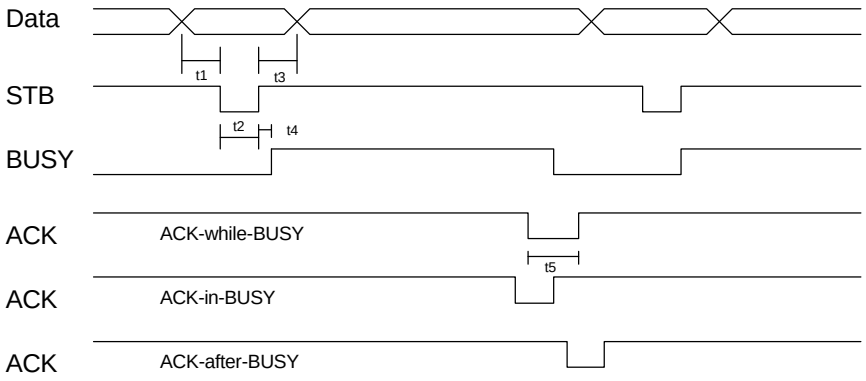


Figure 14 Parallel Port ACK Timing Options

Legend	Time Interval	Minimum	Maximum
t1	DATA Setup to STB	0.5 uS	
t2	STB Width	0.5 uS	500 uS
t3	DATA Hold after STB	0.5 uS	
t4	BUSY Delay after STB	0	0.5 uS
t5	ACK Pulse Width	2.5 uS	

Table 56 Parallel-port Timing

Note: Altered STB timing to take data on the falling edge of STB can be generated as a factory option.

Printer Buffer Size

The POSjet™ 1000 Printer has a configurable buffer size. It can be set from 40 to 8192 bytes. The configurable buffer allows an application to control how far ahead the buffer gets from the printer. The smaller the buffer, the tighter the control will be. It is up to the application developer to select the optimal buffer size.

Parallel Port Inquire IEEE 1284

The POSjet™ 1000 Printer supports the IEEE 1284 bidirectional parallel peripheral interface standard. The IEEE 1284 standard provides for a bidirectional link on the parallel port. The POSjet™ 1000 Printer only supports Modes 0 and 4, which provide a nibble mode reverse channel for printer identification and status inquire commands. It is beyond the scope of this guide to describe the IEEE 1284 protocol. The complete specification is available from the Institute of Electrical and Electronic Engineers, Inc., 345 East 47th Street, New York, NY 10017, USA.

Buffer

The POSjet™ 1000 Printer has a 256-byte buffer that contains information to be returned by the IEEE 1284 reverse link. Information is placed in the buffer in the same format as RS-232 serial information is returned.

Inquire commands sent to the printer in IEEE 1284 mode place responses to the commands in the IEEE 1284 reverse-channel buffer. The buffer is then transmitted to the host when it requests the reverse channel.

Mode 4

Mode 4 allows the printer to return identification information to the host system. The POSjet™ 1000 Printer returns:

xx,yy length of following data, 2 bytes with MSB first

MANUFACTURER	**TransAct Technologies**
COMMAND SET	**IPCL**
MODEL	**1000**
COMMENT	**Rev. x.xx**
ACTIVE COMMAND SET	**IPCL**

When a Mode 4 request is made, the IEEE 1284 buffer is cleared before the ID is sent.

Mode 0

Mode 0 provides a reverse channel for information from the printer. Normal responses to inquire commands are placed in the IEEE 1284 reverse-channel buffer. The Mode 0 reverse-channel request begins returning information to the host. The host may terminate the transmission at any time. If the link is terminated between nibbles, the last nibble is retransmitted on the next request. If a complete byte is transmitted, it is deleted from the IEEE 1284 reverse-channel buffer.

An inquire command can clear the reverse-channel buffer before placing its response in the buffer.

The IEEE 1284 buffer is limited to 1000 characters. If the buffer is not emptied by reverse-channel requests, the buffer overflows. The buffer is a first-in first-out (FIFO) buffer, and the last data placed in the buffer is lost.

Time-outs

IEEE 1284 specifies time-outs for various phases of the protocol. The POSjet™ 1000 Printer treats time-outs as minimums. The printer time outs at the specified period only if it is idle during the complete phase.

Active State

The IEEE 1284 reverse channel may be activated at any time as long as the printer is not busy with data. If the printer is off-line or the cover is open, the reverse channel may be activated. If the printer is placed back on-line while the reverse channel is active, the printer will not exit the reverse-channel mode.

Inquire Responses

In general, inquire commands place two-byte responses in the IEEE 1284 reverse-channel buffer. The two bytes are the same as the serial mode responses. In IEEE 1284 mode, the printer remains busy until the inquire command is processed, assuring responses in real time. To receive the response, the host must ask for it. It is possible for the host to make a number of requests and wait for the responses; however, the status returned is valid at the time the request was made.

It is also possible for the dynamic response mode to be activated and the reverse-channel mode to be opened. The reverse channel then changes from reverse-idle to reverse-data available as the status changes. The application must be careful in dynamic response mode that the dynamic responses are not left active when the reverse channel is closed. If the dynamic responses are active when the reverse channel closes, the output buffer overflows. If data is in the buffer when dynamic responses are activated, it will not be replaced by the current status. If dynamic response is off and a buffer-clear command is issued followed by activation of dynamic responses, the buffer will contain fresh data. If the buffer-clear command is issued after the dynamic response is activated, the buffer will be cleared and any unread responses will be lost.

Parallel Port Plug and Play

Microsoft Windows implements Plug and Play (PnP) by doing a special parallel, IEEE 1284 inquire during boot. The POSjet™ 1000 Printer responds to the inquiry if IEEE 1284 is active.

If the Windows PnP configuration flag is set in the printer, IEEE 1284 will be active for all parallel-port modes. For example, PnP in parallel mode forces IEEE 1284. For PnP to work, the host must have an IEEE 1284-compatible port adapter, and the cable used to connect to the printer must support all of the interface signals.

