

# ithaca<sup>®</sup>

a product of TRANSACT

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## iTherm<sup>®</sup> 280

International Version  
Programmer's Guide



PN 28-07764, Rev C April 2009

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# Change History

Rev A Initial Release

Rev B

Sept 2007

Added Periodic status back  
Added user defined code page description.  
Added double byte code page support

Rev C

April 2009

Revised Page mode section  
Added several internal code pages  
Added Multi-byte Code page support

## **Federal Communications Commission Radio Frequency Interference Statement**

The *iTherm*<sup>®</sup> 280 Printer complies with the limits for a Class A computing device in accordance with the specifications in Part 15 of FCC rules. These regulations are designed to minimize radio frequency interference during installation; however, there is no guarantee that radio or television interference will not occur during any particular installation. Interference can be determined by turning the equipment off and on while the radio or television is on. If the printer causes interference to radio or television reception, try to correct the interference by one or more of the following measures:

1. Reorient the radio or television receiving antenna
2. Relocate the printer with respect to the receiver
3. Plug the printer and receiver into different circuits

If necessary, the user should consult their dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: *How to Identify and Resolve Radio/TV Interference Problems*. This booklet is available from the US Government Printing Office, Washington, DC 20402. Ask for stock number 004-000-00345-4.

## **Canadian Department of Communications Radio Interference Statement**

The *iTherm*<sup>®</sup> 280 Printer does not exceed Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

## **Regulatory Compliance**

FCC Class A

ULc

CE Mark

UL 1950

TUV

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**chapter**  
**1**

**Introducing your iTherm<sup>®</sup> 280 Printer**

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## About your iTherm® 280 Printer

The Ithaca iTherm® 280 printer represents the very latest technology for use for thermal receipt printing for point-of-sale and retail environments. It builds upon the architecture of Ithaca's proven thermal printers, together with a host of features specifically designed to improve the performance of your receipt-printing applications, including:

- Crisp, clear receipt printing in either one or two colors
- Fast 8 inches per second print speed
- Rugged spill-resistant cover
- Large 4-inch paper roll capacity with drop-in loading
- Protected internal power supply
- Ethernet and USB interfaces
- Wireless option for reduced cable clutter
- Application-controllable buzzer
- Configurable cash drawer functionality

The iTherm® 280 also offers a wide range of programmable features, including color and font control, APA graphics support, bar codes, and support for over 60 language character sets. These features let you quickly and easily integrate more layout and printing options than ever – while giving you the reliability, durability and uptime you have come to expect from Ithaca printers.



## Who Should Read This Guide?

This document provides information and programming specifications for operators who will integrate the iTherm® 280 printer into their kitchen operations.

## What Is Included in This Guide?

This Programmer's Guide includes information on the features and programming interface of the iTherm® 280 printer. It provides the following information to support your programming and implementation efforts:

- Warranty and technical support information.
- Specifications and functionality description.
- Programming information, including documentation of low-level and high-level command interfaces, as well as sample scripts to guide your own implementation efforts.

We want you to have a trouble-free implementation with your Ithaca printer. For any issues not covered in this guide, quality technical support is available on-line at **[www.transact-tech.com](http://www.transact-tech.com)**, or by telephone at (607) 257-8901 or (877) 7ithaca. Consult the following pages for more details about our support services.

## Warranty Options

All iTherm® 280 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. You are responsible for insuring any product returned for service, and you assume the risk of loss during shipment to Ithaca. C.O.D. packages are not accepted and warranty repairs are subject to the terms and conditions as stated on the Ithaca warranty policy.





## Technical and Sales support

Your Ithaca printer is backed by the resources of TransAct Technologies, a global technology firm with dedicated technical support and sales assistance. Here is how we can help you:

### On-line Technical Support

Our web site at [www.transact-tech.com](http://www.transact-tech.com) is your on-line portal to obtaining technical assistance with your Ithaca printer. Click on Ithaca link and then the Technical Support link to find documentation for your iTherm® 280 printer, including a current copy of this Programmer's Guide featuring:

- Command codes and descriptions.
- Character fonts.
- Printer features.
- Communication specifics.

Other utilities available include a font utility, a color converter and a terminal application for communicating with your printer, as well as the following drivers and utilities:

Windows 95/98/Me Print Driver with Documentation	Part No. 100-9167
Windows NT 4.0 2K and XP Print Driver with Documentation	Part No. 100-9170
OPOS Drivers with Documentation	Part No. 100-9732
Master Character Set Definitions	Part No. 100-9785

Our on-line support site also includes a convenient e-mail assistance request form, where you can submit support requests 24 hours a day, and receive a return contact from a TransAct support technician during regular business hours.

### Telephone Technical Support

Live telephone support is available Monday through Friday from 8 AM to 5 PM Eastern US time, excluding holidays. We can provide general information about programming for your iTherm® 280 printer, technical support, documentation, or assistance in sending a printer for service. To obtain telephone support, call TransAct's Ithaca Facility at (607) 257-8901 and ask for Technical Support. To help us serve you faster, please have the following information ready when you call:

- The Model Number and Serial Number of the printer.
- A list of any other peripheral devices attached to the same port as the printer.
- What application software, operating system, and network (if any) you are using.
- What happened and what you were doing when the problem occurred.
- How you tried to solve the problem.

## Return Materials Authorization and Return Policies

If the technical support person determines that the printer should be serviced at our facility, and you want to return the printer for repair, we will issue you the Returned Materials Authorization (RMA) number that is required before returning the printer. Repairs are warranted for 90 days from the date of repair or for the balance of the original warranty period, whichever is greater. Please prepare the printer being returned for repair as follows:

- Pack the printer to be returned in the original packing material.
- Packing material may be purchased from TransAct's Ithaca Facility.
- Do not return any accessories unless asked to do so by a support technician.
- Write the RMA number clearly on the outside of the box.

## Service Programs

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.

## Sales Support

To order supplies, receive information about other Ithaca products, or obtain information about your warranty, contact our Sales Department at the contact telephone or fax numbers listed below. To receive information on International distribution, visit our web site at [www.transact-tech.com](http://www.transact-tech.com).

## Contact Information

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Ithaca, NY 14850 USA

Telephone (877) 7ithaca or (607) 257-8901  
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Sales fax (607) 257-3868  
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Web site [www.transact-tech.com](http://www.transact-tech.com)



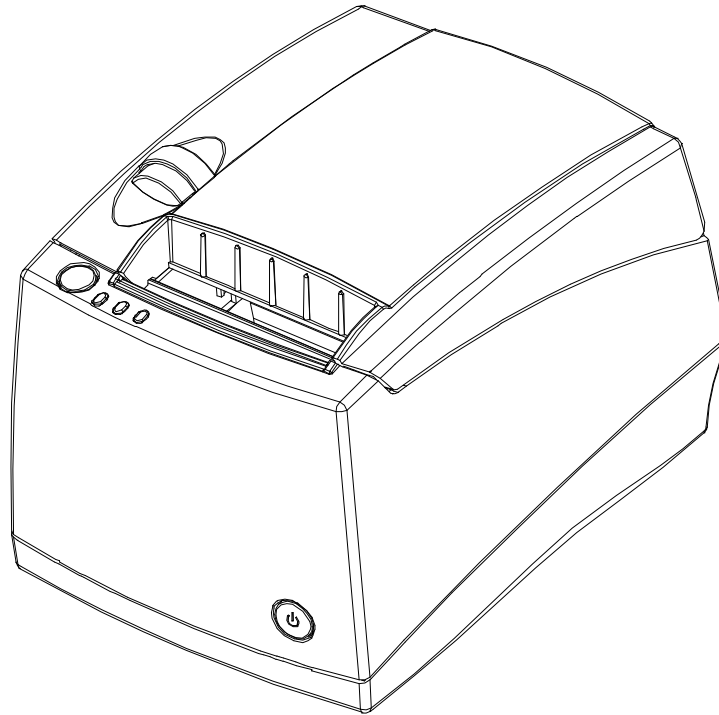


**chapter**  
**2**

**iTherm<sup>®</sup> 280 Specifications and Requirements**

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## iTherm® 280 Specifications and Requirements



### iTherm® 280 Thermal Printer Models

- iTherm® 280-P: parallel interface printer
- iTherm® 280-S: serial interface printer
- iTherm® 280-USB: USB interface printer

### Standard Features

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

- Print Speed for text is 8 inches per second (200 mm/sec) (monochrome)
- 8.0 inches per second paper feed speed
- 3.15 inch (80 mm.) print zone
- 44/57 characters per line
- Built-in self-ranging External Power supply
- Clam-shell paper loading
- Single RJ11 cash drawer driver with status (Single RJ12)
- Parallel (25 or 36 pin), serial (9 or 25 pin) RS232C, and USB interface
- Configurable receiver buffer
- Self diagnostics
- Set up and configuration utility program

- CPI selections from 8 to 30 CPI<sup>1</sup>
- Paper Out sensor
- Multiple printer emulations: Ithaca PcOS and Epson Extended,
- Maximum 8K buffer (adjustable)
- 2 Megabytes Flash Memory
- 2 Megabytes RAM
- APA and Epson graphics
- Bar Codes: Code 39, Code 93, Code 128, Interleaved 2 of 5, UPC-A, UPC-E, EAN-8, EAN-13, EAN-14, PDF417 stacked symbology and Codabar
- WGL4.0 Character set.
- Metal receipt tear off
- 8 dots/mm. thermal print head resolution
- ON/OFF button located on front of printer
- Cable routing strain relief
- Power/Error/Paper LEDs
- Paper feed button
- Cover open button
- Settable cash drawer configurations (Ithaca, Epson, or Star)
- Spill proof design- vertical main PCB mounting
- 58 mm. or 80 mm. paper width – factory-settable
- 4.0 inch (101 mm.) Paper roll diameter
- Portrait/landscape printing under Windows
- Page mode printing
- Cover Open sensor
- Electronic journal capability
- Internal counters for hours on, cuts, print lines and errors
- 100 km print head life
- 60 million print line printer MCBF (excluding knife)
- Strong break-away paper cover
- 1,000,000 cuts cutter life (partial cut)
- Buzzer
- 2 color printing (4 inches per second print speed)



<sup>1</sup> Character spacing is adjustable from 1 to 30 CPI. Typical values will be between 8 and 20 CPI depending on the font selected. Values of 13.3, 14.86, or 17.3 are typical for each resident font.

<sup>2</sup> CPI's greater than 16 will not be supported in NLQ fonts



## Optional Features

The following options are available on some of the models:

- Vertical Wall Mount Kit
- Adjustable paper low
- OCR TrueType font
- Chinese GB18030 Font.
- Custom interfaces and emulations
- DC powered version through Hosiden type connector

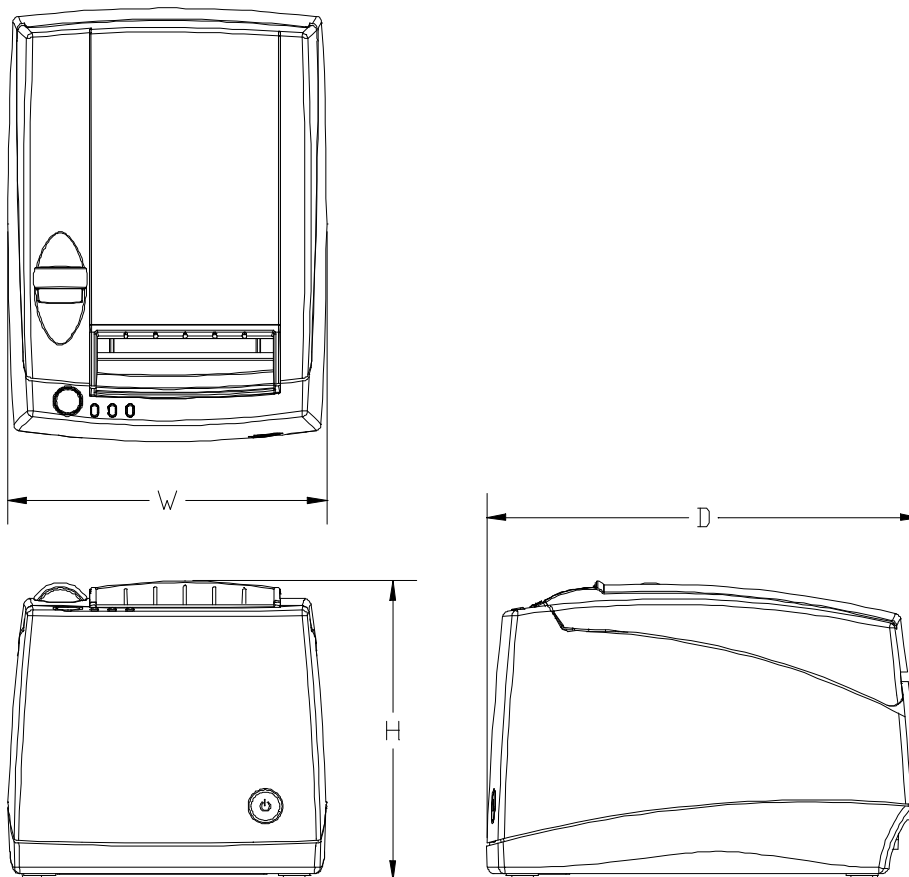


## General Specifications

### Printing Specifications

Printing method:	Thermal Sensitive Line Dot System
Vertical/Horizontal dot pitch:	0.125 mm.
Resolution:	8 dots per mm (203 DPI)
Line feed pitch:	3.2 mm. (.125 inches)
Print zone (maximum)	80 mm (3.15 inch)
Print speed (monochrome):	8 inches per second
Print Speed (two color):	4 inches per second
Number of print elements:	640 dots in-line

### Physical Characteristics



### Dimensions

Max Dimensions			
	W	D	H
Dimensions in inches	6.25	8.50	5.87

## Weight

Approximate weight: 4.6 lb.  
Shipping weight: 6.0 lb.

## Electrical Characteristics

### Internal AC Powered

The iTherm® 280 Printer is designed to be AC self-powered in domestic and international markets. The printer is equipped with a 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	45	.1A @ 120VAC .05 A @ 240VAC	1.4 A @ 120VAC .7 A @ 240VAC

Table 1 Standard Power Input Requirements

### External Powered DC

Optionally, the iTherm® 280 Printer can be operated with 24-volt DC power supplied from a host terminal or external supply. Connection to this printer version is made via a three-pin Hosiden type connector.

Supply Voltage Rating (VDC)	Supply Voltage Range (VDC)	Frequency (Hz)	Idle Current (amps)	Current (amps)
24 -5+10%	22.8 – 26.4 <sup>2</sup>	DC	0.125 A	2.0 A (Cash Drawer Fire) 3.5 A (Printing maximum for < 1 minute) 4.8 A Peak (< 167 msec.)

Table 2 Power Input Requirements with the 24-volt DC Power

The iTherm® 280 can be configured to operate with various power supplies. If a DC power supply with less capability is used, the printer must be configured for reduced power and the printer will print slower.

## Thermal Print Head

### Thermal Print Head Overview:

Number of heat elements:	640
Heat element pitch:	0.125 mm (8 dots/mm.)
Print width:	80 mm. +/- 0.2 mm.
Pulse Life:	100 million pulses
Abrasion Life:	100 km.
Vertical dot pitch	0.264 mm (0.0104 inch) or 96 DPI
Operating Temperature	5-45 degrees C
Humidity:	10-90 % RH (non-condensing)

### Operation Precautions:

- Do not print without paper.
- Clean the head with ethyl-alcohol after power is removed from the printer. This will remove foreign particles or paper dust which may degrade print quality.
- Be sure to set the paper width in the printer's configuration to agree with the paper being used (58 or 80 mm width).

<sup>2</sup> For DC powered printers, the cash drawer is supplied directly from the DC input supply. The cash drawer requirements may affect the allowable range of voltages.

- Once narrow paper has been used, some part of the print head always contacts the platen. If 80 mm. paper is used after setting up and running 58 mm. paper, the head or the cutter blade may be worn out. Never change the paper width from narrow to wide (58 to 80 mm.) once you set the paper width to narrow (58 mm.).

## Media Specifications

### Receipt Paper

Paper feed method	Friction feed
Paper feed pitch	Default - 1/8 inch
Paper width	80 mm: 79.5 +/- 0.5 mm. (3.13 +/- 0.02 inches) 58 mm: 57.5 +/- 0.5 (2.26 +/- 0.02 inches)
Roll diameter	101.6 mm. (4.0 inches) Max.
Paper thickness	0.06 to 0.09 mm. (.00225 to .0035 inches)
Roll paper core	Inside diameter .445 to .635 inches Outside diameter .730 to .860 inches
Roll footage	400 feet (min.)

### Thermal Paper Grades (Monochrome)

Paper Manufacturer	Kanzaki P-300	Kanzaki P-310	Appleton Alpha 400-2.3
Basis Weight	14.1 lbs.	14.2 lbs.	14.5 lbs.
Caliper	.00225 mils	.00226 mils	.00235 inches
Image color	black	Black	Black
Brightness	85%	85%	87%
Activation Temp.	Initial: 74 +/- 5°C Effective: 87 +/- 5°C Optimum: 100 +/- 5°C	Initial: 73 +/- 5°C Effective: 83 +/- 5°C Optimum: 88 +/- 5°C	Initial: 77.2°C  Optimum: 104.8 +/- 5°C
Smoothness (bekk)	325 sec. Ave.	325 sec. Ave.	200 (bekk).

Table 3: Paper Grades-Monochrome

### Thermal Paper Grades (color)

Paper Manufacturer	Kanzaki P-320 RB	Kanzaki P-320 BB	Appleton Dual RB	Appleton Dual BB
Basis Weight	14.6 lbs.	14.6 lbs.	15.6 lbs.	15.6 lbs.
Caliper	.00227 mils	.00227 mils	.00235 mils	.00235 mils
Brightness	87 %	87 %	89.5 %	87.8 %
Image color	Red/Black:	Blue/Black	Red/Black:	Blue/Black
Thermal Response	Initial(Red):80 +/- 5°C Initial(B):98 +/- 5°C Effective(Red): 87 +/- 5°C Effective(B): 116 +/- 5°C Optimum(Red):100 +/- 5°C Optimum(B):130 +/- 5°C	Initial(Blue):74 +/- 5°C Initial(B):90 +/- 5°C Effective(Blue): 80 +/- 5°C Effective(B): 120 +/- 5°C Optimum(Blue):90 +/- 5°C Optimum(B):130 +/- 5°C	Initial(Red):77.8 +/- 5°C Initial(B):77.8 +/- 5°C Optimum(Red):90.5 +/- 5°C Optimum(B):103.3 +/- 5°C	Initial(Blue):69.4 +/- 5°C Initial(B):69.4 +/- 5°C Optimum(Blue):82 +/- 5°C Optimum(B):118 +/- 5°C
Smoothness (bekk)	500 sec. ave.	500 sec. ave.	250 sec./min.	250 sec./min.

Table 8: Paper Grades-Color

### Paper Usage Precautions:

- The life of the thermal head, when two-color paper is used, is reduced to half of the life when single-color thermal paper is used.

- Use only specified thermal paper. If other paper is used, print quality, head life, and cutter life may deteriorate.

**Paper Out**

A receipt paper out sensor is provided as a standard feature. It senses when there is approximately .5 inches length 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 will be provided to allow the printer to sense when the paper roll diameter is between .94 to 1.29 inches (approximate). It is adjustable to compensate for various paper core dimensions.

Paper Low Adjustment Settings	Approximate Paper Remaining (in feet)	Paper Roll Diameter
UPPER LIMIT: 2 turns (counter clockwise)	29'	1.29"
1 turn (counter clockwise)	23'	1.203"
FACTORY SETTING	18'	1.115"
1 turn (clockwise)	13'	1.028"
LOW LIMIT: 2 turns (clockwise)	8.5'	.940"

**Notes:**

- These measurements are approximate. Paper roll used for testing had paper roll core outside diameter of .750 inches, and inside diameter is .625 inches. Results will vary depending on core O.D./I.D. dimensions.
- Paper roll core should meet or exceed paper width.
- Results based on thermal paper .0025 inches thick.
- The receipt printable area is as shown in the following diagram.

RECEIPT PAPER ROLL

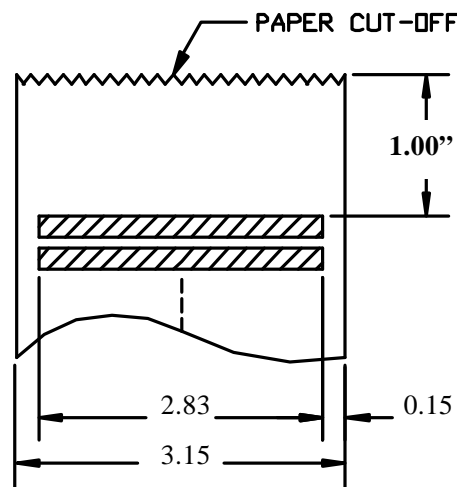


Figure 1 Receipt Printing, Tear off Position

The paper tear off is positioned 1 inch from the last line of print

**Receipt Printing, Auto Cutter Position**

A receipt auto-cutter is a standard feature with all iTherm™ 280 Printers.

Cutter type	Rotary
Media width	3.13 +/- .02 inches (79.5 +/- .5 mm)
Media thickness range	0.0025 to 0.0035 inch
Cut to line of print	0.70 inch
Cutter life	1,000,000 cuts
Partial Cut tab:	.125 inches +/- .0625 inches (right edge of receipt)
Cut time:	Less than 350 milliseconds

**Buzzer**

A buzzer is provided as a standard feature. It is triggered upon command from the host terminal to make a sound loud enough to be heard under noisy conditions. It will produce a sound pressure level of at least 90 dBA, 1 foot from the front of the printer.

**Cover Interlock**

A paper cover interlock switch is provided as a standard feature. When the paper cover is open, the printer is off-line, and will not print.

**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.

## Communications Interface

### Parallel Interface

Your printer features two parallel interfaces:

- An IEEE 1284-A 25-pin, D-shell connector, with pin-outs that interface to a standard IBM PC parallel printer interface with a one-to-one cable.
- An IEEE 1284-B, which is a standard Centronics 36-pin connector.

Both interface cards provide a dual cash drawer interface. The following table lists interface signals and corresponding pins.

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 4 Parallel Interface 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



## RS-232 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

9-pin	25-pin	Signal	Description
Pin 1	Pin 8		Not Connected
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 11		Not Connected

Table 5 Serial Interface Pin-outs

### Signal Voltage and Current levels

The serial interface meets EIA RS232 interface specifications:

Voltage Levels	Max	+/-15 Volts
	Min	+/- 3 Volts
Mark = Off =	-3 to -15 Volts	
Space = On =	+3 to +15 Volts	

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 inter-connect, it will not work. Therefore, a null modem or turn-around cable must be used to interconnect the host and the printer.

### 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.

## USB Interface

The USB interface is a Version 1.1 interface that is Version 2.0 compliant. The standard USB interface card 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 standard type B USB interface cable.

The Standard USB Type B connector has the following pin functions:

#### Pin Signal

- 1 Vbus (+5 V dc) (Not used in the iTherm<sup>®</sup> 280)
- 2 Minus data
- 3 Plus data
- 4 Ground



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

## Ethernet 10-Base-T adapter

An IP addressable 10-Base-T Ethernet adapter is available for the iTherm<sup>®</sup> 280 printer. It provides for web page configuration and supports bi-directional RAW and Telnet interfaces. All protocols are implemented to the extent necessary to support printing from Windows<sup>™</sup> platforms; specific protocols supported include the following:

- Line Printer Daemon Protocol (LPR) – RFC1179
- Simple Network Management Protocol (SNMP) – RFC1157
- Printer MIB – RFC1759
- Port 9100 (Raw data)
- Service Location Protocol (SLP) – RFC2165
- The TFTP Protocol (Revision 2) – RFC1350
- Telnet COM Port Control Option – RFC2217
- Hypertext Transfer Protocol – HTTP/1.1 – RFC2616

Refer to the 100-05072 Wired Ethernet Programmer's Guide for features and additional setup information.



**Note:** The Ethernet adapter supports only the Ithaca Cash Drawer interface.

## 802.11b Wireless Interface

An 802.11b wireless interface is available for the iTherm<sup>®</sup> 280 printer, allowing wireless operation of the printer within a specified distance of a base unit. Contact TransAct technical support for more information on this interface.

## Cash Drawer

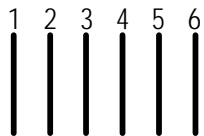
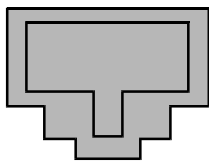
### Interface Description

The iTherm® 280 Printer supports a single cash drawer with status. The driver in the printer is capable of supplying 24 V DC at up to 1.5 amps for up to 250 milliseconds. The iTherm® 280 Printer defines cash drawer closed as switch open. If the drawer is disconnected, it will be viewed by the printer as 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 RJ12 connectors 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

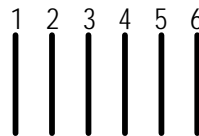
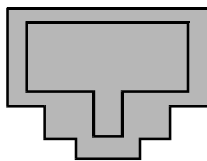
### Cash Drawer Pin Assignments

#### *Ithaca*



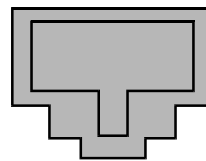
<b>pin 1</b>	CD2-
<b>pin 2</b>	CD1 Sense
<b>pin 3</b>	Ground
<b>pin 4</b>	CD Drive + (+24V)
<b>pin 5</b>	CD1-
<b>pin 6</b>	Not Connected

#### *Epson*



<b>pin 1</b>	Not Connected
<b>pin 2</b>	CD1-
<b>pin 3</b>	CD1 Sense
<b>pin 4</b>	CD Drive + (+24V)
<b>pin 5</b>	CD2-
<b>pin 6</b>	Ground

#### *Star*



<b>pin 1</b>	Not Connected
<b>pin 2</b>	CD1-
<b>pin 3</b>	CD Drive + (+24V)
<b>pin 4</b>	CD Drive + (+24V)
<b>pin 5</b>	CD2-
<b>pin 6</b>	CD1 Sense

Figure 2 Cash Drawer Pin Definitions

The cash drawer can be configured for one of three configurations; Ithaca, Epson, or Star. The Main Controller PCB has three (3) six-pin headers, one each configuration. The cash drawer harness is identical, and is plugged into the appropriate header at time of factory build. The header position defines the configuration of the cash drawer. This design allows for changing the cash drawer in the field by a trained technician. Refer to the markups on the board when determining where the harness should be installed to work in the three different configurations.

Pin Number	<i>Ithaca</i>		<i>Epson</i>		<i>Star</i>	
	Signal Name	Direction	Signal Name	Direction	Signal Name	Direction
1	Frame ground		Drawer kick-out drive signal 2	Output Sink Drive	Frame ground	
2	Drawer kick-out drive signal 1	Output Sink Drive	Drawer open/close signal	Input	Drawer kick-out drive signal 1	Output Sink Drive
3	Drawer open/close signal	Input	Signal ground		+24V DC	
4	+24V DC		+24V DC		+24V DC	
5	Drawer kick-out drive signal 2	Output Sink Drive	Drawer kick-out drive signal 1	Output Sink Drive	Drawer kick-out drive signal 2	Output
6	Signal Ground		Frame Ground		Drawer Open/Close signal	Input

Table 6 Cash Drawer Pin Assignment



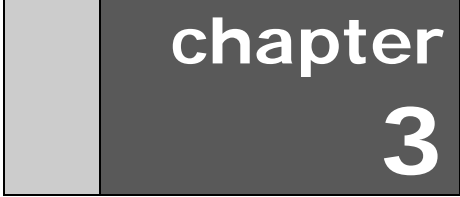
## Vertical Wall Mount Kit Option

A kit is available as an add-on option that allows the iTherm® 280 printer to be vertically mounted to a wall. It is comprised of a metal mounting bracket that attaches to the base of the printer with two M6 thread-cutting screws. Additional hardware is required to mount the bracket to the wall. The hardware should be installed into wall studs to ensure that the printer mounting meets the following conditions:

- The mounting to the wall must withstand 4 times the printer weight in downward and outward directions.
- The kit must include mounting instructions to explain how to meet the load test
- The firewall or the outer housing of the printer is maintained between the controller PCB and the mounting wall.







**chapter**  
**3**

**Setup Procedures**

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## Verifying the Configuration

Before you install an iTherm® 280 Printer into your system, you should verify that the printer is configured as required by your system. There are four parts to this verification process.

1. Verify that the communications interface card is the correct one.
2. Verify that the cash drawer interface is configured correctly.
3. Verify that the power connection is correct.
4. Verify that the firmware in the printer is configured correctly.

## Verify the Communications Interface Card

There are several basic types of interface cards, and each has variations. Make sure your printer has the correct interface card.

### Parallel Interface

- Centronics 36-pin interface
- 25-pin D shell

### Serial Interface

- 9-pin D shell interface
- 25-pin D shell interface

### USB Interface

- Standard 4-pin

### Ethernet 10-Base-T Adapter

- Standard Ethernet port connector

### 802.11b Wireless Interface

- Wireless interface pre-installed within printer unit

It is easy to distinguish most of the interface cards other than the 25-pin serial and 25-pin parallel interface cards. To determine what interface is installed, refer to the configuration receipt shipped with the printer, or enter configuration mode and look at the verification printout. If a serial interface card is installed, the printout will refer to the RS-232 serial interface. If the parallel interface card is installed, the printout will refer to the parallel interface.

## Changing Interface Cards

The interface card on the iTherm® 280 Printer can be changed in the field.

In most cases, interface cards are interchangeable without altering the printer firmware. However, you may have to load new firmware and/or a new boot loader before you change the interface cards. Check with Technical Support for firmware compatibility between interface cards before ordering.

## Removing the Old Interface Card

1. Turn over the printer, taking care not to allow the cover to open or the paper to fall.
2. Disconnect the current communications and cash drawer cables.
3. If equipped, unsnap the power supply retainer and slide out the power supply.
4. Disconnect the power supply from the interface card.
5. Remove the interface retaining screw.
6. Slide the interface card sideways-towards the power supply pocket-and remove it.

## Cash Drawer Configuration

### Verify the Cash Drawer Interface

The printer is shipped from the factory with a cash drawer interface label on the bottom of the printer. You should always verify that the cash drawer you are using matches the printer's cash drawer interface label. If there is no cash drawer label, you should remove the communications interface card and verify the setting. See "Configuring the Cash Drawer Interface" on page 40 .

There are many vendors of cash drawers. If you are unsure what the cash drawer interface is, contact the cash drawer vendor for more information.

If you find that the cash drawer does not match the printer, you may change the printer's cash drawer interface configuration. If the cash drawer interface no longer matches the label on the printer, please remove the label.

### Install the new interface card

1. Slide the interface card into the printer. Make sure the interface card sits flush with the printer. The retaining screws should also line up with the mounting holes.
2. Install the retaining screws.
3. Connect the communications interface card and any cash drawer cables.
4. Turn over the printer, and reconnect the power.

## Configuring the Cash Drawer Interface

CD interface drawing not yet available.

Figure 3 Cash Drawer Selection

The cash drawer connector may be connected to one of three internal connectors on the controller board. To access the internal connector, you must first remove the interface adapter.

### Removing the interface card

1. Unplug the printer
2. Turn over the printer. Take care not to allow the cover to open or the paper to fall.
3. Disconnect the current communications and cash drawer cables.
4. Remove the interface retaining screw2.
5. Slide the interface card towards the back of the printer and remove it.

### Reconfigure the cash drawer

1. Slide the cash drawer socket out of the slot in the frame.
2. Unplug the socket harness from the main circuit board.
3. Plug the harness into the connector for the desired interface.
4. Reinstall the cash drawer socket into the frame.

### Re-Install the interface card

1. Slide the interface card into the printer. Make sure the interface card sits flush with the printer. The retaining screws should also line up with the mounting holes.
2. Install the retaining screws.
3. Connect the communications interface card and any cash drawer cables.
4. Turn over the printer, and reconnect the power.

## Installing Cables

Three cables are required to be connected to the printer.

1. Power
2. Communications
3. Cash Drawer

### Connecting power

The iTherm® 280 Printer is generally supplied with a built-in power supply. As an option, the printer is available without a power supply.

#### Internal Supply

The internal supply connects to an outside power source with a standard two wire power cord.

## External Supply

If an external supply is used a 3 pin mini DIN plug is provided for the external 24 Volt supply.

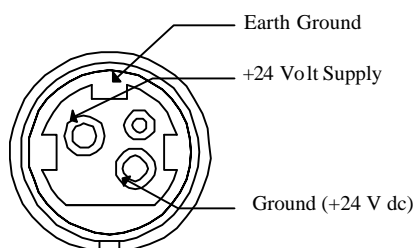


Figure 4 3-pin mini DIN plug

## Connecting Communications Cables

The iTherm® 280 has a number of different communications interfaces.

### Serial

The serial interface connector is either a 9-pin or 25-pin mail D shell interface. The pin-out is shown below

9-pin	25-pin	Signal	Description
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

Table 7 Serial interface pin out

### Parallel

The parallel interface connection is very similar to the serial interface connection. It can be a 36-pin Centronics (IEEE 1284-B) or a 25-Pin female D-Shell (IEEE 1284-A) connector. The pin-out of both connectors are shown below

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	Auto-feed 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 8 Parallel interface pin out

## USB

The USB connector can be one of two types: a standard Type B connector, as is commonly used in the PC industry, or a POS Powered USB connector. In the case of the powered USB connector, there are a number of different versions. Make sure you are using a 24 volt DC version, and the 24 volt supply meets the requirements of the iTherm® 280 printer and any cash drawer that is connected to the printer.

A powered USB interface is a special order option. There are several standards for the power interface. Make sure that you inform TransAct is aware of what interface you require, and that that interface connector is supported by the iTherm® 280.

## Verify the Firmware Configuration

An example receipt is included in the box your printer shipped in that will show how the printer was configured before it shipped from our Ithaca facility. Compare this information to your system requirements. Pay attention to the emulation and the communications link. If they are wrong, the printer may appear inoperative. If the configuration is not correct, refer to the section on changing the iTherm® 280 configuration. If there are a number of printers to be installed and you want the identical configuration in each, you can use the universal configuration program to record the configuration on one printer, and replicate it over a group. The configuration program is available from Transact technical support.

## Installing Paper

It is easy to install paper in the iTherm® 280.

1. Open the paper cover by grasping the green cover release between your thumb and forefinger, and squeeze the release. This will pop the cover up.
2. Open the cover and install a roll of paper with the paper coming off of the bottom of the roll.
3. Lay the paper tail over the front of the printer and center it over the paper path.
4. Close the cover. When the cover is closed, the printer will feed several inches of paper to make sure the paper is aligned in the printer. If equipped with a cutter, the printer will automatically cut the paper tail and the printer is now ready to print. If the printer is not equipped with a cutter, the operator should remove the paper tail.

## Printer Drivers and Printer Controls

### Definitions for terms you will see in this guide:

**OS** – The Operating System, which is the operating software underlying a computer system. Examples of OS's include Microsoft Windows® (9x/Me/2000/XP), Linux, Unix, and OS2.

**Application** - A software program that a person uses to perform a function, such as a point of sale (POS) application. Also referred to as a *program*.

**Driver** - Software that makes hardware do something (something useful, we hope!). A driver translates (or converts) a software command to a command that specific hardware can understand. Types of drivers include printer drivers, port drivers, OPOS drivers, and USB drivers.

**OCX/ActiveX** - a software component that utilizes Microsoft's OLE (Object linking and embedding).

**API** - Application Programming Interface, or the language used to develop applications for devices such as printers. In the generic sense, the term "the API" refers to the Windows Operating System API. Types of APIs include Windows API, Visual Basic API, Delphi API, and MFC API.

## Getting Started – Questions to Ask

Most driver software for TransAct Technologies printers fall into one of three main categories:

- They support or emulate a specific type of communications port – for example, a USB port driver, or a driver to emulate a serial port via an Ethernet interface.
- They support the industry standard OPOS (OLE Point of Sale) interface for point of sale printer applications.
- They support a direct printer interface, such as the Windows printer API or low-level printer commands.

The questions below can help clarify which types of drivers may be appropriate for your printer. The following section then examines each of the most common types of driver software in detail.

### **Do you want to use USB and simulate a communication port?**

The TransAct Virtual Serial (TVS) USB Driver allows your application to think that it is communicating with a serial port, but is actually using the USB link to communicate with the printer. This driver should be downloaded and installed when requested as part of the Windows Plug and Play process, or may be preinstalled.

Some of TransAct Technologies printers support a composite USB interface. This interface allows a Windows printer driver to be installed to a windows USB printer port as well as supporting a virtual serial port. In some cases the printer USB port is configurable, and either the windows printer port or the virtual serial port may be disabled. If you will be using OPOS, you should disable the Windows printer interface. If you are going to use only the Windows printer API, you can but do not need to disable the virtual serial interface.

### **Do you want to use an Ethernet interface and simulate a communication port?**

The TransAct Ethernet Virtual Serial (VSerial) Driver allows your application to think that it is communicating with a serial port, but is actually using the Ethernet link to communicate with the printer. This driver should be downloaded and installed when required. There is currently no reliable Windows Plug and Play protocol for Ethernet devices.

## Are you using OPOS (UnifiedPOS/UPOS)?

If you are using an application that is written to interface with the OPOS (OLE Point of Sale) standard, then the TransAct Technologies OPOS driver will allow you to communicate with most TransAct Technologies printers. The OPOS driver provides the mechanisms to print in all of the print modes supported by the printer.

**Note:** The TransAct Technologies OPOS driver only supports Microsoft Windows operating systems.

**Note:** If you are using a USB printer, you will also need to install the TransAct Technologies Virtual Serial (TVS) driver.

**Note:** If you are using an Ethernet printer, UPOS can be configured to interact directly with the printer. In this case, you do not need the VSerial Ethernet driver.

## Do you want to print from a Windows application?

Microsoft supports a Windows Printing API for Windows applications. This interface is intended to support typical Windows page printers, and has features such as begin document, end document, and tray selection. While this is not an ideal environment for a POS printer, there are cases where such functionality is required.

To support this environment TransAct Technologies provides a Windows print driver with extensions for POS, which may be downloaded and installed for most TransAct Technologies printers.

Please read the Ithaca Printer API documentation included with the driver. A POS printer is not the same as a typical consumer printer and requires unique consideration when using a Windows printer API interface.



## Windows Printer Driver

A Windows printer driver is a specific type of driver defined by Microsoft that the OS uses to translate drawing commands by a Windows application to a specific printer's command set. A standard Windows printer driver is a graphics page mode driver, and is not a POS (point of sale) driver. (Have you ever had to open a cash drawer that was connected to your printer at home?)

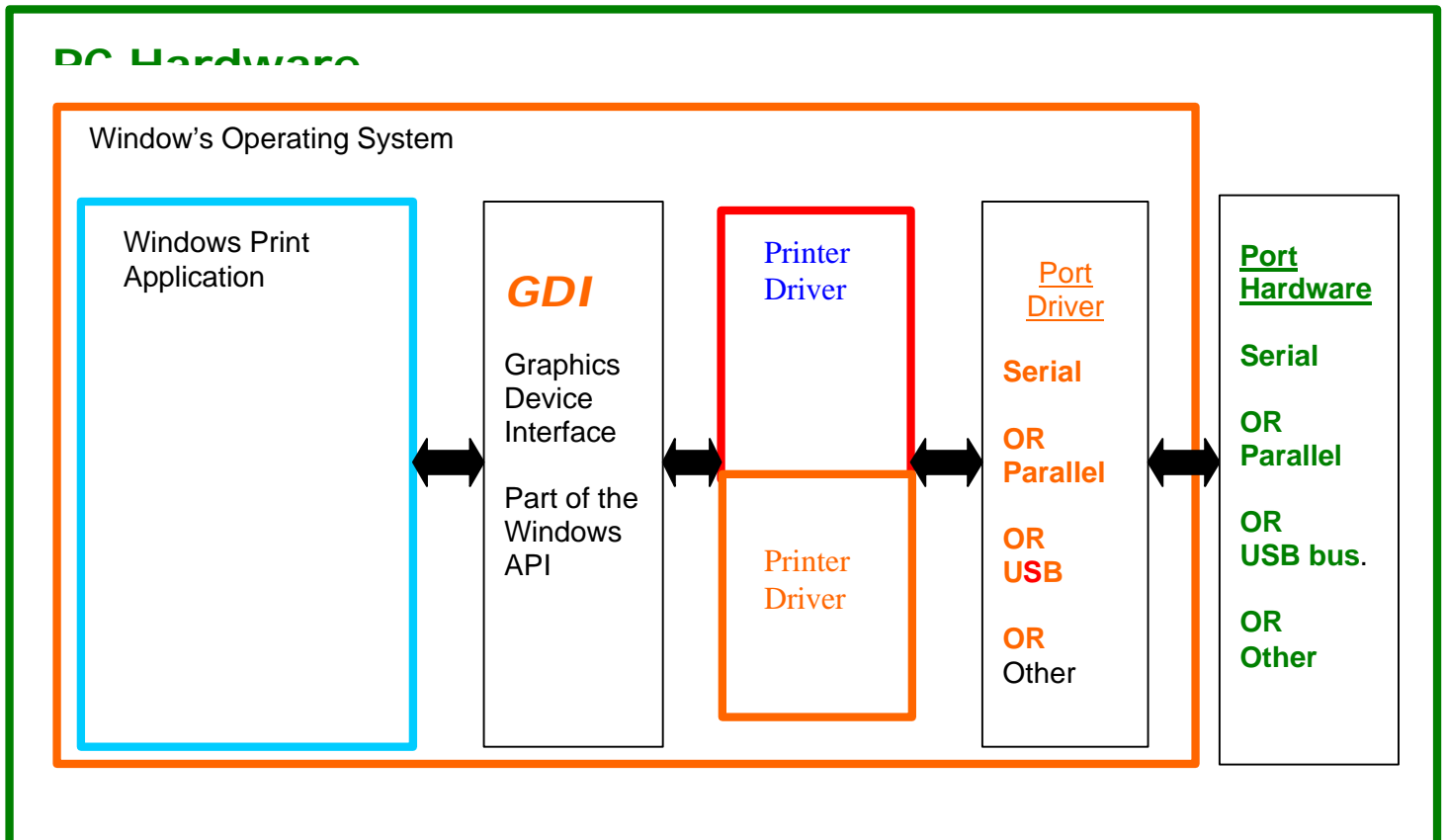


Figure 5 Windows Print Driver

### When to use a windows printer driver:

Use a printer driver when writing a program that uses the Windows API to send print information to the printer.

### When not to use a windows printer driver:

When a program wants to send printer command codes to the printer, or when a program wants to get information back from a printer.

## OPOS driver

An OPOS driver is an implementation of the UnifiedPOS (UPOS) specification.

It provides an application interface for retail devices such as a POS printer, scanner, cash drawer, pole display, MICR, scale, or others.

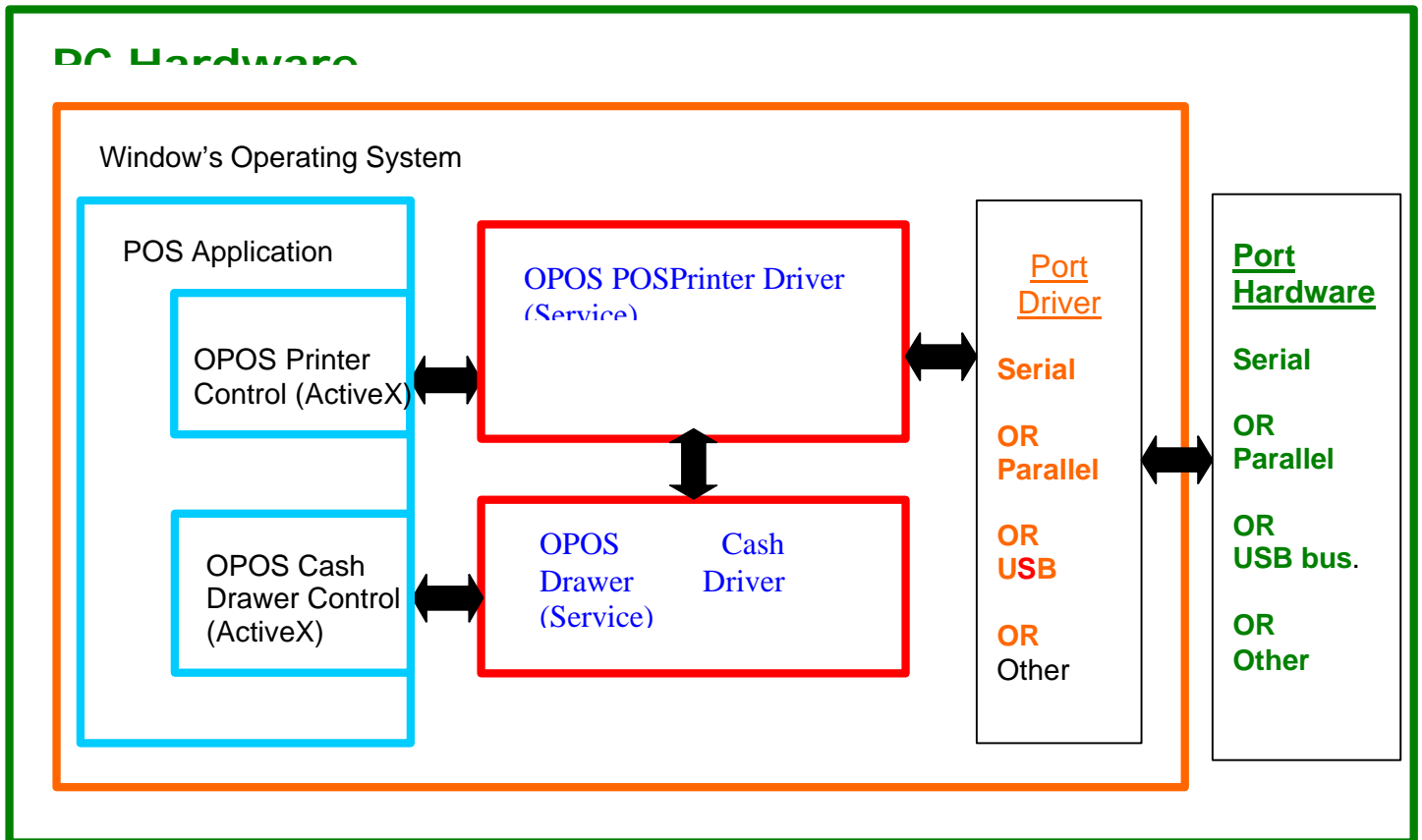


Figure 6 OPOS or UPOS

### When to use an OPOS driver:

When an application is written that invokes the retail device functions based on the UPOS specification, in a vendor independent manner, OPOS can be used on the Microsoft Windows platform. It allows access to all the features of a retail device without having to deal with specific device commands. It also allows information to be retrieved from the retail device.

### When not to use an OPOS driver:

When the application is written using the Windows print API, and device specific commands are sent directly through the application to the device.

## USB driver

A USB driver is a low level device driver, required for USB communication with the printers. It is a Windows Plug and Play driver and needs to be installed for USB printers, when the printer is initially plugged into the system.

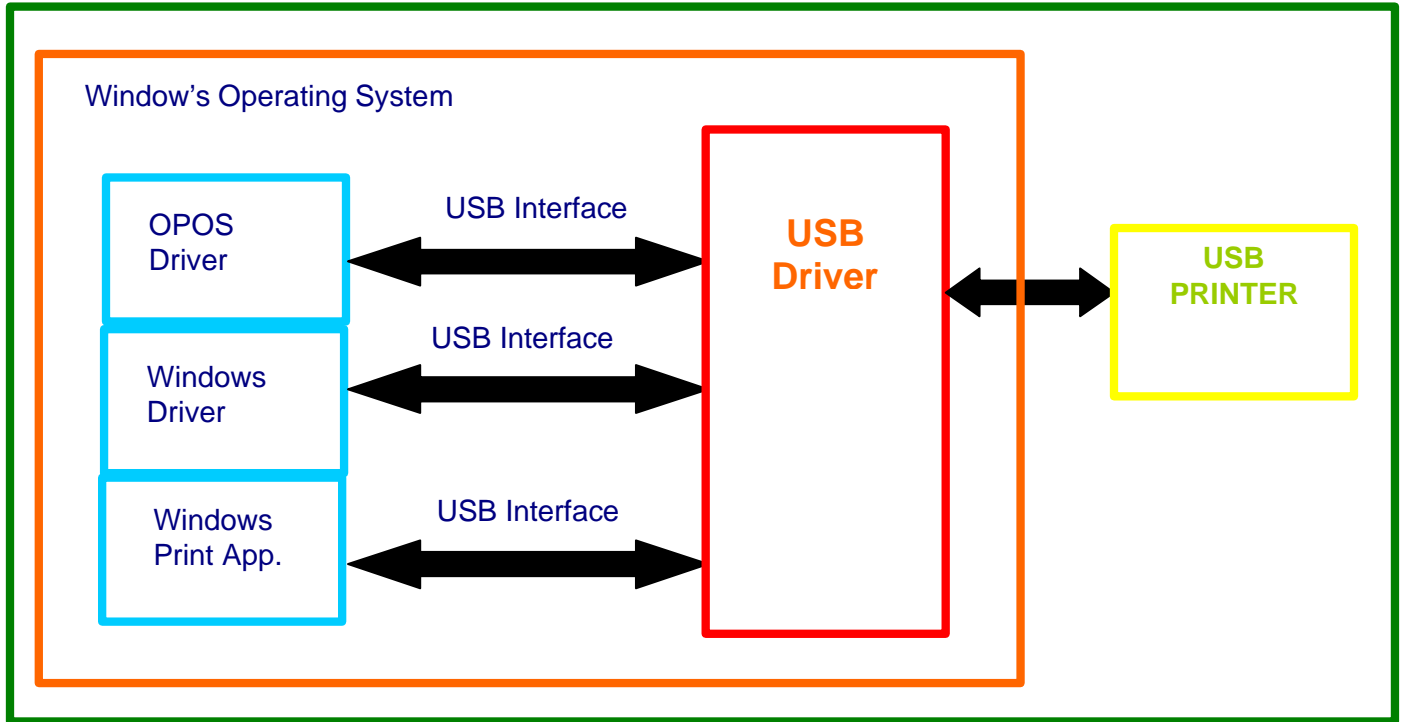


Figure 7 USB Driver

### When to use the USB driver:

A USB driver is needed whenever data is to be sent to or received from the printer using the USB interface. It is needed with both the Windows and the OPOS drivers, when these drivers use the USB interface as the underlying communication path. It is also needed if the application does not use either the OPOS or the Windows driver, but needs to communicate directly with the printer using the USB interface.

### When not to use the USB driver:

A USB driver is not needed if the application uses any of the other forms of communication such as serial, parallel, or Ethernet, and does not use USB.

## Ethernet Virtual Serial driver

A VSerial driver is a low level device driver, which appears to Windows and your application as a serial com port. However, all of the data sent to and received from the serial com port actually comes from the Ethernet printer.

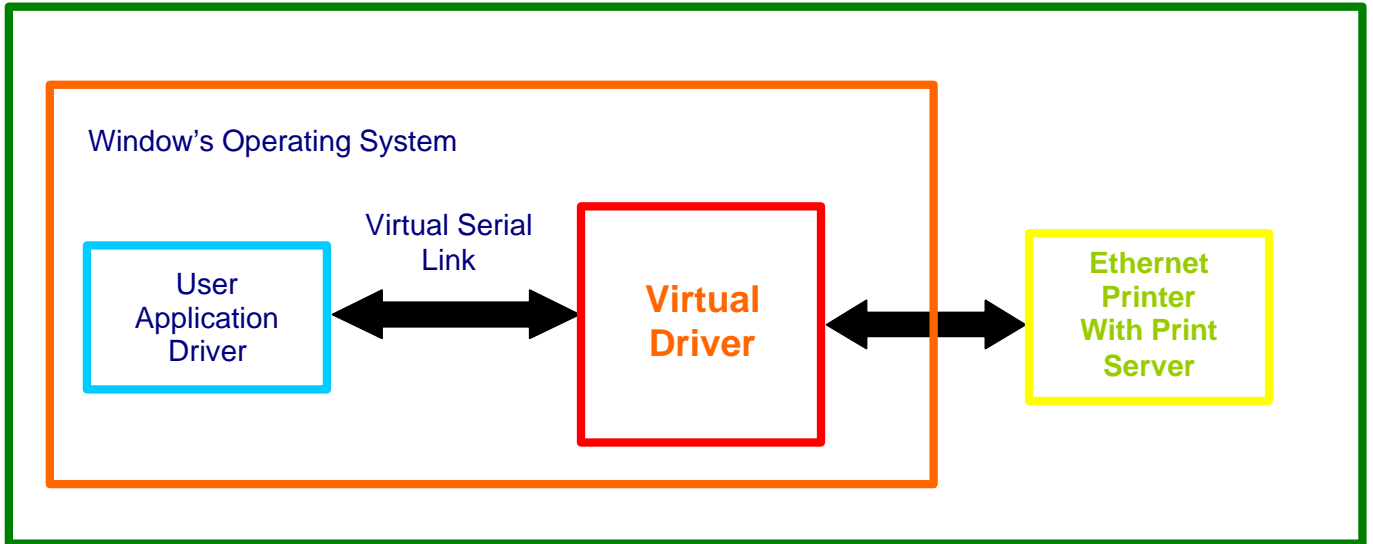


Figure 8 Ethernet Virtual Serial Driver

### When to use the Ethernet Virtual Serial driver:

An Ethernet Virtual Serial Driver is needed whenever data is to be sent to or received from the printer using the Ethernet interface, but needs to appear to the application as a serial port.

### When not to use the Ethernet Virtual Serial driver:

An Ethernet Virtual Serial driver is not needed if the application is able to directly interact with an Ethernet printer using TCP/IP Protocol.

## POSPrinter ActiveX Control (POSPrinter OCX)

This is not a driver; but rather a software component that provides a connection from an application to a port driver. This allows an application to communicate “directly” with a printer. This approach allows an application to send commands to the printer if desired, similar to the legacy DOS approach once used to communicate with a POS printer.

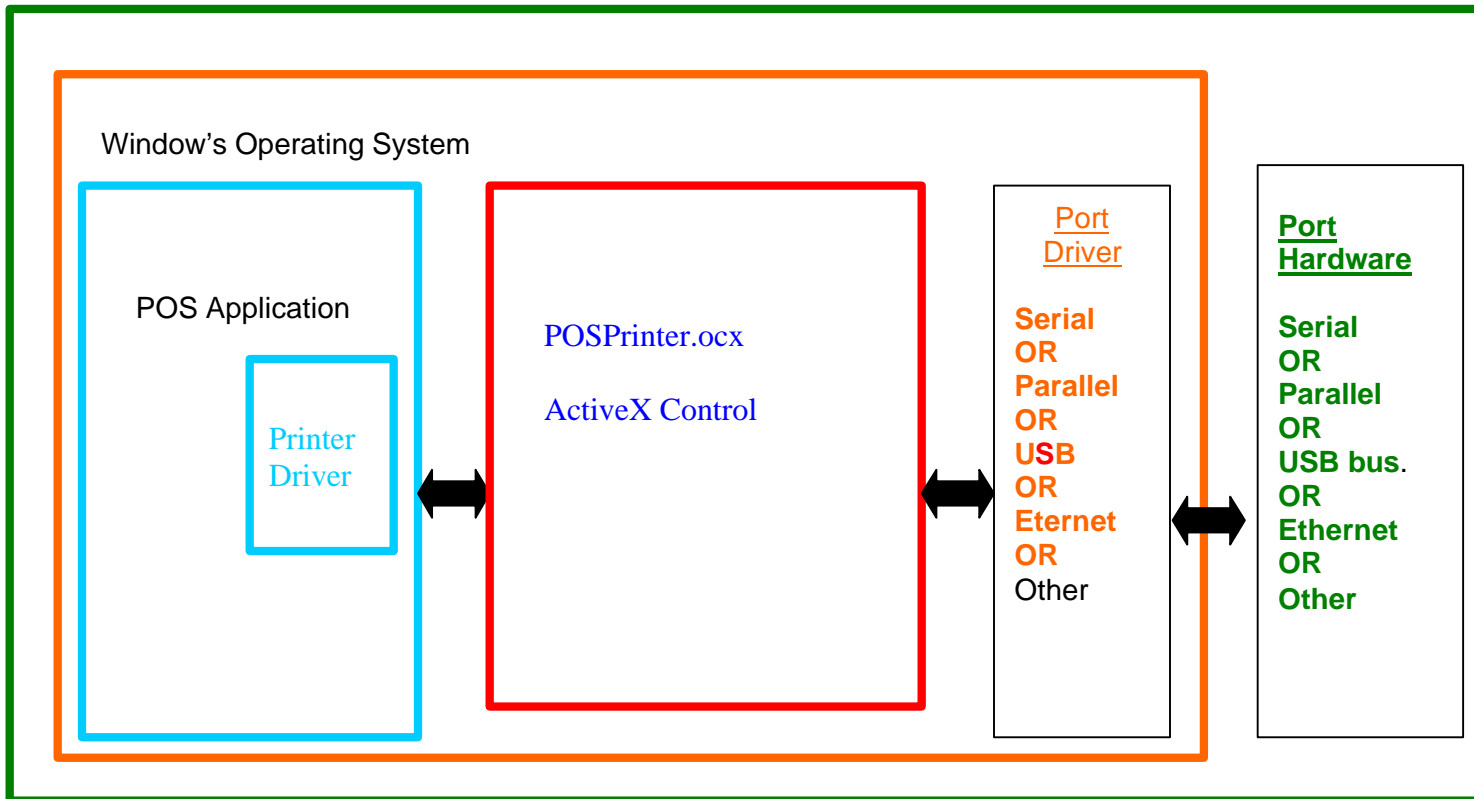


Figure 9 POSPrinter OCX

### When to use the POSPrinter OCX:

When the application writer wants complete control of what is sent to the printer. The application must take the responsibility of sending the correct codes to the printer as well as detecting error conditions, and graceful recovery from error situations.

### When not to use the POSPrinter OCX:

When you do not want to deal with the low-level commands sent to the printer.

## Where to get more information

Additional information about Driver and support programs are available for your Transact Sales representative, from

Transact customer support or from the TransAct Technologies Web site.



**chapter**  
**4**

**How to Operate the iTherm<sup>®</sup> 280 Printer**

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## How to Operate the iTherm® 280 Printer

Your iTherm® 280 printer contains two buttons and three (LED) indicator lights. In addition to power control and feeding paper, these two buttons can be used to perform functions like self-testing, clearing errors and printer configuration. They are:

- \* **BUTTON** This is the standby or power down button, located on front face of the printer's cabinet
- FEED** Located on bottom portion of printer's keypad

### \* **Button**

The iTherm® 280 has been designed to remain connected to a power source at all times. The \* button on the iTherm® 280 Printer does not completely remove power from the printer. Because of this, the \* button is used to alternately switch the printer between OFF and ON modes. The \* button does not disconnect power to the printer. The printer is truly off only when the AC power supply is disconnected. You will notice that none of the indicator lights will be on when the printer is in OFF. When the printer enters ON mode, the green power indicator light will be activated. The operational state of the iTherm® 280 can be determined by looking at the Power Indicator Light (LED).

When the \* button is pressed or the power down command is received, the iTherm® 280 Printer enters an OFF low power mode. The printer is not completely off, but is in Standby mode<sup>3</sup>.

Standby mode is remembered even if the power is removed. Whenever power is turned back on, the printer starts, performs Level 0 diagnostics, and re-enters Standby mode.

### **FEED Button**

The **FEED** button feeds paper through the printer. By pressing the **FEED** button momentarily, the paper will be fed one line at a time. Pressing and holding the **FEED** button will make the printer feed paper continuously until the button is released.

---

<sup>3</sup> The printer draws about four watts of power in Standby.

## Indicator Lights (LED)

The three iTherm® 280 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)

### Power Indicator (LED)

The power indicator lets the user know that the printer is ON. If the POWER indicator blinks in conjunction with the ERROR indicator, the printer is experiencing a non-recoverable error: see the fault indicators discussed below. If the POWER indicator blinks and there is no error indicator blinking, 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 the 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: in this case, the printer stops printing and waits for the paper to be changed.

## Fault Indicators

The ERROR indicator is the primary fault indicator, and is either always on or blinking if a fault has occurred. There are three types of faults:

<b>Fully-recoverable faults</b>	Paper out or cover open
<b>Semi-recoverable faults</b>	Head jam
<b>Non-recoverable faults</b>	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.

**Error Blink Codes**

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. Cycling the power restarts the printer. Blink patterns are defined as follows.

**1 Blink** (1 blink, pause)



**2 Blink** (2 blinks, pause)



**3 Blink** (3 blinks pause)



A similar pattern is followed for other blink counts. Error indications are as follows:

Error Indicated	Blink Count
Unused	1
Configuration Read	2
Configuration Write	3
Software Error	4
Auto Cutter Error	5
Unused	6
User Store Format Error	7
Electronic Journal Format Error	8
Flash Operation Error	9
Internal Memory Error	12
Communication Adapter Error	14
Operating System Error	15

Table 9 Error Blink Codes

## Testing the Printer Overview

### Using Self-Test, Configuration, and Hex Dump Mode

Self-Test Mode allows you to perform a series of tests to show if the printer is functioning correctly. Self-Test Mode also allows you to print a summary of how your iTherm® 280 is currently configured. Use this printout to compare your printer's settings to your system's requirements. Specific attention should be given to emulation and communications settings. For serial printers, the baud rate and other RS-232 interface settings are important. If there is a configuration problem, you should use Configuration Mode to make any changes necessary.

#### Entering Self-Test, and Configuration mode

To enter self test and or configuration mode, perform the following sequence of operations:

1. Press and release the \* button to turn the printer OFF. (The power indicator light will be off.)
2. Press and hold the Feed button.
3. While holding the Feed button, press and release the \* button.
4. When the red, error indicator light blinks, release the Feed button
5. Follow the directions printed on the receipt to cycle through and select the desired TEST option.

The iTherm® 280 has a total of seven Self-Test and or configuration options. Two are designed to be useful when performing on-site print evaluations. One option allows the printers electronic journal to be maintained, one allows the printers configuration to be changed, and two are designed for factory setup by TransAct.

#### Testing the printer

Use the following two TEST options when verifying basic printer operation.

##### TEST-Receipt

The receipt test is the primary test option to use when determining if the printer is functioning correctly.

The receipt test is mostly used during the early stages of troubleshooting, to eliminate the possibility that the problem is occurring with the printer. If the printer experiences a failure, and the error indicator light is activated, call TransAct's Ithaca Facility's Technical Support Department.

##### TEST-Head Test

This test performs a test pattern that will print all the head print elements and verify that the drive roll is free from defects. The print head has two heating elements per dot position. A print element is not considered bad unless both elements are missing. If the head test shows that there is an inconsistency in the drive roll it may be debris or a void. If debris is indicated, cleaning the drive roll should correct the problem. If this does not correct the problem, contact TransAct's Ithaca Facility's Technical Support Department.

**Maintaining the Electronic Journal**

The iTherm® 280 has an electronic journal option. It is possible to configure the printer with a journal station. This selection allows the information saved in the electronic journal to be printed and maintained by the operator.

Operation of this mode will be described later in the manual under Electronic Journal Operation.

If the Electronic Journal is unintentionally initialized, it may be deactivated by this option as well. If the Electronic Journal is password protected, the manual Electronic Journal option will be disabled.

**Configuring Options**

The configuration option allows the configuration of the printer to be printed and, if necessary, changed. When configuration mode is entered, the current configuration, the Current User store status, and the current totals are printed. If any printer errors have occurred, a hardware and software error log may also be printed. At the end of the print out are instructions on how to use configuration mode. Please read these instructions carefully, as they are not the same as Self-Test. You may exit configuration mode at any time, without affecting the printer configuration, by pressing the power button.

**TEST- Configuration**

The content of the configurable features will alter based on the hardware installed. There will be at least three groups of options:

1. Emulation
2. Communications
3. General Options

Under emulation the instruction set or emulation of the printer may be changed. Available options will depend on the model of printer, however Ithaca PcOS is always available. Other options may be Epson TM88, TM90, Microline, and Ithaca M50.

Under Communications, the way the printer deals with the communications port can be adjusted. The printer will only show communications options that deal with the communications adapter installed.

Under General Options, all other configurable features of the printer can be adjusted. The default language, paper options, electronic Journal features, and print defaults may be set.

Details of all printer options and features will be discussed later in this manual.

**Factory Test**

The printer is equipped with several factory test modes. These test options are only used for factory burn-in and testing.

TEST-Burn-in  
TEST-Rolling ASCII

## Hex-dump Mode

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.

### Entering Hex-dump Mode

To enter hex-dump mode, perform the following sequence of operations:

1. Press and release the \* button to turn the printer OFF. (The power indicator light will be off.)
2. Press and hold the Feed button.
3. While holding the Feed button, press and release the \* button.
4. When the red, error indicator light blinks, continue to hold the Feed button until the blink pattern changes (about 5 seconds). After the pattern changes, release the line feed button and the printer will enter Hex-dump mode.

### Hex-dump format

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 3F "?" symbols when it should be printing other characters, the communications are probably incorrect, such as the parity, baud rate, or bit length setting. 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.

## Level 0 Diagnostics

Level 0 diagnostics always and only run at power up, e.g. power being applied. These 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 (NOTE: If the firmware is corrupted, the printer will remain in boot load.)
6. Start Normal Firmware
7. Verify Configuration Integrity
8. Interface Card Configuration
9. User-store Integrity
10. Start Kernel, Verify Multitasking, Start Tasks

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 OFF.

11. Cover Closed Check
12. Knife Home (if installed)
13. Paper Present
14. Place Printer On-line, Start Normal Operation

The first phase of testing consists of step 1-5, and determines that the boot loader is accurate and the printer firmware is correct. Tests 1 through 4 produce non-recoverable errors if they fail, in which case the power must be removed from the printer and the printer returned for service. If the boot loader is intact, but the main firmware is corrupted, the printer automatically enters boot loader mode, where 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: (1) when Level 0 Diagnostics finds that the firmware check (also known as a cyclical redundancy check, or CRC) is bad, or (2) manually.

To manually enter the boot loader, hold the \* button while the power is applied. The ERROR Indicator comes on, and the POWER indicator blinks. At this time, the firmware boot program is operating and the boot load file may be sent to the printer. When the printer receives the boot load file, the printer will automatically restart if the firmware load was successful. If the load fails, the printer will remain in boot load mode. If the load fails, reset the printer by removing the power and restarting it.







**chapter**  
**5**

**Configuring Your iTherm<sup>®</sup> 280 Printer**

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## Configuration Mode Overview

There are two ways to configure the iTherm® 280 printer: the first is to use the manual configuration sequence by using the keypad controls, and the second is to use TransAct's remote configuration software. TransAct Technologies offers the use of a remote CONFIG program as a fast, easy way for system integrators to configure or reconfigure your iTherm® 280 printer. To obtain more information, or the latest version of the CONFIG program, call our Sales Department or Technical Support.

## Most Frequent Configuration Incompatibilities

### Parallel Printer

Emulation  
Carriage Return Options

### Serial Printer

Emulation  
RS-232 Serial Interface (baud rate)  
Carriage Return Options

## How to Change Configuration Settings

### Entering into Configuration Mode

- 1) Place the printer in standby by pressing the \* button.
- 2) Press and hold the Feed button while pressing and releasing the \* button.
- 3) When the error indicator blinks, indicating a stuck key, release the Feed key and enter Self Test Mode.
- 4) Press and hold the Feed button until the next test is printed. Then release the Feed button.
- 5) Repeat step 4 until "Test-Configuration" is printed.
- 6) Press and release the Feed button briefly. The current configuration will then be printed.
- 7) You are now in Configuration Mode.

After you enter Configuration Mode, the printer will print the current configuration, the current totals and the error logs, if any. Save this printout as a guide to changing the configuration, and in case you wish to return the printer to the previous configuration.

Each emulation can have different configurable features. If you are changing the emulation, note that the printout that was printed at the beginning of the configuration process may be incorrect for the new emulation, and the configurable features may be different. If you are using this print out as a configuration guide, and you are changing the emulation, you may wish to save the new emulation and then re-enter Configuration Mode to change other options. This will print all the available features for the new emulation.

## Using Configuration Mode

The Feed button is used to select and change configuration setting. By pressing and releasing the Feed button, the parameter to be changed can be selected. By pressing and holding the Feed button, the value of the selected parameter will change.

The following chart lists some of the potential parameters and their options.

Parameter	Definition	Options	Default
Emulation Mode	Printers command set	Ithaca PcOS, Epson TM-TXX, ESC/POS, Microline, Ithaca M50	Ithaca PcOS
Model	Type of Epson Printer	TM-T85, TM-T88II, TM-T88III, TM-T90	TM-T88II
Paper Colors			
Black Dot Eo	This option allows the Custom Black or Custom Color paper Black energy to be set.	10 to 40	24
Red Dot Eo	This option allows the Custom Color paper Color energy to be set.	10 to 40	12
Color	This option selects the secondary paper color	Monochrome, Red, Green, or Blue	None
Density Adjust	This is a fine adjustment for the print density.	-50 to + 50	0
Baud Rate	Serial Communications Bit rate	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200	19200
Mode	Number of bits, parity and stop bits.	7 bit or 8 bit Even, Odd, No Parity 1 or 2 Stop Bits	8 Bit, No parity, 1 Stop bit
Handshaking	Flow control options	Ready/Busy Xon/Xoff None	Ready/Busy
Receive Error	What happens when an error is detected.	Prints ? Ignores the data.	Prints ?
Windows PnP	Flag for Windows Plug and Play active.	Enabled, Disabled	Enabled.
DTR/RTS Signal	What RS232 signals are used for flow control	DTR, RTS, or Both DTR and RST	Both DTR and RTS
CTS/DSR Signal	How CTS and DSR used	None (Not used)	None (Not used)
Multidrop Mode	Flag for multidrop active	Off, A, B, or C Address	Off
Busy-to-ACK	Relationship of Busy to ACK on the IEEE1284 interface.	ACK while Busy ACK in Busy ACK after Busy	ACK in Busy
Select/Deselect	Command used for printer select and deselect (Microline and M50 only)	DC3/DC1 DC1/DC3	DC3/DC1
Code Page or Language Set	What character set is used for a default.	See appendix	0 or 437
Zero	Is the zero slashed, unslashed or defined by the language set.	Slashed Un-Slashed Follow Language set	Defined by the language set.
Font	Sets the size of the default font	9x24, 10x24, 13x24, or 15x24	12 x 24
CPI	Sets the default characters per inch	Value may be form 10 to 24 characters per inch	15

Smoothing	Flag for whether scaled characters smoothed.	Enabled, Disabled	Enabled
Paper Width	Width of the paper installed.	80 or 58 mm paper and print zone from 608 to 256 dots	80 mm and 576 dots.
Bar Code Width	Default barcode line width.	1 to 8	3
10CPI (DC2)			
ESC v			
nINIT/ENQ<10>			
Carriage Return	This option defines how CR and LF characters are used.	Normal, Ignore LF, Ignore CR, Add LF to CR, Add CR to LF, Add to Both, Use CR as Print	Ithaca Emulation: Normal Epson Emulation: Ignore CR. Axiohm Emulation: Use CR as Print.
Off-Line Option	This option defines what conditions place the printer off line.	Normal: Cover open, paper out, and buffer full. Buffer full only.	Normal.
Line Spacing	How many lines per inch are printed by default.	6, 7.5, or 8 lines per inch.	Ithaca Emulation: 8 Most others: 6
Input Buffer	This option specifies how large the input buffer is.	40 Characters 256 Characters 1024 Characters 2048 Characters 4096 Characters 8192 Characters One Line	8192 Characters
Print Energy Control			
Paper	This option will select a paper type by brand name.	Generic Black Generic Color Custom Black Custom Color Optima POS Kanzaki P-320 Kanzaki P-350 Kanzaki P-320RB Kanzaki P-320GB Kanzaki P-320BB Appleton RB100-2.3 Appleton GB100-2.3 Appleton BB100-2.3	Generic Black
PreHeat Temp.	This sets the temperature that the print head tries to maintain.	See the section on Head pre-heat later in the manual.	25
Power Supply	The printer uses an 80W internal supply. If an external supply is used, this adjustment will limit the printer to the power indicated.	60 to 120 Watts	80
Page Length	This options sets the default form feed page length.	0 – 60 lines. 0 disables the form feed	40
Cash Drawer CMD	The Microline option has two potential cash drawer commands	ESC + BEL	BEL

CD ESC BEL Parm.	The Microline Emulation has the option of using the ESC BEL command to operate the cash drawer	Enabled Disabled	Disabled
Microline Mode	There are three Microline modes	M50, M50 Plus, OKI ML192	M50
Cash Drawer Time	The cash drawer fire time is adjustable in the Ithaca emulation.	10 to 250 Ms	250 Ms
Cash Drawer Sense	The sense of the cash drawer open status can be reversed.	Normal, Inverted	Normal
External User Store	Flag for user store in use or configurable. If the user store is in use and has data in it, it can not be reconfigured.	In use or configurable.	Not Settable.
Electronic Journal	This specifies the amount of external flash available for the electronic journal or user data space.	1 to 31 64K blocks	2
External User Store	This indicates the amount of external flash that is available for user storage (Graphics and characters.)	1 to 31 64K Blocks	This is not settable. It equals 32 – the Electronic Journal setting.
EJ Manual Print	This sets whether or not the manual electronic journal options are available.	Enabled Disabled	Enabled
EJ Record Numbers	This options sets whether or not the record number is printed with journal entries.	Enabled Disabled	Enabled
User Store	This option sets a lock on user store that prevents any changes to the data.	Unlocked Locked	Unlocked
On/Off Switch	This option disables the On/Off switch	Enabled Disabled	Enabled
Audio Alert	This option configures the operation of the audio alert	Off, 50 ms to 1 Second in 50 mSec steps	250 mS
Cutter Option	This activates or deactivates the auto cutter	Active Inactive	Active if the printer is equipped with an auto cutter.
Pre-Cut Feed or Tear Point Adjust	This option sets how much the cut point is adjusted before the auto cut or manual tear-off.	0 or none to 20 mm.	0
Cutter Speed	This option adjusts the auto cutter speed to allow the use of thicker paper.	130 to 80 where 80 is the slowest speed.	100



**Note:** There are other features that may be configurable. It is intended that if you need to change them, you will contact TransAct Technical support for assistance.

## Remote Configuration

Remote configuration is provided for all printers, and is accessed through a series of extended diagnostic and configuration commands. The TransAct universal configuration program will allow the configuration to be read, edited, and written back to the printer. It will also allow the configuration of one printer to be recorded and replicated over a number of printers. The program is available from TransAct Technical Support or by downloading it from the Internet – consult the section On-line Technical Support for further details.

## Setting up for Color Paper

The iTherm® 280 may be configured to print two color thermal paper. For good print quality, the printer should be configured to print the paper being used. If the paper you are using is included in the list of papers displayed during printer configuration, that configuration should be used. If not, the printer should be set to Generic Color. If this does not produce acceptable print quality, you may select Custom Color.

### Custom Color

When using Custom Color, start with a read setting of about 0.12 mJ/sq.mm and a black energy of 0.24 mJ/sq.mm. First, adjust the black level to produce acceptable black print.



**DO NOT EXCEED** 0.40 mJ/sq.mm, or the paper may start to stick to the print head and cause paper jams. Setting the Black energy too high will also slow the printer down. All color papers tested by TransAct will operate with black levels less than 0.35 mJ/sq.mm. When the Black energy is set, adjust the Color value.



**NEVER** exceed the Black energy with the Color energy. The color level can be very critical. Do not attempt to make the color darker by increasing the energy to the point where black starts to appear, the print quality will not be consistent.







**chapter**  
**6**

**Programming Codes**

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## Control Codes Overview

This Programmer's Guide is designed to help users of the iTherm® 280 printer develop applications. iTherm® 280 Printers are specialized point-of-sale printers that have several features not normally found on general-purpose printers. Because of these special features, iTherm® 280 Printers have unique control codes. This programmer's guide documents the control codes that are unique to the iTherm® 280 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<sub>1</sub>> <n<sub>2</sub>> Indicates that there are two parameters, <n<sub>1</sub>> and <n<sub>2</sub>>, where both can have values from zero to 255.
- <m<sub>1</sub>> <m<sub>2</sub>> Is an Ithaca® Printer Control Language (IPCL) parameter consisting of two digits where <m<sub>1</sub>> and <m<sub>2</sub>> are ASCII characters from zero to nine. The parameter is combined to form a value from zero to 99. If <m<sub>3</sub>> 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<sub>1</sub>> <m<sub>2</sub>> 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 324) lists ASCII, hexadecimal, and decimal equivalents.

## Standard Emulation

The standard control codes for the iTherm® 280 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 iTherm® 280 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<sup>4</sup> is referred to here as EPOS. The iTherm® 280 Printer supports two Epson emulations. One emulation is for the TM-T88, and the other is an enhanced TM-T90 emulation.



Specific EPSON compatibility features, such as its Automated Status Back (ASB) feature, are available as an option from TransAct Technologies. Command codes pertaining to these features are documented as “licensed” within the command description.

**It is intended that the standard Ithaca® PcOS emulation be used for new applications. Not all features of iTherm® 280 Printers are supported by EPOS – specifically, the ability to print color horizontal graphics is not supported.**

## Axiohm

The printer contains an Axiohm A793 emulation that will allow the printer to replace an Axiohm thermal print in most applications. Note that the iTherm® 280 does not support the printer configuration commands provided in the A793 Printer. The iTherm® 280 should be configured through the keypad or with the TransAct configuration program.

## Ithaca® Microline Emulation

The iTherm® 280 printer supports several Microline emulations. These emulations allow the iTherm® 280 Printer to replace some older Ithaca® M50 printers with Microline commands. This emulation is not documented here. Refer to our Microline Emulation Programmer's Guide (12-03244) for more information.