The Plug and Play response follows.

Device ID string:
Manufacturer: TransAct.;
CMD:PJ1000CL,IPCL;
CLS:PRINTER;MDL S1000 PcOS;
DES:TransAct POSjet™ 1000;
REV:02.00;OPTS;$9xyz

PnP ID: LPTENUM\TransAct.S1000_PcECB3
Device: **Ithaca POSjet™ 1000**
Device **Class: Printer**
The OPTS field is always: OPTS;$2XYZ

Where X is a model definition, X and Y are bit fields that designate the options attached to the printer.

Y		X	
Bit 0	Print zone	Bit 0	0
Bit 1	Undefined	Bit 1	Knife module attached
Bit 2	Undefined	Bit 2	0
Bit 3	0	Bit 3	0
Bits 4-5	1	Bits 4-5	1
Bits 6-7	0	Bits 6-7	0

Serial Port

Serial Port Protocol

The serial port supports two flow control standards, XON/XOFF and Ready/Busy (sometimes called Data Terminal Ready (DTR) or hardware handshake).

When Ready/Busy flow control is selected, the printer can be configured to use DTR, Request to Send (RTS), or both for flow control. If only DTR is selected for flow control, RTS will indicate the cover is open or the printer has faulted. The following discussion assumes the DTR is being used for flow control.

The Ready/Busy protocol generally uses the DTR signal to indicate to the host computer that the printer is not ready to accept data. The host should stop sending data to the printer as soon as possible. Because the host may not notice the DTR signal until it has transmitted several bytes of data to the printer, the printer continues to except up to 255[15] bytes of data after it indicates that it is not ready. Figure 15 Serial Port Flow Control Using DTR illustrates how the Ready/Busy protocol works, and Figure 16 XON/XOFF Serial Port Flow Control illustrates how the XON/XOFF protocol works.

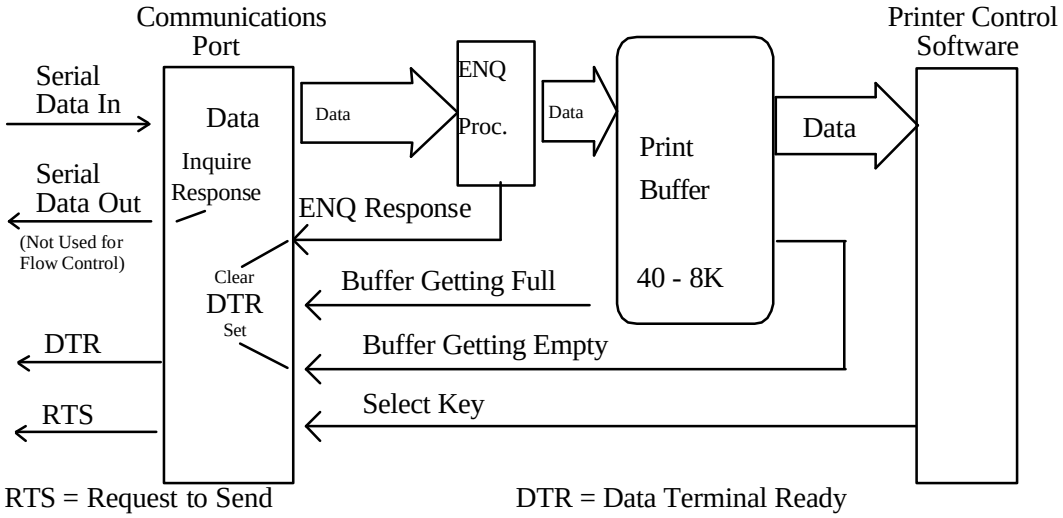
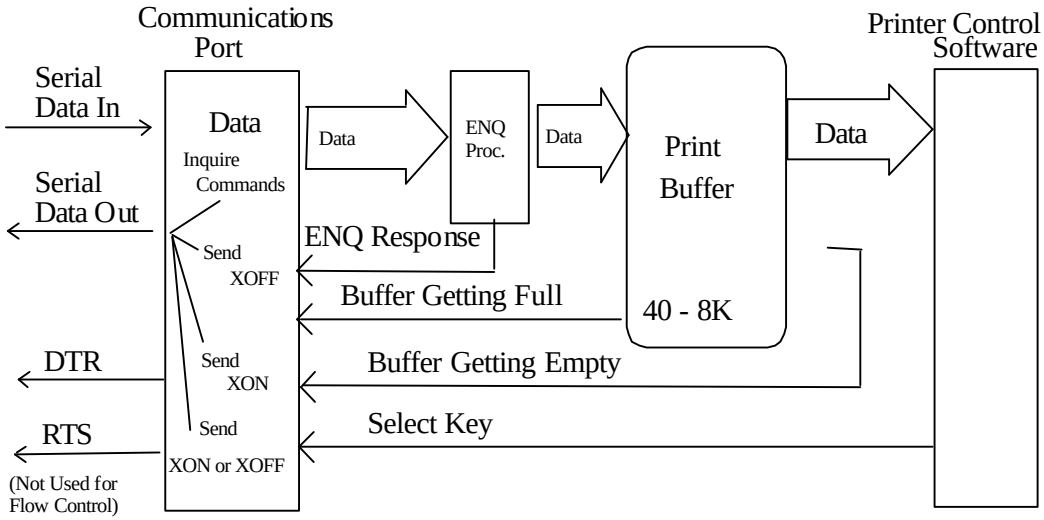


Figure 15 Serial Port Flow Control Using DTR

[15] The buffer always signals it is full before it overflows. The size of the reserve depends on the buffer size selected. It is always at least 255 bytes.