## Application Development

To aid application development, several chapters in this manual are designed to help the programmer understand the iTherm® 280 Printer. The next chapter provides a detailed description of each of the commands. Subsequent chapters provide explanations of

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<sup>4</sup> ESC/POS is a registered trademark of the Seiko Epson Corporation.

how the printer works, including a description of the internal print buffer, communications link, and interaction between the host computer and printer.

## **Ithaca Control Codes and Commands**

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. Code summary charts, arranged by code and function, are provided to help quickly find commands.

### **PcOS Printer Control Codes**

The following section defines the iTherm® 280 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.

One new feature in the iTherm® 280 Printer is the ability to print color graphics, and the control codes for color graphics are all new. Due to the complexity of color graphics, TransAct provides several drivers to integrate into your application. TransAct does not recommend that you generate drivers. In addition, TransAct has created several tools that can be used to generate and maintain graphic images and files for print on the iTherm® 280. Information about drivers and tools are available on the TransAct web site and on a *TransAct Software Developer's Toolkit*. For more information about either of these options, contact Technical Support.

## Quick PcOS Reference Chart

Description	ASCII	Hex	IPCL equivalent code	Page
<b>Low Level paper Motion</b>				
Line feed.	[LF]	0AH	&%LF	82
Carriage return.	[CR]	0DH	&%CR	82
<b>Horizontal Motion</b>				
Back space.	[BS]	08H	&%BS	83
Horizontal tab.	[HT]	09H	&%HT	83
Set horizontal tab stops.	[ESC] D <n1> <n2> ... <ni> <0>	1BH,44H	none	83
Set horizontal position.	[ESC] n <n1> <n2>	1BH,6EH	&%HP<m1> <m2> <m3>	84
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)	[ESC] a <n>	1BH,61H	&%JR {n=2} &%JC {n=1} &%JL {n=0}	84
Reset horizontal and vertical tab stops.	[ESC] R	1BH,52H	&%HV	84
Set left/right print margins. n <sub>1</sub> = Left margin, n <sub>2</sub> = Right margin	[ESC] X <n <sub>1</sub> ><n <sub>2</sub> >	1BH,58H	none	161
Select Minimum character Height and Width in points	[ESC] + P<w><h>	1BH 50H	none	278
Select Minimum character Height and Width in ¼ points	[ESC] + p<w><h>	1BH 70H	none	278
<b>Vertical Motion</b>				
Perform a fine line feed.	[ESC] J <n>	1BH,4AH	&%FM <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >	85
Set 1/8-inch line spacing.	[ESC] 0	1BH,30H	&%ST	86
Set 7/72-inch line spacing.	[ESC] 1	1BH,31H	&%SG	86
Begin variable line spacing. (Enable [ESC] A <n>).	[ESC] 2	1BH,32H	none	87
Set variable line spacing to n/216 inch.	[ESC] 3 <n>	1BH,33H	&%SV <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >	85
Set variable line spacing to n/72 inch.	[ESC] A <n>	1BH,41H	none	86
Feed <n> lines at current spacing.	[ESC] d <n>	1BH,64H	&%FL <m <sub>1</sub> > <m <sub>2</sub> >	87
Set vertical tab stops.	[ESC] B <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> >...<n <sub>i</sub> > 0	1BH,42H	none	88
Vertical tab.	[VT]	0BH	&%VT	88
Form feed.	[FF]	0CH	&%FF	89
Feed to black dot	[ESC][VT]	1BH,0BH	None	91
Set top of form.	[ESC] 4	1BH,34H	&%TF	89
Set form length in lines.	[ESC] C <n>	1BH,43H	&%SL <m <sub>1</sub> > <m <sub>2</sub> >	89
Select Minimum character Height and Width in points	[ESC] + P<w><h>	1BH 50H	none	278
Select Minimum character Height and Width in ¼ points	[ESC] + p<w><h>	1BH 70H	none	278
Begin auto line feed. (n=0, end n=1)	[ESC] 5 <n>	1BH,35H	&%CA {n=0} &%MA {n=1}	90
Set form length in inches.	[ESC] C [NUL] <n>	1BH,43H	&%SI <m <sub>1</sub> > <m <sub>2</sub> >	89

Description	ASCII	Hex	IPCL equivalent code	Page
Reverse line feed.	[ESC] ]	1BH,5DH	&%LR	90
<b>Character Pitch</b>				
Set character spacing in points	[ESC]+I<n>	1BH 2BH 49H	None	276
Set character spacing in ¼ points	[ESC]+i<n>	1BH 2BH 69H	None	277
Set character spacing in points with adjustment	[ESC]+J<n>	1BH 2BH 4AH	None	277
Set character spacing in ¼ points with adjustment	[ESC]+j<n>	1BH 2BH 6AH	None	278
Begin 10 CPI character pitch.	[DC2]	12H	&%F3	93
Begin 12 CPI character pitch.	[ESC] :	1BH,3AH	&%F2	93
Begin 17 CPI character pitch.	[SI]	0FH	&%F1	93
Set character pitch.	[ESC] [ P <n>	1BH,5BH, 50H	&%F<n>	94
Set inter-character spacing.	[ESC] V <n>	1BH,56H	none	95
Begin 24 CPI character pitch	[ESC][SI]	1BH,0FH	&%F4	93
Select Minimum character Height and Width in ¼ points	[ESC] + p<w><h>	1BH 70H	none	278
Set left/right print margins. n <sub>1</sub> = Left margin, n <sub>2</sub> = Right margin	[ESC] X <n <sub>12 <td>1BH,58H</td> <td>none</td> <td>161</td> </sub>	1BH,58H	none	161
<b>Character Font</b>				
Select font	[ESC] + 3 <ID>	1BH 2BH 31H	none	270
Select font by name	[ESC] + N Filename<0>	1BH 2BH 4EH	none	271
Define Stacked Font	[ESC] + S <ID <sub>1</sub> > <ID <sub>2</sub> > ...	1BH 2BH 53H	none	270
Set stroke font Brush Size	[ESC] + B <w>	1BH 2BH 42H	none	279
Select Minimum character Height and Width in points	[ESC] + P<w><h>	1BH 50H	none	278
Select Minimum character Height and Width in ¼ points	[ESC] + p<w><h>	1BH 70H	none	278
Begin 12 x 12 draft print.	[ESC] # <0>	1BH,23H, 00H	&%QT	96
Set 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	[ESC] I <n>	1BH,49H	&%QT {n=0} &%QU {n=1} &%QL {n=2} &%QS {n=3}	96
Begin rotated font. (See command description).	[ESC] P <n>	1BH,50H	&%RI &%RF &%RN	97
Select character code page.	[ESC] [ T <n <sub>1</sub> > <n <sub>1</sub> >	1BH,5BH, 54H	&%CP <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> > <m <sub>4</sub> >	101
Insert Euro character.	[ESC] [ C <n>	1BH,5BH, 43H	&%EU	102
Print control character.	[ESC] ^ <n>	1BH,5EH	&%CC <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >	102
Redefine character set.	[ESC] [ S ...	1BH,5BH, 53H...		104
Define user-defined characters.	[ESC] = <y> <c <sub>1</sub> > <c <sub>2</sub> >...	1BH,3DH	none	105
Enable user-defined characters.	[ESC] > <n>	1BH,3EH	none	106
Cancel user-defined characters.	[ESC] \$	1BH,24H	none	106

Description	ASCII	Hex	IPCL equivalent code	Page
Print control character.	[ESC] ^ <n>	1BH,5EH	&%CC <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >	102
Print Unicode character	[ESC] " <n <sub>l</sub> ><n <sub>H</sub> >	1BH,22H	&%PU <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> > <m <sub>4</sub> > <m <sub>4</sub> >	102
<b>Character Attributes</b>				
Select color.	[ESC] c <n>	1BH,63H	&%CL <m <sub>1</sub> >	107
Begin one-line double-wide print.	[SO]	0EH	&%MW	107
Cancel one-line double-wide print.	[DC4]	14H	&%MN	107
Multi-line double-wide double-high mode. n=0 Standard mode n=1 Double-wide n=2 Double-high 3 = Both	[ESC] W <n>	1BH,57H	&%FS {n=0} &%FD {n=1} &%FH {n=3}	108
Enable/disable Strike Through. n=0 End n=1 Begin	[ESC] _ <n>	1BH,5FH	&%CO {n=0} &%MO {n=1}	108
Begin underline mode. n = 0 End n = 1 Begin	[ESC] - <n>	1BH,2DH	&%CU {n=0} &%MU {n=1}	110
Begin enhanced print.	[ESC] G	1BH,47H	&%ME	110
End enhanced print.	[ESC] H	1BH,48H	&%CE	110
Begin emphasized print.	[ESC] E	1BH,45H	&%MM	110
End emphasized print.	[ESC] F	1BH,46H	&%CM	111
Set print style. (See command description.)	[ESC] [ @ ...	1BH,5BH, 40H...	&%DH &%SH	109
Select superscript.	[ESC] S <0>	1BH,53H, 00H	&%SP	111
Select subscript.	[ESC] S <1>	1BH,53H, 01H	&%SB	111
End superscript or subscript.	[ESC] T	1BH,54H	&%SE	111
Begin italics.	[ESC] % G	1BH,25H, 47H	&%MI	112
End italics.	[ESC] % H	1BH,25H, 48H	&%CI	112
<b>Rotated Print</b>				
<b>Page Mode</b>				
Select page mode	[ESC] t <n>	1BH,74H	&%PM <m <sub>1</sub> >	114
Set page mode page position	[ESC] o <n <sub>1</sub> > ...	1BH,6FH		122
Exit page mode	[FF]	0CH	&%FF	122
<b>APA Graphics</b>				
Print single-density graphics. <n <sub>1</sub> >=0...255 <n <sub>2</sub> >=0...3 len=<n <sub>1</sub> > + 256 * <n <sub>2</sub> >	[ESC] K <n <sub>1</sub> > <n <sub>2</sub> >	1BH,4BH	none	123
Print half-speed double-density graphics.	[ESC] L <n <sub>1</sub> > <n <sub>2</sub> >	1BH,4CH	none	123
Print full-speed double-density graphics.	[ESC] Y <n <sub>1</sub> > <n <sub>2</sub> >	1BH,59H	none	123
Print quad-density graphics.	[ESC] Z <n <sub>1</sub> > <n <sub>2</sub> >	1BH,5AH	none	124
Select bidirectional or unidirectional print. n=0 Bidirectional n=1 Unidirectional	[ESC] U <n>	1BH,55H	&%GU {n=1} &%GB {n=0}	125
Print graphics in mode <m>.	[ESC] * <m> <n <sub>1</sub> > <n <sub>2</sub> >	1BH,2AH	none	124
Reassign graphic mode.	[ESC] ? <m><n>	1BH,3FH	none	124
<b>Two Color Graphics</b>				



Description	ASCII	Hex	IPCL equivalent code	Page
Process horizontal graphics data.	[ESC] h <color> <length> <format> <data>	1BH,68H	none	127
Set horizontal graphic mode.	[ESC] * <m> <0> <0>	1BH,2AH	none	128
<b>User Store</b>				
Begin named macro record.	[ESC] [US] b <Name..> <0>	1BH,1FH, 62H	&%UB <Name..><0>	132
Save macro data in user store.	[ESC] [US] m <Name..> <0>	1BH,1FH, 6DH	&%UM <Name..><0>	133
End named macro record.	[ESC] [US] e <Name..> <0>	1BH,1FH, 65H	&%UG <Name..><0>	133
Load item from user store.	[ESC] [US] l <Name..> <0>	1BH,1FH, 6CH	&%UL <Name..><0>	134
Save user-defined characters.	[ESC] [US] c <Name..> <0>	1BH,1FH, 63H	&%UC <Name..><0>	133
Run macro data from user store.	[ESC] [US] r <Name..> <0>	1BH,1FH, 72H	&%UR <Name..><0>	134
Flag item as a start-up macro.	[ESC] [US] s <Name..> <0>	1BH,1FH, 6DH	&%US <Name..><0>	134
Delete item from user store.	[ESC] [US] d <Name..> <0>	1BH,1FH, 64H	&%UD <Name..><0>	134
Flush information from user store.	[ESC] [US] f ALL <0>	1BH,1FH, 66H,00H	&%UF	135
Transfer user store to extended user store	[ESC] [US] t ALL <0>	1BH,1FH, 66H,00H	&%UF	135
Report on user store.	[ESC] [US] q <Name..> <0>	1BH,1FH, 72H	&%UQ <Name..><0>	136
Return a report on user store	[ESC] [US] ? <Name..> <0>	1BH,1FH, 72H	&%UQ <Name..><0>	136
Process user macro.	[ESC] g <0>	1BH,67H, 00H	&%GP	138
Start macro record.	[ESC] g <1>	1BH,67H, 01H	&%GS	138
Stop macro record.	[ESC] g <2>	1BH,67H, 02H	&%GE	138
Stop macro record and save.	[ESC] g <3>	1BH, 67H, 03H	&%GW	138
<b>Bar Codes</b>				
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	[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}	139
PDF 417 bar code control	[ESC] [EM] E <f> <v>	1BH 19H 45H	none	146
Set bar code height. n=0 Restore defaults n=1 - 9 Number of passes (0.11 inch per pass)	[ESC] [EM] B <n>	1BH,19H, 42H	&%BH <m <sub>1</sub> ><m <sub>2</sub> >	147
Set bar code width	[ESC] [EM] W <n>	1BH 19H 57H	&%BW <m>	147
Set bar code justification, HRI print mode, and print direction.	[ESC] [EM] J <n>	1BH,19H, 4AH	&%BJ<m <sub>1</sub> ><m <sub>2</sub> >	147
<b>Unicode</b>				

Description	ASCII	Hex	IPCL equivalent code	Page
Initiate Unicode UTF-16BE encoding	[ESC] + H	1BH 2BH 48H	none	271
Initiate Unicode UTF-16LE encoding	[ESC] + L	1BH 2BH 4CH	none	271
Initiate Unicode UTF-8 encoding (MBCS)	[ESC] + M	1BH 2BH 4DH	none	271
Initiate Unicode UTF-8 Text only encoding (MBCS)	[ESC] + T	1BH 2BH 54H	none	272
Initiate normal 8-bit ASCII character encoding	[ESC] + A	1BH 2BH 41H	none	272
<b>File System Commands</b>				
Open File	[ESC][RS] O<Mod> FileName<0>	1BH 1EH 4FH	none	283
Return Free Space for Open File	[ESC][RS] S	1BH 1EH 53H	none	284
Return Free Space for Partition	[ESC][RS] s	1BH 1EH 73H	none	284
Return Last File Command Status	[ESC][RS] ?	1BH 1EH 3FH	none	286
Close File	[ESC][RS] C	1BH 1EH 43H	none	285
Close All Files	[ESC][RS] K	1BH 1EH 4BH	none	285
Open File	[ESC][RS] O FileName<0>	1BH 1EH 4FH	none	283
Set/Clear File Attributes	[ESC][RS] A <Atb> FileName<0>	1BH 1EH 41H	none	285
Write File Data	[ESC][RS] W <L <sub>L</sub> > <L <sub>H</sub> > <data>	1BH 1EH 57H	none	286
Read File Data	[ESC][RS] R <L <sub>L</sub> > <L <sub>H</sub> >	1BH 1EH 52H	none	287
File Directory File	[ESC][RS] I	1BH 1EH 49H	none	287
Delete all Files in partition	[ESC][RS] E <p>	1BH 1EH 45H	none	287
De-fragment File system	[ESC][RS] F	1BH 1EH 46H	none	287
<b>Electronic Journal</b>				
Electronic journal initialize and set password	[ESC][GS]I <Password> <0>	1BH 1DH 49H	%&EI	151
Electronic journal erase the electronic journal	[ESC][GS]E <Password> <0>	1BH 1DH 45H	&%EC	151
Print the electronic journal	[ESC][GS]P< S <sub>1</sub> > <S <sub>1</sub> >< L <sub>1</sub> > <L <sub>1</sub> >	1BH 1DH 50H	&%EP	152
Report the electronic journal	[ESC][GS]R< S <sub>1</sub> > < S <sub>1</sub> >< L <sub>1</sub> > <L <sub>1</sub> >	1BH 1DH 52H	&%EQ	152
Electronic journal begin entry	ESC] <3>	1BH 6CH	%&EB	
Electronic journal suspend entry	[ESC]I <2>	1BH 6CH	&%ES	160
Electronic journal resume entry	[ESC]I <1>	1BH 6CH	&%ER	160
Electronic journal end entry	[ESC]I <0>	1BH 6CH	&%EE	160
Electronic journal mode begin (journal station)	[ESC]{	1BH 7BH	None	159
<b>Miscellaneous Commands</b>				
Disable paper out sensor.	[ESC] 8	1BH,38H	&%PF	161
Enable paper out sensor.	[ESC] 9	1BH,39H	&%PO	161

Description	ASCII	Hex	IPCL equivalent code	Page
Set left/right margins. n1 = Left margin n2 = Right margin	[ESC] X <n1><n2>	1BH,58H	none	161
Clear print buffer.	[CAN]	18H	&%RP	162
Query marker.	[ESC] q <n>	1BH,71H	none	162
Open cash drawer. n=1 Cash Drawer 1 n=2 Cash Drawer 2	[ESC] x <n>	1BH,78H	&%D1 {n=1} &%D2 {n=2}	163
Perform Auto Cut	[ESC] v	1BH,76H	&%FC	163
Audio alert.	[BEL]	07H	&%BL	164
Configure audio alert.	[ESC] [BEL] <n1> <n2> <n3>	1BH,07H	none	164
Print suppress and data pass through.	[ESC] <n>	1BH,3CH	&%PT <n>	166
Initialize printer.	[ESC] @	1BH,40H	none	163
Enable paper error mode operation.	[ESC] p <n>	1BH,70H	&%PE <m1> <m2>	164
Enable dynamic response	[ESC] w <n>	1BH,77H	none	154
Begin multi-drop control.	[SOH] <n>	01H	none	170
Inquire status. (Refer to command descriptions.)	[ENQ] <n>	05H	none	172
Inquire cash drawer 1 status	[ENQ] <1>	05H01H	none	172
Control Periodic Status	[ESC][EM]P	1BH, 19H, 50H	none	179
Control Periodic Status	[ESC][EM]p	1BH, 19H, 70H	none	179
<b>Extended Diagnostics</b>				
Set control feature commands.	[ESC] y <n>	1BH,79H	&%Y0 - 9 or &%YX<m1> <m2><m3> (for numbers >9)	167
Extended diagnostics.	[ESC] ~ <n>	1BH,7EH	none	168

## Low Level Paper Motion Control

### Print/Paper Motion

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**[CR]**            **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 auto-feed is active. The print rotation direction and the left margin command define the left margin.

---

**[LF]**            **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 iTherm® 280 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.

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### [HT] 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.

---

### [BS] 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; rather, the following data is OR'ed with the previous data.

---

### [ESC] D Set horizontal tab stops

**ASCII** [ESC] D <n<sub>1</sub>> <n<sub>2</sub>> <n<sub>3</sub>> ... <n<sub>i</sub>> 0  
**Hexadecimal** 1BH 44H <n<sub>1</sub>> <n<sub>2</sub>> <n<sub>3</sub>> ... <n<sub>i</sub>> 00H  
**Decimal** <27> <68> <n<sub>1</sub>> <n<sub>2</sub>> <n<sub>3</sub>> ... <n<sub>i</sub>> <0>  
**IPCL** none  
**EPOS** [ESC] D <n<sub>1</sub>> <n<sub>2</sub>> <n<sub>3</sub>> ... <n<sub>i</sub>> 0

**Description** The [ESC] D <n<sub>1</sub>> <n<sub>2</sub>> <n<sub>3</sub>> ... <n<sub>i</sub>> 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 re-specify 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.



## Vertical Motion Control

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### [ESC] j      Perform a fine line feed

<b>ASCII</b>	[ESC] J <n>
<b>Hexadecimal</b>	1BH 4AH <n>
<b>Decimal</b>	<27> <74> <n>
<b>IPCL</b>	&%FM <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >
<b>EPOS</b>	[ESC] J <n>

**Description** The [ESC] J <n> command prints the contents of the buffer 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.



**Notes:**

- In EPOS mode, the command performs feeds in n/144-inch increments.
- Immediately after APA graphics, the command is adjusted for the difference between 72 dpi graphics and 96 dpi print.

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### [ESC] 3      Set variable line spacing to n/216 inch

<b>ASCII</b>	[ESC] 3 <n>
<b>Hexadecimal</b>	1BH 33H <n>
<b>Decimal</b>	<27> <51> <n>
<b>IPCL</b>	&%SV <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >
<b>EPOS</b>	[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:** In EPOS mode, the command performs line feeds in n/144-inch increments.

---

**[ESC] 0 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:** In EPOS mode, the command sets 1/6-inch spacing or six lines per inch.

---

**[ESC] 1 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.

---

**[ESC] A 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.



**[ESC] 2      Enable [ESC] A <n> variable line spacing**

<b>ASCII</b>	[ESC] 2
<b>Hexadecimal</b>	1BH 32H
<b>Decimal</b>	<27> <50>
<b>IPCL</b>	none
<b>EPOS</b>	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.

**[ESC] d      Feed <n> lines at the current spacing**

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

<b>ASCII</b>	[ESC] e <n>
<b>Hexadecimal</b>	1BH 65H <n>
<b>Decimal</b>	<27> <101> <n>
<b>IPCL</b>	&%FB <m1> <m2>
<b>EPOS</b>	[ESC] e

**Description** The [ESC] e <n> command prints the contents of the buffer (if any) and performs <n> reverse 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:** 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.

---

<b>[VT]</b>	<b>Vertical tab</b>
<b>ASCII</b>	[VT]
<b>Hexadecimal</b>	0BH
<b>Decimal</b>	<11>
<b>IPCL</b>	&%VT
<b>EPOS</b>	(VT)
<b>Description</b>	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.

---

<b>[ESC] B</b>	<b>Set vertical tab stops</b>
<b>ASCII</b>	[ESC] B <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> > ... <n <sub>i</sub> > 0
<b>Hexadecimal</b>	1BH 42H <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> > ... <n <sub>i</sub> > 00H
<b>Decimal</b>	<27> <66> <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> > ... <n <sub>i</sub> > <0>
<b>IPCL</b>	none
<b>EPOS</b>	[ESC] B <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> > ... <n <sub>i</sub> > 0
<b>Description</b>	The [ESC] B <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> > ... <n <sub>i</sub> > 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 <sub>n</sub> is less than n <sub>n-1</sub> , 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).

---

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

---

**[FF] 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:** The form feed command can be disabled. Set the form length to zero.

---

**[ESC] 4 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.

---

**[ESC] C Set form length in lines**

**ASCII** [ESC] C <n>  
**Hexadecimal** 1BH 43H <n>  
**Decimal** <27> <67> <n>  
**IPCL** &%SL <m<sub>1</sub>> <m<sub>2</sub>>  
**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.

---

**[ESC] C [NUL] Set form length in inches**

**ASCII** [ESC] C [NUL] <n>  
**Hexadecimal** 1BH 43H <0> <n>  
**Decimal** <27> <67> <0> <n>  
**IPCL** &%SI <m<sub>1</sub>> <m<sub>2</sub>>  
**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.

---

**[ESC] 5      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:** The begin and end auto line feed command overrides the configuration setting.

---

**[ESC] ]      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:** The iTherm<sup>®</sup> 280 Printer can tolerate no more than 1/2 inch of reverse feed.

## Feed to Black Dot

An option for the iTherm® 280 is a black dot sensor. This command is supported by a feed to black dot command.



**Note:** This is a special order option, and requires an additional sensor and modified firmware. It is not possible to field retrofit a standard iTherm® 280 with a black dot sensor.

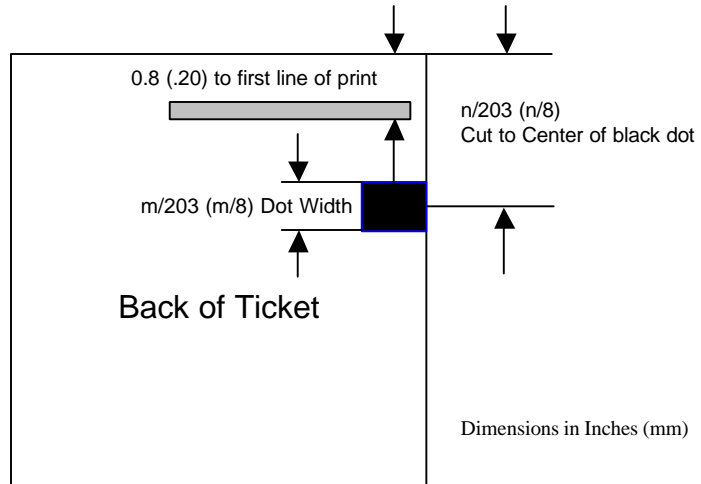
Function	Feed to Black Dot
ASCII	[ESC][VT]<n>
Hexadecimal	!BH,0BH,<n>
Decimal	<27><11><n>
IPCL	None
EPOS	[GS][VT]<n>
Where n	<n> is the number of inches to feed while looking for the black marker.
Description	<p>The [ESC][VT] command performs feeds the paper until the black dot is positioned as configured.</p> <p>The iTherm keeps track of the location of the black dot and will feed paper until the black dot is positioned as configured.</p> <p>There are three configurable Black Dot parameters. The Dot Width, and the Offset may be adjusted to operate with a specific paper. The Calibration is preset and should not be changed.</p>

Function	Adjusting the width and offset of the Black Dot
ASCII	ESC ~ W nl nh m
Hexadecimal	1B 7E 57 nl nh m
Decimal	27 126 87 nl nh m
Where	<p>n = The offset adjustment of the Black dot in n/203 inches where n = nl + 256*nh. Default is 304 or 1.5 inches. Values greater than 368 will set n to 368.</p> <p>m = The Width of the black dot in m/203 inches. The default is 76 or 0.375 inches. Values less than 51 will be ignored.</p>

The offset adjustment is the position of the black dot in relation to the cut point. If n = 0 the cut point will be in the center of the black dot. If the value of n = 304, the cut point will be 1.5 inches above the black dot.



**Note:** This command may be issued as part of an application. If the values in the configuration match the requested values, no operation occurs.



**Note:** This command interacts with the Feed to Black Dot command. If the Black Dot paper Option is set, the black dot position specified by this command will be used for the Cover Close operation.

## 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.

---

### [DC2]           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.

---

### [ESC] :           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.

---

### [SI]              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.

---

### [ESC] [SI]       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.

**[ESC] [ P     Set character pitch**

**ASCII**            [ESC] [ P <n>  
**Hexadecimal** 1BH 5BH 50H <n>  
**Decimal**        <27> <91> <80> <n>  
**IPCL**            &%F1, &%F2, &%F3, &%F4, &%F5, &%F6, &%F7  
**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	<n>	Resulting Characters per Inch	IPCL
1	1.00		16	16.00	
2	2.00		17	17.33	&%F1
3	3.01		18	17.33	
4	4.00		19	18.91	
5	4.95		20	20.8	&%F5
6	5.94		21	20.8	
7	6.93		22	23.11	
8	8.00	&%F7	23	23.11	
9	9.04		24	23.11	&%F4
10	9.90	&%F3	25	23.11	
11	10.95		26	26	
12	12.23	&%F2	27	26	
13	13.00		28	26	
14	13.87		29	29.71	
15	14.86	&%F6	30	29.71	

Table 10 Character Pitch

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



**[ESC] V      Set inter-character spacing**

<b>Mode</b>	Global
<b>ASCII</b>	[ESC] V <n>
<b>Hexadecimal</b>	1BH 56H <n>
<b>Decimal</b>	<27> <86> <n>
<b>IPCL</b>	none
<b>EPOS</b>	[ESC] [SP] <n>

**Description** The [ESC] V <n> command sets inter-character spacing by adding white space between characters. The value of <n> sets the spacing in 216ths of an inch. The printer can only set the spacing in 208ths of an inch and converts 216ths to the nearest 208th of an inch. Each font has a basic size, and the inter-character 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>.

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 11 Inter-character Spacing

## Character Font

---

### [ESC] #      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.

---

### [ESC] I      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> (e.g. capital “i”) 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.

**[ESC] P      Begin rotated font/Right to left entry**

**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)
- n = 8    Enter Text right to left
- n = 9    Enter Text right to left and Rotate 90° (Single pass, 12 x 12 draft)
- n = 10   Enter Text right to left and Rotate 270° (Single pass, 12 x 12 draft)
- n = 11   Enter Text right to left and Rotate 90° (Two pass, 12 x 12 draft or 12 x 14 large draft)
- n = 12   Enter Text right to left and 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.

Modes 8-12 allow right to left text entry. (Note: right to left text entry is not supported in formatted rotated print mode (See the [ESC]r command for formatted rotated print.)

## Character Sets and Code Pages

The iTherm® 280 Printer is primarily intended to be used in Unicode based systems. However to provide legacy support, the printer supports 8 bit and double byte ASCII encoding with code pages.

When not using Unicode or double byte encoding, the printer is restricted to the 8 bit ASCII character set. To support international languages, the characters that are assigned to each of the 256 possible locations can be remapped to any character in the Unicode standard. Typically, the first 32 characters are reserved for control characters. The next 72 are typically fixed to alpha numeric and punctuation. The upper 128 characters are typically redefined to characters that support the specific language or country. These mappings are generally referred to as codepages.

The iTherm® 280 provides several legacy commands to select a country code or codepage maps. However, they all simply select an ASCII to Unicode translation map. Several predefined mappings to provide legacy support are internal to the printer, but the majority of the maps are placed in the printer's file system. This allows any preexisting codepage mapping to be defined as well as the ability to define custom mappings unique to your application.

### Codepage description files

The format of the codepage description file is somewhat flexible. The basic format is that each line will specify an ASCII character ID and the Unicode character that is to appear in that ASCII ID location.

The file format is one character per line with the first value being the ASCII ID and the second value being the Unicode address. The file should be something like this:

```

0x00 0x0000      # NULL
0x01 0x0001      # START OF HEADING
0x02 0x0002      # START OF TEXT
0x03 0x0003      # END OF TEXT
...
or
\Language = USA
\Code Page = 437
0x00 0x0000      ; 0      NULL
0x01 0x263A      ; 9786  WHITE SMILE
0x02 0x263B      ; 9787  BLACK SMILE
0x03 0x2665      ; 9829  BLACK HEART SUIT
0x04 0x2666      ; 9830  BLACK DIAMOND SUIT
0x05 0x2663      ; 9827  BLACK CLUB SUIT
...
or
0      0      ; NULL
1      9786 ; WHITE SMILE
2      9787 ; BLACK SMILE
3      9829 ; BLACK HEART SUIT
4      9830 ; BLACK DIAMOND SUIT
5      9827 ; BLACK CLUB SUIT

```

```

...
or
SYMBOL SET = WE
/name = Windows 3.1 Latin 2
/pcl char = E
...
/symbols =
32 0x0020 ; Space Code, Prntabl Thin Space
33 0x0021 ; Exclamation
34 0x0022 ; Neutral Double Quote
5  0x0023 ; Number
36 0x0024 ; Dollar
...
or
\Language = USA
\Code Page = 437
0x00 - 0x0000 ; 0 NULL
0x01 - 0x263A ; 9786 WHITE SMILE
0x02 - 0x263B ; 9787 BLACK SMILE
0x03 - 0x2665 ; 9829 BLACK HART SUIT
0x04 - 0x2666 ; 9830 BLACK DIAMOND SUIT
0x05 - 0x2663 ; 9827 BLACK CLUB SUIT
...
or
\Language = USA
\Code Page = 437
0x00 = 0x0000 ; 0 NULL
0x01 = 0x263A ; 9786 WHITE SMILE
0x02 = 0x263B ; 9787 BLACK SMILE
0x03 = 0x2665 ; 9829 BLACK HART SUIT
0x04 = 0x2666 ; 9830 BLACK DIAMOND SUIT
0x05 = 0x2663 ; 9827 BLACK CLUB SUIT

```

Numbers beginning with 0x... are treated as hexadecimal, all other as decimal. Any line beginning with a non-numeric value is ignored. Any information after the Unicode value is ignored. Not all of the ASCII ID's need to be present, however, only ID's present will be affected.

There are two ways to select a codepage file. The first is by using the standard code page select command. If this command is used, the file name is critical; it must follow the format of Cpxyz.CPM. The xyz is the code page number that is being selected in the command. For example CP850.CPM would be referred to as 850. If the legacy commands are to be used to select file based code page mapping, the selection mode must be selected in the printer's configuration.

The second form is by name. This command is free form and will select any file present which will then be to use it as a code page definition. If the file is not a code page file, you will get unexpected results. If the file does not exist, the command is ignored. Any extension may be used for a codepage map, however, it is best to use the .CPM extension, with a descriptive filename recommended. For example ISO8859-1.CPM would be a good choice for the ISO8859-1 code page.

## Double-Byte and Multi-Byte Code Page Description Files

In ASCII mode the iTherm® 280 Printer supports double byte code pages. Currently there are 4 double-byte codepages available and one multi-byte.

Double Byte code pages available are: Code page 932, 936, 949 and 950

Multi-byte code page available are GB18030-2000.

These code pages require an appropriate Unicode font be loaded that support all the characters in the requested code page.

Due to the large number of characters in these code pages. These files are not supported in a customer definable ASCII form like the Code page descriptions files described above. They are compiled and compressed into a 2 or 3 file code description set. One file is like the Code page description file in that it may be referenced just like the normal code page description files. The other two files are double byte and multi-byte decode files and are referenced in the master code page description. These files not distributed with the standard printer but are available from Transact upon request.

## Code page selection

In ASCII mode the iTherm® 280 Printer supports over 40 different international character sets by default. In IBM and EPOS printers, there are two ways of selecting a character set.

One way substitute's 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, and it became a problem for the application to match the characters displayed and printed.

To solve this problem, a second method of selecting a character set was developed – code pages. The printer and display use the same code page, and 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 iTherm® 280 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 iTherm® 280 Printer.

The iTherm® 280 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<sup>5</sup> 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.

---

<sup>5</sup> Epson provides limited code page support through ID to code page translation. Only six translations are defined.

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 allow all of the possible character sets to be selected, it is provided for compatibility with older programs only. The second is [ESC] [ T, which selects any code page. In EPOS mode, the [ESC] R command has been expanded to select any code page.

---

### [ESC] !      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 12 Language Table ID's

---

### [ESC] [ T      Select character code page

**ASCII**            [ESC] [ T <n<sub>h</sub>> <n<sub>i</sub>>  
**Hexadecimal**   1BH 5BH 54H <n<sub>h</sub>> <n<sub>i</sub>>  
**Decimal**         <27> <91> <84> <n<sub>h</sub>> <n<sub>i</sub>>  
**IPCL**            &%CP <m<sub>1</sub>> <m<sub>2</sub>> <m<sub>3</sub>> <m<sub>4</sub>>  
**EPOS**            [ESC] t <n>

**Description**   The [ESC] [ T <n<sub>h</sub>> <n<sub>i</sub>> command selects character code page <n<sub>h</sub>> <n<sub>i</sub>>. The iTherm® 280 Printer supports many code pages. The following code pages are supported.

**Refer to Appendix A for a list of supported code page.**



**Note:** The code page field is a 16-bit field that is a function of the code page numbers  $\langle n_h \rangle$  and  $\langle n_l \rangle$ , e.g.  $(\langle n_h \rangle * 256) + \langle n_l \rangle$ . For example,  $1 * 256 + 181 = 437$ . For the IPCL command, the page is specified in ASCII as a 4-byte field.



**Note:** If the code page is not found in the internal translation, the code page requested is translated into a code page file name and if a user defined file is found, it will be used as the code page definition.

<b>Function</b>	<b>Select character code page by name.</b>	<b>All</b>
<b>ASCII</b>	[ESC] + C Codepage.CPM <0>	
<b>Hexadecimal</b>	1BH 2BH 43H	
<b>Decimal</b>	<27> <43> <67>	
<b>CodePage</b>	File name from 5 to 30 characters.	
<b>Description</b>	The [ESC] + C command will select and read a code page encoding file. If the file does not exist, the current code page will be selected. If the code page definition is not complete, only the character locations defined by the file will be effected.	

**Note:** Code page translations only occur in ASCII mode. This command has no effect in Unicode mode.

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

<b>[ESC] “</b>	<b>Print Unicode character</b>
<b>ASCII</b>	[ESC] “ <n <sub>L</sub> ><n <sub>H</sub> >
<b>Hexadecimal</b>	1BH 22H <n <sub>L</sub> ><n <sub>H</sub> >
<b>Decimal</b>	<27> <34> <n <sub>L</sub> ><n <sub>H</sub> >
<b>IPCL</b>	&%PU<m1> <m2> <m3><m4> <m5>
<b>EPOS</b>	[ESC] “ <n <sub>L</sub> ><n <sub>H</sub> >
<b>Description</b>	The [ESC] “<n <sub>L</sub> ><n <sub>H</sub> >command allows any Unicode character to be directly addressed and inserted into the print data. <n <sub>L</sub> ><n <sub>H</sub> > can range in value from zero to 65535.

<b>[ESC] [ C</b>	<b>Insert Euro character</b>
------------------	------------------------------



**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 (multi-lingual) 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 (hex)
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 13 Euro Character Substitution Matrix

**[ESC] [ S    Redefine character set**

**ASCII**            [ESC] [ S <L<sub>L</sub>> <L<sub>H</sub>> <B<sub>C</sub>> <T<sub>1L</sub>><T<sub>1H</sub>> <T<sub>2L</sub>><T<sub>2H</sub>> <T<sub>3L</sub>><T<sub>3H</sub>>  
                           ...<T<sub>nL</sub>><T<sub>nH</sub>>  
**Hexadecimal** 1BH 5BH 53H ...  
**Decimal**        <27> <91> <83> ...  
**IPCL**            none

**Description** The [ESC] [ S <L<sub>L</sub>> <L<sub>H</sub>> <B<sub>C</sub>> <T<sub>1L</sub>><T<sub>1H</sub>> <T<sub>2L</sub>><T<sub>2H</sub>> <T<sub>3L</sub>><T<sub>3H</sub>> ... <T<sub>nL</sub>><T<sub>nH</sub>> command allows an application to replace or redefine the active character set mapping in the printer, where <L<sub>L</sub>> <L<sub>H</sub>> defines the total length of the following data:

<L<sub>L</sub>> + 256 \* <L<sub>H</sub>> = 1 + 2 \* the total number of characters to be replaced;  
 <B<sub>C</sub>> is the first character in the active map to be replaced  
 <T<sub>1H</sub>> <T<sub>1L</sub>><sup>6</sup> 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 iTherm® 280 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. Unicode addressing is used. 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.

<sup>6</sup> The internal character map is provided in the *Master Character Set Definitions Guide*, PN 100-9785.