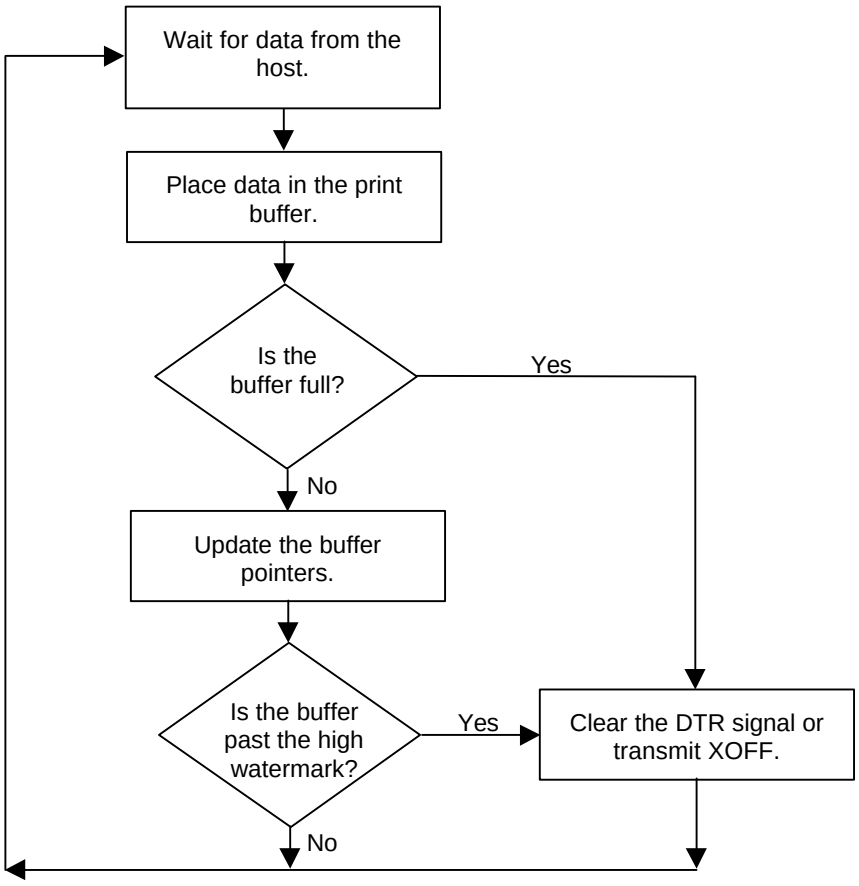


RTS = Request to Send DTR = Data Terminal Ready

Figure 16 XON/XOFF Serial Port Flow Control

Print Buffer Flow

Flow Chart 1 illustrates how the communications driver acquires data from the serial port and places it in the buffer using Ready/Busy or XON/XOFF flow control.

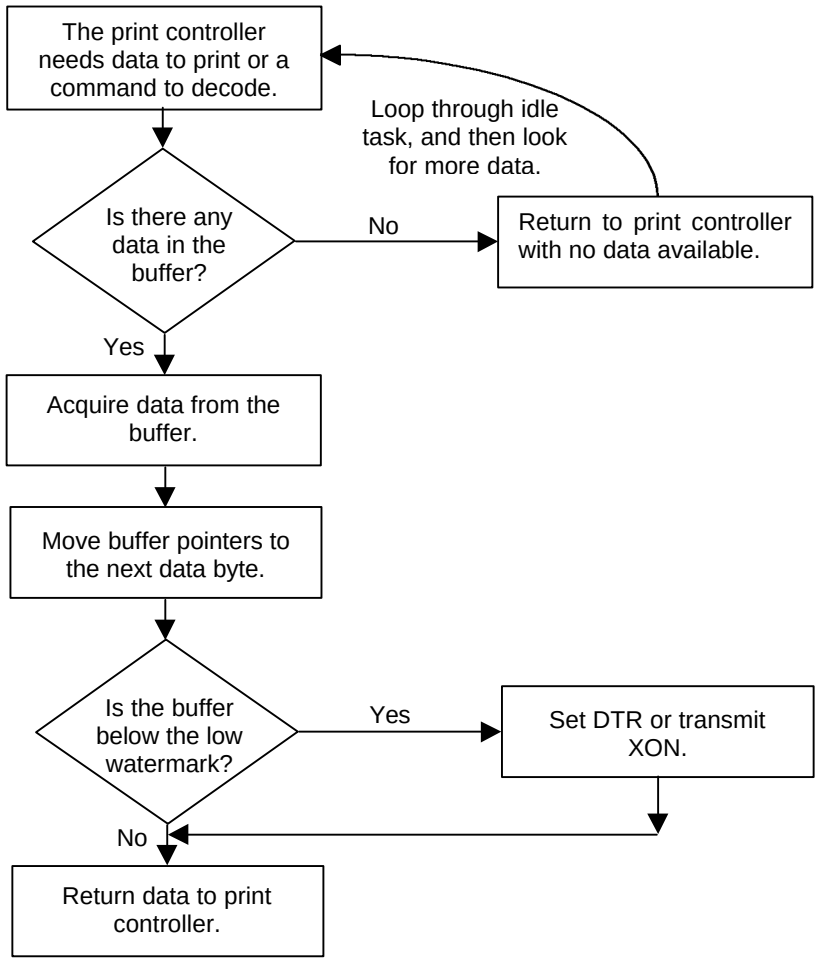


Flow Chart 1 Serial Buffer Operation

At the top of Flow Chart 1, the driver is waiting for data. When data is received from the host, the printer checks to see if it is an inquire command. If the data is an inquire, it is responded to and placed in the buffer. If not, the data is placed in the buffer without response. The buffer is then checked to see if it is full before the internal pointer is incremented. If it is not full, the pointer is incremented in preparation for the next data byte. The buffer is checked by looking to see if it has passed a high watermark. If the buffer has, the communication driver is notified, and it resets DTR to indicate to the host that no more data should be sent.

Flow Chart 2 illustrates how the print control software takes data from the buffer and controls flow. At the top of the chart, the print control software asks for data. If there is no data in the buffer, a “no data flag” is returned. The print software must then wait for data. If there is data in the buffer, it is read, and the pointers are updated. The buffer is then checked to see how much information is left. If the buffer is below a low watermark (about 100 bytes left), the communication driver is notified, and DTR is reasserted.

When XON/XOFF flow control is used, the flow is similar to DTR flow except that DTR is not used and XON/XOFF control characters are transmitted back to the host on the serial link. The XON/XOFF advantage is that only three wires are required to interconnect to a printer. The disadvantage is that a serial-port receiver driver must be written for the host.



Flow Chart 2 Print Controller Using Data

When the printer is on, the print controller looks for data. If there is data, it processes it. Flow control is done when the data is taken from the buffer and the amount of data in the buffer is less than a prescribed amount. The low watermark is set based on the expected environment. The POSjet™ 1000 Printer sets the low watermark at half the buffer size or 1024 characters whichever is smaller. The low watermark gives the host application time to get more data to the printer before the printer uses up what it has.

When XON/XOFF protocol is implemented, it is possible for the host to miss an XON or an XOFF. To prevent this from causing a communication lockup, the printer sends an XOFF for every character received after the high watermark is reached. If the printer detects that the serial data link is inactive, it sends out an XON about every two seconds. When the printer cover is opened, an XOFF is sent. An XOFF is sent even when the internal data buffer is past the high watermark and is done to allow the host to know that the printer is not ready.

Printer Buffer Size

The size of the POSjet™ 1000 buffer is configurable, which allows an application to control how far ahead of the printer it can get before being asked to wait. The buffer size can be set from 256 to 6144 bytes (not including the 64-character high-speed buffer). The smaller the buffer, the tighter the control will be. It is up to the developer to select the optimal buffer size for an application.

Serial Mode Plug and Play

Microsoft has defined a Plug and Play (PnP) protocol to identify devices on serial links. The enumeration process is designed to find and automatically configure a device driver for the printer. It is done by toggling the control lines in a specific sequence that is recognized by the printer. The peripheral then responds such that Windows can identify the device.

To allow the printer to look for and respond to the sequence, EISA PnP must be enabled. When enabled in serial mode, the flow control is forced to Request to Send (RTS) with Data Terminal Ready (DTR) static.

Using DSR

Windows uses the host's Data Set Ready (DSR) line (the printer's DTR line) on the serial port to determine whether a device is attached to the port. When Windows is booted (or does PnP), the system sets the host's DTR and RTS to zero and waits approximately 200 milliseconds. It then sets the DTR to one and waits another 200 milliseconds. After 200 milliseconds, the system checks to see whether the DSR line is high. This indicates that a serial device is attached to the serial port. The system responds by setting RTS high and waits to receive the device identification string.

In some devices, such as the serial mouse, the DSR line can be held high by tying it directly to the DTR line. When the mouse is connected to the serial port on the personal computer, the power supplied through the DTR line also raises DSR high.

For Plug and Play compatibility, RTS flow control is used at the printer because DSR must stay high as long as the device is attached to the serial port.

Serial Device Identification

The serial device must report its identification to the system using an identification string at 1200 baud. The identification string consists of 18 fields that identify the device, class of the device, and other compatible devices. Only five of the fields are required by all serial devices; all others are optional. The identification string used by the POSjet™ 1000 Printer follows.

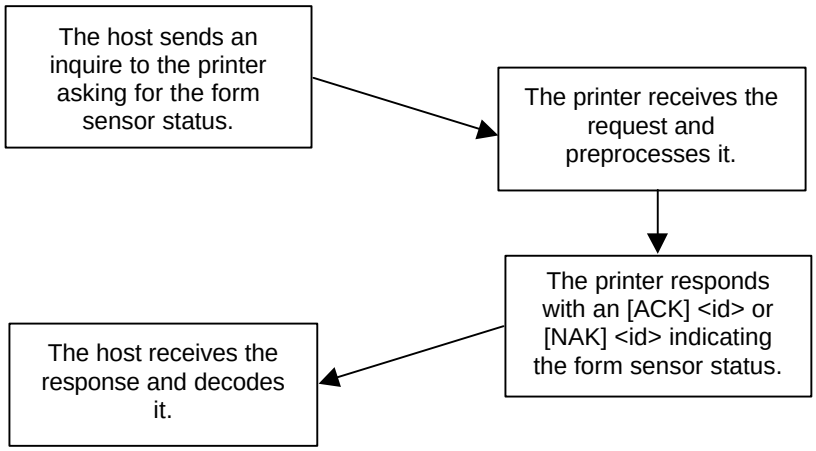
028H	Start of ASCII response
0,1	PnP Rev
'IPR0210'	Unique ID (IPR plus revision level)
\PRINTER	Printer
\S1000 PcOS	Model
\SC:	9600,N,8,1
Serial Configuration:	Baud, Parity, Bits, Stop Bits
xxH	Check-sum
029H	End PnP

Note 1 The model field may be altered to generate PnP ID's other than "S1000 PcOS" by special order.

When the identification is complete, the printer returns to the baud rate specified in the configuration.

Serial Port Inquire

The serial port inquire is more straightforward than parallel mode. The serial acknowledged (ACK) or not acknowledged (NAK) responses follow a uniform format, the ACK or NAK is always followed by the command ID that requested it. This makes the design of the host application easier because the response can be identified and always follows the same format.



Flow Chart 3 Inquire Flow

The host sends an [ENQ] <id> (form sensor status) request to the printer. The printer responds with an [ACK] <id> indicating that the request was identified, status true.