**[ESC] = Define user-defined characters**

**ASCII** [ESC] = <y> <c<sub>1</sub>> <c<sub>2</sub>> [<x<sub>1</sub>> <d<sub>1</sub>> ... d(y x x<sub>1</sub>)] ... [<x<sub>k</sub>> <d<sub>1</sub>> ... d (y x x<sub>k</sub>)]

**Hexadecimal** 1BH 3DH <y> ...

**Decimal** <27> <51> <y> ...

**Range** y = 2 or 3

$32 \leq c_1 \leq c_2 \leq 126$

$0 \leq x \leq 12$  (12 x 12 font)

$0 \leq x \leq 14$  (12 x 14 font)

$0 \leq x \leq 16$  (24 x 16 font)

$0 \leq d_1 \dots d (y \times x) \leq 255$

**IPCL** none

**Description** The [ESC] = <y> <c<sub>1</sub>> <c<sub>2</sub>> [<x<sub>1</sub>> <d<sub>1</sub>> ... d(y x x<sub>1</sub>)] ... [<x<sub>k</sub>> <d<sub>1</sub>> ... d (y x x<sub>k</sub>)] command defines user-defined characters from character code <c<sub>1</sub>> to <c<sub>2</sub>>. <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 32 (20H) to 126 (7EH) can be defined by <c<sub>1</sub>> and <c<sub>2</sub>>. 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.

---

**[ESC] \$      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.

---

**[ESC] >      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 characters. The internal character set is printed.

---

**Character Attributes**


---

**[ESC] c      Select color**

**ASCII**      [ESC] c <n>  
**Hexadecimal** 1BH 63H <n>  
**Decimal**    <27> <99> <n>  
**IPCL**      &%CL <m<sub>1</sub>>  
**EPOS**      none

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

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

---

**[SO]            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 auto-print.

---

**[DC4]          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.

**[ESC] \_ Enable/Disable Strike Through**

**ASCII** [ESC] \_ <n>  
**Hexadecimal** 1BH 5FH 01H  
**Decimal** <27> <95> <n>  
**IPCL** &%MO (Begin)  
**IPCL** &%CO (End)  
**EPOS** [ESC] ! <n>

**Description** The [ESC] \_ <1> command begins strike through print mode. All subsequent text, leading spaces, and trailing spaces are over-scored. [ESC] \_ <0> ends the mode.

**[ESC] W Multi-line 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}  
 &%FHA {n = 3}  
 (Note: Single-wide, double-high mode is not available in IPCL mode.)  
**EPOS** [ESC] ! <n>

**Description** The [ESC] W <n> command controls multi-line 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:** The [ESC] W <n> command does not affect line spacing.



**Note:** 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

**[ESC] [ @ Set print style: double-wide, double-high, italic control**

<b>ASCII</b>	[ESC] [ @ [EOT] [NUL] <k> [NUL] <n> <m>
<b>Hexadecimal</b>	1BH 5BH 40H 04H 00H <k> 00H <n> <m>
<b>Decimal</b>	<27> <91> <64> <04> <0> <K> <0> <n> <m>
<b>IPCL</b>	&%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.

<b>Where k bits</b>	<b>k</b>	<b>76543210</b>	
		----xxxx	Italic control
	0	----0000	No change
	1	----0001	Italics On
	2	----0010	Italics Off
<b>Where n bits</b>	<b>n</b>	<b>76543210</b>	
		----0nnn	Height multiplier (Maximum 4)
	0	----0000	No change
		xxxx----	Line spacing
	0	0000----	No change
<b>Where m bits</b>	<b>m</b>	<b>76543210</b>	
		----0nnn	Width multiplier (Maximum 4)
	0	----0000	No change



**Note:** The maximum height and width multiplier is four.

---

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

---

**[ESC] G      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.

---

**[ESC] H      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.

---

**[ESC] E      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.



---

**[ESC] F      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.

---

**[ESC] S <0>    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:** Superscript is not available in all print modes.

---

**[ESC] S <1>    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.

---

**[ESC] T      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.

---

**[ESC] % G    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.

---

**[ESC] % H    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.

## Page Mode

The iTherm® 280i supports two operational modes, standard and page mode. In standard mode, as a line of text is received it is buffered and printed when the line feed is received. In page mode the printer waits for a complete "page" (a number of lines) to be received before printing the complete page. The advantage of page mode is that text and/or graphics can be placed anywhere on the page, in any order, and in any of 4 orientations.

### How to use page mode

Page mode requires two phases to operate correctly.

1. Page definition
  - a. Define the master page size either just before or just after entering page mode.
  - b. Optionally define a sub page.

The master page defines the maximum page size, all sub pages must be smaller and contained within the master page. Master and sub page definitions are always done base on the 0 degree orientation not the current rotation.
  - c. Optionally set an orientation. This may be 0, 90, 180 or 270 degrees.
  - d. Optionally set the entry position. This is based on the current sub page and the current rotation.
  - e. Enter text or graphics.
  - f. Go to step b to define additional sub pages or step c to change the orientation.
2. Print the page.

### Page Definition

The [ESC]t command will start page definition and define the initial orientation. An [ESC]t command during page definition will change the orientation and reset the entry location back to the top left corner of that orientation.

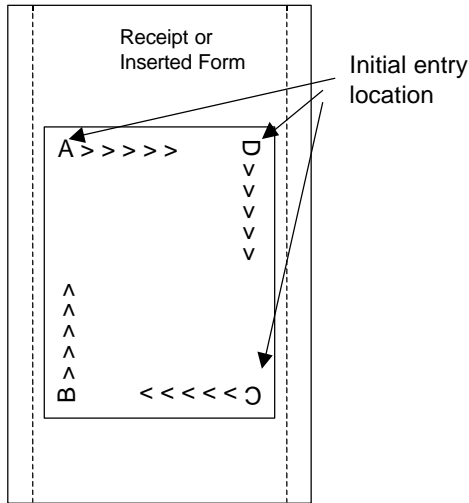


Figure 10 Page Mode Entry Orientations

The [ESC] u command sets the maximum page dimensions. Note that these dimensions are always based on 0 degree rotation. Enter text and/or graphics as required.

**Auto-cutter and page mode**

You may embed an auto-cutter command within a page definition. The auto-cut command may be placed anywhere in the page definition, however, it will be processed after the page is printed. To prevent the cut from occurring in the page, it will be preceded with a feed that will place the end of the page about 0.125 inches above the auto-cut position.

**Mechanism commands in page mode**

In general, mechanism commands received during page mode will be processed if the result will not affect the printed result.

**Stopping page mode definition**

The following operations will stop a page mode definition:

- 1) [ESC]@ Printer initialize command.
- 2) Real time reset request [ENQ]<10>
- 3) Turning the printer off.

**Printing the page**

The [FF] command starts the printing process.

Printing starts at the current paper position. The complete page definition is printed excluding any blank information at the bottom of the page.

If the [FF] command is used to print the page, the memory used to store the page image is not maintained and is released to be used by other functions.

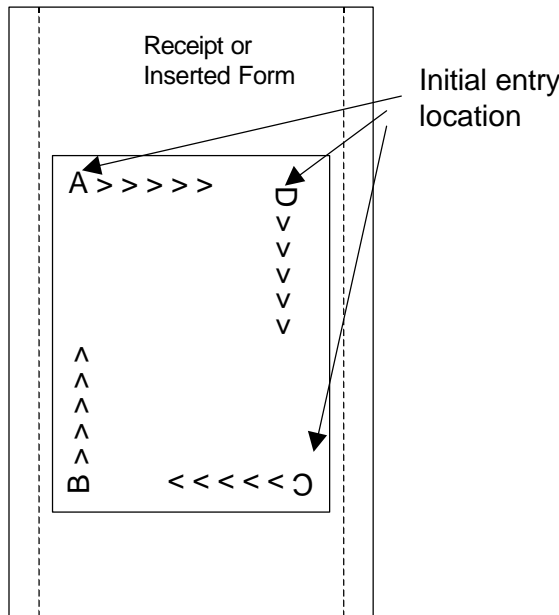
---

**Function      Select page mode**

**ASCII** [ESC] t<x> or [ESC] [SUB] t  
**Hexadecimal** 1BH 74H<x> or 1BH 1AH 74H  
**Decimal** <27><116><x> or <27><26><116>  
**IPCL** &%PM<x<sub>1</sub>>  
**EPOS** [ESC] L

**Description** This command activates page mode and sets the orientation. This command may also be issued during page definition. When issued in page mode it resets the orientation and entry position, but does not cause the currently defined image to be erased or printed.

**Where** x = 0 for standard orientation (Direction A).  
 x = 1 for 270° Rotation (Direction B)  
 x = 2 for 180° Rotation (Direction C)  
 x = 3 for 90° Rotation (Direction D)



**Note 1:** This command saves the current right and left margin and sets them to the maximum values for the orientation currently defined.

**Note 2:** During page mode definition almost all printer commands are active. The following table lists the exceptions.

Command	Active	Action
Cash drawer commands	Yes	Immediate action
Bell command	Yes	Immediate action
Auto cut commands	Delayed	The printer will perform a feed to cut and then operate the auto cutter after the page is printed. The cut command may be anywhere in the definition. If the page is printed twice, the Auto cut command must be reissued after the first print to generate additional cuts.
Electronic journal	No	This command is like a station select and is not active. You

station select		cannot store page mode images in the electronic journal. A page mode command in journal station mode will exit journal mode.
Electronic journal entries	Yes	You can make journal entries as part of a page description. They are saved as text and not part of the page.
Status requests	Yes	The status is returned during definition.
Printer initialize command	Yes	Cancels page mode definition and returns the printer to standard mode.
Set top of form	No	You must set the top of form outside of page mode. The form position is maintained after the page is printed.
Vertical tab	No	The definition of a vertical tab is ambiguous in page mode and is ignored.
Macro definitions	No	You can not define or delete a macro while in page mode. You can, however, invoke a macro or stored graphic. You can not enter page mode while in a macro definition.

**Note 3:** Unless specified by a page mode set page size command, the default page size is the full paper width for about 14 inches. Printing starts at the current paper position. The complete page definition is printed excluding any blank information at the bottom of the page.

Function	Set Print Area in Page Mode	Enhanced
<b>ASCII</b>	[ESC] [SUB] S <XO <sub>L</sub> ><XO <sub>H</sub> ><<YO <sub>L</sub> ><YO <sub>H</sub> ><W <sub>L</sub> ><W <sub>H</sub> >< H <sub>L</sub> ><H <sub>H</sub> >	
<b>Hexadecimal</b>	1BH 1AH 53H <XO <sub>L</sub> ><XO <sub>H</sub> ><<YO <sub>L</sub> ><YO <sub>H</sub> ><W <sub>L</sub> ><W <sub>H</sub> >< H <sub>L</sub> ><H <sub>H</sub> >	
<b>Decimal</b>	<27><26><83><XO <sub>L</sub> ><XO <sub>H</sub> ><<YO <sub>L</sub> ><YO <sub>H</sub> ><W <sub>L</sub> ><W <sub>H</sub> >< H <sub>L</sub> ><H <sub>H</sub> >	
<b>IPCL</b>	<b>None</b>	
<b>EPOS</b>	[ESC] W	
<b>Description</b>	This command Sets the position and size of the initial area in page mode and sub pages.	

Where:

<XO <sub>L</sub> ><XO <sub>H</sub> >	the x direction offset	Min 0
<YO <sub>L</sub> ><YO <sub>H</sub> >	the y direction offset	Min 0
<W <sub>L</sub> ><W <sub>H</sub> >	the width in dots	Max 576
< H <sub>L</sub> ><H <sub>H</sub> >	the height in dots	Max 3000

This command should always be sent before or immediately after page mode is entered to define the initial page size.

Once in page mode (after the [ESC]t command) the command can be sent multiple times so that several different print areas, aligned in different print directions, can be developed in the printer's page buffer before being printed using the Print Page Mode commands (FF or ESC FF).

The starting position of the print area is the upper left of the area to be printed. The Yoffset is in the y direction and is YO dots and the Xoffset is in the x direction and is XO dots in. The length of the area to be printed in the y direction is set to H dots. The length of the area to be printed in the x direction is set to W dots.

The set print area command may be invoked multiple times while in page mode. The first invocation specifies the initial master page size. Following invocations will define

smaller windows within the initially defined page. If the Set page size command is not used, the page size will default to the maximum size.

The orientation of the set print area command is always based on 0 degrees regardless of the current orientation setting. This includes if the command is sent before the start page mode command, after the start page mode command, or as a sub-page.



*Note: The maximum printable area in the x direction is 576/203 or 3.15 inches.*

*Note: The maximum printable area in the y direction is 2999/203 or 14.78 inches.*

*Note: Only the used portion of the page is printed. That is the page length will only include what actually has print data. See illustration below.*

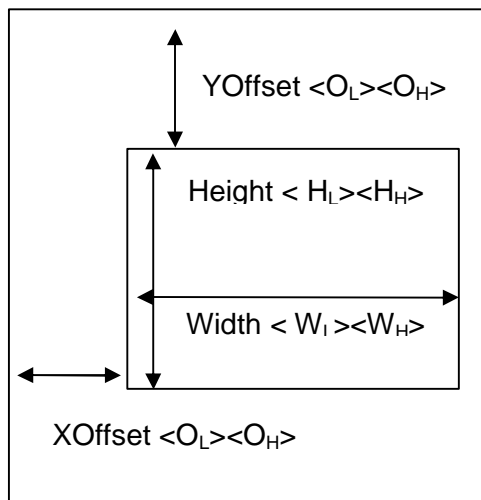


Figure 11 Page mode set printable area

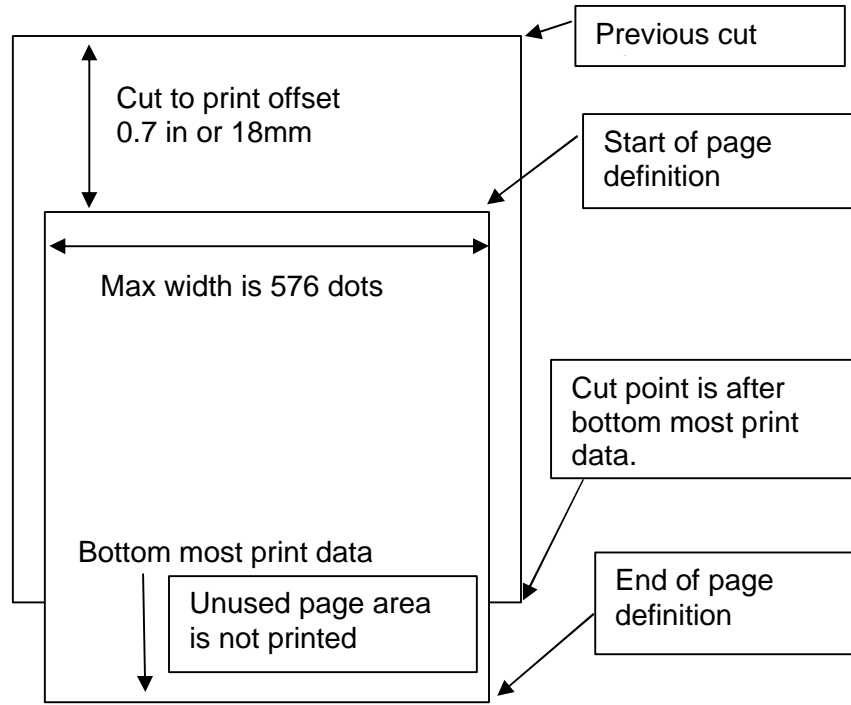


Figure 12 Default Page mode printed area



Function	Set Printed Area in Page Mode	Enhanced
ASCII	[ESC] [SUB] W <XO <sub>L</sub> ><XO <sub>H</sub> ><<YO <sub>L</sub> ><YO <sub>H</sub> ><W <sub>L</sub> ><W <sub>H</sub> >< H <sub>L</sub> ><H <sub>H</sub> >	
Hexadecimal	1BH 1AH 57H <XO <sub>L</sub> ><XO <sub>H</sub> ><<YO <sub>L</sub> ><YO <sub>H</sub> ><W <sub>L</sub> ><W <sub>H</sub> >< H <sub>L</sub> ><H <sub>H</sub> >	
Decimal	<27><26><87><XO <sub>L</sub> ><XO <sub>H</sub> ><<YO <sub>L</sub> ><YO <sub>H</sub> ><W <sub>L</sub> ><W <sub>H</sub> >< H <sub>L</sub> ><H <sub>H</sub> >	
IPCL	None	
EPOS	[ESC] W	
Description	This command is similar Set Print Area in Page Mode command above, however it will force the complete page to be printer rather than only what is used. It will define sub pages, however is intended to set the initial page size.	

Where:

- <XO<sub>L</sub>><XO<sub>H</sub>> the x direction offset      Min 0
- <YO<sub>L</sub>><YO<sub>H</sub>> the y direction offset      Min 0
- <W<sub>L</sub>><W<sub>H</sub>> the width in dots              Max(576)
- < H<sub>L</sub>><H<sub>H</sub>> the height in dots              Max(3000)

This command should always be sent before or immediately after select page mode command and will define the initial page size. This command differs from the Set Print Area in Page Mode command in that it does not allow the page to be shortened. The complete page is printed even if it is not used.

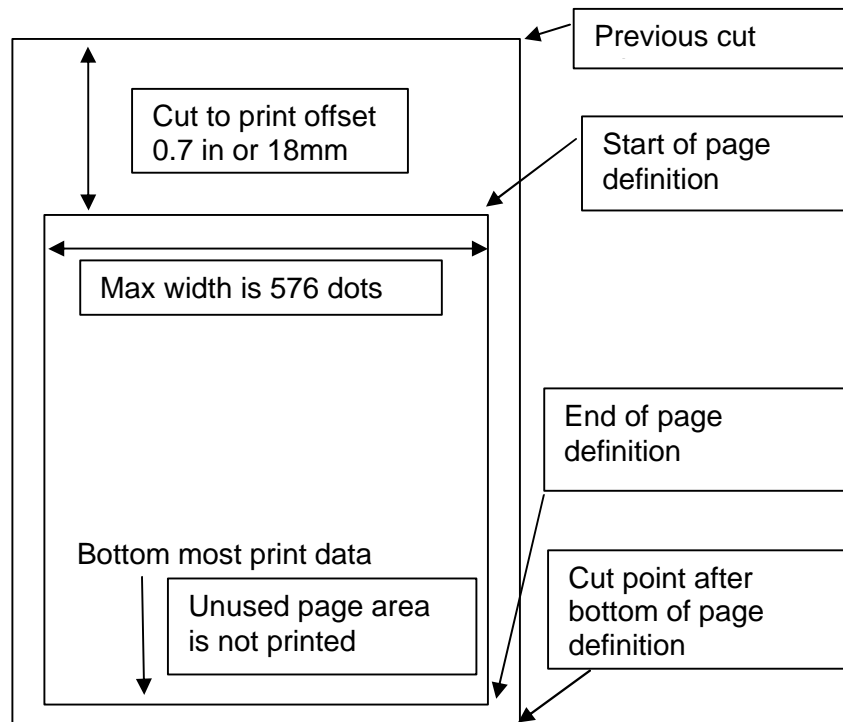


Figure 13 Defined Page mode printed area

Function	Set Print Area in Page Mode	Legacy Support Command
ASCII	[ESC] u <O <sub>L</sub> ><O <sub>H</sub> ><W <sub>L</sub> ><W <sub>H</sub> >< H <sub>L</sub> ><H <sub>H</sub> >	
Hexadecimal	1BH 75H <O <sub>L</sub> ><O <sub>H</sub> ><W <sub>L</sub> ><W <sub>H</sub> >< H <sub>L</sub> ><H <sub>H</sub> >	
Decimal	<27><117><O <sub>L</sub> ><O <sub>H</sub> ><W <sub>L</sub> ><W <sub>H</sub> >< H <sub>L</sub> ><H <sub>H</sub> >	
IPCL	&%PS<0000><WWWW><HHHH>	
EPOS	[ESC] W	
Description	This command Sets the position and size of the printing initial area in page mode and sub pages.	

Where:

<O<sub>L</sub>><O<sub>H</sub>> the y direction offset Default(0)  
 <W<sub>L</sub>><W<sub>H</sub>> the width in dots Default(576)  
 < H<sub>L</sub>><H<sub>H</sub>> the height in dots Default(3000)

This command should always be sent before or immediately after page mode is entered to define the initial page size.

Once in page mode (after the [ESC]t command) the command can be sent multiple times so that several different print areas, aligned in different print directions, can be developed in the printer's page buffer before being printed using the Print Page Mode commands (FF or ESC FF).

The starting position of the print area is the upper left of the area to be printed. The offset is in the x direction and is O dots. The length of the area to be printed in the y direction is set to H dots. The length of the area to be printed in the x direction is set to W dots. (Note that the Y offset is always 0)

The set print area command may be invoked multiple times while in page mode. The first invocation specifies the final page height. Following invocations will define smaller windows within the initially defined page. If the Set page size command is not used, the page size will default to the maximum size.

The orientation of the set print area command is always based on 0 degrees regardless of the current orientation setting. This includes if the command is sent before the start page mode command, after the start page mode command, or as a sub-page.



*Note: The maximum printable area in the x direction is 576/203 or 3.15 inches.*

*Note: The maximum printable area in the y direction is 2999/203 or 14.78 inches.*

*Note: The printed page length will only include what actually has print data.*

---

<b>Function</b>	<b>Set Page Mode Entry Position</b>
<b>ASCII</b>	[ESC] [SUB] A <X <sub>L</sub> ><X <sub>H</sub> ><Y <sub>L</sub> ><Y <sub>H</sub> >
<b>Hexadecimal</b>	1BH 1AH 41H <X <sub>L</sub> ><X <sub>H</sub> ><Y <sub>L</sub> ><Y <sub>H</sub> >
<b>Decimal</b>	<27><26><65><X <sub>L</sub> ><X <sub>H</sub> > <Y <sub>L</sub> ><Y <sub>H</sub> >
<b>IPCL</b>	&%PY<XXXX><YYYY>
<b>EPOS</b>	[ESC] W
<b>Description</b>	<p>This command sets the horizontal and vertical entry position to anywhere on the page. It is only valid in page mode. If the value specified is beyond the page boundary, the command is ignored. (X and Y refers to the current active orientation specified by the [ESC]t command, and is not same as the page definition of X and Y.)</p> <p>The X and Y positions are in dots.</p> <p><math>Y = Y_h * 256 + Y_l</math> dots from the top</p> <p><math>X = X_h * 256 + X_l</math> dots from the left</p>
<b>Note:</b>	You can also use the [ESC]J, [ESC]M, [ESC]d and [ESC]e commands to position the print on the page.

---

<b>Function</b>	<b>Set Page Mode Entry Position Relative</b>
<b>ASCII</b>	[ESC] [SUB] R <X <sub>L</sub> ><X <sub>H</sub> ><Y <sub>L</sub> ><Y <sub>H</sub> >
<b>Hexadecimal</b>	1BH 1AH 52H <X <sub>L</sub> ><X <sub>H</sub> ><Y <sub>L</sub> ><Y <sub>H</sub> >
<b>Decimal</b>	<27><26><82><X <sub>L</sub> ><X <sub>H</sub> > <Y <sub>L</sub> ><Y <sub>H</sub> >
<b>IPCL</b>	None
<b>EPOS</b>	[ESC] W
<b>Description</b>	<p>This command sets the horizontal and vertical entry position to anywhere on the page. It is only valid in page mode. If the value specified is beyond the page boundary, the command is ignored. (X and Y refers to the current active orientation specified by the [ESC]t command, and is not same as the page definition of X and Y.)</p> <p>The X and Y positions are in dots.</p> <p><math>Y = Y_h * 256 + Y_l</math> dots from the current Y</p> <p><math>X = X_h * 256 + X_l</math> dots from the current X</p>
<b>Note:</b>	You can also use the [ESC]J, [ESC]M, [ESC]d and [ESC]e commands to position the print on the page.

Function	Set Page Mode Entry Position	Legacy Support
ASCII	[ESC] o <X <sub>L</sub> ><X <sub>H</sub> ><Y <sub>L</sub> ><Y <sub>H</sub> ><F>	
Hexadecimal	1BH 6FH <X <sub>L</sub> ><X <sub>H</sub> ><Y <sub>L</sub> ><Y <sub>H</sub> ><F>	
Decimal	<27><111><X <sub>L</sub> ><X <sub>H</sub> > <Y <sub>L</sub> ><Y <sub>H</sub> ><F>	
IPCL	None	
EPOS	[ESC] W	
<b>Description</b>	<p>This command sets the horizontal and vertical entry position to anywhere on the page. It is only valid in page mode. If the value specified is beyond the page boundary, the command is ignored. (X and Y refers to the current active orientation specified by the [ESC]t command, and is not same as the page definition of X and Y.)</p> <p>The X and Y positions are in dots.</p> <p><math>Y = Y_h * 256 + Y_l</math> dots from the top</p> <p><math>X = X_h * 256 + X_l</math> dots from the left</p> <p>The F parameter is a flag that specifies if this command is an absolute position command or relative to the current position. If its value is &lt;1&gt; the command is processed as a relative position command, and if its value is &lt;0&gt; the command is interpreted as an absolute position command.</p>	
<b>Note:</b>	You can also use the [ESC]J, [ESC]M, [ESC]d and [ESC]e commands to position the print on the page.	

Function	Exit Page Mode
ASCII	[FF] or [ESC][SUB] P
Hexadecimal	0CH or 1BH 1AH 50H
Decimal	<12> or <27><26><80>
IPCL	&%FF
EPOS	[FF]
<b>Description</b>	This command exits page mode definition and starts the print process. If the printer is not in page mode, this command is treated as a normal form feed command.

**Note:** When page mode finishes printing, the left and right margins are restored to the values before the select page mode command. All other format changes are preserved.

## Graphic Mode

The iTherm® 280 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 emulation.

The iTherm® 280 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 iTherm® 280 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 iTherm® 280 Printer is used with programs that convert text to graphics, the printer is slower than if the printer is sent ASCII text. The iTherm® 280 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

<b>[ESC] K</b>	<b>Print single-density graphics (60h x 72v dpi)</b>
<b>ASCII</b>	[ESC] K <n <sub>1</sub> > <n <sub>2</sub> >
<b>Hexadecimal</b>	1BH 4BH <n <sub>1</sub> > <n <sub>2</sub> >
<b>Decimal</b>	<27> <75> <n <sub>1</sub> > <n <sub>2</sub> >
<b>IPCL</b>	none
<b>Description</b>	The [ESC] K <n <sub>1</sub> > <n <sub>2</sub> > command prints <n <sub>1</sub> > + 256 * <n <sub>2</sub> > bytes of single-density graphics (60 dpi).
<b>[ESC] L</b>	<b>Print half-speed double-density graphics (120h x 72v dpi)</b>
<b>ASCII</b>	[ESC] L <n <sub>1</sub> > <n <sub>2</sub> >
<b>Hexadecimal</b>	1BH 4CH <n <sub>1</sub> > <n <sub>2</sub> >
<b>Decimal</b>	<27> <76> <n <sub>1</sub> > <n <sub>2</sub> >
<b>IPCL</b>	none
<b>Description</b>	The [ESC] L <n <sub>1</sub> > <n <sub>2</sub> > command prints <n <sub>1</sub> > + 256 * <n <sub>2</sub> > bytes of double-density graphics (120 dpi) at half speed, allowing full and half dots to be printed.
<b>[ESC] Y</b>	<b>Print full-speed double-density graphics (120h x 72v dpi)</b>

**ASCII** [ESC] Y <n<sub>1</sub>> <n<sub>2</sub>>  
**Hexadecimal** 1BH 59H <n<sub>1</sub>> <n<sub>2</sub>>  
**Decimal** <27> <89> <n<sub>1</sub>> <n<sub>2</sub>>  
**IPCL** none

**Description** The [ESC] Y <n<sub>1</sub>> <n<sub>2</sub>> command prints <n<sub>1</sub>> + 256 \* <n<sub>2</sub>> 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).

**[ESC] Z Print quad-density graphics (240h x 72v dpi)**

**ASCII** [ESC] Z <n<sub>1</sub>> <n<sub>2</sub>>  
**Hexadecimal** 1BH 5AH <n<sub>1</sub>> <n<sub>2</sub>>  
**Decimal** <27> <90> <n<sub>1</sub>> <n<sub>2</sub>>  
**IPCL** none

**Description** The [ESC] Z <n<sub>1</sub>> <n<sub>2</sub>> command prints <n<sub>1</sub>> + 256 \* <n<sub>2</sub>> 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**

**[ESC] \* Print graphics in mode <m> (60h/ 120h/ 240h x 72v dpi)**

**ASCII** [ESC] \* <m> <n<sub>1</sub>> <n<sub>2</sub>>  
**Hexadecimal** 1BH 2AH <m> <n<sub>1</sub>> <n<sub>2</sub>>  
**Decimal** <27> <42> <m> <n<sub>1</sub>> <n<sub>2</sub>>  
**IPCL** none

**Description** The [ESC] \* <m> <n<sub>1</sub>> <n<sub>2</sub>> command selects one of three graphic modes as specified by <m>.

<b>Where &lt;m&gt;</b>	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		

**[ESC] ? 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>	Resolution	Speed	Slices	Default
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:** Modes 11 through 13 are designed to support horizontal graphics and not intended for APA graphics.

---

### [ESC] U <1> Select 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:** Unidirectional print should be canceled before normal text is printed. Print time is slowed if it is not canceled.

---

**[ESC] U <0> Select 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 bi-directional, logic-seeking print mode.



### Horizontal Graphics (Color Graphics)

The iTherm® 280 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 iTherm® 280 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 that 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 Chapter 7, "Color Graphics."

---

#### [ESC] h      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



**Note 1:** Red, green, and blue pixels set to one at the same location result in a 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 – for example, setting the color to six would set green and blue simultaneously.

<length> =      byte specifying the length of the data including the format byte, ranging from 0 to 254 (255 is reserved for future use.)

<format> = byte specifying the format of the graphics data.  
 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  
 <data> = the data bytes that define the graphics to be printed.

**[ESC] \* 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 ESC \* command documentation in previous section.)  
 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**

<i><b>Command</b></i>	<i><b>Comment</b></i>
[ESC] * <10> <0> <0>	Set resolution to 100x96 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.

## Graphics Compression

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 Compression.** In difference compression, data is represented in byte pairs. In 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 iTherm® 280 Printer maintains a 16K (16384 bytes) section of flash memory and up to 192K of extended 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.

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.

When the basic user store is full, it can be moved to extended user store. Individual items in the extended user store can not be erased. The entire extended user store must be erased all at once. You may place two items in user store with the same name and the last defined item will be used.

### 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.

<b>Function</b>	<b>Begin named macro record</b>
<b>ASCII</b>	[ESC] [US] b <Name..> <0> Then send the data to be recorded. The printer does not process the data. The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 136.
<b>Function</b>	<b>End name macro record</b>
<b>ASCII</b>	[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. The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 136.
<b>Function</b>	<b>Start macro record</b>
<b>ASCII</b>	[ESC] g <1>Then send the data to be recorded. (The data is processed and printed).
<b>Function</b>	<b>Stop macro record</b>
<b>ASCII</b>	[ESC] g <2>Then save the macro.
<b>Function</b>	<b>Save macro data</b>
<b>ASCII</b>	[ESC] [US] m <Name..><0> Saving User-defined Characters. To save user-defined characters, first define the character set.

---

<b>Function</b>	<b>Define user-defined characters</b>
<b>ASCII</b>	[ESC] = <y> <c <sub>1</sub> > <c <sub>2</sub> > [x <sub>1</sub> d <sub>1</sub> ... d(y x x <sub>1</sub> )] ... [x <sub>k</sub> d <sub>1</sub> ... d(y x x <sub>k</sub> )] 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.

---

<b>Function</b>	<b>Save user-defined characters</b>
<b>ASCII</b>	[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. The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 136.

---

<b>Function</b>	<b>Load item from user store</b>
<b>ASCII</b>	[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. The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 136.

---

<b>Function</b>	<b>Flag as a start-up macro</b>
<b>ASCII</b>	[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. The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 136.

---

<b>Function</b>	<b>Remove item from user store</b>
<b>ASCII</b>	[ESC] [US] e <Name..> <0> The [ESC] [US] e <Name..> <0> command removes an item from user store and frees up its space. The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 136.

---

<b>Function</b>	<b>Flush information from user store</b>
<b>ASCII or</b>	[ESC] [US] f ALL <0> Base User Store [ESC] [US] f EXT <0> Extended User Store.
<b>Description</b>	The [ESC] [US] f ALL <0> command clears all of the information to the user store and frees the data space. The [ESC] [US] f EXT <0> command clears all of the information in the extended the user store.  The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 136.

---

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



**Note:** 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.

The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 136.

### User-Store Commands

---

<b>Function</b>	<b>Begin named macro record</b>
<b>ASCII</b>	[ESC] [US] b <Name..> <0>
<b>Hexadecimal</b>	1BH 1FH 62H
<b>Decimal</b>	<27> <31> <98>
<b>IPCL</b>	&%UB <Name..> <0>
<b>EPOS</b>	none
<b>Description</b>	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.  The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 136.

---

<b>Function</b>	<b>End named macro record</b>
<b>ASCII</b>	[ESC] [US] e <Name..> <0>
<b>Hexadecimal</b>	1BH 1FH 65H
<b>Decimal</b>	<27> <31> <101>
<b>IPCL</b>	&%UG <Name..> <0>
<b>EPOS</b>	none
<b>Description</b>	<p>The [ESC] [US] e &lt;Name..&gt; &lt;0&gt; command ends the macro record operation and saves the macro to flash. It uses the &lt;Name..&gt; 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 &lt;Name..&gt; 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.</p> <p>The terminating &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&lt;n&gt; on page 136.</p>

---

<b>Function</b>	<b>Save macro data in user store</b>
<b>ASCII</b>	[ESC] [US] m <Name..> <0>
<b>Hexadecimal</b>	1BH 1FH 6DH
<b>Decimal</b>	<27> <31> <109>
<b>IPCL</b>	&%UM <Name..> <0>
<b>EPOS</b>	[GS] -...<Name..> <0> is from one to 15 characters and must be null terminated.
<b>Description</b>	<p>The [ESC] [US] m &lt;Name..&gt; &lt;0&gt; command saves the current macro buffer structure into the flash user-store area. It uses the &lt;Name..&gt; field as a reference name. If the name already exists in the flash user store, the command does not store the data.</p> <p>The terminating &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&lt;n&gt; on page 136.</p>

---

<b>Function</b>	<b>Save user-defined characters</b>
<b>ASCII</b>	[ESC] [US] c <Name..> <0>
<b>Hexadecimal</b>	1BH 1FH 63H
<b>Decimal</b>	<27> <31> <99>
<b>IPCL</b>	&%UC <Name..><0>
<b>EPOS</b>	[GS] 6<Name..> <0> is from one to 15 characters and must be null terminated.
<b>Description</b>	<p>The [ESC] [US] c &lt;Name..&gt; &lt;0&gt; command saves the current user-defined character structure in the flash user-save storage area. It uses the &lt;Name..&gt; field as a reference. If the name already exists in the flash user store, the command will not store the data.</p> <p>The terminating &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&lt;n&gt; on page 136.</p>

**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.

The terminating &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&lt;n&gt; on page 136.

**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.

The terminating &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&lt;n&gt; on page 136.

**Function**    **Flag item as a start-up macro****ASCII**        [ESC] [US] s <Name..> <0>**Hexadecimal** 1BH 1FH 73H**Decimal**       <27> <31> <115>**IPCL**         &%US <Name..> <0>**EPOS**        [GS] 0<Name..> <0> is from one to 15 characters and must be null terminated.**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.

The terminating &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&lt;n&gt; on page 136

**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.  
                       The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT>n> on page 136.

**Function**        **Transfer all items from user store to extended user store.**  
**ASCII**            [ESC] [US] t <0>  
**Hexadecimal**    1BH 1FH 74H  
**Decimal**         <27> <31> <116>  
**IPCL**            &%UX <0>  
**EPOS**            None  
**Description**     This command transfers the information in the base 16K user store to the extended user store. The base user store is erased if the transfer was successful.  
                       The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT>n> on page 136.

**Function**        **Flush information from user store or extended user store**  
**ASCII**            [ESC] [US] f ALL <0> User Store.  
**Or**                [ESC] [US] f EXT <0> Extended User Store.  
**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. If "EXT" is substituted for "ALL", extended user store (if any) is cleared.  
                       The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT>n> on page 136.

---

<b>Function</b>	<b>Report on user store</b>
<b>ASCII</b>	[ESC] [US] q <0>    Print a user store report
<b>Or</b>	[ESC] [US] ? <0>    Return a formatted user store report
<b>Hexadecimal</b>	1BH 1FH 71H
<b>Decimal</b>	<27> <31> <113>
<b>IPCL</b>	&%UQ <Name..> <0>
<b>EPOS</b>	[GS] 3
<b>Description</b>	<p>The [ESC] [US] q &lt;Name..&gt; &lt;0&gt; 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.</p> <p>The terminating &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&lt;n&gt; on page 136.</p>



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

---

<b>Function</b>	<b>Redefine User Store Termination Character</b>
<b>ASCII</b>	[ESC] [EM] T <n>
<b>Hexadecimal</b>	1BH 19H 54H <n>
<b>Decimal</b>	<27> <25> <84> <n>
<b>IPCL</b>	&%UT <n>
<b>EPOS</b>	None
<b>Description</b>	<p>This command allows the terminator used to signal the end of the name field in User Store commands to be modified. The value of &lt;n&gt; is used (in addition to the &lt;0&gt;) for the terminator. The value of n may be from 0 to 255.</p> <p>The default value for the second terminator is &amp;. If this command redefines the terminator to something other than &amp;, the &amp; will no longer function.</p>
<b>Example</b>	<p>If &amp;%UT% were sent to the printer, the user store command to run macro "Demo" would be &amp;%URDemo%.</p>

## 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, but rather a maximum of once per day.

The buffer is initially about 16K<sup>7</sup> bytes long. All commands<sup>8</sup> 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.

---

<sup>7</sup> The actual buffer is smaller because of the overhead.

<sup>8</sup> 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.

---

**[ESC] g <0> 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.

---

**[ESC] g <1> 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.

---

**[ESC] g <2> 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.

---

**[ESC] g <3> 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:** The [ESC] g <3> command is supplied for compatibility with the Series 80PLUS and 90PLUS printers.

## Bar Codes

The iTherm® 280 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 correctly 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 bar codes the printer generates. Bar codes are printed at a 203 x 203 resolution.

Barcodes may be printed horizontally or vertically. When printed vertically the length of the barcode can be greater (i.e. more characters can be printed). You can not print human readable interpretation (HRI) characters in vertical mode. It is generally better to print vertical barcodes by printing horizontal barcodes in page mode rotated 90° or 270°. You can then mix HRI and other text with the barcodes.