Inquire commands affect the printer's performance. Communication is a high priority for the printer. Inquire commands take processing time away from the print tasks. It is possible to ask for so much status that the printer slows. In serial mode, it is important that the response to an inquiry is received by the host before another command is issued. When an inquiry is received by the printer, it is buffered in a high-speed processing queue. When the printer has time, it empties the queue and processes the inquiries. The printer responds to the command as soon as the second byte of the command is taken from the high-speed buffer. If the host is looking for a form to be inserted, it should not send status requests as fast as it can. The host will receive a response to all of them. If the host did not wait for a response to each, there would be unnecessary responses.

In IEEE 1284 mode, inquire responses are placed in an IEEE 1284 transmit queue. When the IEEE 1284 reverse channel is open, the responses are returned to the host. It is important that after each request the reverse channel be opened. Inquire responses remain in the queue until read. If the [ENQ] <9> command is sent to the printer, the IEEE 1284 buffer will be cleared, and only the response to the [ENQ] <9> will remain.

Remote Printer Reset

Reset in Serial Mode

It is possible to generate a software printer reset in serial mode. The [ENQ] <10> command requests that the printer reset. (This is not a hardware reset). The reset completely initializes the hardware and software, but the printer does not recover from a loss of software control.

Note: If the printer mode was changed by the [ESC] y <2> or <3> command, a soft reset will not return to the power on default.

The command flow follows

The [ENQ] <10> is acknowledged. During cleanup and initialization, the printer is placed off-line. Before the printer initializes, it tries to clean up its input buffer and other internal processes.

The printer's software is reinitialized.
The power-cycled flag is set.
The print head is homed and recalibrated.
The printer goes back on-line.

Reset in Parallel Mode

In parallel mode, driving the INIT signal on the parallel port for 100 milliseconds generates a software reset. It takes about two seconds for the printer to recover from a reset. The [ENQ] <10> command has the same effect, but it is not acknowledged.

Remote Power Control

The POSjet™ 1000 Printer has a remote power control command that instructs it to enter standby mode. When the command is issued, the printer performs print cartridge maintenance and enters standby mode. Unlike pushing the POWER button, remote power mode leaves the communications active. All commands except the exit power down command are ignored.

Function	**Remote Power Control**
ASCII	[ESC] y <n>
Hexadecimal	1BH 79H <n>
Decimal	<27> <121> <n>
IPCL	&%YX17 or &%YX18
EPOS	[ESC] y <n>

Where n	17 Requests the printer to enter remote standby mode Requests the printer to exit remote standby mode

Inquiry (ENQ) commands are accepted and answered. The printer reactivates if the POWER button is pressed after the power down command is issued. If power is lost after the power down command is issued, the printer remembers it is in power down mode but does not reactivate the communications link. The POWER button must be pushed to restart the printer.

Miscellaneous Communication Features

Power-cycle Recovery

Sometimes the host needs to know if the printer was power cycled. An example would be after the receipt tape was changed. It is not necessary to turn off the printer to change the receipt. However, if the operator does, any information sent to the printer before the power cycle will be lost.

The POSjet™ 1000 Printer has a flag that is set after a reset. The flag stays set until the host requests a reset. The [ENQ] <11> command reads the flag. If the command returns power-cycled status, the power has been reset or power cycled since the last request. All unprinted information has been lost.

If the print operation is critical, it is a good idea to check the power-cycle flag before and after all transactions. An alternate approach is to check the flag after every off-line to on-line transition.

Note: If the printer mode was changed by the [ESC] y <2> or <3> command, a power-cycle reset will return to the power-on default.

Data Pass-through

The POSjet™ 1000 Printer supports data pass-through (sometimes referred to as display pass-through). Data pass-through is activated by the print-suppress command with the pass-through bit set. In pass-through mode, the printer can be requested to transmit any data that it receives. When this is the case, the printer's inquire commands are active but of little use. Typically, the printer's transmit data is connected to the next device in line. Inquire commands have no data path back to the host. If pass-through is to be used, it is a good idea to deactivate the inquire commands. (Use [ESC] y <6>).

Before pass-through data can be used, it must be activated in the configuration menu, which is the third selection in the print-suppress/pass option.

All data after, but not including, the print-suppress command is pass through. When deactivated, the print-suppress command is again not pass through. During pass through the multi-drop commands are active (if configured).

The printer will act upon a multi-drop control command found in the pass-through data. If the printer is deselected during pass-through, it stops passing on the data. When the printer is re-addressed, data pass-through is active.

Multidrop Configuration

The POSjet™ 1000 Printer supports a multi-drop configuration where up to three printers can be connected in parallel. Each printer has a different address A, B, or C. The printer does not accept any print information unless it is addressed. Multi-drop configuration is only available in serial mode, as parallel printers cannot be connected together.

Off-line Active

A configuration flag that prevents the printer from going off-line (in most cases) is available. Off-line mode allows the application to query the printer for status rather than assume a status from the control signals. The feature allows the host application to query the printer at all times except when there is no power; a full input buffer; or a hard failure. For example, when the printer's cover is open, the printer stops printing but still accepts data and inquiries. The inquire cover status command returns, "Cover open."

Hard failures result when there is no power or a printer fault occurs. If the printer is off-line, either the input buffer is full or a hard fault has occurred. The host application should not allow the input buffer to fill.

Programmer's Notes

When the serial port is used, it is important that the output lines from the printer not be shorted or back driven. If the signals are not to be used, they should be left open.

Pins 3, 4, and 7 are outputs from the printer. If any one of these signals is grounded or back driven, the other two outputs are degraded.

The best time to configure the printer by the host with remote configuration is during system setup or software update.

Chapter 11:

Printing Graphics

The POSjet™ 1000 Printer has bit-image graphic capability and a full PC-compatible graphic character set. The bit image format is similar to that used on other personal computer printers. Three modes of operation are available. Single-density is the fastest mode. It makes a single unidirectional 60 dpi print pass. Full-speed double-density mode makes two passes with a half-dot offset. Full-speed double-density mode is half the speed of single-density mode, but it prints at 120 dpi. Half-speed double-density mode is half the speed of full-speed double-density; however, the print quality is enhanced.

Character Graphics

Character graphics is the term for joining individual characters together to produce a mosaic of characters that form a graphic image. The simplest method uses an * (or any other character) to form an image. For example, ITHACA might be formed as follows.

```
***   ***   *    *    **     ***     **
 *     *    *    *   *  *   *    *   *  *
 *     *    *****   ****   *        ****
 *     *    *    *   *  *   *    *   *  *
***    *    *    *   *  *    ***    *  *
```

Figure 17 Example of Character Graphics

The extended character set of the printer supports line graphic characters that can be combined to form windows and other shapes. For the shapes to join from line to line, the spacing must be set properly.

All characters are in a nine-dot-high character cell. The dots are 1/60 inch apart. Therefore, the line spacing should be 10/60 or 1/6 inch. The set fine line space command can be used to set the line spacing. If possible, the spacing should be reduced slightly to overlap the rows, which prevents any white spacing from appearing between the lines. The following example illustrates the use of extended character graphics.

```
[ESC]:
[ESC]3<27>
[ESC]a<1>
<201>
<205><205><205><205><205><205><205><205><205>
<205><205><205><205><205><205><205><205><205>
<205><205><205><205>
<187>[CR][LF]
<186>    PcOS PRINTERS     <186>[CR][LF]
<186>                      <186>[CR][LF]
<186>    MADE TO ORDER     <186>[CR][LF]
<186>    BUILT TO LAST     <186>[CR][LF]
<200>
<205><205><205><205><205><205><205><205><205>
<205><205><205><205><205><205><205><205><205>
<205><205><205><205>
<188>[CR][LF]
[ESC]a<0>
[ESC]0
[ESC][P<15>
[CR][LF]

ST# 2000  OP# 00067  TE# 021 0035[CR][LF]
KLEENEX FAM  D04 QTY 1     1.68 J[CR][LF]
RITZ         D01 QTY 1     2.50 D[CR][LF]
CHIPS        D01 QTY 1     1.50 D[CR][LF]
STORAGE BAG  D04 QTY 1     1.50 J[CR][LF]
               SUB TOTAL   7.18[CR][LF]
               SALES TAX 1  .50[CR][LF]
                          ------[CR][LF]
               TOTAL       7.68[CR][LF]
               CASH TEND  20.00[CR][LF]
               CHANGE DUE 12.23[CR][LF]
[CR][LF]
[ESC]a<1>
THANK YOU FOR SHOPPING WITH US[CR][LF]
[ESC]a<0>
[CR][LF]
{DATE:0}         {TIME:0}[CR][LF]
[ESC]d<10>
```

Figure 18 Example Commands for a Sample Receipt

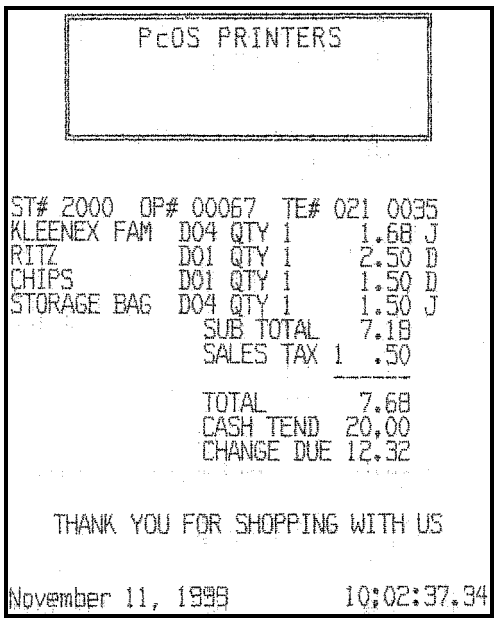


Figure 19 Sample Receipt

When printing line graphics, the data path to the printer must be eight bits. Seven-bit serial protocols do not access the extended characters. The extended characters require that the form be reverse fed. Consequently, printing line graphics on the receipt may be less than acceptable.

APA Graphics

The printer is capable of all-points-addressable (APA) or horizontal graphics. Generating a graphic image by hand is time consuming and tedious. It is recommended that a graphic package be used to create a graphic image. The following procedure will help with the setup.

Procedure for APA graphics:

1. Generate the graphic image in the program of your choice. APA graphics only support monochrome images.
2. Make sure the paper size chosen fits the printer (3 inches wide with 0.25-inch margins). If the paper size cannot be set, print a portion of the page.
3. Print the graphic to a file using a generic, IBM, graphic, 9-pin driver. The standard IBM resolutions are 240 x 216 dpi, 120 x 72 dpi, and 60 x 72 dpi. The POSjet™ 1000 Printer supports all three resolutions. For good resolution with reasonable speed, use 120 x 72 dpi.
4. Print the graphic image to a file.
5. Edit the resulting file to remove any unwanted form control, and insert the POSjet™ 1000 form control.
6. Make the resulting file available to your application, so it can be sent to the printer when required.

Color Graphics

The POSjet™ 1000 is a two-color printer. It is not a full color printer. A full color printer forms the various colors of an image by mixing inks of different colors on the paper. The amount of each color determines the hue. Typically the paper is white and no ink produces a white dot. Mixing yellow and cyan produces a red dot and mixing cyan, magenta, and yellow in equal amounts produces a black or gray dot. If the printer has a forth cartridge, it will be black.

The POSjet™ 1000 is a two-color printer. It has white (the paper), black (an ink cartridge), and one other premixed color (a red cartridge for example). The printer does not mix the inks on the paper. It either leaves the paper color, prints a black dot, or a color dot. To allow the POSjet™ Printer to use colors other than red, the architecture of the color provides for the sending of three color plains to the printer.