Function	Print bar code																																	
<b>ASCII</b>	[ESC] b <n> {information} [ETX]																																	
<b>Hexadecimal</b>	1BH 62H <n> ... 03H																																	
<b>Decimal</b>	<27> <98> <n> ... <3>																																	
<b>IPCL</b>	&%25 ... [CR] Interleaved 2 of 5 &%39 ... [CR] Code 39 &%12 ... [CR] Code 128 &%28 .<m <sub>1</sub> > <m <sub>2</sub> > Code 128 (allows a two character length, preceding the information) &%UP ... [CR] UPC A &%UE ... [CR] UPC E &%EA .. [CR] EAN-13 &%E8 ... [CR] EAN-8 &%93 .. [CR] Code 93 &%CB .. [CR] Codabar																																	
<b>EPOS</b>	[ESC] b <n> or [GS] k <n>																																	
<b>Description</b>	The [ESC] b <n> {information} [ETX] command prints information as a bar code. The bar code is centered on the print zone.																																	
<b>Where n =</b>	<table border="0"> <tr> <td>0</td> <td>Interleaved 2 of 5</td> <td>Numeric (0-9) only; must be even number of digits</td> </tr> <tr> <td>1</td> <td>Code 39</td> <td>26 uppercase letters (A-Z); 10 digits (0-9) (See description for full 128 character set support)</td> </tr> <tr> <td>2</td> <td>Code 128</td> <td>Three sets of 106 different characters (See description for character set selection)</td> </tr> <tr> <td>3</td> <td>UPC A</td> <td>Numeric (0-9) only; 11 digits</td> </tr> <tr> <td>4</td> <td>EAN-13</td> <td>Numeric (0-9) only; 12 digits</td> </tr> <tr> <td>5</td> <td>UPC E</td> <td>Numeric (0-9) only; 11 digits</td> </tr> <tr> <td>6</td> <td>EAN-8</td> <td>Numeric (0-9) only; 7 digits</td> </tr> <tr> <td>7</td> <td>Code 93</td> <td>26 letters; 10 digits (0-9); and 7 special characters</td> </tr> <tr> <td>8</td> <td>Codabar</td> <td>10 digits (0-9); 4 start/stop characters, A, B, C, and D; and 6 special characters.</td> </tr> <tr> <td>9</td> <td>PDF-417</td> <td>2D alpha Numeric (See notes below)</td> </tr> <tr> <td>12</td> <td>EAN-14</td> <td>Numeric (0-9) only 14 digits</td> </tr> </table>	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) (See description for full 128 character set support)	2	Code 128	Three sets of 106 different characters (See description for character set selection)	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; 7 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.	9	PDF-417	2D alpha Numeric (See notes below)	12	EAN-14	Numeric (0-9) only 14 digits
0	Interleaved 2 of 5	Numeric (0-9) only; must be even number of digits																																
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9	PDF-417	2D alpha Numeric (See notes below)																																
12	EAN-14	Numeric (0-9) only 14 digits																																



**Note:** You may print barcodes in page mode. If you rotate these barcodes 90° or 180° you can get significantly longer barcodes.

### **Interleaved 2 of 5**

Interleaved 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 iTherm<sup>®</sup> 280 printer, it will be zero padded. Due to space limitations, only 16 characters can be printed.

**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. The number of characters that can be printed depends on the bar width scaling. If the bar code scale is set to 2, 17 characters may be printed per line. There are two modes of operation for the Code 39 barcodes. The first is in a variable length format. In this mode all characters sent to the printer will be printed up to the termination character. Only 0-9, A-Z -, period, and space may be printed. \$, %, +, and / Characters may be used as escape characters for full 128 character support. If illegal characters are passed to the printer, they are converted to legal codes. (For example, a would be converted to A).

In full 128 character mode, the printer will encode the full 128 character set. In this mode, the first character received must be the length. IE. [ESC]k<1><n>... where n specifies the number of characters to follow. The characters following n characters may be from 0 to 127. Values greater than 127 are converted to printable characters by removing the 8<sup>th</sup> bit.

The following table specifies the Code 39 character set.

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

**Figure 14 Code 39 full 128 character encoding**

**Code 128**

Code 128 is an alphanumeric bar code. It is a high-density, variable-length, continuous code, which employs multiple element widths. Code 128 has three possible start codes. The start code defines the code set, Code A, B, or C that will be used to generate the barcode. The iTherm® 280 allows the code set to be specified, or it can be select by the printer based on the information in the data field.

To specify code set: [ESC] b <2> <Code>{information} [ETX]

If the first character in the data field <Code> is a start code as shown in Figure 15 below, the printer will print the complete data field from the selected set. Due to space limitations, only ten characters can be printed. The check digit is generated and printed by the printer. Characters are also specified as shown in Figure 15.

To have the printer selected code set and automatically generate an optimal barcode, the value of Code should be the length.

[ESC] b <2> <Length>{information}

If the first character <Length> is from 1 to 31, the printer will automatically select Code A, B, or C depending on the data present. If the data is all numeric, the data can be printed as pairs. This effectively doubles the amount of data that can be printed. The check digit is generated and printed by the printer.



**Note:** If the first character is greater than <31> and not <135> through <137>, the printer will discard the first character and print the data as defined in Code A..

Space is defined as a <0>, which makes programming difficult and causes control character conflicts for the printer. To solve the problem, the iTherm® 280 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.

Barcode 128 consists of 107 unique symbols. 101 of the symbols take on different meanings based on the start code or an embedded shift code sequence. Code stick A consists of alphanumeric characters and ASCII control codes (see the table below). Code stick B consists of Alpha numeric with lower case alpha, Code stick C consists of numeric pairs.

In automatic mode, any ASCII data from 0 to 127 could be entered. Values less than 32 will be encoded as Code stick A NUL- US, values from 96 through 127 will be encoded from Code stick B. Where ever possible numeric pairs will be encoded from Code stick C.

In the past, FNC1, FNC2, FNC3, and FNC4 have not been accessible to the programmer. The EAN 128 barcode requires that FNC1 be made available. To provide EAN 128 compatibility, the acceptable character range has been expanded by 10 to include the ability to specify FNC1, FNC2, FNC3 and FNC4. In automatic mode, values of 130-132 will be accepted, however, the resulting barcode may be unreadable.



128 Code	Value in Decimal	Value in Hex
FNC3	128	80
FNC2	129	81
Not Valid	130	82
	131	83
	132	84
FNC4	133	85
FNC1	134	86
Start A	135	87
Start B	136	88
Start C	137	89

**Figure 15 Expanded Function coding**



**Note:** In automatic mode, FNC4 is always specified as 133 regardless of what code stick is currently active.

In most cases, the iTherm® supreme will generate the most compact barcode for you. However, if it is desirable to have complete control, the programmer should use manual mode.

Code 128 Encoding			iTherm Manual Encoding		
Code Stick			Code 128 Value	Decimal Value	Hex Value
Code A	Code B	Code C			
Space	Space	00	00	32	20
!	!	01	01	33	21
"	"	02	02	34	22
#	#	03	03	35	23
\$	\$	04	04	36	24
%	%	05	05	37	25
&	&	06	06	38	26
'	'	07	07	39	27
(	(	08	08	40	28
)	)	09	09	41	29
*	*	10	10	42	2A
+	+	11	11	43	2B
,	,	12	12	44	2C
-	-	13	13	45	2D
.	.	14	14	46	2E
/	/	15	15	47	2F
0	0	16	16	48	30
1	1	17	17	49	31
2	2	18	18	50	32
3	3	19	19	51	33
4	4	20	20	52	34
5	5	21	21	53	35
6	6	22	22	54	36
7	7	23	23	55	37
8	8	24	24	56	38
9	9	25	25	57	39
:	:	26	26	58	3A
;	;	27	27	59	3B
<	<	28	28	60	3C
=	=	29	29	61	3D
>	>	30	30	62	3E
?	?	31	31	63	3F
@	@	32	32	64	40
A	A	33	33	65	41
B	B	34	34	66	42
C	C	35	35	67	43
D	D	36	36	68	44
E	E	37	37	69	45
F	F	38	38	70	46
G	G	39	39	71	47
H	H	40	40	72	48
I	I	41	41	73	49
J	J	42	42	74	4A
K	K	43	43	75	4B
L	L	44	44	76	4C
M	M	45	45	77	4D
N	N	46	46	78	4E
O	O	47	47	79	4F
P	P	48	48	80	50
Q	Q	49	49	81	51
R	R	50	50	82	52
S	S	51	51	83	53
T	T	52	52	84	54
U	U	53	53	85	55

Code 128 Encoding			iTherm Manual Encoding		
Code Stick			Code 128 Value	Decimal Value	Hex Value
Code A	Code B	Code C			
V	V	54	54	86	56
W	W	55	55	87	57
X	X	56	56	88	58
Y	Y	57	57	89	59
Z	Z	58	58	90	5A
[	[	59	59	91	5B
\	\	60	60	92	5C
]	]	61	61	93	5D
^	^	62	62	94	5E
_	_	63	63	95	5F
NUL	`	64	64	96	60
SOH	a	65	65	97	61
STX	b	66	66	98	62
ETH	c	67	67	99	63
EOT	d	68	68	100	64
ENQ	e	69	69	101	65
ACK	f	70	70	102	66
BEL	g	71	71	103	67
BS	h	72	72	104	68
HT	i	73	73	105	69
LF	j	74	74	106	6A
VT	k	75	75	107	6B
FF	l	76	76	108	6C
CR	m	77	77	109	6D
SO	n	78	78	110	6E
SI	o	79	79	111	6F
DLE	p	80	80	112	70
DC1	q	81	81	113	71
DC2	r	82	82	114	72
DC3	s	83	83	115	73
DC4	t	84	84	116	74
NAK	u	85	85	117	75
SYN	v	86	86	118	76
ETB	w	87	87	119	77
CAN	x	88	88	120	78
EM	y	89	89	121	79
SUB	z	90	90	122	7A
ESC	{	91	91	123	7B
FS		92	92	124	7C
GS	}	93	93	125	7D
RS	~	94	94	126	7E
US	DEL	95	95	127	7F
FNC3	FNC3	96	96	128	80
FNC2	FNC2	97	97	129	81
Shift	Shift	98	98	130	82
Code C	Code C	99	99	131	83
Code B	FNC4	Code B	100	132	84
FNC4	Code A	Code A	101	133	85
FNC1			102	134	86
Start Code A			103	135	87
Start Code B			104	136	88
Start Code C			105	137	89
Stop			-	-	-

Figure 16 Code 128 encoding values

**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.

**EAN-14**

EAN-14 It is a high-density, fixed-length, numeric, continuous code, which employs multiple element widths. EAN-14, is a subset of Code 128 that encodes FNC1 and 14 digit pairs. If fewer than 14 digits are sent, leading zeros will be added to complete the code.

**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 10 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.

### PDF 417

PDF 417 is a two dimensional barcode that will encode the full ASCII character set. As it encodes the full set including control characters, the length of the following data must be provided to the printer. The form of the command is as follows:

[ESC]b<9><nL><nH><d1> ... <dn>

Where the data length is  $(nH * 256) + nL$ . The length is limited to be from 1 to 2048 characters.

To control the formation of the barcode, the x and y aspect ratios, rows and columns, and error correction levels can be altered.

Function	PDF 417 bar code control
ASCII	[ESC] [EM] E <f> <v>
Hexadecimal	1BH 19H 45H <f> <v>
Decimal	<27> <25> <69><f> <v>
IPCL	None
EPOS	None
Description	This command alters the way PDF 417 barcodes are generated and printed.
Where	f = Feature to control and v = the value of the feature.
	f = C, 43H, 67 Set encoding columns. v = 1-30, 0 sets to auto.
	f = R, 52H, 82 Set encoding rows. v = 3-90, 0 sets to auto.
	f = X, 58H, 88 Set encoding X aspect. v = 2-6, 3 is default.
	f = Y, 59H, 89 Set encoding Y aspect. v = 2-32, 9 is default.
	f = E, 45H, 69 Set error correction level.
	If v between 1 and 40 it is interpreted as a percentage of the data.
	If v is between 48 and 56 it is set to a specific level of 0 to 8.
	If v = 0, it will return it to the default setting of 10%.

Typically the row and columns should be set to 0 so that auto encoding will be used. The X and Y aspect represent the number of dots horizontally and vertically to form the smallest image element. Values of 2 for each produce very small elements, and is probably too small unless good paper is used. The defaults are 3 by 9, which produce easily readable barcodes.

Error correcting levels are selected using one of two methods. The first is a fixed level.

v	Level	Code Word
48	Level 0	2
49	Level 1	4
50	Level 2	8
51	Level 3	16
52	Level 4	32
53	Level 5	64
54	Level 6	128
55	Level 7	256
56	Level 8	512

The second way is to determine correction level based on the amount of data in the barcode. This is determined by calculating a correction ration based on the formula  $Cf = (v * 0.1 * Len)$

Cf	Level	Code Word
0-3	Level 1	4
4-10	Level 2	8
11-20	Level 3	16
21-45	Level 4	32
46-100	Level 5	64
101-200	Level 6	128
201-400	Level 7	256
401 Up	Level 8	512

---

**Function Set bar code height**

**ASCII** [ESC] [EM] B <n>  
**Hexadecimal** 1BH 19H 42H <n>  
**Decimal** <27> <25> <66> <n>  
**IPCL** &%BH <m>  
**EPOS** [GS] h <n>

**Description** The [ESC] [EM] B <n> command sets the bar code height where <n>\*24 is the number dots. The default is n = 4, and results in a barcode that is about 0.47 inches high.

---

**Function Set bar code width**

**ASCII** [ESC] [EM] W <n>  
**Hexadecimal** 1BH 19H 57H <n>  
**Decimal** <27> <25> <87> <n>  
**IPCL** &%BW <m>  
**EPOS** [GS] w <n>

**Description** The [ESC] [EM] w <n> command sets the minimum bar width. The value may be between 1 and 8. The default is 3.



**Note:** A value of 1 may result in barcodes that are unreadable with some readers.

**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<sub>1</sub>> <m<sub>2</sub>>  
**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. (Page mode may work better)
	0	00	-0-----	Bar code printed in horizontal direction (default)
	64	64	-100-----	Bar code printed in vertical direction



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



**Note 2:** HRI is not available in vertical print mode. You may print normal barcodes in page mode, which will provide for HRI and significantly longer barcodes.

## Electronic Journal

The iTherm<sup>®</sup> 280 has the capability to store electronic journal<sup>9</sup> data in flash memory. There are two ways entries can be made into the electronic journal. The first is by selecting the journal station. The second is by requesting that print data be placed into the electronic journal.

Before the electronic journal can be used, it must be configured and initialized.

### Configuring the Electronic Journal

The iTherm<sup>®</sup> 280 has about<sup>10</sup> 1024K bytes of flash that can be assigned to the electronic journal or to extended user store. The 1024K is segmented in 64K segments, which may be assigned to either to electronic journal or extended user store. That is you can assign 2 segments or 128K to the electronic journal and the remaining segments will be assigned to extended user store.

When electronic journal is in use, you can not reconfigure the configuration of the extended flash memory. If you want to reconfigure the flash, the electronic journal must be erased. To erase the electronic journal you must know the password that was assigned when it was initialized. When printers are initially configured by TransAct, the extended flash is erased and partitioned but not initialized. Before you use the electronic journal you must initialize it.



**CAUTION:** You can use the extended user store without initializing the electronic journal. If any data has been stored in the extended user store, it will be lost if the extended flash is repartitioned.



**CAUTION:** The printer does not stop if the electronic journal runs out of memory. If the printer were to stop there would be no way for the host to print and clear the journal. The host system should monitor the Journal with the [ENQ]<25> command. This command will return the electronic journal status and report how much memory is remaining (See page 154). When the free electronic journal space is less than a predetermined amount, the journal should be printed or retrieved and then reinitialized.

### Electronic Journal Security

Electronic journal security is provided by applying a password to the erase feature of the electronic journal. Additionally, there is a factory set configuration that disables the ability for the operator to print the journal through the keypad.

It is possible to assign a blank password to the electronic journal. If this is done either through the keypad or by host control, the manual print mode will be allowed to erase and reinitialize the journal.

---

<sup>9</sup> It must be noted that the iTherm<sup>®</sup> 280 does not maintain the current time or date. If a journal entry is to contain the time and/or date, the host system must transfer this as printable text.

<sup>10</sup> The amount of free flash depends on the version of code installed and the amount of flash used for enhanced language support.

It is up to the end user of the iTherm<sup>®</sup> 280 to implement and use the level of security that is required.



**CAUTION:** If you have initialized the electronic journal and don't know the password, there is no way to erase the electronic journal without returning the printer for service. The warranty does not cover this. All iTherm<sup>®</sup> 280's are shipped with the electronic journal partitioned and erased but not initialized.



### Initializing the Electronic Journal

Once the electronic journal is partitioned, it can be initialized. Initializing the electronic journal sets the password and formats the flash to accept journal entries. Each entry may be any length up to 8K. Entries greater than 8K are truncated. Entries will be added to the electronic journal until it is full. If the electronic journal is full, entries will be lost. The [ENQ]<25> command can be used to query the state of the electronic journal.

### Electronic Journal Configuration and Reporting Commands

Function	Initialize and Set Password
ASCII	[ESC][GS]I<Password><0>
Hexadecimal	1BH 1DH 49H <Password><0x00>
Decimal	<27> <29><73> <Password><0>
IPCL	&%EI<Password>&
EPOS	
Description	This command initializes the electronic journal and sets the password that allows the electronic journal to be erased. The password may be up to 14 characters and may contain any alphanumeric characters.



**Note:** The electronic journal can not be deleted without this password.

Function	Erase the Electronic Journal
ASCII	[ESC][GS]E<Password><0>
Hexadecimal	1BH 1DH 45H <Password><0x00>
Decimal	<27> <29><50> <Password><0>
IPCL	&%EC<Password>&
EPOS	
Description	This command erases all of the electronic journal. The password was set using the [ESC][GS]I command.



**Note:** The electronic journal can not be deleted without this password.

---

<b>Function</b>	<b>Print the Electronic Journal</b>
<b>ASCII</b>	[ESC][GS]P< S <sub>i</sub> >< S <sub>h</sub> >< L <sub>i</sub> >< L <sub>h</sub> >
<b>Hexadecimal</b>	1BH 1DH 50H < S <sub>i</sub> >< S <sub>h</sub> >< L <sub>i</sub> >< L <sub>h</sub> >
<b>Decimal</b>	<27> <29><80> < S <sub>i</sub> >< S <sub>h</sub> >< L <sub>i</sub> >< L <sub>h</sub> >
<b>IPCL</b>	&%EP <S> <L> (L and S are 4 digits ie. 00100020 for 20 records starting at 10)
<b>EPOS</b>	
<b>Description</b>	This command prints all or part of the electronic journal. <S <sub>h</sub> >*256 + <S <sub>i</sub> > specifies the first record to be printed and <L <sub>h</sub> >*256 + <L <sub>i</sub> > specifies the number of records to print. If <L <sub>h</sub> >*256 + <L <sub>i</sub> > are 0, records from the specified start to the last record are printed. Setting both start and end to 0 will print the complete contents of the electronic journal.



**Note:** The first record is identified as record 1.

---

<b>Function</b>	<b>Report the Electronic Journal</b>
<b>ASCII</b>	[ESC][GS]R< S <sub>i</sub> >< S <sub>h</sub> >< L <sub>i</sub> >< L <sub>h</sub> >
<b>Hexadecimal</b>	1BH 1DH 52H < S <sub>i</sub> >< S <sub>h</sub> >< L <sub>i</sub> >< L <sub>h</sub> >
<b>Decimal</b>	<27> <29><82> < S <sub>i</sub> >< S <sub>h</sub> >< L <sub>i</sub> >< L <sub>h</sub> >
<b>IPCL</b>	&%EQ <S> <L> (L and S are 4 digits ie. 00100020 for 20 records starting at 10)
<b>EPOS</b>	
<b>Description</b>	This command reports all or part of the electronic journal. <S <sub>h</sub> >*256 + <S <sub>i</sub> > specifies the first record to be printed and <L <sub>h</sub> >*256 + <L <sub>i</sub> > specifies the number of records to report. If <L <sub>h</sub> >*256 + <L <sub>i</sub> > are 0, all records from the specified start to the end are reported. Setting both start and end to 0 will report the complete contents of the journal.



**Note:** The first record is identified as record 1.  
 The report format will be as follows:  
 [STX] Record number [SOH] Record Text [ETX]  
 ...  
 [EOT]

---

<b>Function</b>	<b>Set the Electronic Journal Record Header</b>
<b>ASCII</b>	[ESC][GS]F<String %d><0>
<b>Hexadecimal</b>	1BH 1DH 46H
<b>Decimal</b>	<27> <29><70>
<b>IPCL</b>	None
<b>EPOS</b>	
<b>Description</b>	This command allows the record separator that is printed between records to be changed. The default format is: \r\nRecord %d\r\n
<b>Where:</b>	\r represents CR, \n represents LF, %d represents the position of the record number.



- Note:** The %d must be present.
- Note:** This follows standard “C” programming conventions. Most standard “C” formatting print parameters may be used.
- Note:** The record header may be totally disabled by a configuration option.

---

<b>Function</b>	<b>Print/Report an Electronic Journal Log</b>
<b>ASCII</b>	[ESC][GS]L                      Print the report
<b>Or</b>	[ESC][GS]I                      Return the report
<b>Hexadecimal</b>	1BH 1DH 4CH or 6CH
<b>Decimal</b>	<27> <29><76> or <108>
<b>IPCL</b>	&%UL                      (No IPCL for returning the report)
<b>EPOS</b>	
<b>Description</b>	This command prints or returns a summary of the electronic journal. The format is as follows: Electronic journal is inactive. (The electronic journal is off, or not initialized) or Electronic journal has xxxx Records and is full. or Electronic journal has xxxx Records with yyyyyy bytes free.

**Function Query the Electronic Journal**

**ASCII** [ENQ]<25>  
**Hexadecimal** 05H 19H  
**Decimal** <05> <25>  
**IPCL** None  
**EPOS**

**Description** This is a real time status request that returns the current state of the electronic journal.

**Return Format:** [NAK]<25><42><n<sub>H</sub>><n<sub>L</sub>>  
 [NAK] EJ is not active. It is either off, not initialized or full. If n<sub>H</sub>\*256 + n<sub>L</sub> is not zero, the EJ is available but not initialized and n<sub>H</sub>\*256 + n<sub>L</sub> is the available space in K (1024) bytes.  
 or  
 [ACK]<25><42><n<sub>H</sub>><n<sub>L</sub>>  
 [ACK] the EJ is active and available and n<sub>H</sub>\*256 + n<sub>L</sub> is the available space in K (1024) bytes.

**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

<b>Where Bit</b>	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	Electronic Journal (Low/Out)	ACK/NAK<25><low><high>
	5	Validation Form present	ACK/NAK <7>
	6	Mechanical Error Status	ACK/NAK <14>
	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 USB operation the status is automatically returned to the host. If the printer is configured for parallel, IEEE 1284 operation, the HOST must initiate a reverse channel request to return the status.



**Note** For mechanical error status to function, the "Buffer Full Only" off line option should be selected.

**Note** The electronic journal status follows the format of the [ENQ]<25> response and reports the amount of electronic journal memory remaining.

### Printing/Reporting and Resetting the Electronic Journal

The electronic journal may be printed on the receipt or reported to the host. The printed report will print each journal entry with an entry separator defined by the user (or, if not defined, with a default). The journal can be erased and reinitialized at any time. It is up to the host application to assure the electronic journal is reported or printed before it is erased. To provide some level of security on the erase process, the erase function is password protected. The password is set by the previous initialize command. See the [ESC][GS] and E commands for further details.

There are two ways to print the electronic journal: one is under host control, and the second is by entering journal print mode and using the keypad to control the printout.

### Journal Entering and using Journal Print Mode

Journal print mode can be used to initialize, print then erase the electronic journal. To provide a level of security for the journal, if the electronic journal is initialized under software control and a password is provided, the electronic journal can not be erased in journal print mode. There is also a factory configured mode that completely disables this feature.

To enter Journal Print Mode:

1. Press and release the \* Button to switch the printer into STANDBY/OFF mode. (The POWER INDICATOR LIGHT will be not be illuminated.)
2. Press and hold the FEED Button.
3. While holding the FEED Button, press and release the \* Button.
4. When the red, ERROR INDICATOR LIGHT blinks, release the FEED Button.
5. Follow the directions printed on the receipt to cycle through the options until Electronic Journal is selected. Press and hold the FEED button until Electronic journal mode is entered. Then select the desired option.

The available options are:

1. Initialize Journal. (If the electronic journal is not initialized)
2. Print Complete Journal.
3. Erase Complete Journal. (If the electronic journal is not password protected)
4. Print Last 20 Records
5. Print First Record.
6. Skip 10 Records.
7. Back 10 Records.
8. Print remaining journal.
9. Print last record.

When journal print is entered, the printer will print a short list of instructions, the available options, and a summary of the total number of records in the journal and the amount of space left.

## Journal Print Mode Options

### Initialize Journal

If this option is offered, the journal has never been initialized. Selecting this option will initialize the journal with no password. Once initialized, the journal configuration can not be changed unless the journal is erased by command.

### Print Complete Journal.

This option will print the complete journal log from record 1 to the end. The printer will use the default configuration and emulation to print the log. That is if the printer is configured for Ithaca PcOS emulation and set to 6 lpi, large draft 16 cpi, the printer will print the log with these defaults. If a journal entry has been saved with print mode settings they will take effect for all following entries.

### Erase Complete Journal.

If the electronic journal is not password protected, this option will erase the complete journal and reinitialize it.

### Printing part of the journal.

- Print Last 20 Records
- Print First Record.
- Skip 10 Records.
- Back 10 Records.
- Print Remaining Journal.
- Print Last Record.

These commands will allow part of the journal to be printed. For example if the last 10 journal entries are to be printed, select print last record, then back 10 and then print remaining journal.

### Security

The security of the journal is up to the user. If the journal is host controlled, it should be password protected and if manual printing is not desirable, the printer should be configured so as to disable manual printing. The TransAct printer configuration utility will allow set and clear this feature. When iTherm<sup>®</sup> 280 printers leave the factory, the electronic journal is erased and is not initialized.

## Electronic Journal Entries

There are two ways to place information in the electronic journal. The first is by selecting journal mode. The second is by requesting that validation or receipt information is copied into the electronic journal.

If you select journal mode, information sent to the printer is not printed, but stored in the flash memory. The information is stored as records in a linked list. Whenever a "journal mode begin" command is received, a new record is started. When journal mode is exited, the record is finished, closed and the link updated. This journal mode is intended to be printed at a later time. No printer control codes are allowed in the journal. Only [CR], [HT] and [LF] commands are allowed. Any other control character will end the journal record. Use [EOT] or [NUL] to provide the most graceful exit from journal mode.

The other way to place information in the electronic journal is with carbon copy mode. In this mode select information sent to the validation or receipt station is carbon copied into the electronic journal. A record is started with the "Electronic Journal Begin" command and ended with the "Electronic Journal End" command. There is an "Electronic Journal Suspend" and "Electronic Journal Resume" which allows some information not to be saved.

```
[esc][P<12[esc]I<1>[esc]0[esc]a<1>
[ESC][@<4><0><0><0><34><2>[ESC]c<1>
QUICK MART[CR][LF]
[ESC][@<4><0><0><0><17><1>
1234 Rt1 Anytown,CT[CR][LF]
[esc]c<0>[esc]I<0>
203-123-4567[cr][lf]
[esc][P<15>[esc]a<0>[CR][LF]
[esc]l<3>                                     Start journal record
---{Date:0} {Time:0:}--[cr][lf]
ST# 2000 OP# 00067 TE# 021 0035[CR][LF]
[esc]l<2>                                     Suspend the record
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]
[esc]<1>                                     Resume the record
          SUB TOTAL 8.68[CR][LF]
          SALES TAX 1.50[CR][LF]
          -----[CR][LF]
          TOTAL 10.18[CR][LF]
          CASH TEND 20.00[CR][LF]
[ESC]c<1>
          CHANGE DUE 9.82[CR][LF]
[ESC]c<0>
[esc]l<0>                                     End the record
[esc]a<1>[LF][LF][ESC][@<4><0><0><0><34><2>
THANK YOU [CR][LF]
[ESC][@<4><0><0><0><17><1>
FOR SHOPPING WITH US[cr][lf]
[esc]a<0>[esc]d<15>[esc]v
```

The resulting journal entry would then only contain:

```
---{Date:0} {Time:0:}--  
ST# 2000  OP# 00067  TE# 021 0035  
      SUB TOTAL    8.68  
      SALES TAX    1.50  
      -----  
      TOTAL       10.18  
      CASH TEND   20.00  
      CHANGE DUE  9.82
```

In carbon copy mode any printer control commands in the record data will be added to the journal record. As the records are printed, those commands will be used to format the print. Some care should be taken to assure that only format control command that you intend to be printed later get in the journal.



**Note:** Information is gathered in packets or 16 bytes. If power is lost before the record is closed, up to 16 bytes of information may be lost. The link list will be repaired, with data loss, when power is next applied.



### Journal mode

Journal mode is a station select command. All data sent to the printer, following the journal mode select command, is stored in the EJ as a single record. Any control commands sent to the electronic journal will end the journal entry. An EOT, NUL or any printer command will end journal mode. Typically an EOT, CAN or station select will be used to end the journal mode.

---

#### Function      Electronic Journal Mode Begin

**ASCII**            [ESC]{  
**Hexadecimal**    1BH 7BH  
**Decimal**         <27> <123>  
**IPCL**             None  
**EPOS**

**Description**    The function enters journal mode. When in journal mode, commands are parsed and any command that is not appropriate is removed, causes journal mode to exit, or is saved.

The following commands are ignored:

[ESC][BEL]    [ESC][EM]    [ESC]!        [ESC]4        [ESC]8  
 [ESC]9        [ESC]?        [ESC]C        [ESC]v

The following commands cause the journal to stop and will be processed again after the journal information is saved.

[ESC][FS]    [ESC][FF]    [ESC][GS]    [ESC][US]    [ESC]"  
 [ESC]\$        [ESC]\*        [ESC]@        [ESC]=        [ESC]>  
 [ESC]K        [ESC]L        [ESC]Y        [ESC]Z        [ESC]f  
 [ESC]j        [ESC]k        [ESC]l        [ESC]m        [ESC]o  
 [ESC]t        [ESC]u        [ESC]y        [ESC]{        [ESC]~

The following commands are processed and not placed in the journal:

[ESC]q        [ESC]w        [ESC]x        [BEL]

All other commands are placed in the journal, and will be processed when the journal is printed.

The [EOT] (4 or 4H) and CAN (24 or 14H) will cause the journal to stop and will not be processed again.

In typical operation, a station select command should be used to exit journal mode. Note that any station select including another Journal select will close the journal entry. If a Journal select is processed in Journal mode, the current record will be closed, and a new record opened.

**Carbon Copy Journal Mode**

Carbon copy mode allows information sent to the receipt or validation station to be copied into the electronic journal. An electronic journal entry is started with a "Start Carbon Copy" mode command and continues until a station select command is received or a "Stop Carbon Copy" command is received. The carbon copy operation may be suspended and restarted by a "Carbon Copy Suspend" and "Carbon Copy Resume" command. (Note: "Carbon Copy Suspend" and "Carbon Copy Resume" commands do not generate new electronic journal records.)

---

**Function      Electronic Carbon Copy Begin****ASCII**      [ESC]I <3>**Hexadecimal** 1BH 6CH<3>**Decimal**      <27> <108><3>**IPCL**        &%EB**EPOS****Description** This command begins a carbon copy journal entry.

---

**Function      Electronic Carbon Copy Suspend****ASCII**      [ESC]I <2>**Hexadecimal** 1BH 6CH<2>**Decimal**      <27><108><2>**IPCL**        &%ES**EPOS****Description** This command temporarily suspends carbon copy journal entry.

---

**Function      Electronic Carbon Copy Resume****ASCII**      [ESC]I <1>**Hexadecimal** 1BH 6CH<1>**Decimal**      <27><108><1>**IPCL**        &%ER**EPOS****Description** This command resumes a temporarily suspended carbon copy journal entry.

---

**Function      Electronic Carbon Copy End****ASCII**      [ESC]I <0>**Hexadecimal** 1BH 6CH<0>**Decimal**      <27> <108><0>**IPCL**        &%EE**EPOS****Description** This command ends a carbon copy journal entry.

---

## Miscellaneous Control

---

### [ESC] 8      Disable paper out sensor

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

**Description**   The [ESC] 8 command temporarily 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.

---

### [ESC] 9      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.

---

### [ESC] X      Set left/right print margins

**ASCII**            [ESC] X <n<sub>1</sub>> <n<sub>2</sub>>  
**Hexadecimal**   1BH 58H <n<sub>1</sub>> <n<sub>2</sub>>  
**Decimal**         <27> <88> <n<sub>1</sub>> <n<sub>2</sub>>  
**IPCL**            none  
**EPOS**            [ESC] I, [ESC] Q

**Description**   The [ESC] X <n<sub>1</sub>> <n<sub>2</sub>> command sets left and right print margins in characters from the home position. Where n<sub>1</sub> = left margin and n<sub>2</sub> = 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.

---

**[CAN] Clear print buffer**

<b>ASCII</b>	[CAN]
<b>Hexadecimal</b>	18H
<b>Decimal</b>	<24>
<b>IPCL</b>	&%RP
<b>EPOS</b>	[CAN]

**Description** The [CAN] command clears the print buffer and any unprinted 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.

---

**[ESC] q Query marker**

<b>ASCII</b>	[ESC] q <n>
<b>Hexadecimal</b>	1BH 71H <n>
<b>Decimal</b>	<27> <113> <n>
<b>IPCL</b>	none
<b>EPOS</b>	none

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

**Response** [SOH] <n>

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:** 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.

---

**[ESC] x      Open cash drawer**

<b>ASCII</b>	[ESC] x <n>
<b>Hexadecimal</b>	1BH 78H <n>
<b>Decimal</b>	<27> <120> <n>
<b>IPCL</b>	&%D1 (Cash Drawer 1) &%D2 (Cash Drawer 2)
<b>EPOS</b>	[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.

---

**[ESC] v      Perform Auto Cut**

<b>ASCII</b>	[ESC] v
<b>Hexadecimal</b>	1BH 76H <n>
<b>Decimal</b>	<27><118>
<b>IPCL</b>	&%FC   &%PC
<b>EPOS</b>	[ESC] i or [ESC] m

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



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

---

**[ESC] @      Initialize the printer**

<b>ASCII</b>	[ESC] @
<b>Hexadecimal</b>	1BH 40H
<b>Decimal</b>	<27> <64>

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

---

**[BEL] Audio alert**

<b>ASCII</b>	[BEL]
<b>Hexadecimal</b>	07H
<b>Decimal</b>	<7>
<b>IPCL</b>	&%BL
<b>EPOS</b>	[BEL]

**Description** When enabled, the [BEL] command starts the audio alert sequence. 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.

---

**[ESC] [BEL] Configure audio alert**

<b>ASCII</b>	[ESC] [BEL] <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> >
<b>Hexadecimal</b>	1BH 07H <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> >
<b>Decimal</b>	<27> <7> <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> >
<b>IPCL</b>	None
<b>EPOS</b>	None

**Description** The [ESC] [BEL] <n<sub>1</sub>> <n<sub>2</sub>> <n<sub>3</sub>> command alters the way the audio alert sounds.

The default is a single sound lasting the period of time defined by the audio alert setting. The [ESC] [BEL] <n<sub>1</sub>> <n<sub>2</sub>> <n<sub>3</sub>> command allows the sound to be altered.

**Where** <n<sub>1</sub>> is the number of alert cycles  
 <n<sub>2</sub>> is the on time of the alert cycle in ten Ms intervals  
 <n<sub>3</sub>> is the off time of the alert cycle in ten Ms intervals

---

**[ESC] p 5 Enable/disable paper feed**

<b>ASCII</b>	[ESC] p 5 <n>
<b>Hexadecimal</b>	1BH 70H 35H <n>
<b>Decimal</b>	<27> <112> <53> <n>
<b>Range</b>	0 ≤ n ≤ 255

**Description** The [ESC] p 5 <n> command enables or disables the FEED button. When the least significant bit (LSB) of <n> = one, the FEED button is disabled; when it is zero, the button is enabled. To prevent problems caused by accidentally pressing the FEED button, use the command to disable it. The 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.

**Where <n>** Bit 0 = 1 the FEED button is disabled  
 Bit 0 = 0 the button is enabled.

**[ESC] p 4    Select paper sensor(s) to stop printing**

**ASCII**            [ESC] p 4 <n>  
**Hexadecimal**   1BH 70H 34H <n>  
**Decimal**        <27> <112> <52> <n>  
**Range**           0 ≤ n ≤ 255

**Description**    The [ESC] p 4 <n> command selects the sensors that tell the printer to stop printing. The default setting occurs when only the Paper Out sensor stops 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 line and 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.



**Note:** The ITherm® does not allow the Paper Out sensor to be disabled. It is always on.

<n> is defined as follows:

Bit	On/Off	Hexadecimal	Decimal	Function
0,1	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 14 Paper Sensor Commands

**[ESC] p 3    Select paper sensor(s) to output paper-end signals**

**ASCII**            [ESC] p 3 <n>  
**Hexadecimal**   1BH 70H 33H <n>  
**Decimal**        <27> <112> <51> <n>  
**Range**           0 ≤ n ≤ 255

**Description**    The [ESC] p 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 15 Paper Sensor Commands

**[ESC] < 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 preprocessed. It is processed as soon as it is received. The printer may continue to print while previously received data is processed. The printer must be on-line and ready to activate the command.



**Note 2:** Pass through should only be used with serial printers. If the printer is configured for parallel operation, the data is still pass through on the IEEE 1284 port. In most cases this is not useful.



**Note 3:** When Ithaca® Series 50 Printer compatibility is being used, these commands do not function. Series 50 Printer pass through must be used.



**Note 4:** Multi-drop is not operational during suppress and pass through. If a multi-drop address is present in the pass through data, it is not processed.



**[ESC] y      Set control feature commands**

<b>ASCII</b>	[ESC] y <n>
<b>Hexadecimal</b>	1BH 79H <n>
<b>Decimal</b>	<27> <121> <n>
<b>IPCL</b>	&%Y0-9 or &%YX <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> > (for numbers greater than nine)
<b>EPOS</b>	[ESC] y <n>
<b>Where n</b>	<ul style="list-style-type: none"> <li>0      Reinitializes the printer and forces Citizen mode</li> <li>1      Reinitializes the printer and forces Star mode</li> <li>2      Reinitializes the printer and forces iTherm® 280 mode</li> <li>3      Reinitializes the printer and forces extended EPOS mode</li> <li>4      Disables IPCL commands</li> <li>5      Enables IPCL commands</li> <li>6      Disables inquire processing (All command preprocessing is disabled.)</li> <li>7      Enables inquire processing</li> <li>8      Enables extended diagnostics</li> <li>9      Print Current Configuration</li> <li>10     Not used</li> <li>11     Overlays the current character chart with Group 2 OCR MA Characters</li> <li>12     Replaces the OCR characters with normal characters</li> <li>13     Not used</li> <li>14     Forces head maintenance</li> <li>15     Print Current totals</li> <li>16     Enable Test Font</li> <li>17     Requests the printer to enter remote OFF.</li> <li>18     Requests the printer to exit remote OFF.</li> <li>20     Print alignment settings</li> </ul>

**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:** Once IPCL commands are disabled, the Enable IPLC command will not be a valid IPCL code.