There are two ways to define colors, CMY and RGB. CMY stands for cyan, magenta, and yellow. Mixing cyan, magenta, and yellow can be compared to blending paint. When cyan, magenta, and yellow are mixed, the result is black. RGB stands for red, green, and blue. Mixing red, green, and blue together can be compared to blending light beams. When the lights are turned off, everything looks black. When all the lights are on, the result is white. Because the POSjet™ 1000 Printer does not mix colors, either CMY or RGB color definitions work.

For the POSjet™ 1000 Printer, RGB color definition was chosen because the colors are closer to those most often used in print, and as a result, RGB color definition generally requires sending less data to the printer. It also turns out to be convenient for Windows to generate data because RGB color definition is the same as the display.

The printer does not have a gray scale and cannot print various hues of color. Therefore, only two bits per pixel are required. To allow multicolor support, three bits per pixel are available. (Compression reduces the data back to two bits). After the data is decompressed in the printer, each dot contains three bits of information. The color print algorithm follows.

Color Bits Received			Second Cartridge Color					
			Red		Green		Blue	
Red	Green	Blue	Black	Red	Black	Green	Black	Blue
OFF	OFF	OFF	X		X		X	
ON	ON	ON						
ON	OFF	OFF		X				
OFF	ON	OFF				X		
OFF	OFF	ON	X		X			X
ON	ON	OFF		X		X	X	
OFF	ON	ON	X			X		X
ON	OFF	ON	X		X			X

Table 57 Color Bits Received

The Ithaca Windows print driver provides the translation from Windows color to the three color plains. When a graphic is created for the POSjet™ 1000 Printer, the colors used must take into account that colors other than the pen color will print black. The Ithaca Windows driver helps adjust the color content and generates the desired print from a full color image. *(Ithaca Windows print driver patent pending.)*

Procedure for color horizontal graphics:

1. Generate the graphic image in the program of your choice. Use colors consistent with the two colors in the printer.
2. Optionally, process the color image with the Ithaca color image processor. The program can print the image or generate a printable file.
3. Make sure the paper size you pick fits the printer (3 inches wide with 0.25-inch margins).
4. The POSjet™ 1000 print driver should be installed(even if the printer is not connected).
5. Set up the print driver to print the graphic to a file using whatever resolution required.
6. Print the graphic image to a file.
7. When you want to print the graphic, simply copy the file to the printer.

Note: You may copy the graphic to the graphic save buffer and then request the printer to retrieve and print it without re-sending the graphic data.

(Ithaca Color Image Processor is patent pending.)

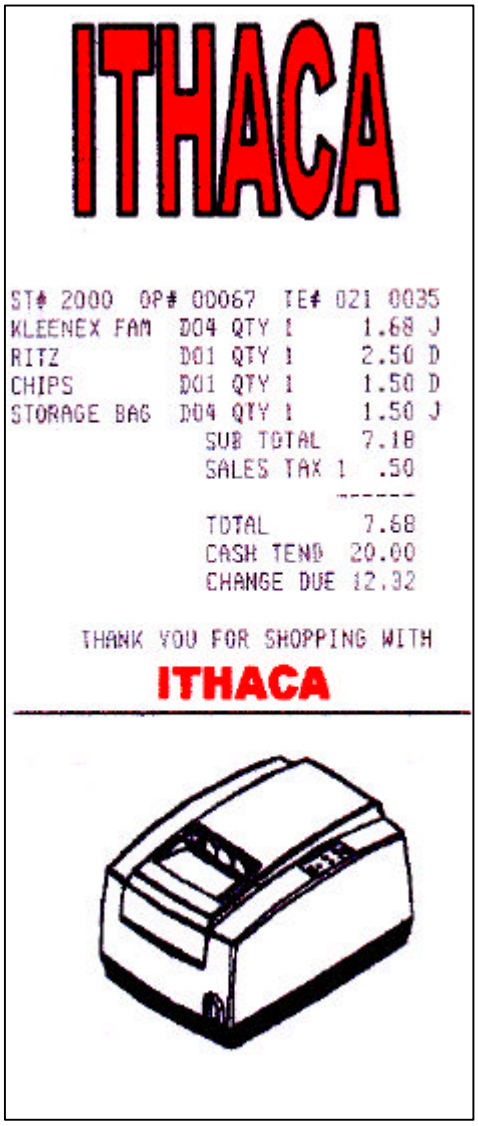


Figure 20 Receipt with graphics

As with all graphics, the data path to the printer must be eight bits. Seven-bit protocols do not work.

Appendix A

Code Page Definition Table

Code Page	Country Code/ Language Set	Decimal <n_1><n_2>	Hex <n_1><n_2>	ASCII <n_1> <n_2> <n_3>	Epson ID
64	USA (Slashed 0)	0,64	0H,040H	0,0,6,4	NA
65	USA (Unslashed 0)	0,65	0H,041H	0,0,6,5	NA
66	British	0,66	0H,042H	0,0,6,6	3
67	German	0,67	0H,043H	0,0,6,7	2
68	French	0,68	0H,044H	0,0,6,8	NA
69	Swedish I	0,69	0H,045H	0,0,6,9	5
70	Danish I	0,70	0H,046H	0,0,7,0	NA
71	Norwegian	0,71	0H,047H	0,0,7,1	NA
72	Dutch	0,72	0H,048H	0,0,7,2	14
73	Italian	0,73	0H,049H	0,0,7,3	NA
74	French Canadian	0,74	0H,04AH	0,0,7,4	13
75	Spanish I	0,75	0H,04BH	0,0,7,5	NA
76	Swedish II	0,76	0H,04CH	0,0,7,6	15
77	Swedish III	0,77	0H,04DH	0,0,7,7	16
78	Swedish IV	0,78	0H,04EH	0,0,7,8	17
79	Turkish	0,79	0H,04FH	0,0,7,9	18
80	Swiss I	0,80	0H,050H	0,0,8,0	19
81	Swiss II	0,81	0H,051H	0,0,8,1	20
91	Welsh	0,91	0H,05BH	0,0,9,1	NA
437	USA	1,181	1H,0B5H	0,4,3,7	0
774	Baltic	3,6	3H,006H	0,7,7,4	74
850	Multilingual	3,82	3H,052H	0,8,5,0	26
852	East European Latin II	3,84	3H,054H	0,8,5,2	46
855	Cyrillic I	3,87	3H,057H	0,8,5,5	44
857	Turkey	3,89	3H,059H	0,8,5,7	57
860	Portugal	3,92	3H,05CH	0,8,6,0	28
861	Icelandic	3,93	3H,05DH	0,8,6,1	73
862	Hebrew NC	3,94	3H,05EH	0,8,6,2	60
863	Canada French	3,95	3H,05FH	0,8,6,3	43
865	Norway	3,97	3H,061H	0,8,6,5	27
866	Cyrillic II	3,98	3H,062H	0,8,6,6	45
869	Greek_869	3,101	3H,065H	0,8,6,9	47
874	Thailand	3,106	3H,06AH	0,8,6,4	NA
895	Kamenicky (MJK)	3,127	3H,07FH	0,8,9,5	55

Code Page	Country Code/ Language Set	Decimal <n_1><n_2>	Hex <n_1><n_2>	ASCII <n_1> <n_2> <n_3>	Epson ID
1008	Greek 437	3,240	3H,0F0H	1,0,0,8	38
1009	Greek 928	3,241	3H,0F1H	1,0,0,9	39
1011	Greek 437 Cyprus	3,243	3H,0F3H	1,0,1,1	41
1012	Turkey	3,244	3H,0F4H	1,0,1,2	29
1014	Polska Mazovia	3,246	3H,0F6H	1,0,1,4	22
1015	ISO Latin 2	3,247	3H,0F7H	1,0,1,5	23
1016	Serbo Croatic I	3,248	3H,0F8H	1,0,1,6	24
1017	Serbo Croatic II	3,249	3H,0F9H	1,0,1,7	25
1018	ECMA-94	3,250	3H,0FAH	1,0,1,8	42
1019	Windows East Europe	3,251	3H,0FBH	1,0,1,9	49
1020	Windows Greek	3,252	3H,0FCH	1,0,2,1	50
1021	Latin 5 Windows Turkey	3,253	3H,0FDH	1,0,2,2	51
1022	Windows Cyrillic	3,254	3H,0FEH	1,0,2,4	52
1024	Hungarian CWI	4,0	4H,000H	1,0,2,5	54
1026	ISO Latin 4	4,2	4H,002H	1,0,2,6	56
1027	Ukrainian	4,3	4H,003H	1,0,2,7	66
1028	Roman-8	4,4	4H,004H	1,0,2,8	58
1029	ISO Latin 6	4,5	4H,005H	1,0,2,9	67
1031	Hebrew OC	4,7	4H,007H	1,0,3,0	61
1032	Windows Hebrew	4,8	4H.008H	1,0,3,2	62
1033	KBL-Lithuanian	4,9	4H,009H	1,0,3,3	63
1034	Windows Baltic	4,10	4H,00AH	1,0,3,4	68
1035	Cyrillic-Latvian	4,11	4H,00BH	1,0,3,5	69
1072	Bulgarian	4,48	4H,030H	1,0,7,2	72
NA	French				1
NA	Danish I				4
NA	Italian				6
NA	Spanish I				7
NA	Japanese				8
NA	Norwegian				9
NA	Danish II				10
NA	Spanish II				11
NA	Latin American				12

Appendix B

ASCII Code Table

Hex	Decimal	ASCII
00	0	NULL
01	1	SOH
02	2	STX
03	3	ETX
04	4	EOT
05	5	ENQ
06	6	ACK
07	7	BEL
08	8	BS
09	9	HT
0A	10	LF
0B	11	VT
0C	12	FF
0D	13	CR
0E	14	SO
0F	15	SI
10	16	DLE
11	17	DC1
12	18	DC2
13	19	DC3
14	20	DC4
15	21	NAK
16	22	SYN
17	23	ETB
18	24	CAN
19	25	EM
1A	26	SUB
1B	27	ESC
1C	28	FS
1D	29	GS
1E	30	RS
1F	31	US

Hex	Decimal	ASCII
20	32	(SP)
21	33	!
22	34	"
23	35	#
24	36	$
25	37	%
26	38	&
27	39	'
28	40	(
29	41	)
2A	42	*
2B	43	+
2C	44	,
2D	45	-
2E	46	.
2F	47	/
30	48	0
31	49	1
32	50	2
33	51	3
34	52	4
35	53	5
36	54	6
37	55	7
38	56	8
39	57	9
3A	58	:
3B	59	;
3C	60	<
3D	61	=
3E	62	>
3F	63	?

Hex	Decimal	ASCII
40	64	@
41	65	A
42	66	B
43	67	C
44	68	D
45	69	E
46	70	F
47	71	G
48	72	H
49	73	I
4A	74	J
4B	75	K
4C	76	L
4D	77	M
4E	78	N
4F	79	O
50	80	P
51	81	Q
52	82	R
53	83	S
54	84	T
55	85	U
56	86	V
57	87	W
58	88	X
59	89	Y
5A	90	Z
5B	91	[
5C	92	\
5D	93	]
5E	94	^
5F	95	_

Hex	Decimal	ASCII
60	96	`
61	97	a
62	98	b
63	99	c
64	100	d
65	101	e
66	102	f
67	103	g
68	104	h
69	105	i
6A	106	j
6B	107	k
6C	108	l
6D	109	m
6E	110	n
6F	111	o
70	112	p
71	113	q
72	114	r
73	115	s
74	116	t
75	117	u
76	118	v
77	119	w
78	120	x
79	121	y
7A	122	z
7B	123	{
7C	124	|
7D	125	}
7E	126	~
7F	127	(sp)

Index

[

A

B

C

D

E

F

G

I

L

M

N

O

P

R

S

T

U

W