**Note 2:** [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 3:** [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 4:** 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 5:** In EPOS mode, the [ESC] y command is active.

---

**[ESC] ~ Extended Configuration and Control**

<b>ASCII</b>	[ESC] ~ <n>
<b>Hexadecimal</b>	1BH 7EH <n>
<b>Decimal</b>	<27> <126> <n>
<b>IPCL</b>	none
<b>EPOS</b>	[ESC] ~ <n>

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

## Remote Power Control

The iTherm® 280 Printer has a remote power control command that instructs it to enter OFF mode. When the command is issued, the printer performs print cartridge maintenance and enters OFF mode. Unlike pushing the \* button, remote power mode leaves the communications active. All commands except the exit power down command are ignored.

---

### [ESC] y Remote Power Control

<b>ASCII</b>	[ESC] y <n>
<b>Hexadecimal</b>	1BH 79H <n>
<b>Decimal</b>	<27> <121> <n>
<b>IPCL</b>	&%YX17 or &%YX18
<b>EPOS</b>	[ESC] y <n>
<b>Where n</b>	17 Requests the printer to enter remote OFF. 18 Requests the printer to exit remote OFF

**Description** Inquiry (ENQ) commands are accepted and answered in remote power down mode. The printer reactivates if the \* button is pressed or a power up command is received.



**Note 1:** 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 \* button must be pushed to return the printer to full operation.



**Note 2:** This command is not available in STAR mode.

## Documented Extended Control commands

The iTherm® 280 has a number of Extended Control commands designed to make operation and maintenance of the printer easier for the host application. For further details, refer to the iTherm® Extended Control discussion in Chapter 8.

---

### [SOH]      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 a universal address that activates the printer.

## Printer Status

### Status Inquire

The iTherm® 280 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 are processed as they are received (preprocessed or real time) and require a response from the printer. Consequently, parallel, IEEE 1284 bidirectional communications, USB or bidirectional serial operation is required.

The iTherm® 280 Printer looks at and evaluates all commands as they are received, and does not respond to inquire commands that happen to be embedded in graphics or other commands. (Refer to the buffer and preprocessor descriptions in later sections.)

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. If the printer is configured for serial or USB operation the status is automatically returned to the host. If the printer is configured for parallel, IEEE 1284 operation, the HOST must initiate a reverse channel request to return the status.

### Serial and USB 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. Most status responses sequences contain a length field to help decode and separate responses.

In general the printer should be configured for "Buffer Full Only" off-line operation if inquire commands are used. This prevents the printer from using flow control for anything but buffer full. The programmer must take on the responsibility for assuring that inquire commands are used to maintain status of the printer.

The printer always accepts serial data even when it is off-line. The printer has reserve buffer space that allows additional information to be received even if the printer is signaling buffer full or 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, the response to an inquiry should 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 through the IEEE 1284 reverse channel. 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 in format.

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.

In general, the printer should be configured for "Buffer Full Only" off-line operation if inquire commands are used. This prevents the printer from using flow control for anything but buffer full. The programmer must take on the responsibility for assuring that inquire commands are used to maintain status of the printer.

**Inquire Commands****[ENQ] 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:** When the printer is off-line, inquires may not be accepted.

**[ENQ] <1> 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.

**[ENQ] <3> 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.

---

**[ENQ] <4> 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

---

**[ENQ] <8> 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

---

**[ENQ] <9> 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.

---

**[ENQ] <10> 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:** If reset inhibit is set in the configuration menu, this command is ignored.

---

### [ENQ] <11> Inquire power cycle status

<b>ASCII</b>	[ENQ] <11>
<b>Hexadecimal</b>	05H 0BH
<b>Decimal</b>	<5> <11>
<b>Function</b>	Has the printer been power cycled since the last request?
<b>Response</b>	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 reset, 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.

---

### [ENQ] <14> Inquire Mechanical error status

<b>ASCII</b>	[ENQ] <14>
<b>Hexadecimal</b>	05H 0EH
<b>Decimal</b>	<5> <14>
<b>Function</b>	Error status
<b>Response</b>	ACK <14> (06H 0EH)      No mechanical errors NAK <14> (15H 0EH)      Mechanical error has occurred (Use [ENQ]<22> to identify the error)



**Note:** For this status request to function, the "Buffer Full Only" off-line option should be selected.



**[ENQ] <15> 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<sub>1</sub>> <r<sub>2</sub>>...**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<sub>1</sub>>: bit 0 = 1 always

bit 1 = Cover is closed.

bit 2 = Receipt paper is out.

bit 3 = 0

bit 4 = Printer is waiting in an error mode. Use [ENQ]&lt;22&gt; to identify the specific error and [ENQ]&lt;10&gt; to recover

bit 5 = 0

bit 6 = 1 always

bit 7 = 0 always

<r<sub>2</sub>>: bit 0 - 5 = 0 always

bit 6 = 1 always

bit 7 = 0 always

**Note:** For this status request to function, the "Buffer Full Only" off-line option should be selected.

**[ENQ] <20> 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<sub>1</sub>> <r<sub>2</sub>>...

**Where** <20> is the echo of command ID.  
 <n> is the number of return bytes + 40 (28H) (to prevent confusion with XON/XOFF).  
 <r<sub>1</sub>>:  
 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<sub>2</sub>>:  
 bit 0 = 1 always  
 bit 1 = Cover is closed.  
 bit 2 = Buffer is empty.  
 bit 3 = Printer has been power cycled,  
 Reading this does not affect the state of the power-cycled flag.  
 (Use [ENQ] <11> to reset the power cycled bit.)  
 bit 4 = Printer is waiting in an error mode. Use [ENQ]<22> to identify the  
 specific error and [ENQ]<10> to recover  
 bit 5 = 0  
 bit 6 = 1 always  
 bit 7 = 0 always  
 <r<sub>3</sub>>:  
 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<sub>4</sub>>:  
 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<sub>5</sub>>: Percentage of ink remaining on Head 1 (0-100) + 40 (28H)  
 <r<sub>6</sub>>: Percentage of ink remaining on Head 2 (0-100) + 40 (28H)  
 <r<sub>7</sub>>: Current multi-head alignment (0-16, 8 = 0 offset)

**[ENQ] <21> Inquire printer ID**

<b>ASCII</b>	[ENQ] <21>
<b>Hexadecimal</b>	05H 15H
<b>Decimal</b>	<5> <21>
<b>Function</b>	The [ENQ] <21> command returns the printer IEEE 1284 ID string.
<b>Response</b>	[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 iTherm® 280;
REV:PE1200-01.16
OPTS:$20xy
```

Where x is a bit field defined as follows:

```
bit 0 = 1 Red paper support
bit 1 = 1 Green paper support
bit 2 = 1 Blue paper support
bit 3 = Always 0
bit 4 = Always 1
bit 5 = Always 1
bit 6 = Always 0
bit 7 = Always 0
```

The 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
```

**[ENQ] <22> Inquire Error status**

<b>ASCII</b>	[ENQ] <22>
<b>Hexadecimal</b>	05H 17H
<b>Decimal</b>	<5> <22>
<b>Function</b>	The [ENQ] <22> command reports on the error status.
<b>Response</b>	[ACK] <22> <n> <r>

**Where**

**<22>** is the echo of the command ID.  
**<n>** is the number of return bytes + 40 (28H)  
 (to prevent confusion with XON/XOFF).  
**<r<sub>1</sub>>**: Bit status as follows:  
 bit 0 = Cover is open.  
 bit 1 = Receipt Paper is Low  
 bit 2 = Receipt paper is out.  
 bit 3 = Ink is Low (This is set if either cartridge is low)  
 bit 4 = Either or Both Cartridges are removed.  
 bit 5 = The Auto-Cutter has faulted.  
 bit 6 = 1 always  
 bit 7 = An serious error has occurred.



**Note 1:** If bit 7 is set, a serious error has occurred. The printer is not able to recover from type of error without operator intervention. If bit 7 is set without bit 5 (Auto-cutter fault) then the print carriage has faulted, which is probably caused by a paper jam or a component failure. The host system may issue an [ENQ]<10> (Reset Request command) to attempt to recover. The Reset Request will reset the printer to an initial power up state. All data will be lost.



**Note 2:** When a serious error occurs (bit 7 set) the printer enters a static state. Status responses will reflect the state of the printer when the error occurred.



**Note 3:** For this status request to function during a serious error, the "Buffer Full Only" off line option should be selected.

**[ENQ] <23> 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>

**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

**[ENQ] <24> Inquire Color status**

**ASCII** [ENQ] <24>  
**Hexadecimal** 05H 18H  
**Decimal** <5> <24>  
**Function** The [ENQ] <24> command reports Color Cartridge status.  
**Response** [ACK] <24> <Length+40><n<sub>1</sub>><n<sub>2</sub>><n<sub>3</sub>>

**Where <24>** Is the echo of command  
<n<sub>1</sub>> Secondary Paper Color 0 = Not installed, 1 = Red, 2 = Green, 4 = Blue  
<n<sub>2</sub>> Primary Paper Color 1 = Red, 2 = Green, 4 = Blue 16 = Black  
<n<sub>3</sub>> Pen Status  
bit 0 = Not defined  
bit 1 = Not defined  
bit 2 = Secondary Cartridge not installed  
bit 3 = Primary Cartridge not installed  
bit 4 = Secondary Cartridge low on ink.  
bit 5 = Primary Cartridge low on ink.  
bit 6 = 1 always  
bit 7 = 0 always

**[ESC] [EM]P<n>****Activate Periodic Status Back**

**ASCII** [ESC] [EM] P<n>  
**Hexadecimal** 1BH 19H 50H <n>  
**Decimal** <27> <25> <80><n>  
**IPCL** None  
**EPOS** None

**Description** This command activates the periodic status back feature. It will automatically return an [ENQ]<20> status (See page **Error! Bookmark**

**not defined.**) on a periodic bases. The value of n is the period in 100 MS intervals. This command is saved through power cycles. Once set it need not be set again, however you can set it the same value repeatedly as it is only saved if it is changed. In general it should not be changed on a regular bases.

**Where** n = Interval in 100 MS increments. IE 20 = 2 Seconds. Setting the value to 0 disables the feature.

Note: Periodic status back can also be activated with the [ESC][EM]p command, however it is not save during a power cycle.

---

[ESC] [EM]p<n>

**Activate Periodic Status Back**

**ASCII** [ESC] [EM] p<n>

**Hexadecimal** 1BH 19H 70H <n>

**Decimal** <27> <25> <112><n>

**IPCL** None

**EPOS** None

**Description** This command temporarily disables and enables the periodic status back feature if previously activated with the [ESC][EM]P command.

**Where** n = 0 disables PSB and n = (non zero) Enables PSB at the interval defined by the [ESC][EM]P command.

If not previously activated with the [ESC][EM]P command, this command will activate it but not save the value through a power cycle.

**Where** n = Interval in 100 MS increments. IE 20 = 2 Seconds. Setting the value to 0 disables the feature.

## ESC/POS™ Codes

The EPOS codes that are supported by the iTherm® 280 Printer are listed in this section. TransAct Technologies, Inc. has no control over how Epson extends or changes these control codes, and can make no guarantees as to the operation of our printer when it replaces an Epson printer. The TM-T90 and EPOS emulation's are intended to make it as easy as possible to replace an Epson printer with an iTherm® 280 Printer.

The iTherm® 280 Printer provides two Epson emulations. The first emulation is as close as possible to the TM-T90 Printer and tries to make the iTherm® 280 Printer a drop in replacement. However, when the iTherm® 280 Printer is in Epson TM-T90 emulation mode, it is subject to the same limitations as a TM-T90 Printer.

The second Epson emulation is EPOS mode. It extends and enhances the TM-T90 emulation to remove some of the restrictions and give access to some of the iTherm® 280 Printer features not addressed by the TM-T90. It is intended that the standard Ithaca® PcOS emulation be used for new applications.

The following section lists all TM-T90 and EPOS commands that are processed. They are as close as possible to Epson's definitions. The user must remember that the iTherm® 280 EPOS emulation, unlike the TM-T90 emulation, is not designed as a drop in replacement for an Epson printer. The iTherm® 280 Printer is designed to bring new and unique features and functionality's to a point-of-sale receipt printer. These features are not always compatible with Epson printers.



**Note:** The Epson emulation does not support Unicode, Double Byte or downloaded True Type fonts.

## Differences between Epson TM T90 and iTherm® 280

In a few minor ways, the operation and programming iTherm® 280 is not identical to a TM-T90. The following is a summary of key differences.

### Page Mode

The page mode in the iTherm® 280 operates in the same way as the TM-T88 and the TM-T90, however, the page size can be larger if the ESC/POS emulation is selected.

### Undocumented Epson Commands

There are a number of undocumented commands in Epson printers. Where TransAct is aware of these commands, they have been duplicated in the iTherm® 280 Printer.

### Real-time Status

The iTherm® 280 Printer is available in serial and parallel versions. Epson supports parallel operation through a parallel to serial interface. Consequently, the response times for the iTherm® 280 Printer are generally faster. The iTherm® 280 Printer implements the IEEE 1284 nibble-mode standard. If an application requires real-time status from the printer, the IEEE 1284 bi-directional protocol must be used. The iTherm® 280 Printer does not support byte mode. If the iTherm® 280 Printer is used in an IEEE 1284

compliant system, byte mode should be an extension and the default should be nibble mode.

The iTherm® 280 Printer supports the EPOS real-time status commands [DLE] [ENQ] and [DLE] [EOT] and are preprocessed by the printer. The printer supports all the response bit fields as defined by the TM-T88 and TM-T90 Printers. See the descriptions below. The iTherm® 280 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-T88 Commands

Print and Feed Commands			
Command		Name	Page
LF	0AH	Print and line feed	191
CR	0DH	Print and carriage return	191
ESC d	1BH,64H	Print and feed <n> lines	191
ESC J	1BH,4AH	Print and feed paper <n> vertical units	192
Line Spacing Commands			
Command		Name	Page
ESC 2	1BH,32H	Select default line spacing, 1/6 lpi	193
ESC 3	1BH,33H	Set line spacing	193
Character Commands			
Command		Name	Page
ESC SP	1BH,20H	Set right-side character spacing	193
ESC !	1BH,21H	Select print mode(s)	199
ESC %	1BH,25H	Select/cancel user-defined character sets	193
ESC &	1BH,26H	Define user-defined characters	194
ESC -	1BH,2DH	Turn underline mode on/off	199
ESC ?	1BH,3FH	Cancel user-defined characters	194
ESC E	1BH,45H	Turn emphasized mode on/off	199
ESC G	1BH,47H	Turn double-strike mode on/off	200
ESC M	1BH,4DH	Select character font	194
ESC R	1BH,52H	Select an international character set	195
ESC V	1BH,56H	Turn on/off 90° rotation mode	200
ESC t	1BH,74H	Select character code table	198
ESC {	1BH,7BH	Turn upside-down printing mode on/off	200
GS !	1DH,21H	Select character size	201
GS B	1DH,42H	Turn white/black reverse printing mode on/off	198
Panel Button Commands			
Command		Name	Page
ESC c 5	1BH,63H, 35H	Enable/disable panel buttons	202
Paper Sensor Commands			
Command		Name	Page
ESC c 4	1BH,63H, 34H	Select paper sensor(s) to stop printing	203
ESC c 3	1BH,63H, 33H	Select paper sensor(s) to output paper out signals	204

## Supported TM-T88 Commands

Print Position Commands			
Command		Name	Page
HT	09H	Set horizontal tab positions	206
ESC \$	1BH,24H	Set absolute print position	205
ESC D	1BH,44H	Set horizontal tab positions	207
ESC \	1BH,5CH	Set relative print position	205
ESC a	1BH,61H	Select justification	206
GS L	1DH,4CH	Set left margin	207
GS T	1DH,54H	Set print position to the beginning of the line	205
GS W	1DH,57H	Set printing area width	207
Bit-image Command			
Command		Name	Page
ESC *	1BH,2AH	Select bit-image mode	209
GS v 0	1DH,76H,30 H	Print raster bit image	209
Status Commands			
Command		Name	Page
DLE EOT	10H,04H	Real-time status transmission	213
DLE ENQ	10H,05H	Real-time status request to printer	213
GS a	1DH,61H	Enable/disable Automatic Status Back (ASB)	210
GS r	1DH,72H	Transmit status	212
Bar Code Commands			
Command		Name	Page
GS H	1DH,48H	Select printing position of HRI characters	222
GS f	1DH,66H	Select font HRI characters	222
GS h	1DH,68H	Set bar code height	221
GS k	1DH,6BH	Print bar code	220
GS w	1DH,77H	Set bar code width	220
Mechanism Control Commands			
Command		Name	Page
GS V	1DH,56H	Select cut mode and cut paper	223

## Supported TM-T88 Commands

Miscellaneous Commands			
Command		Name	Page
DLE DC4 <1>	10H,14H,01H	Generate pulse in real-time	225
DLE DC4 <2>	10H,14H,02H	Execute power-off sequence	225
DLE DC4 <8>	10H,14H,08H	Clear buffers	225
ESC =	1BH,3DH	Select peripheral device status	226
ESC @	1BH,40H	Initialize printer	224
ESC p	1BH,70H	Generate pulse	225
GS ( A	1DH,28H,41 H	Enter Test Mode	228
GS I	1DH,49H	Transmit printer ID	224
GS P	1DH,50H	Set horizontal and vertical motion units	224
GS b	1DH,62H	Turns smoothing mode on/off	201
GS c	1DH,63H	Print counter	228
GS g 0	1DH,67H,30 H	Initialize maintenance counter	228
GS g 2	1DH,67H,32 H	Transmit maintenance counter value	229
Macro Function Commands			
Command		Name	Page
GS :	1DH,3AH	Start/end macro definition	230
GS ^ r t m	1DH,5EH	Execute macro	230
Page Mode Commands			
Command		Name	Page
FF	0CH	Print and return to standard mode	89
CAN	18H	Cancel print data in page mode	217
ESC FF	1BH,0CH	Print data in page mode	220
ESC L	1BH,4CH	Select Page mode	218
ESC S	1BH,53H	Switches from page mode to standard mode	218
ESC T	1BH,54H	Select print direction in page mode	218
ESC W	1BH,57H	Set printing area in page mode	218
GS \$	1DH,24H	Set absolute vertical print position in page mode	220
GS \	1DH,5CH	Set relative vertical print position in page mode	220
User-defined Memory Commands			
Command		Name	Page
GS *	1DH,2AH	Define single user-defined bit-image	234
GS /	1DH,2FH	Print single user-defined bit-image	235

Table 16 Supported TM-T90 Commands

## Undocumented TM-T88 Commands

Command	Name	
ESC I	Auto Cut	223
ESC m	Auto Cut	223
ESC u	Transmit Peripheral Device Status	214
ESC v	Transmit Paper status	215

Table 17 Undocumented TM-T90 Commands

## Supported TM-T90 Commands

Print and Feed Commands			
Command		Name	Page
LF	0AH	Print and line feed	191
CR	0DH	Print and carriage return	191
ESC d	1BH,64H	Print and feed <n> lines	191
ESC e	1BH,65H	Print and reverse feed <n> lines	191
ESC J	1BH,4AH	Print and feed paper <n> vertical units	192
ESC K	1BH,4BH	Print and reverse feed [<n> x (1/144)] inches	192
ESC j	1BH,6AH	Print and reverse feed	192
Line Spacing Command			
Command		Name	Page
ESC 2	1BH,32H	Select default line spacing, 1/6 lpi	193
ESC 3	1BH,33H	Set line spacing	193
Character Commands			
Command		Name	Page
ESC SP	1BH,20H	Set right-side character spacing	193
ESC !	1BH,21H	Select print mode(s)	199
ESC %	1BH,25H	Select/cancel user-defined character sets	193
ESC &	1BH,26H	Define user-defined characters	194
ESC -	1BH,2DH	Turn underline mode on/off	199
ESC 4	1BH,34H	Set italics mode	201
ESC 5	1BH,35H	Reset italics mode	201
ESC ?	1BH,3FH	Cancel user-defined characters	194
ESC E	1BH,45H	Turn emphasized mode on/off	199
ESC G	1BH,47H	Turn on/off double-strike mode	200
ESC M	1BH,4DH	Select character font	194
ESC R	1BH,52H	Select an international character set	195
ESC V	1BH,56H	Turn on/off 90° rotation mode	200
ESC [ T	1BH,5BH, 54H	Select character code table	196
ESC ^	1BH,5EH	Print control character	198
ESC r	1BH,72H	Select color	198
ESC t	1BH,74H	Select character code table	198
ESC {	1BH,7BH	Turn on/off upside-down printing mode	200
GS !	1DH,21H	Set character size	201
GS #	1DH,23H	Insert euro character	198
GS B	1DH,42H	Turn white/black reverse printing mode on/off	198
Panel Button Commands			
Command		Name	Page
ESC c 5	1BH,63H, 35H	Enable/disable panel buttons	202

Table 18 Supported EPOS Commands

## Supported TM-T90 Commands

Paper Sensor Commands			
Command		Name	Page
ESC c 4	1BH,63H, 34H	Select paper sensor(s) to stop printing.	203
ESC c 3	1BH,63H, 33H	Select paper sensor(s) to output paper out signals.	204
ESC c 1	1BH, 63H, 31H	Select paper types for command settings	217
ESC c 0	1BH, 63H, 30H	Select paper types for printing	216
Print Position Commands			
Command		Name	Page
BS	08H	Set back space	206
HT	09H	Set horizontal tab positions	206
ESC \$	1BH,24H	Set absolute print position	205
ESC <	1BH,3CH	Return home	208
ESC D	1BH,44H	Set horizontal tab positions	207
ESC Q	1BH,51H	Set right margin in characters	208
ESC U	1BH,55H	Turn on/off unidirectional printing mode	207
ESC \	1BH,5CH	Set relative print position	205
ESC a	1BH,61H	Select justification	206
ESC I	1BH,6CH	Set left right margin in characters	208
GS L	1DH,4CH	Set left margin	207
GS T	1DH,54H	Set print position to the beginning of the line	205
GS W	1DH,57H	Set printing area width	207
Bit-image Commands			
Command		Name	Page
ESC *	1BH,2AH	Select bit-image mode	209
GS v 0	1DH,76H,30H	Print raster bit image	209
Status Commands			
Command		Name	Page
DLE EOT	10H,04H	Transmit real-time status	213
DLE ENQ	10H,05H	Real-time status request to printer	227
ESC u	1BH, 75H	Transmit peripheral status	214
ESC v	1BH, 76H	Transmit paper status	215
GS a	1DH,61H	Enable/disable automatic status back (ASB)	210
GS r	1DH,72H	Transmit status	212

## Supported TM-T90 Commands

Bar Code Commands			
Command		Name	Page
GS H	1DH,48H	Select printing position of HRI characters	222
GS f	1DH,66H	Select font HRI characters	222
GS h	1DH,68H	Set bar code height	221
GS k	1DH,6BH	Print bar code	220
GS w	1DH,77H	Set bar code width	220
Mechanism Control Commands			
Command		Name	Page
GS V	1DH,56H	Select cut mode and cut paper	223
ESC I	1BH,69H	Set partial knife cut	223
ESC m	1BH,69H	Set partial knife cut	194
BEL	07H	Sound buzzer	223
ESC BEL	1BH,07H	Sound buzzer	223
Miscellaneous Commands			
Command		Name	Page
DLE DC4 <1>	10H,14H,01H	Generate pulse in real-time	225
DLE DC4 <2>	10H,14H,02H	Execute power-off sequence	225
DLE DC4 <8>	10H,14H,08H	Clear buffers	225
ESC =	1BH,3DH	Select peripheral device status	226
ESC @	1BH,40H	Initialize printer	224
ESC p	1BH,70H	Generate pulse	225
GS ( A	1DH, 28H,41H	Enter test mode	228
GS I	1DH,49H	Transmit printer ID	224
GS P	1DH,50H	Set horizontal and vertical motion units	224
GS b	1DH,62H	Turns smoothing mode on/off	201
GS c	1DH,63H	Print counter	228
GS g 0	1DH,67H,30H	Initialize maintenance counter	228
GS g 2	1DH,67H,32H	Transmit maintenance counter value	229
Macro Function Commands			
Command		Name	Page
GS :	1DH,3AH	Start/end macro definition	230
GS ^ r t m	1DH,5EH	Execute macro	230
GS _	1DH,5FH	Delete start-up macro definition	231
Page Mode Commands			
Command		Name	Page
FF	0CH	Print and return to standard mode	89
CAN	18H	Cancel print data in page mode	162
ESC FF	1BH,0CH	Print data in page mode	220
ESC L	1BH,4CH	Select Page mode	218
ESC S	1BH,53H	Switches from page mode to standard mode	218
ESC T	1BH,54H	Select print direction in page mode	218
ESC W	1BH,57H	Set printing area in page mode	218
GS \$	1DH,24H	Set absolute vertical print position in page mode	220
GS \	1DH,5CH	Set relative vertical print position in page mode	220

## Supported TM-T90 Commands

User-defined Memory Commands			
Command		Name	Page
GS - <Name> ...	1DH,2DH, <Name> ...	Define user-defined bit image	231
GS 0 <Name> ... <m>	1DH,30H, <Name> ...	Print user-defined bit image	233
GS 1 <Name> ...	1DH,31H, <Name> ...	Erase single entry from nonvolatile memory	233
GS *	1DH,2AH	Define single user-defined bit-image	234
GS /	1DH,2FH	Print single user-defined bit-image	235
GS 3	1DH,33H	Query nonvolatile memory pool information	235
GS 5	1DH,35H	Erase all entries from nonvolatile memory	233
GS 6	1DH,36H	Save user-defined character set	235
GS 7	1DH,37H	Select user-defined character set	235

## Extended Electronic Journal Commands

Electronic Journal Commands			
Command		Name	Page
[ESC][GS]I <Password><0>	1BH 1DH 49H	Electronic journal initialize and set password	151
[ESC][GS]E <Password><0>	1BH 1DH 45H	Electronic journal erase the electronic journal	151
[ESC][GS]P< S> <S <sub>h</sub> >< L>< L <sub>h</sub> >	1BH 1DH 50H	Print the electronic journal	152
[ESC][GS]R< S> < S <sub>h</sub> >< L>< L <sub>h</sub> >	1BH 1DH 52H	Report the electronic journal	152



## TM-T88 / TM-T90 and ESC/POS™ Command Descriptions

The TM-T90 and EPOS emulation's are grouped together. The TM-T90 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**  $0 \leq n \leq 255$

**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**         $0 \leq n \leq 255$ **Description** The [ESC] J <n> command prints the data in the print buffer and feeds the paper [ $n \times (1/144)$ ] 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**         $0 \leq n \leq 48$ **Description** The [ESC] K <n> command prints the data in the print buffer and feeds the paper [ $\text{<n>} \times (1/144)$ ] 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****ASCII**        [ESC] j**Hexadecimal** 1BH 6AH**Decimal**     <27> <106>**Range**         $0 \leq n \leq 48$ **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 [ $\text{<n>} \times (1/144)$ ] inches. The default setting of the paper feed amount is 1/6 inch ( $\text{<n>} = 24$ ). 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 [ $\text{<n>} \times (1/160)$ ] inches. It is used to change the spacing between characters. The default right-side character spacing is set to zero. ( $\text{<n>} = 0$ ). 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**           $0 \leq n \leq 255$

**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.

**Function      Define User-Defined Characters****ASCII**      [ESC] & <y> <c1> <c2> [x1 d1 ... d(y x x1)] ... [xk d1 ... d(y x xk)]**Hexadecimal** 1BH 26H y c1 c2 [x1 d1 ... d(y x x1)] ... [xk d1 ... d(y x xk)]**Decimal**      <27> <38> y c1 c2 [x1 d1 ... d(y x x1)] ... [xk d1 ... d(y x xk)]**Range**      y = 232 ≤ c<sub>1</sub> ≤ c<sub>2</sub> ≤ 126

0 ≤ x ≤ 12 (9 x 9 font)

0 ≤ x ≤ 9 (7 x 9 font)

0 ≤ d<sub>1</sub> ... d(y x x) ≤ 255

**Description** The [ESC] & <y> <c<sub>121</sub> d<sub>1</sub> ... d(y x x<sub>1</sub>)] ... [x<sub>k</sub> d<sub>1</sub> ... d(y x x<sub>k</sub>)] command defines user-defined characters from character code <c<sub>1212</sub>

**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.

**Function      Select Character Font****ASCII**      [ESC] M <n>**Hexadecimal** 1BH 4DH <n>**Decimal**      <27> <77> <n>**Range**      0,1,48,49

**Description** The [ESC] M <n> command selects one-byte character font.

<n>	Function
0, 48	Page 0 [PC437 (U.S.A. and Standard Europe)]
1, 49	Page 1 [PC850 (Multilingual)]

Table 19 Select Character Font Table

**Function**      **Select an International Character Set****ASCII**            ESC R <n>**Hexadecimal**    1BH 52H <n>**Decimal**         <27> <82> <n>**Range**             $0 \leq n \leq 74$ **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	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	Arabic	93

Table 20 International Character Sets

**Function      Select Character Code Table****ASCII**        ESC [ T <n<sub>h</sub>> <n<sub>l</sub>>**Hexadecimal** 1BH 5BH 54H <n<sub>h</sub>> <n<sub>l</sub>>**Decimal**      <27> <91> <84> <n<sub>h</sub>> <n<sub>l</sub>>**Default**      <n<sub>h</sub>> = 1**<n<sub>l</sub>> =**        181 (Code Page 437)**Description** The ESC [ T <n<sub>h</sub>> <n<sub>l</sub>> command selects a code page, <n>, from the character code table.

Code Page	Country	Decimal <n <sub>h</sub> > <n <sub>l</sub> >	Hex <n <sub>h</sub> > <n <sub>l</sub> >
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
93	Arabic	0,93	0H,05DH
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 <sub>h</sub> > <n <sub>l</sub> >	Hex <n <sub>h</sub> > <n <sub>l</sub> >
866	Cyrillic II-866	3,98	3H,062H
869	Greek 869	3,101	3H,065H
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 21 Character Code Pages

**Function      Print Control Character****ASCII**        [ESC] ^ <n>**Hexadecimal** 1BH 5EH <n>**Decimal**      <27> <94> <n>**Range**         $0 \leq n \leq 255$ **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****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 code page 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**         $0 \leq n \leq 5$ ; <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 22 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 23 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.

---

<b>Function</b>	<b>Turn ON/OFF Double-Strike Mode</b>
<b>ASCII</b>	[ESC] G <n>
<b>Hexadecimal</b>	1BH 47H <n>
<b>Decimal</b>	<27> <71> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	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.

---

<b>Function</b>	<b>Turn ON/OFF Upside-Down Print Mode</b>
<b>ASCII</b>	[ESC] { <n>
<b>Hexadecimal</b>	1BH 7BH <n>
<b>Decimal</b>	<27> <123> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	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.

---

<b>Function</b>	<b>Turn ON/OFF 90° Rotation Mode</b>
<b>ASCII</b>	ESC V <n>
<b>Hexadecimal</b>	1BH 56H <n>
<b>Decimal</b>	<27> <86> <n>
<b>Range</b>	<n> = 0, 1, 2, 48, 49, 50
<b>Description</b>	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 24 Rotation Modes

---

**Function      Set Character Size****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 x2.**Where <n>**  
xxxx0000      Vertical scale 1  
xxxx0001      Vertical scale 2  
0000xxxx      Horizontal scale 1  
0001xxxx      Horizontal scale 2

---

**Function      Begin Italics****ASCII**      [ESC] 4**Hexadecimal** 1BH 34H**Decimal**      <27> <52>**Description** The [ESC] 4 command begins italics print mode.**Note:** Italics are not available in all print modes.

---

**Function      End Italics****ASCII**      [ESC] 5**Hexadecimal** 1BH 35H**Decimal**      <27> <53>**Description** The [ESC] 5 command ends italics print mode.**Description** The [ESC] % H command ends italic print mode.

---

**Function      Turns smoothing on/off****ASCII**      [GS] b <n>**Hexadecimal** 1DH 62H <n>**Decimal**      <29> <98> <n>**Description** The [GS] b <n> command turns smoothing mode on or off.

- When the LSB of *n* is 0, smoothing mode is turned off.
- When the LSB of *n* is 1, smoothing mode is turned on.

---

## Panel Button Commands

---

**Function**      Enable/Disable Paper Feed

**ASCII**            [ESC] c 5 <n>

**Hexadecimal**    1BH 63H 35H <n>

**Decimal**          <27> <99> <53> <n>

**Range**             $0 \leq n \leq 255$

**Description**    The [ESC] c 5 <n> command enables or disables the FEED Button. When the least significant bit (LSB) of <n> = one, the FEED Button is disabled; when it is zero, the button is enabled. To prevent problems caused by accidentally pressing the FEED Button, use the command to disable it. The 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.

**Where <n>**        Bit 0 = 1 the FEED Button is disabled

Bit 0 = 0 the button is enabled.

## 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	$0 \leq n \leq 255$

**Description** ESC c 4 n selects whether to stop printing or not when the paper low is detected. There are three sensors in the TM-88 or TM-90 that are simulated in the iTherm® 280: the paper roll low, paper roll end sensor, and validation sensor. The paper roll low sensor is enabled when either bit 0 or bit 1 is on. The paper roll end sensor is enabled when either bit 2 or bit 3 is on. The validation sensor is enabled when either bit 6 or bit 7 is on. When a paper low or a paper out is detected, printing stops after printing the current line. The printer goes off line after printing stops. Installing a new roll starts printing again. The default setting is n=12. If the paper roll low sensor or paper roll end sensor is disabled and a paper out is detected, printing does not stop. The printer does not go off line, and the Paper Out LED comes on. When the validation sensor is enabled and a paper-end is detected, the printer ejects the paper after printing as much as possible and enters the paper waiting state. When the validation sensor is disabled and a paper-end is detected, the printer does not stop printing and eject the paper. It is possible to select multiple sensors to stop printing. Then when any sensor detects a paper-end, printing stops. When a paper sensor is enabled with this command, printing stops only when the corresponding paper is selected for printing. Print sheet can be selected by using ESC c 0.



**Note:** The iTherm® 280 does not allow the paper out sensor to be disabled.

The paper sensor(s) used to stop printing are selected by using *n* as follows:

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Paper roll low sensor disabled.
	On	01	1	Paper roll low sensor enabled.
1	Off	00	0	Paper roll low sensor disabled.
	On	02	2	Paper roll low sensor enabled.
2- 3	—	—	—	Paper roll end sensor enabled (always on)
4-5	—	—	—	Undefined.
6	Off	00	0	Validation sensor disabled.
	On	40	64	Validation sensor enabled.
7	Off	00	0	Validation sensor disabled.
	On	80	128	Validation sensor enabled.

Table 25 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**  $0 \leq n \leq 255$ 

**Description** ESC c 3 n selects whether to output paper-end signals or not to a parallel interface. The default setting is n=15. The paper roll low, paper roll end, and validation sensors can be selected. When the sensors are selected to output signals and any sensor detects a paper-end, the paper-end signal is output. When all sensors are disabled, and a paper out is detected, status is always a paper present. The paper roll low sensor is enabled when either bit 0 or bit 1 or both is on. The paper roll end sensor is enabled when either 2 or 3 or both bits is on. The validation sensor is enabled when either 6 or 7 or both bits are on. This command is enabled only with a parallel interface and is ignored with a serial interface.

The paper sensor(s) used to output paper-end signals are selected by using n as follows:

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Paper roll low sensor disabled.
	On	01	1	Paper roll low sensor enabled.
1	Off	00	0	Paper roll low sensor disabled.
	On	04	2	Paper roll low sensor enabled.
2	Off	00	0	Paper roll end sensor disabled.
	On	04	4	Paper roll end sensor enabled.
3	Off	00	0	Paper roll end sensor disabled.
	On	08	8	Paper roll end sensor enabled.
4-5	—	—	—	Undefined.
6	Off	00	0	Validation sensor disabled.
	On	40	64	Validation sensor enabled.
7	Off	00	0	Validation sensor disabled.
	On	80	128	Validation sensor enabled.

Table 26 Paper Sensor Commands



**Note:** The electronic journal will not stop the printer. Bits 0,1,2 and 3 all control the receipt station.

## Print Position Commands

---

### Function Set Print Position to the beginning of print line

**ASCII** [GS] T <n>  
**Hexadecimal** 1DH 54H <n<sub>l</sub>> <n<sub>h</sub>>  
**Decimal** <29> <84> <n<sub>l</sub>> <n<sub>h</sub>>  
**Range** 0 ≤ n ≤ 1  
 48 ≤ n ≤ 49

**Description** The GS T <n> command sets the print position to the beginning of the print line.

<n>	Function
0, 48	Sets the print position after the data in the print buffer is deleted.
1, 49	Sets the print position after the data in the print buffer is printed

When printing is specifies (n=1,49), the printer prints the data in the print buffer and executes a line feed based on the line feed amount set.

When deleting is specified (n=0,48), the printer cancels the print data in the print buffer, and keeps other data or setting values except for the print data.

---

### Function Set Absolute Print Position

**ASCII** [ESC] \$ <n<sub>l</sub>> <n<sub>h</sub>>  
**Hexadecimal** 1BH 24H <n<sub>l</sub>> <n<sub>h</sub>>  
**Decimal** <27> <36> <n<sub>l</sub>> <n<sub>h</sub>>  
**Range** 0 ≤ n<sub>l</sub> ≤ 255  
 0 ≤ n<sub>h</sub> ≤ 255

**Description** The ESC \$ <n<sub>l</sub>> <n<sub>h</sub>> command sets the print starting position from the beginning of the line.

---

### Function Set Relative Print Position

**ASCII** [ESC] \ <n<sub>l</sub>> <n<sub>h</sub>>  
**Hexadecimal** 1BH 5CH <n<sub>l</sub>> <n<sub>h</sub>>  
**Decimal** <27> <92> <n<sub>l</sub>> <n<sub>h</sub>>  
**Range** 0 ≤ n<sub>l</sub> ≤ 255  
 0 ≤ n<sub>h</sub> ≤ 255

**Description** The ESC \ <n<sub>l</sub>> <n<sub>h</sub>> command sets the print starting position based on the current position and the distance from the current position to [(n<sub>l</sub> + n<sub>h</sub> × 256) × horizontal unit]. When standard more 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**         $0 \leq n \leq 2$  $48 \leq n \leq 50$ 

**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****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.



---

<b>Function</b>	<b>Set Horizontal Tab Positions</b>
<b>ASCII</b>	[ESC] D <n <sub>1</sub> > ... <n <sub>k</sub> > NUL
<b>Hexadecimal</b>	1BH 44H <n <sub>1</sub> > ... <n <sub>k</sub> > 00
<b>Decimal</b>	<27> <68> <n <sub>1</sub> > ... <n <sub>k</sub> > <0>
<b>Range</b>	1 ≤ n ≤ 255 0 ≤ k ≤ 32
<b>Description</b>	The [ESC] D <n <sub>1</sub> > ... <n <sub>k</sub> > 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.

---

<b>Function</b>	<b>Set Left Margin</b>
<b>ASCII</b>	GS L <n <sub>l</sub> > <n <sub>h</sub> >
<b>Hexadecimal</b>	1DH 4CH <n <sub>l</sub> > <n <sub>h</sub> >
<b>Decimal</b>	<29> <76> <n <sub>l</sub> > <n <sub>h</sub> >
<b>Range</b>	0 ≤ n <sub>l</sub> ≤ 255 0 ≤ n <sub>h</sub> ≤ 255
<b>Description</b>	The GS L <n <sub>l</sub> > <n <sub>h</sub> > command sets the left margin using n <sub>l</sub> and n <sub>h</sub> . The left margin is set to [(n <sub>l</sub> + n <sub>h</sub> × 256) × 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.

---

<b>Function</b>	<b>Set Printing Area Width</b>
<b>ASCII</b>	GS W <n <sub>l</sub> > <n <sub>h</sub> >
<b>Hexadecimal</b>	1DH 57H <n <sub>l</sub> > <n <sub>h</sub> >
<b>Decimal</b>	<29> <87> <n <sub>l</sub> > <n <sub>h</sub> >
<b>Range</b>	0 ≤ n <sub>l</sub> ≤ 255 0 ≤ n <sub>h</sub> ≤ 255
<b>Description</b>	The printing area width is set to [(n <sub>l</sub> + n <sub>h</sub> × 256) × 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.

---

<b>Function</b>	<b>Turn ON/OFF Uni-Directional Printing Mode</b>
<b>ASCII</b>	[ESC] U <n>
<b>Hexadecimal</b>	1BH 55H <n>
<b>Decimal</b>	<27> <85> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	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 i-directional 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****ASCII**            [ESC] I <n>**Hexadecimal**   1BH 6CH <n>**Decimal**         <27> <108> <n>**Range**            0 ≤ n ≤ 255**Description**    The [ESC] I <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****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> <nl> <nh> <dl> ... <dk>
Hexadecimal	1BH 2AH <m> <nl> <nh> <dl> ... <dk>
Decimal	<27> <42> <m> <nl> <nh> <dl> ... <dk>
Range	<m> = 0, 1, 32, 33 $0 \leq nl \leq 255$ $0 \leq nh \leq 3$ $0 \leq d \leq 255$ $k = nl + nh \times 256$ for <m> = 0 or 1 $k = (nl + nh \times 256) \times 3$ for <m> = 32 or 33

**Description** [ESC] \* <m> <n<sub>l</sub>> <n<sub>h</sub>> <d<sub>l</sub>> ... <d<sub>k</sub>> command selects a bit-image mode using <m> for the number of dots specified by  $(n_l + n_h \times 256)$  in mode 0 or 1 and  $(n_l + n_h \times 256) \times 3$  in mode 32 or 33 and <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	101 dpi	8	80 dpi	200
1	8-dot double density	101 dpi	8	160 dpi	400
32	24 dot single density	101 dpi	24	120 dpi	300
33	24 dot double density	203 dpi	24	240 dpi	600

Table 27 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**  $0 \leq n \leq 255$

**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 offline mode configuration. If offline buffer full only is set the ASB is defaulted on. 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. The paper roll low sensor is an option. If the printer is not equipped with the paper low 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 28 Automatic Status Back (ASB) Values for <n>



**Note:** This command and the Automatic Status Back feature are licensed from Epson, and is only available in the Full Epson Emulation of the firmware. Problems with this command are frequently caused by not using the correct version of the firmware. Contact Transact sales and/or technical support for this added cost option.

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 FEED Button
	On	40H	<64>	Paper is being fed by the FEED Button
7	Off	00H	<0>	Not used; fixed to Off

Table 29 Automatic Status Back (ASB) First Byte (Printer Information)

Bit	Off/On	Hex	Decimal	Status for Automatic Status Back (ASB)
0	-	-	<0>	Undefined
1	-	-	<0>	Undefined
2	Off	00H	<0>	No mechanical error
	On	04H	<4>	Mechanical error occurred
3	Off	00H	<0>	No Auto-cutter error
	On	08H	<8>	Auto-cutter error occurred
4	Off	00H	<0>	Not used; fixed to off
5	Off	00H	<0>	No unrecoverable error <sup>11</sup>
	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
7	Off	00H	<0>	Not used; fixed to Off

Table 30 Automatic Status Back (ASB) Second Byte (Error Information)

<sup>11</sup> The iTherm® 280 can not recover from mechanical errors without flushing the input buffer. All print data will be lost if a mechanical error occurs.

Bit	Off/On	Hex	Decimal	Status for Automatic Status Back (ASB)
0	Off	00H	<0>	Journal memory adequate
	On	01H	<1>	Journal memory low (Less than 8K)
1	Off	00H	<0>	Paper low sensor: paper adequate
	On	02H	<2>	Paper low sensor: paper low
2	Off	00H	<0>	Journal memory adequate
	On	04H	<4>	Journal memory exhausted.
3	Off	00H	<0>	Paper out sensor: paper present
	On	08H	<8>	Paper out 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 31 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 32 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 out is detected by the paper out sensor. The paper roll low 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	Off	00H	<0>	Journal Memory adequate
	On	01H	<1>	Journal Memory low (Less than 8K)
1	Off	00H	<0>	Paper low sensor: paper adequate
	On	02H	<2>	Paper low sensor: paper low
2	Off	00H	<0>	Journal Memory adequate
	On	04H	<4>	Journal Memory exhausted.
3	Off	00H	<0>	Paper out sensor: paper present
	On	08H	<8>	Paper out 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 33 Paper Sensor Status (&lt;n&gt; = 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 34 Drawer Kick-out Connector Status (&lt;n&gt; = 2, 50)

**Function Transmit Real-Time Status****ASCII** [DLE] [EOT] <n>**Hexadecimal** 10H 04H <n>**Decimal** <16> <4> <n>**Range**  $1 \leq n \leq 4$ 

**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 low sensor is an option. If the printer does not have a paper low 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 35 Values for the Status Function, &lt;n&gt;

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	-	-	-	Undefined
6	-	-	-	Undefined
7	Off	00H	<0>	Not used; fixed to off

Table 36 Printer Status (&lt;n&gt; = 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 FEED Button
	On	08H	<8>	Paper is being fed by the FEED Button
4	On	10H	<16>	Not used; fixed to on
5	Off	00H	<0>	No paper out stop
	On	20H	<32>	Printing stops due to paper out
6	Off	00H	<0>	No error
	On	40H	<64>	Error occurs
7	Off	00H	<0>	Not used; fixed to off

Table 37 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 auto-cutter error
	On	08H	<8>	Auto-cutter error occurred
4	On	10H	<16>	Not used; fixed to on
5	Off	00H	<0>	Unrecoverable error occurred <sup>12</sup>
	On	20H	<32>	Recoverable error occurred
6	Off	00H	<0>	Not used; fixed to off
7	Off	00H	<0>	Not used; fixed to off

Table 38 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 low sensor: paper adequate
	On	(0CH)	(<12>)	Paper low sensor: paper low
4	On	10H	<16>	Not used; fixed to on
5,6	Off	00H	<0>	Paper out sensor: paper adequate
	On	60H	<96>	Paper out sensor: paper not present
7	Off	00H	<0>	Not used; fixed to off

Table 39 Paper Roll Sensor Status (<n> = 4)

**Function Transmit Peripheral Status**

**ASCII** [ESC] u <n>

**Hexadecimal** 1BH 75H <n>

**Decimal** <27> <117> <n>

**Range** n = 0

**Description** The [ESC] r <n> command transmits peripheral status has been replaced by the [GS] r command. The iTherm® 280 return cash drawer status as specified below.

Bit	Off/On	Hex	Decimal	Status
-----	--------	-----	---------	--------

<sup>12</sup> The iTherm® 280 does not allow buffer recovery on unrecoverable errors. Following the recovery process will not restore the data buffers.



0	Off	00H	<0>	Pin 3 is Low
	On	(03H)	(3)	Pin 3 is High
1 – 7	Off	00H	<0>	Not used; fixed to Off

Table 40 Peripheral Status (&lt;n&gt; = 0, 48)

**Function Transmit Paper Sensor Status****ASCII** [ESC] v**Hexadecimal** 1BH 76H**Decimal** <27> <118>

**Description** The [ESC] v command has been replaced by the [GS] r command. The [ESC] v command transmits paper status has been replaced by the [GS] r command. The iTherm® 280 return paper status as specified below. If the Electronic Journal is enabled, Journal Low and Out are supported by this command

Electronic Journal Disabled				
Bit	Off/On	Hex	Decimal	Status
0,1	Off	00	<0>	Receipt Paper present
	On	02H	<2>	Receipt Paper Low or not present
2,3	Off	00	<0>	Cover is closed
	On	04H	<4>	Cover is open
4	Off	00	<0>	Not used, fixed Off
5	Off	00	<0>	Slip is present
	On	04H	<4>	Slip is not present
6	ON	20H	<64>	Fixed On
7	Off	00	<0>	Not used, fixed Off
Electronic Journal Enabled				
Bit	Off/On	Hex	Decimal	Status
0	Off	00H	<0>	Journal Space adequate > 8K
	On	01H	<1>	Journal Space Low < 8K
1	Off	00	<0>	Receipt Paper present
	On	02H	<2>	Receipt Paper Low or not present
2	Off	00	<0>	Cover is closed
	On	04H	<4>	Cover is open
3	Off	00	<0>	Journal is active and not full (Cover Closed)
	On	08H	<8>	Journal Full and has been disabled (or Cover Open)
4	Off	00	<0>	Not used, fixed Off
5	Off	00	<0>	Slip is present
	On	04H	<4>	Slip is not present
6	ON	20H	<64>	Fixed On
7	Off	00	<0>	Not used, fixed Off

Table 41 Paper Status

## Printing Paper Command

### Function Select Paper Type for Printing

**ASCII** [ESC] c 0 <n>

**Hexadecimal** 1BH 63H 30H <n>

**Decimal** <27> <99> <48> <n>

**Range**  $n = 1, 1 \leq n \leq 3, 8 \leq n \leq 11$

**Description** ESC c 0 *n* selects paper type(s) for printing. User's have the option to select either Paper roll or validation paper. Both bits 0 and 1 indicate paper roll and if either of them is available, the paper roll is selected as the print sheet. Validation and paper roll can be selected simultaneously, but in this case, be sure to use a pressure sensitive paper so that the printing result is on the paper roll. At this time, the setting values for validation are available for ESC 2, ESC 3, GS L, and GS W. This command is enabled only when processed at the beginning of a line. When previously disabled validation paper is enabled, the printer waits for the validation to be inserted. When previously enabled validation paper is disabled, the printer ejects the paper. The default setting is  $n = 1$ . The paper type(s) are selected for printing by using *n* as follows:

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Electronic Journal disabled.
	On	01	1	Electronic Journal enabled
1	Off	00	0	Paper roll disabled.
	On	02	2	Paper roll enabled.
2	Off	00	0	Slip Paper Disabled (EPOS only)
	On	04	4	Slip Paper enabled (EPOS only)
3	Off	00	0	Validation paper disabled.
	On	08	8	Validation paper enabled.
4-7	—	—	—	Undefined.



**Note:** The TM88 and TM90 do not support the electronic journal. The electronic journal may be printed and reported in the same way as the Ithaca PcOS emulation. The full range of [ESC][GS] journal control commands are available in EPOS mode. See the section on initializing, printing and reporting the electronic journal starting on page 151. In EPOS mode, the electronic journal and the paper roll may be both selected. As there is limited space in the electronic journal, the amount of data sent the journal should be limited.



**Note:** In EPOS emulation the iTherm® 280 printer will recognize the Epson Slip Select command and enter Validation mode.

**Function**      **Select Paper Type for Command Settings**

**ASCII**            [ESC] c 1 <n>  
**Hexadecimal**   1BH 63H 31H <n>  
**Decimal**         <27> <99> <49> <n>  
**Range**             $n = 1, 1 \leq n \leq 3, 8 \leq n \leq 11$

**Description**   ESC c 1 *n* selects paper type(s) for setting. Paper roll and validation paper are available. Both bits 0 and 1 indicate paper roll and if either of them is available, the paper roll is selected as the print sheet. The commands that need to select paper types for setting are ESC 2, ESC 3, GS L, and GS W. The value of *n* is used as follows:

Bit	Off/On	Hex	Decimal	Function
0	Off	00	0	Not Used.
	On	01	1	Not Used.
1	Off	00	0	Paper roll disabled.
	On	02	2	Paper roll enabled.
2	—	—	—	Undefined.
3	Off	00	0	Validation paper disabled.
	On	08	8	Validation paper enabled.
4-7	—	—	—	Undefined.

**Function**      **Select Paper Type for Command Settings**

**ASCII**            [ESC] f <*t*<sub>1</sub>><*t*<sub>2</sub>>  
**Hexadecimal**   1BH 66H <*t*<sub>1</sub>><*t*<sub>2</sub>>  
**Decimal**         <27> <116> <*t*<sub>1</sub>><*t*<sub>2</sub>>  
**Range**             $0 \leq t_1 \leq 15$   
                        $0 \leq t_2 \leq 64$

**Description**   ESC f *t*<sub>1</sub> *t*<sub>2</sub> sets the time that the printer waits for validation paper to be inserted to *t*<sub>1</sub> × 1 minutes, and the time from detection of the validation to the start of printing to *t*<sub>2</sub> × 0.1 seconds. When *t*<sub>1</sub>=0, the validation waiting time is not set and the printer continues waiting for a validation to be inserted. The default validation waiting time is not set, and the start operation time is set to 10 seconds (*t*<sub>1</sub>=0, *t*<sub>2</sub>=10). This setting alone, however, does not cause the printer to immediately start waiting for a validation to be inserted. The setting becomes effective when validation paper is used. DLE ENQ is used to cancel the validation waiting state.

## Page Mode

**Function**      **Cancel Print Data in Page Mode**

**ASCII**            [CAN]  
**Hexadecimal**   18H  
**Decimal**         <24>

**Description**   CAN In page mode, deletes all the print data in the current printable area.

---

**Function      Select Page Mode****ASCII**        [ESC] L**Hexadecimal** 1BH 4CH**Decimal**      <27> <76>**Description** ESC L Switches from standard mode to page mode and starts the page mode definition.

---

**Function      Set Printing Area in Page Mode****ASCII**        [ESC] W xL xH yL yH dxL dxH dyL dyH**Hexadecimal** 1BH 57H xL xH yL yH dxL dxH dyL dyH**Decimal**      <27> <87> xL xH yL yH dxL dxH dyL dyH**Range**         $0 \leq (xL + xH \times 256) \leq 65535$  ( $0 \leq xL \leq 255$ ,  $0 \leq xH \leq 255$ ) $0 \leq (yL + yH \times 256) \leq 65535$  ( $0 \leq yL \leq 255$ ,  $0 \leq yH \leq 255$ ) $1 \leq (dxL + dxH \times 256) \leq 65535$  ( $0 \leq dxL \leq 255$ ,  $0 \leq dxH \leq 255$ ) $1 \leq (dyL + dyH \times 256) \leq 65535$  ( $0 \leq dyL \leq 255$ ,  $0 \leq dyH \leq 255$ )**Description** ESC W sets the position and the size of the printing area.

- Horizontal starting position =  $[(xL + xH \times 256) \times (\text{horizontal motion units})]$ .
- Vertical starting position =  $[(yL + yH \times 256) \times (\text{vertical motion units})]$ .
- Horizontal printing area width =  $[(dxL + dxH \times 256) \times (\text{horizontal motion units})]$ .
- Vertical printing area width =  $[(dyL + dyH \times 256) \times (\text{vertical motion units})]$ .

---

**Function      Select Standard Mode****ASCII**        [ESC] S**Hexadecimal** 1BH 53H**Decimal**      <27> <83>**Description** ESC S Switches from page mode to standard mode with out printing the page. All page definition is lost.

---

**Function      Select Page Mode Entry Direction****ASCII**        [ESC] T <n>**Hexadecimal** 1BH 54H <n>**Decimal**      <27> <84>**Description** ESC T Select print direction in page mode

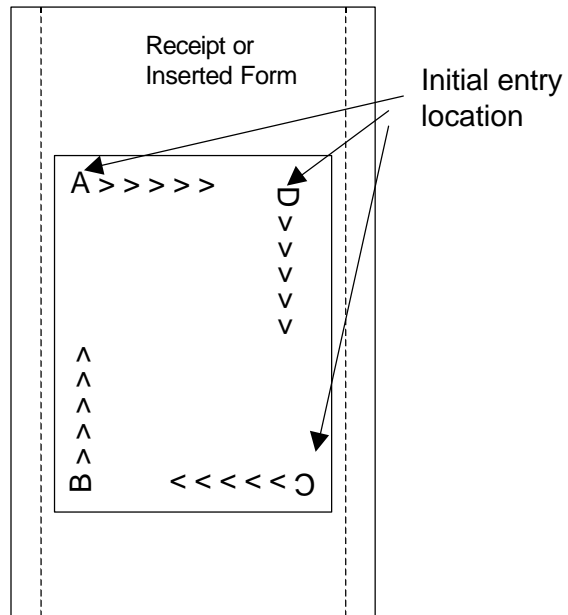
This command may also be issued during page definition. When issued in page mode it resets the orientation and entry position but does not cause the currently defined image to be erased or printed.

**Where**        x = 0 for standard orientation (Direction A).

x = 1 for 270° Rotation (Direction B)

x = 2 for 180° Rotation (Direction C)

x = 3 for 90° Rotation (Direction D)




---

**Function** Print and return to standard mode (in page mode)

**ASCII** [FF]

**Hexadecimal** 0CH

**Decimal** <12>

**Description** [FF] In page mode, prints the data in the print buffer collectively and returns to standard mode.

---

<b>Function</b>	<b>Print data in page mode</b>
<b>ASCII</b>	[ESC][FF]
<b>Hexadecimal</b>	1BH,0CH
<b>Decimal</b>	<27><12>
<b>Description</b>	[ESC][FF] Prints the page as it is currently defined and reenters page mode without deleting the page definition.

---

<b>Function</b>	<b>Set Absolute Vertical Print Position in Page Mode</b>
<b>ASCII</b>	[GS]\$
<b>Hexadecimal</b>	1DH,24H
<b>Decimal</b>	<29><36>
<b>Description</b>	GS \$ sets the absolute vertical print starting position to $[n_L + n_H \times 256] \times x$ (vertical or horizontal motion units) in page mode.

---

<b>Function</b>	<b>Set Relative Vertical Print Position in page mode</b>
<b>ASCII</b>	[GS] \ <n <sub>l</sub> > <n <sub>h</sub> >
<b>Hexadecimal</b>	1BH 5CH <n <sub>l</sub> > <n <sub>h</sub> >
<b>Decimal</b>	<27> <92> <n <sub>l</sub> > <n <sub>h</sub> >
<b>Range</b>	0 ≤ n <sub>l</sub> ≤ 255 0 ≤ n <sub>h</sub> ≤ 255
<b>Description</b>	The [GS] \ <n <sub>l</sub> > <n <sub>h</sub> > command sets the print starting position based on the current position and the distance from the current position to $[(n_l + n_h \times 256) \times x]$ vertical or horizontal unit.

## Bar Code Commands

---

<b>Function</b>	<b>Print Bar Code</b>
<sup>1</sup> <b>ASCII</b>	GS k <m> <d <sub>1</sub> > ... <d <sub>k</sub> > NUL Mode 1 <m> between 0 and 6
<b>Hexadecimal</b>	1DH 6BH <m> <d <sub>1</sub> > ... <d <sub>k</sub> > 00
<b>Decimal</b>	<29> <107> <m> <d <sub>1</sub> > ... <d <sub>k</sub> > 0
<sup>2</sup> <b>ASCII</b>	GS k <m> <n> <d <sub>1</sub> > ... <d <sub>n</sub> > Mode 2 <m> between 65 and 73 <n> = Length of <d>
<b>Hexadecimal</b>	1DH 6BH <m> <n> <d <sub>1</sub> > ... <d <sub>n</sub> >
<b>Decimal</b>	<29> <107> <m> <n> <d <sub>1</sub> > ... <d <sub>n</sub> >
<b>Range</b>	<sup>1</sup> 0 ≤ m ≤ 6 (k and d depend on the bar code system used.) <sup>2</sup> 65 ≤ m ≤ 73 (n and d depend on the bar code system used.)
<b>Description</b>	The GS k <m> <d <sub>1</sub> > ... <d <sub>k</sub> > NUL command selects a bar code system and prints the bar code. If <m> is between 65 and 73, the length must be specified. If <m> is between 0 and 6, the data must be null terminated. (See the descriptions below.)

Mode	<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	$1 \leq k$	$48 \leq d \leq 57, 65 \leq d \leq 68$ $d = 32, 36, 37, 43, 45, 46, 47, 58$
2	65	UPC A	$11 \leq k \leq 12$	$48 \leq d \leq 57$
2	66	UPC E	$11 \leq k \leq 12$	$48 \leq d \leq 57$
2	67	JAN-13 (EAN-13)	$12 \leq k \leq 13$	$48 \leq d \leq 57$
2	68	JAN-8 (EAN-8)	$7 \leq k \leq 8$	$48 \leq d \leq 57$
2	69	Code 39	$1 \leq n \leq 255$	$48 \leq d \leq 57, 65 \leq d \leq 90$ $d = 32, 36, 37, 43, 45, 46, 47$
2	70	ITF	$1 \leq n \leq 255$ (even number)	$48 \leq d \leq 57$
2	71	Codabar	$1 \leq n \leq 255$	$48 \leq d \leq 57, 65 \leq d \leq 68$ $d = 32, 36, 37, 43, 45, 46, 47, 58$
2	72	Code 93	$1 \leq n \leq 255$	$0 \leq d \leq 127$
2	73	Code 128	$2 \leq n \leq 255$	$0 \leq d \leq 127$

Table 42 Bar Code System Based on &lt;m&gt;

[Description for <sup>1</sup>]

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

[Description for <sup>2</sup>]

<n> indicates the number of bytes of bar code data to be processed immediately following <n>. Additionally, <d> indicates the character code to be printed.

The following apply to both

GS k <m> <dl> ... <dk> NUL  
GS k <m> <n> <dl> ... <dn>:

If the horizontal width exceeds the printing area, the printer only feeds the paper. These commands feed as much paper as necessary to print the bar code according to the GS h command. 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. After printing a bar code, the print position is set at the beginning of the line. These commands are not effected by print modes (emphasized, underline, character size, etc.)



**Note:** Barcode 39 allows the "\*" character to be used as a start and stop flag. If the "\*" is used, the length specified must be at least as long as the desired barcode.

---

**Function Set Bar Code Height**

**ASCII** GS h <n>

**Hexadecimal** 1DH 68H <n>

**Decimal** <29> <104> <n>

**Range**  $1 \leq n \leq 255$

**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 Select Printing Position of HRI Characters**

**ASCII** GS H <n>

**Hexadecimal** 1DH 48H <n>

**Decimal** <29> <72> <n>  
**Range**  $0 \leq n \leq 3, 48 \leq n \leq 51$   
**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 43 Printing Position of HRI Characters

---

**Function** Select Font for HRI Characters

**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 44 Font for Human Readable Interpretation (HRI) Characters

---

**Function** Set Bar Code Width

**ASCII** GS w <n>  
**Hexadecimal** 1DH 77H <n>  
**Decimal** <29> <119> <n>  
**Range**  $2 \leq n \leq 6$   
**Description** The GS w <n> command sets the size of the bar code as follows.

N	Multi-level bar code	Binary-level bar code	
	Module width (mm)	Thin element width (mm)	Thick element width (mm)
2	0.250	0.250	0.626
3	0.375	0.375	1.001
4	0.500	0.500	1.251
5	0.626	0.626	1.627
6	0.751	0.751	2.002

Table 45 Horizontal size of the bar code



## Mechanism Control Commands

---

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

---

<b>Function</b>	<b>Partial knife cut</b>
<b>ASCII</b>	[ESC] i
<b>Hexadecimal</b>	1BH 69H
<b>Decimal</b>	<27> <105>
<b>Description</b>	The [ESC] i command performs a partial knife cut.

---

<b>Function</b>	<b>Perform a partial knife cut</b>
<b>ASCII</b>	[ESC] m
<b>Hexadecimal</b>	1BH 6DH
<b>Decimal</b>	<27> <109>
<b>Description</b>	The [ESC] m command performs a partial knife cut.

---

<b>Function</b>	<b>Sound buzzer</b>
<b>ASCII</b>	[BEL]
<b>Hexadecimal</b>	07H
<b>Decimal</b>	<07>
<b>Description</b>	The [BEL] command sounds the internal buzzer, if equipped.

---

<b>Function</b>	<b>Sound buzzer</b>
<b>ASCII</b>	[ESC] BEL
<b>Hexadecimal</b>	1BH 07H
<b>Decimal</b>	<27> <07>
<b>Description</b>	The [ESC] BEL command sounds the internal buzzer, if equipped.

## Miscellaneous Commands

### Function Set Horizontal and Vertical Motion Units

**ASCII** [GS] P x y

**Hexadecimal** 1DH 50H x y

**Decimal** <29> <80> x y

**Range**  $0 \leq x \leq 255$

**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.



**Note:** This feature is licensed from Epson, and is only available in the Full Epson Emulation of the firmware. Problems with this command are frequently caused by not using the correct version of the firmware. Contact Transact sales and/or technical support for this added cost option.

### 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**  $1 \leq n \leq 3$   
 $49 \leq n \leq 51$

**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	20H or 32D <sup>13</sup>
3,51	ROM version ID	2H or 2D.

Table 46 Printer ID

Bit	Off/On	Hex	Decimal	Function
0	Off	00H	<0>	No two-byte character code
1	Off	00H	<0>	Not Auto-cutter equipped
	On	02H	<2>	Auto-cutter 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 47 Type ID (<n> = 2 or 50)

### Function Generate Pulse

<sup>13</sup> The Epson Type ID and ROM version are based on the Epson TM-88 documentation and a sample printer. This value can be reconfigured to any 8 bit value.

**ASCII** [ESC] p <m> <t<sub>1</sub>> <t<sub>2</sub>>  
**Hexadecimal** 1BH 70H <m> <t<sub>1</sub>> <t<sub>2</sub>>  
**Decimal** <27> <112> <m> <t<sub>1</sub>> <t<sub>2</sub>>  
**Range** <m> = 0, 1, 48, 49  
 $0 \leq t_1 \leq 255$   
 $0 \leq t_2 \leq 255$

**Description** The [ESC] p <m> <t<sub>1</sub>> <t<sub>2</sub>> command sends a pulse (on time = <t<sub>1</sub>> 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 49, the pulse is sent to drawer-kick-out connector pin 5.

---

**Function** **Generate Pulse in real time**

**ASCII** [DLE] [DC4] <1> <m> <t>  
**Hexadecimal** 10H 14H <1> <m> <t>  
**Decimal** <16> <20> <1> <m> <t>  
**Range**  $0 \leq m \leq 8$   
 $0 \leq t \leq 8$

**Description** The [DLE] [DC4] <1> <m> <t> command sends a pulse specified by <t> in real-time to the connector pin specified by <m> as follows:

<m>	Connector pin
0	Drawer kick-out connector pin 2
1	Drawer kick-out pin 5



**Note:** This feature is licensed from Epson, and is only available in the Full Epson Emulation of the firmware. Problems with this command are frequently caused by not using the correct version of the firmware. Contact Transact sales and/or technical support for this added cost option.

---

**Function** **Execute power-off sequence**

**ASCII** [DLE] [DC4] <2> <a> <b>  
**Hexadecimal** 10H 14H <2> <a> <b>  
**Decimal** <16> <20> <2> <a> <b>  
**Range** a = 1  
b = 8

**Description** The [DLE] [DC4] <2> <a> <b> command executes the printer power-off sequence as follows:

Stores the values of the maintenance counter.

Transmits the following power-off status (Header + Status + NUL)

Power off status	Hex	Decimal	Amount of data
Header	3BH	59	1 byte
Status	30H	48	1 byte
NUL	00H	0	1 byte

Executes the printer power off

---

**Function** **Clear buffer(s)**

**ASCII** [DLE] [DC4] <8> d1...d7

**Hexadecimal** 10H 14H <8> d1...d7

**Decimal** <16> <20> <8> d1...d7

**Range** d1=1, d2=3, d3=20, d4=1, d5=6, d6=2, d7=8

**Description** The [DLE] [DC4] <8> command clears all data stored in the receive buffer and the print buffer.

Transmits the following three bytes of data

	Hex	Decimal	Amount of data
Header	37H	55	1 byte
Flag	25H	37	1 byte
NUL	00H	0	1 byte

Enters in standard mode

---

**Function** Select Peripheral Device Status

**ASCII** [ESC] = <n>

**Hexadecimal** 1BH 3DH <n>

**Decimal** <27> <61> <n>

**Range**  $1 \leq n \leq 3$

**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 48 Peripheral Device Bit Definitions



**Note:** Epson Customer display is not supported by the iTherm® 280 printer.

---

<b>Function</b>	<b>Real-Time Request to Printer</b>
<b>ASCII</b>	[DLE] [ENQ] <n>
<b>Hexadecimal</b>	10H 05H <n>
<b>Decimal</b>	<16> <5> <n>
<b>Range</b>	<n> = 0, 2
<b>Description</b>	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.
<b>Where &lt;n&gt;</b>	0 Recovers to on-line 2 Recovers from an error after clearing the receive and print buffers



**Note:** This feature is licensed from Epson, and is only available in the Full Epson Emulation of the firmware. Problems with this command are frequently caused by not using the correct version of the firmware. Contact Transact sales and/or technical support for this added cost option.

---

<b>Function</b>	<b>Enter Test Mode</b>
<b>ASCII</b>	[GS] ( A <2> <0> <n> <m>
<b>Hexadecimal</b>	1DH 28H 41H <2> <0> <n> <m>
<b>Decimal</b>	<29> <40> <65> <2> <0> <n> <m>
<b>Description</b>	This command places the printer into test mode based on the parameters <n> and <m>.
<b>Where &lt;n&gt;</b>	may be 0, 1, 2, 48, 49, or 50. It is intended to select the print station. The iTherm® 280 will accept any of these values
<b>Where &lt;m&gt;</b>	1 or 49 Selects Hex Dump mode. You must press the * Button to exit this mode 2 or 50 Selects Printer Configuration print out. 3 or 51 Selects Rolling ASCII test pattern. You must press * Button to exit this mode.

---

<b>Function</b>	<b>Print counter</b>
<b>ASCII</b>	[GS] c:
<b>Hexadecimal</b>	1DH 63H
<b>Decimal</b>	<29> <99>
<b>Description</b>	Sets the serial counter value in the print buffer and increments or decrements the counter value. <ul style="list-style-type: none"> <li>After setting the current counter value in the print buffer as print data (a character string), the printer counts up or down based on the count mode set</li> </ul>

---

<b>Function</b>	<b>Initialize maintenance counter</b>
<b>ASCII</b>	[GS] g 0 m nl nh:
<b>Hexadecimal</b>	1DH 67H 30H
<b>Decimal</b>	<29> <103> <48>
<b>Description</b>	Initializes the resettable maintenance counter to 0.
	• nl, nh specifies the maintenance counter number as (nl + nh x 256)

Counter number		Counter [Unit]
Hex	Decimal	
14	20	Number of line feeds: Roll paper
15	21	Number of energizing head: Roll paper
32	50	Number of autocutter operation
46	70	Print operation time

- Frequent write command executions by this command may damage the NV memory. Therefore, it is recommended to write to the NV memory no more than 10 times a day.

- While processing this command, the printer is BUSY while writing data to the NV counter memory and stops receiving data. Therefore it is prohibited to transmit data including the real-time commands during the execution of this command

**Function** Transmit maintenance counter**ASCII** [GS] g 2 m nl nh:**Hexadecimal** 1DH 67H 32H**Decimal** <29> <103> <50>

Description Transmits the value of the specified maintenance counter.

- nl, nh specifies the maintenance counter number as (nl + nh x 256)

Counter number		Counter [Units]	Kind of counter
Hex	Decimal		
14	20	Number of line feeds: roll paper	can be reset
14	20	Number of times energizing head: roll paper	
14	20	Number of autocutter operations	
14	20	Printer operation time	
14	20	Number of line feeds: roll paper	cumulative
14	20	Number of times energizing head: roll paper	
14	20	Number of autocutter operations	
14	20	Printer operation time	

- The contents of the maintenance counter are as follows:

	Hexadecima	Decimal	Amount of data
Header	5FH	95	1 byte
Data	30H-39H	48-57	1-10 bytes
NUL	00H	0	1 byte

- During the transmission of block data values in the maintenance counter, the printer ignores the real-time commands. Also, the printer does not transmit ASB even when the ASB is enabled. Therefore, the user cannot confirm changes in the printer status during these periods.
- The counter values may be different from the actual counts depending on time differences at power off or the occurrence of an error.

## Macro Function Commands

### Function Start/End Macro Definition

**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

**ASCII** GS ^ r t m

**Hexadecimal** 1DH 5EH r t m

**Decimal** <29> <94> r t m

**Range**  $0 \leq r \leq 255$

$0 \leq t \leq 255$

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  $t \times 100$  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 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	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 49 Macro Control Bit Definitions



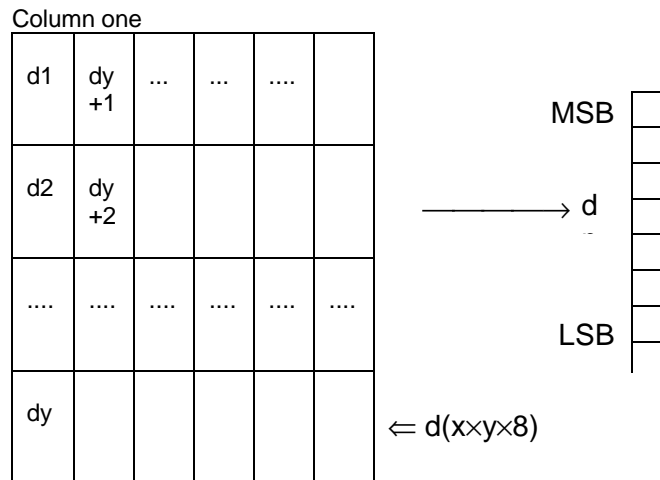
---

<b>Function</b>	<b>Delete Start-Up Macro Definition</b>
<b>ASCII</b>	GS _
<b>Hexadecimal</b>	1DH 5FH
<b>Decimal</b>	<29> <95>
<b>Description</b>	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 Images and Graphics Commands

---

<b>Function</b>	<b>Define user-defined bit image</b>
<b>ASCII</b>	GS - <Name..> <0> x y d <sub>1</sub> ... d(x x y x 8)
<b>Hexadecimal</b>	1DH 2DH <Name..> <0> x y d <sub>1</sub> ... d(x x y x 8)
<b>Decimal</b>	<29> <45> <Name..> <0> x y d <sub>1</sub> ... d(x x y x 8)
<b>Range</b>	1 ≤ x ≤ 255 1 ≤ y ≤ 255 0 ≤ d ≤ 255 <Name> = a 15-byte maximum length name to identify the image
<b>Description</b>	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),
PRINT #1, "MY IMAGE",CHR$(0);
PRINT #1, CHR$(1),CHR$(1);
PRINT #1, CHR$(255),CHR$(255),CHR$(255),CHR$(255);
PRINT #1, CHR$(255),CHR$(255),CHR$(255),CHR$(255)
```

```
REM Enter the GS command
REM Define the image name
REM Image size (8 x 8 bits)
REM Send 8 bytes of image
REM data
```

**Function** Print User-Defined Bit Image**ASCII** GS 0 <Name..> <0><m>**Hexadecimal** 1DH 30H <Name..> 0H<m>**Decimal** <29> <48> <Name..> <0><m>**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$(0) CHR$(0)  REM Enter the image name
```

Where <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

**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>

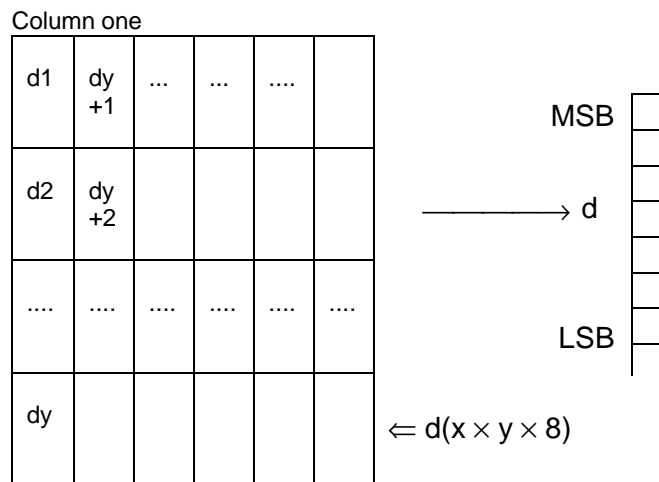
**Description** GS 5 erases the entire contents of the nonvolatile memory pool and frees up the memory for new entries.

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

**Function** Define Single User-Defined Bit-Image

**ASCII** GS \* x y d<sub>1</sub> ... d(x y x 8)  
**Hexadecimal** 1DH 2AH x y d<sub>1</sub> ... d(x y x 8)  
**Decimal** <29> <42> x y d<sub>1</sub> ... d(x y x 8)  
**Range** 1 ≤ x ≤ 255  
 1 ≤ y ≤ 48  
 0 ≤ d ≤ 255

**Description** The GS \* x y d<sub>1</sub> ... d(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**  
**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 50 User-defined Bit-image Resolutions

---

**Function**     **Save User-Defined Character Set**  
**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**  
**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**  
**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 iTherm® 280 Commands

The iTherm® 280 has a number of extended control commands designed to make operation and maintenance of the printer easier for the host application refer to the iTherm® 280 extended control discussion on page 170.

### Panel Button Commands

---

#### Function      Enable/Disable Paper Feed

**ASCII**            [ESC] p 5 <n>

**Hexadecimal**   1BH 70H 35H <n>

**Decimal**         <27> <112> <53> <n>

**Range**           0 ≤ n ≤ 255

**Description**    The [ESC] c 5 <n> command enables or disables the FEED Button.

**Where <n>**      Bit 0 = 1 the FEED Button is disabled  
                       Bit 0 = 0 the button is enabled.

### Paper Out/Low Sensor Commands

---

#### Function      Paper Low Sensor

**ASCII**            [ESC] p 4 <n>

**Hexadecimal**   1BH 70H 34H <n>

**Decimal**         <27> <112> <52> <n>

**Range**           0 ≤ n ≤ 255

**Description**    The [ESC] c 4 <n> command determines if the printer stops printing when paper low is detected.

**Where <n>**      0 Printer continues to print with paper low.  
                       1 Printer stops printing when paper low is detected.

---

#### Function      Paper Error Signal Control

**ASCII**            [ESC] p 3 <n>

**Hexadecimal**   1BH 70H 33H <n>

**Decimal**         <27> <112> <51> <n>

**Range**           0 ≤ n ≤ 255

**Description**    The [ESC] c 3 <n> command controls how the paper error pin on the parallel interface operates.

**Where <n>**      Bit 0 controls paper low operation.  
                       If Bit 0 = 1 Paper low will set the paper error pin.  
                       If Bit 0 = 0 Paper low will not effect the paper error pin.

                      Bit 2 controls how paper out effects the paper error pin.  
                       If Bit 2 = 1 Paper out will set the paper error pin.  
                       If Bit 2 = 0 Paper out will not effect the paper error pin.



**Note:** The paper out sensor will always stop printing.  
 The default setting allows only paper out to control the paper error pin.

The Epson section has the following description of the enable/disable paper feed command.

**Description** The [ESC] c 5 <n> command enables or disables the FEED Button. When the least significant bit (LSB) of <n> = one, the FEED Button is disabled; when it is zero, the button is enabled.

## **iTherm® Citizen Emulation**

The iTherm® 280 printer uses a subset of the Epson emulation for Citizen.

## **iTherm® Star Emulation**

The iTherm® 280 printer has Star emulation that will allow the iTherm to replace most Star printers with similar features to the iTherm.

Star used a real time cash drawer command that uses features patented by Epson. If you use the Star real time cash drawer command, you must use the added cost licensed firmware.

## **iTherm® Axiohm Emulation**

The iTherm® 280 printer has an Axiohm emulation that closely matches the A793 and A794 printers. The Axiohm command set (for the most part) is a superset of the Epson emulation. Because several of the Axiohm commands make use of features that patented by Epson, you must use the added cost licensed firmware to use these commands. If you don't need those commands and features, using the standard iTherm firmware will result in a lower cost printer.







**chapter**  
**7**

**iTherm<sup>®</sup> 280 Color Graphics**

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## Printing Graphics

The iTherm® 280 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>  ITHACA PRINTERS      <186>[CR][LF]
<186>                                <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]

```

Figure 18 Example Commands for a Sample Receipt

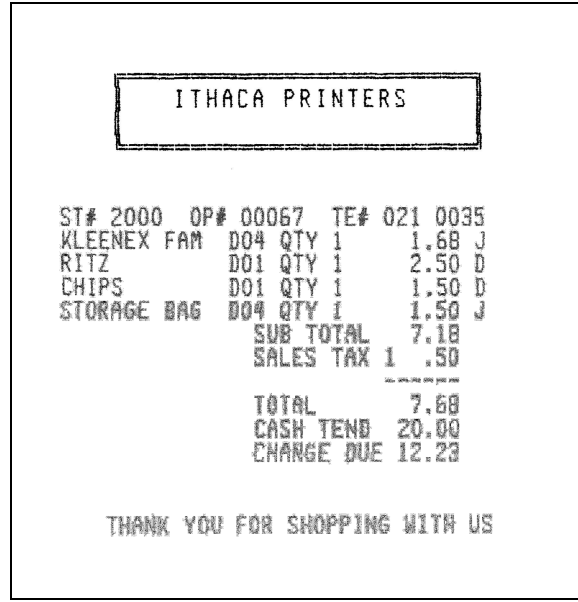


Figure 19 Sample Receipt

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 iTherm® 280 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 iTherm® 280 form control.
6. Make the resulting file available to your application, so it can be sent to the printer when required.

## Color Graphics

The iTherm® 280 is a two-color printer as rather than 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. Mixing yellow and cyan produces a green and mixing cyan, magenta, and yellow in equal amounts produces a black or gray. If the printer has a fourth cartridge, it will be black and conserves the color cartridges ink.

The iTherm® 280 is a two-color printer. It has white (the paper), and two predefined colors. Typically one of the colors is black, and the other is a highlight color. The high light color is primarily used in text printing to highlight a line, and typically is red.

When the iTherm® 280 generates graphics, both colors are used to generate the image. Because the program that generates the graphic image data should not need to be aware of the colors available in the printer, three color planes are sent to the printer. The printer is aware of what colors the cartridges are that will generate the image. The printer will convert the full color image information into a two color image.

If the iTherm® 280 printer is configured with a black color and a highlight color, there is no point in the printers mixing the highlight color with black. If however, the iTherm® 280 printer is configured with two colors other than black, the printer attempts to mix the colors to generate black. (Note that in text mode the colors are not mixed.) This requires that there be two basic modes of color graphic generation.

If the iTherm® 280 printer is configured with two colors, the printer will mix the two colors on the thermal paper, using the primary and the secondary color. Because there are three primary colors, the printer is unable to print full color. The printer follows the rules for mixing colors and if the result is ambiguous (because of the missing color), the printer will print with the primary color. This results in a image made up of primary color dots, secondary color dots and mixed dots. The mixed dots color may not be black but a mixture of whatever colors are installed.

In text mode, the primary color is assigned as the default color and the secondary color is assigned as the alternate highlight color. In most cases the darkest color should be initialized as the primary color.

The Ithaca® Windows print driver provides the translation from Windows color to the three color planes. When a graphic is created for the iTherm® 280 Printer, the colors used must take into account that colors other than the highlight color will print black. The Ithaca® Windows driver helps adjust the color content and generates the desired print from a full color image<sup>14</sup>.

**Procedure for color horizontal graphics:**

There are many ways to generate graphics for the iTherm® 280 printer. The easiest is to use the PJColor program. (See the next section.) The other way is to use the Ithaca windows driver and capture the output to a file.

To generate an image using the windows print driver:

1. Generate the graphic image in the program of your choice. Use colors consistent with the two colors installed in the printer.
2. Make sure the paper size you pick fits the printer (3 inches wide with 0.25-inch margins).
3. The iTherm® 280 print driver should be installed (even if the printer is not connected).
4. Set up the print driver to print the graphic to a file using whatever resolution is required.
5. Print the graphic image to a file.
6. Later, when you want to print the graphic, simply copy the file to the printer with your application.
7. You may also copy the graphic to the graphic save buffer and then request the printer to retrieve and print it without re-sending the graphic data.

Optionally, process the color image with the Ithaca® color image processor<sup>14</sup> in the PJColor program. The program can print the image or generate a printable file.

---

<sup>14</sup> 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.

## iTherm® 280 Universal Color Graphics

Starting with Version 1.88 of the iTherm® 280 Printer firmware supports the ability to print two color graphics in all emulations. This support is an enhancement to the original TM-U200, ESC/POS, Star, and Citizen printer emulations.

The intent of Universal Color Graphic support is to allow the iTherm® 280 color graphics capability to be used in existing applications that do not support color graphics.

There are several ways to add color graphics to an existing application. The easiest for you will depend on how much control you have over your application. At a minimum, you

should be able to change the name printed on the top of a receipt. With the PJColor<sup>15</sup> program you can store a named graphic into the printer and print it by changing the text name to match the stored graphic. For example, if your receipt has a name like "Joe's Market", you can save a graphic in the printer named "Joe's" and then change the "Joe's Market" to "&%URJoe's&". When the iTherm® 280 finds "&%URJoe's&", it is replaced with the stored graphic.

Some applications allow a graphic file to be sent to the printer. In this case PJColor can generate the graphic file and then your application can send it to the printer. This file will support two color print.

PJColor also has a feature that will allow you to generate a file that will define the graphic to be stored into the printer. You can then use this file to setup any number of printers with the same graphic.

If you are using a windows print driver (other than the Transact iTherm® 280 driver) to support your printer, you will not be able to send color graphics to the printer through the print driver. The print driver will not support universal color graphics. You can however, store the graphic in the printer and use IPCL commands to print the stored graphic. (You must select a printer resident font for this to work.)

The following is a short summary and how to description of these features.

## Print File Graphics

PJColor can generate a print file that may be sent to the printer in any emulation and produce a two color print graphic.

### To generate a print file.

- 1) Start PJColor
- 2) Under Settings, Select the iTherm® 280 printer. Then select the emulation that machines the printer.
- 3) Select the resolution you would like to have the printer use to print the graphics. Low resolutions are faster, high resolutions produce better graphics.
- 4) Load the graphics Image you wish to print.
- 5) Select the communications port and configuration.
- 6) Adjust the image to produce the effect you would like. The lower graphic window displays an approximation of the printed image.
- 7) When you are satisfied with the graphic, press the "Print to a File" button. PJColor will ask what file you would like to receive the print data.
- 8) This file can be sent to the printer and the graphic will be printed.

---

<sup>15</sup> The PJColor program has been enhanced to provide several ways to create color Logos and Coupons and make them available to the iTherm® 280 printer.

## Store Graphics in the printer:

PJColor can store a graphic in the iTherm<sup>®</sup> 280 Printer or generate a file that will store a graphic in the printer.

### To Store a graphic in the printer

- 1) Start PJColor
- 2) Under Settings, Select the iTherm<sup>®</sup> 280 printer. Then select the emulation that you will be setting the printer to.
- 3) Select the resolution you would like to have the printer use to print the graphics. Low resolutions are faster, high resolutions produce better graphics.
- 4) Select the communications port and protocol that is to be used to communicate to the printer.
- 5) Load the graphics Image you wish to print.
- 6) Adjust the image to produce the effect you would like. The lower graphic window displays an approximation of the printed image.
- 7) When you are satisfied with the graphic, press the "Store in Printer" button. PJColor will attempt to interrogate the printer and will display the graphics currently in the printer if any. (Note: If PJColor cannot communicate with the printer, only the "Save to File" option will be allowed.)
- 8) Make sure there is enough room in the printer for the graphic.
- 9) Insert a name in the "Macro Name" box. Keep it simple, this name will be used later to print the graphic.
- 10) Record the graphic in the printer.

### Print a stored graphic.

In the data stream to the printer enter "&%URName&" and the graphic will print in place of the "&%URName&" data. The "Name" must be identical to the name entered earlier.

### Generate a file to store graphics into a printer

To generate a file that will store a graphic into a printer, follow the same procedure to store a graphic in a printer up through step 8. Then:

- 1) Insert a name in the "Macro Name" box. Keep it simple, this name will be used later to print the graphic
- 2) Press the "Save to File" button. This will allow you to select a file where the stored universal graphic information is saved.
- 3) This file contains an "erase any previous graphic with the same name" command, "a save new graphic with this name" command and the graphics information.
- 4) This file can then be sent to the printer and the graphic will be saved in the printer. Note: If the target printer does not have enough room for the graphic information to be stored, the graphic will not be stored.

## How universal graphics is done

The printer extends all the emulations to support two additional escape sequences and adds limited IPCL support.

IPCL (Ithaca Printer Control Language) is an ASCII method of sending printer commands to the printer. In Ithaca PcOS emulation, IPCL command support is extensive. In other emulations, IPCL support is limited to the following commands.

&%CR	Insert a [CR]
&%LF	Insert a [LF]
&%UAxxx	Feed xxx paper steps and cycle auto-cutter
&%CLx	Select Color where x = 0 for the Primary or 1,2,3 for secondary
&%UBName&	Begin defining universal graphic "Name"
&%UGName&	End the definition of "Name"
&%URName&	Run (print) universal graphic "Name"
&%UDName&	Remove universal graphic "Name" from nonvolatile memory
&%USName&	Flag universal graphic "Name" to be run when the printer is turned on
&%UFALL&	Erase all stored universal graphics. (Erases all User Store)
&%UQ&	Prints a directory of the universal graphics currently stored in the printer
&%UTx	Changes the Name termination character from "&" to "x". "x" may range from 21H to 255H



**Note:** The & used to flag the end of the Name string is not valid in PcOS Ithaca emulation mode. You should use <0> or define the terminator with the &%UTx command.

The extended Escape sequences are [ESC][US]... and [ESC][FS]...

The [ESC][US] commands are the same as the PcOS emulation. The [ESC][FS] commands are not intended to be used by the customer. They provide the universal graphics support. Because graphics would be very difficult to generate and are not supported by any graphics drives other than PJColor .

## How to use IPCL commands in text strings

If your software allows you to pass text strings to the printer, you should be able to use the universal graphics commands. Most POS software allows user customization of the text message printed at the beginning and the end of the receipt.

To use the Universal IPCL commands simply place them in a text string like the following example; note that your results may vary depending on the operation system, software and the ability to pass ASCII Characters.

### Load and store named graphic image

- First you must create the graphic image using the PJColor Color Image Converter and save the image to a file. See the section “**Generate a file to store graphics into a printer**” above.

- Send the following text strings to the printer using whatever means is available to you.
  - &%UBLogo& Begin defining macro "Logo"
  - &%UGLogo& End the Definition of "Logo"
  - &%UMLogo& Save Macro "Logo" to nonvolatile memory
- A graphic image named "Logo" should now be stored in the nonvolatile memory.
- To verify the image is present, use the "&%UQ&" IPCL command or the PjColor Color Image Converter to print the name and size of the stored images.

### **Recall and print stored named graphic image**

- Send the following text string to the printer using whatever means is available to you.
  - &%URLogo& Run Macro "Logo" (Print the macro)

### **Cautions**

Universal graphics information is stored in the same place as user defined characters and user defined macros. If you are using an emulation such as ESC/POS that supports macros and/or user defined characters, universal graphics will compete for space with these functions. In addition, the "&%UFALL&" (Erase universal graphics) will also erase any user defined graphics and macros.

If you are using the Ithaca PcOS emulation, these commands are identical with the User Store commands except for the terminator character. You may change the NUL terminator to "&" with "&%UT&" if you find the "&" easier.

## Universal Color Command Descriptions

---

### **&%UB <Name..>& Begin named universal graphic record**

**IPCL**            &%UB <Name..>&

**Description** The &%UB <Name..>& command initializes the universal graphic buffer structure, and redirects the following data to the universal graphic 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 universal graphic record" command with the same name. If the data that follows is larger than the universal graphic buffer (about 16K), the universal graphic definition is terminated without saving any data.

---

### **&%UG <Name..>& End named universal graphic record**

**IPCL**            &%UG <Name..>&

**Description** The &%UG <Name..>& command ends the universal graphic record operation and saves the universal graphic to flash. It uses the <Name..> field to verify the command end and must match the "Begin named universal graphic record" command. If the name already exists in the flash user store or the universal graphic memory is exceeded, the command is invalid, and the <Name..> field prints.

---

### **&%UR <Name..>& Run universal graphic data from user store**

**IPCL**            &%UR <Name..>&

**Description** The &%UR <Name..>& command loads the referenced universal graphic into the universal graphic buffer. The universal graphic buffer is then inserted into the data stream. If the named item does not exist or is not a universal graphic, the iTherm® 280 ignores the command.

---

### **&%US <Name.. >& Flag item as a start-up universal graphic**

**IPCL**            &%US <Name.. >&

**Description** The &%US <Name.. >& command flags the referenced item to be processed at startup. Only one user character definition and one universal graphic may be flagged to run at startup.

---

### **&%UD <Name..>& Delete item from user store**

**IPCL**            &%UD <Name..>&

**Description** The &%UD <Name..>& command removes an item from user store and frees up space. If the item does not exist, the iTherm® 280 ignores the command.

---

### **&%UFALL& Flush information from user store**

**IPCL**            &%UFALL&

**Description** The &%UFALL& command clears all entries in user store and frees the data space. It must have the name, "ALL" (in uppercase) attached.

---

<b>&amp;%UQ&amp;</b>	<b>Report on user store</b>
<b>IPCL</b>	&%UQ&
<b>Description</b>	The &%UQ& command prints a status report. The intention of the command is to aid in universal graphic development.

---

<b>&amp;%UT&lt;n&gt;</b>	<b>Redefine User Store Termination Character</b>
<b>IPCL</b>	&%UT<n>
<b>Description</b>	This command allows the terminator used to signal the end of the name field in User Store commands to be modified. The value of <n> is used for the terminator. The value of n may be from 0 to 255.
<b>Example</b>	If &%UT% were sent to the printer the User Store command to run universal graphic "Demo" would be &%URDemo%.

---

<b>&amp;%CL</b>	<b>Set Print Color</b>
<b>IPCL</b>	&%CL <n>
<b>Description</b>	This command allows various colors to be selected on printer emulations that do not support color text.
<b>Where n:</b>	0      Print with the Left cartridge (Typically Black) 1, 2, 3 Print with the Right cartridge (Typically Red, Blue, or Green)

---

<b>&amp;%UA</b>	<b>Cycle Auto-Cutter</b>
<b>IPCL</b>	&%UA <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >
<b>Description</b>	This command feeds m/96 inches of paper and cycles the auto cutter.
<b>Where m:</b>	$m = m_1 * 100 + m_2 * 10 + m_3$

## iTherm® 280 Coupon-Cut-Logo Feature

The iTherm® 280 printer has a feature that will allow a coupon and or logo graphic to printed as part of the existing auto cutter command.

To activate this feature, it must first be configured. Configuration consists of specifying in what order the Coupon-Cut-Logo is processed and optionally, how much paper is to be feed after the new cut operation.

Once configured, the Coupon and/or logo must be defined and loaded into the printer. The "Universal Graphics" feature should be used to define and load the graphic. The Coupon is named "Coupon", and the Logo is named "Logo". They may be saved in any resolution and of any size. They also need not be all graphics.

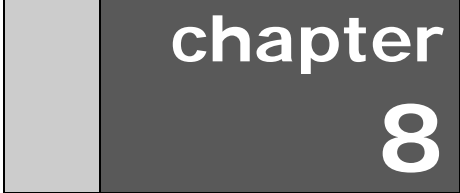
The existing application cut command will be replaced by the Coupon-Cut-Logo operation. Configuration options are as follows:

Cut Command Logo:

Cut-Logo	Perform Feed to cut, then cut, and then print the Logo.
Coupon-Cut	Print the Coupon, Feed to Cut, and Cut.
Logo-Cut	Print the Logo, Feed to Cut, and Cut.
Cut-Coupon	Perform Feed to cut, then cut, and then print the Coupon.
Coupon-Cut-Logo	Print the Coupon, Feed to cut, Cut, ad then print the Logo.
Logo-Cut-Coupon	Print the Logo, Feed to cut, Cut, ad then print the Coupon.
Cut-Logo-Coupon	Perform the Feed to cut, Print the Logo and then the Coupon.
Cut-Coupon-Logo	Perform the Feed to cut, Print the Coupon and then the Logo.
Logo-Coupon-Cut	Print the Logo, then the Coupon, feed to cut and Cut.
Coupon-Logo-Cut	Print the Coupon, then the Logo, feed to cut and Cut.
Disabled	Perform the Normal cut.

Cut Command Logo Feed: 0 to 80 mm.



A graphic consisting of a dark gray rectangle with a thin black border. The left side of the rectangle is a lighter gray vertical bar. The text "chapter" is written in white lowercase letters, and the number "8" is written in white uppercase letters, both centered within the dark gray area.

**chapter  
8**

**Unicode and Fonts**

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## Unicode and Fonts

### Fonts

Your TransAct® ITherm 280 printer uses outline and/or stroke based scalable fonts. These fonts provide you with additional font options as well as improved character appearance, while functioning transparently within legacy applications.

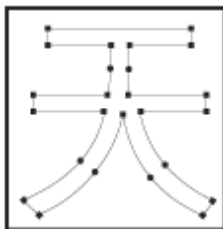
Such fonts represent a substantial improvement to the so-called bitmap fonts that are traditionally used for thermal printers, which are based on a pixel by pixel definition of characters. With a fixed size and fixed character spacing, these bitmap fonts were limited to specific magnification factors from 2-8X, and required scaling and smoothing at larger font sizes. Moreover, such scaling and smoothing operations were often unsuitable for complex fonts such as Asian characters, where changes to pixel layout actually risk changing character meanings.

To take full advantage of scalable fonts, the ITherm 280 supports additional commands and features, including:

- 1) Character size selection by points
- 2) Character pitch selection by points
- 3) Variable character spacing if desired
- 4) Custom fonts
- 5) Unicode support for international language support
- 6) Enhanced code page support for ASCII based applications.

### Character Generation

The font technology in the ITherm 280 printer uses standard outline fonts (sometimes referred to as TrueType fonts) or stroke fonts. Both technologies are scalable, however each has unique advantages.



#### Outline characters

Outline characters use points along the edge of the character to describe the character. The character generator defines the edge and then fills in the enclosed space to define the character.

This type of character generation produces very well formed characters and produces the best looking characters. However, it requires more storage than stroke fonts, and is best for non-Asian fonts.



**Stroke-based characters**

With stroke based characters, the points stored are along the center line. Less than half the points are needed to render stroke based characters. This improves character-generation performance and uses less space.

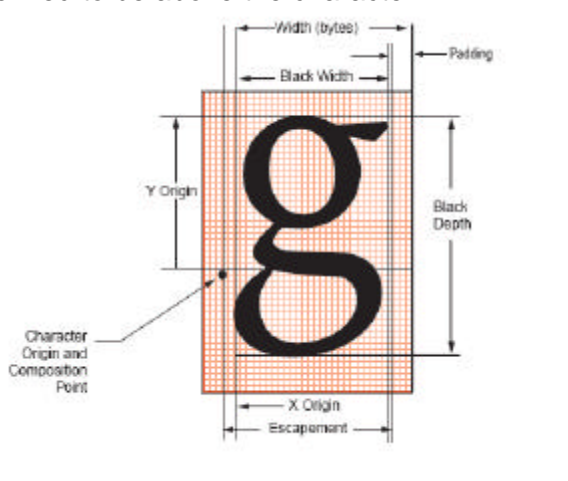
This type of character generation is fast and efficient, and is ideally suited for Asian fonts.

**Character Definition**

True Type and Stroke fonts are designed as a complete font with character cell size and character position in the cell based on the overall font design. Typically the characters are defined as vectors and stored as coordinates on a character cell grid. The grid is in an arbitrary design unit and may be up to 4096 units on a side.

In most systems character sizes is specified as a point size where the point size refers to the character height. The character width is typically variable and designed to produce the optimal appearance. The font rendering system must take the requested point size and generate a character based on the original design units and produce a character that is the correct size and position for the printer.

In most font designs, the vertical point size includes white space between lines. The font designer defines the height of the character cell in design units for all characters then defines a character origin that will be used for all the characters in the font. The designer then defines individual character sizes based on how the font is supposed to look and all the characters that are to be included. Characters are then positioned in the cell based on this origin. All characters in the font are then based on the same rules. The white space between lines is defined to be above the character.



The information available at print time is listed above. The complete cell is not provided, only the escapement, black width and depth and the x and y offsets to the origin are available. The printer cannot arbitrarily shorten the cell height that was defined by the font designer even though the provided character may fit in a smaller space. Using these rules, may result in characters that at first appear too small with excessive white space between lines, however this is how the font was designed. The printer must allow the minimum line spacing based on the

point selection and not on the actual character height of any given characters. Second guessing the font designer can have very bad results when character are encountered that use the full cell.

Asian fonts require slightly different rules for character placement and are not as one would expect. The Asian ideographs are positioned on center of mass, rather than on a baseline. The Latin data in Asian typefaces must be built on the same rules. As a result, when Latin characters are scaled the expected baselines do not line up. Asian fonts are also fixed pitch, however, Latin character in the font are basically  $\frac{1}{2}$  the width of the typical Asian character.

### Character Size

The character generation engine used in the ITherm 280 internally uses a standard point based system to specify the character size. One point is  $\frac{1}{72}$  of an inch. Therefore a 72 point character would form a character suitable to generate one line per inch printing. The typical application might refer to a 12 point character. This is the character height and not the width. The character width typically varies on character by character bases; for example, the lower case "i" is much narrower than the upper case "W".

Font selection commands for selecting character sizes in legacy applications are also supported. For printers such as the ITherm 280, two or three character sizes are generally predefined with a dot matrix size of 10x24 or 13x24 dots, and this fixed size may then be double or tripled to provide larger characters when needed. To supply legacy support, the ITherm 280 will automatically select the appropriate character size to support the legacy font and character scaling commands.

In the ITherm 280, the horizontal and vertical point size may be set independently. Typically this type of printer would print a tall, narrow, mono-spaced character. Tall narrow mono-spaced character provides a very readable print with easy column alignment while using less paper than standard type fonts. This type of font is sometimes referred to as a condensed font.

### Selecting Character Size

The ITherm 280 provides two ways to specify character size. The legacy or classic font selection method is based on dot matrix size. The second method is based on the standard type points system. The advantage of the type point system is that the print produced by the printer will match what is displayed by the host system, as both use the same system for describing the characters produced.

### Legacy or Classic Method

With the classic method, the application selects a character size and then sets the character spacing by adding or removing dot spaces between the characters. Using the scaled font, the ITherm 280 provides 3 basic predefined character sizes. The smallest is a 10x24 dot-like<sup>16</sup> font and is typically printed in pitches from 16 to 20 characters per inch (CPI). The next larger font is 13 x 24 dot-like, and is typically printed in pitches from 14 to 16 CPI. The largest font is 14 x 24 dot-like font and is typically printed at pitches from 10 to 14 CPI.

The ITherm 280 always prints at 203 dots per inch (dpi) and always uses the scalable font to form characters. The resulting characters are not necessarily exactly the dot size indicated, but

---

<sup>16</sup> Characters are dot-like because they are not guaranteed to be exactly at an exact dot equivalent. They are spaced in a fixed character cell that provides equivalent spacing and alignment as a fixed character size, however the actual character size is defined by the font designer.

are always spaced in a fixed dot cell provided that the legacy commands are used. Adding or subtracting space between characters achieves different character pitches with a fixed character cell size. As each dot has a fixed size and position, only specific pitches are possible.

Character spacing may also be selected by requesting a print pitch based on characters per inch. Once again, the results are not exact.

If the requested spacing is zero, the character spacing will be defined by the character definition, and will result in variable spacing.

### **Line spacing**

The legacy commands select line spacing as lines per inch. With scalable characters, the lines per inch is a minimum spacing. If a character is larger than the spacing between lines, the line spacing will be increased to allow enough room for the characters on that line.

### **Selecting character size by points.**

In addition to the legacy or classic method of character size selection, the ITherm 280 allows selection by point size. Point sizes from 4 to 72 points may be selected for both the horizontal and vertical axes. If a horizontal point size of zero (0) is selected for the horizontal spacing the characters are printed using variable spacing based on the character definition, using the vertical point size for the horizontal point size.

To provide fine control over character size, two commands are available, one of which specifies the size in points, and the other of which specifies the size in ¼-point increments.

If the font is a stroke font, the boldness of the characters is controlled through variations in individual stroke width.

## **Internal Fonts**

The ITherm 280 is provided by default with a standard WGL4 outline-based font, and optionally with an additional GB18030 stroke-based font. Additional user defined outline or stroke fonts may be used as required.

The default font provided with the ITherm 280 is called "Andale Mono Regular" from Monotype. This is a fixed-pitch font that produces good results when compared to legacy bitmap fonts. As another alternative, the printer may be ordered with a variable-pitch font, which will allow variable-pitch printing.

### **Character Cache**

The ITherm 280 supports a high speed character cache that can cache character bitmaps, outlines, tiles, or bands of characters. The caching technique is based on a least-recently used (LRU) algorithm. The Cache contains an entry for each size of character used. The amount of space in the cache used by each character is dependant on the size of the character.

At power up, the character cache is empty. The first ticket will require that all characters to be printed be generated from the vector data. This will typically make the first ticket slightly slower than subsequent tickets. It is also possible to define a user defined font with different metrics that will cause the cache to be flushed when any of the user characters are being accessed. If this should occur, the user defined font should be changed to match the other fonts in the printer.

## Custom Fonts

The ITherm 280 supports TrueType fonts. There are several companies that will provide custom character sets. The ITherm 280 uses fonts provided by Monotype. You can contract Monotype through their website [www.fonts.com](http://www.fonts.com), or by phone in U.S. & Canada (toll-free 1-800-424-8973, directly at 1-781-970-6020), or the United Kingdom (Free Phone 0800 371242, direct +44 (0)1737 765959.)

## Stacked or Linked fonts

The ITherm 280 also uses a font stacking technology where fonts are linked together. This means that as each character is looked up, the first font in the stack containing the character is then printed. For example, if a customer would like to replace several standard characters with custom characters, a user defined font can be provided that would, if first in the link, replace the characters in the standard font.

It may also be desirable to stack fonts to provide a precedent for how individual characters are looked up. For example:

- An application may wish to alter the appearance of several characters for security.
- It might be necessary to define a group of special symbols for a specific application.
- It might be necessary to supplement a font with special characters like OCR characters.

To provide this flexibility, the ITherm 280 has the ability to link up to 8 fonts together. When this is done, the first font in the link is searched first. If the character is not defined, the next font in the link is searched. This process is continued until the character is found or the last font is searched.

There are two ways to define a linked font. This first is to define a default linked font in the POR.INI file. If a link font is defined in the POR.INI file, it will be selected as the default power on font. Selecting font 0 will select the linked font provided that a link font is defined.

It is also possible to dynamically define a linked font. This requires that the fonts to be linked be aliased to a font id in the POR.INI file. Defining a linked font does not necessarily activate it. If the linked font was not already active, it must be selected by selecting font 0.

## Font Storage

The ITherm 280 supports a Flash file system used to store fonts, custom graphic and custom macros. A file system interface is provided for this system, where the host application may download files. In addition, TransAct Technologies provides a file loading tool that runs on Windows® based systems.

To allow flexible and easy support for all kinds of fonts, fonts are stored in the ITherm 280 printer as a standard font file. These files are typically not visible to the user, however; TransAct Technologies provides a support tool that will allow the user to load their own font directly from Windows and change the way fonts are printed. It is also possible for the host application to load fonts into the printer.

The printer can contain up to 99 unique and selectable fonts. Any font may be selected at any time. In addition up to 8 fonts may be linked or stacked together. Some standard character size

and character pitch commands are supported as legacy commands. The appearance of the print using those commands has been optimized using the TransAct WGL4 font. If you elect to use your own font, or the GB18030 font, you may wish to use the scalable font control commands to select the character size and spacing rather than the legacy commands.

TransAct Technologies provides a basic WGL4 font with the printer. This may be supplemented or replaced with a GB18030 Chinese font upon request. The printer will accept TrueType and compressed stroke fonts as defined by Monotype. If required, the customer may supplement the TransAct supplied fonts with their own custom fonts.



**WARNING:** If you elect to load fonts into the printer you must have proper rights to that font. **Do not** download a font to the printer if you do not have the right to use the font as a downloaded printer font.

## Unicode

As computer systems started to address more and more international environments, the classic ASCII standard with code pages became unworkable. Several competing systems were developed, however it was clear that a standard needed to be developed. In 1991 Version 1.0 of the Unicode standard was developed, to standardize how and where characters are to be addressed in an expanded addressing scheme. In 2000 Version 3.0 of the Unicode standard was published and generally accepted. The ITherm 280 follows this standard for character placement and encoding<sup>17</sup>.

**Note:** If a custom font is used that is not in Unicode order, the order of the font will be used as if it were in Unicode order. Any subsequent character mappings will assume to be in Unicode order and may not produce the desired effects.

## Unicode Encoding

The ITherm 280 Printer supports Unicode character addressing using Unicode Transform Format or UTF as defined in the Version 3.0 Unicode Specification. There are several forms of UTF encoding.

UTF-16 is the most straightforward way to access characters above 255. UTF-16 essentially sends two 8-bit bytes that form a 16-bit address to access the desired character. Basic UTF-16 does not define the byte order. If you wish to use UTF-16 and allow the printer to determine the byte order, you must send the byte order mark (0xFEFF) before you send any characters. To prevent loss of byte order synchronization, you should periodically send the byte order mark to resynchronize the printer with your application. If UTF-16 is selected, all data sent to the printer must be 16 bits. All commands and command parameters are also 16 bit, however only values between 0 and 255 are valid. Note that 24 bit encoding is not supported.

UTF-16BE uses the big-endian method of sending the two bytes. This method sends the high byte first and then the low byte. It is not required to send the byte order mark (0xFEFF) for the correct byte order to be initialized. However, to prevent loss of byte order synchronization, you should periodically send the byte order mark to resynchronize the printer with your application. If

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<sup>17</sup> The Version 3.0 Unicode standard defines a 24 bit addressing method that is not supported by the Epic 430™. The Epic 430™ is limited to a 16-bit address value. Values greater than 65535 will be truncated to 16 bits.



UTF-16BE is selected, all data sent to the printer must be 16 bits. All commands and command parameters are also 16 bit, however only values between 0 and 255 are valid.

UTF-16LE uses the little-endian method of sending the two bytes. This method sends the low byte first and then the high byte. It is not required to send the byte order mark (0xFEFF) for the correct byte order to be initialized. However, to prevent loss of byte order synchronization, you should periodically send the byte order mark to resynchronize the printer with your application. If UTF-16LE is selected all data sent to the printer must be 16 bits. All commands and command parameters are also 16 bit, however only values between 0 and 255 are valid.

UTF-8 uses a Multiple Byte Character Sequence (MBCS) to identify the desired Unicode character. This encoding method is less straightforward but preserves some of the 8-bit character of ASCII encoding.. This method uses unique bit sequences at the MSBs of a byte to determine its location and meaning within the MBCS encoding. See the table below for more information. If UTF-8 is selected all data sent to the printer must be encoded. All command parameters over 127 must be encoded in UTF-8.

UTF-8TXT uses a Multiple Byte Character Sequence (MBCS) to identify the desired Unicode character. This encoding method is identical to UTF-8 except command parameters over 127 are not UTF-8 encoded. They must be sent unmodified as 8-bit values.

**Note:** Extended UTF encoding past 65534 is not supported in UTF-16 or UTF-8. Only Unicode addresses from 0 to 65534 are supported by the ITherm 280 Printer.

Scalar Value	1 <sup>st</sup> Byte	2nd Byte	3rd Byte
00000000xxxxxxx	0xxxxxxx		
00000yyyyyxxxxxx	110yyyyy	10xxxxxx	
Zzzzyyyyyyxxxxxx	1110zzzz	10yyyyyy	10xxxxxx

NOTE: 4 byte encoding is not supported.

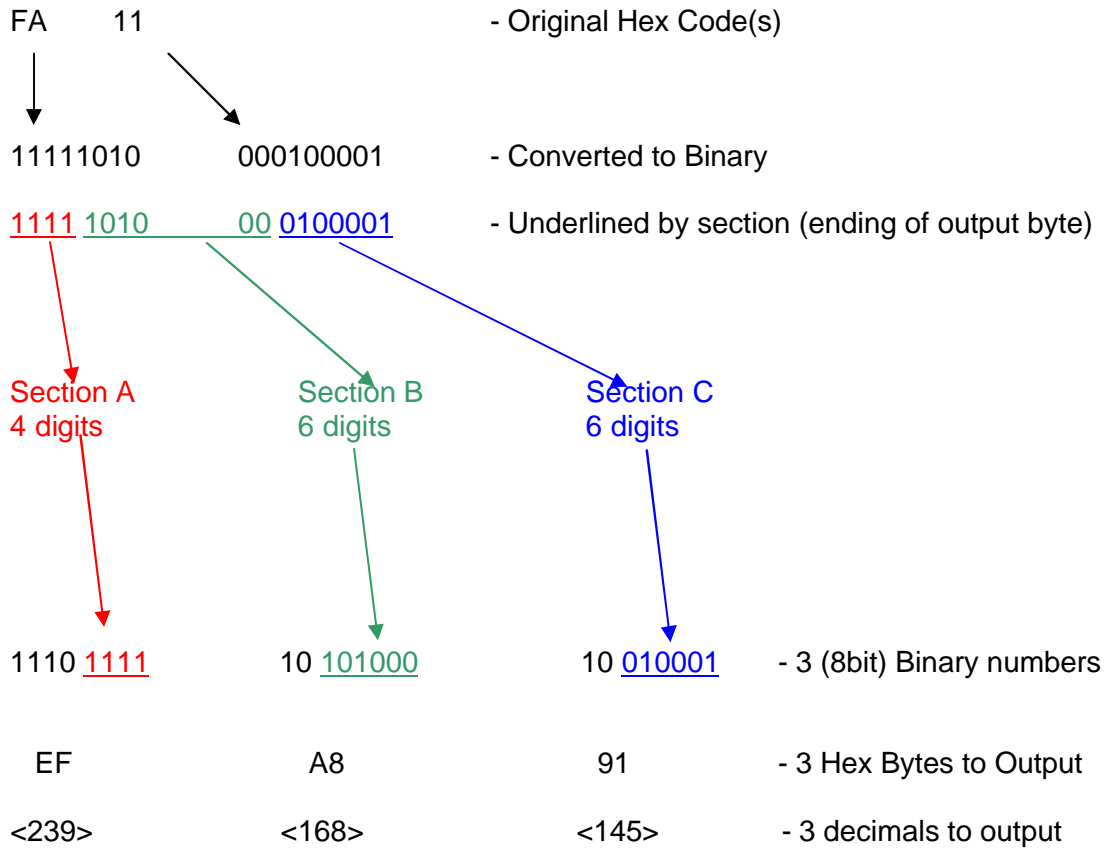


UTF-8TXT is probably the easiest mode to use. It allows normal 8 bit commands and graphics while still supporting the full Unicode character encoding range. Typically ITherm 280 Printers are shipped set to this mode.

### Unicode Encoding Example

3 Byte output Example

Hex Character Code: FA11



## Bitmap Fonts

It is possible to use bitmap fonts with the iTherm 280 Printer. Bitmap fonts are fixed pitch and are not scalable. They will only function as legacy fonts. The printer is optionally supplied with 4 legacy bitmap fonts. They are in a 10x24, 12x24 draft font format and a 16x24 near letter quality format. They are defined as follows:

```
BMFont0 = chr10x24.bft10 x 24 draft font with typical spacing of 16 characters per inch
BMFont1 = chr12x24.bft12 x 24 draft font with typical spacing of 14 characters per inch
BMFont2 = chr16x24.bft16 x 24 NLQ font with typical spacing of 12 characters per inch
BMFont4 = ocr16x24.bft16 x 24 OCR font with typical spacing of 12 characters per inch
```

It is possible to define a custom bitmap font. Transact supports a bitmap font compiler that will convert a bitmap font picture file into a compressed bitmap file that may be loaded into the printer as a bitmap (.bft) font file.

The input to the program is a text file in a predefined format consisting of a font description and then character definitions consisting of the character ID and then the character definition. The format is as follows: (Note lines preceded with # characters are comments.

```
# 11 by 24 font with a base line at 22
# F=X is not used in Thermal Products
W=11 H=24 B=22 F=0
; N=0000 U=0000 NULL
01 .....
02 .....
03 .....
04 .....
05 .....
06 .....
07 .....
08 .....
09 .....
10 .....
11 .....
12 .....
13 .....
14 .....
15 .....
16 .....
17 .....
18 .....
19 .....
20 .....
21 .....
22 .....
23 .....
24 .....
; N=0001 U=0020 SPACE
01 .....
02 .....
```

03 .....  
04 .....  
05 .....  
06 .....  
07 .....  
08 .....  
09 .....  
10 .....  
11 .....  
12 .....  
13 .....  
14 .....  
15 .....  
16 .....  
17 .....  
18 .....  
19 .....  
20 .....  
21 .....  
22 .....  
23 .....  
24 .....

; N=0002 U=0021 EXCLAMINATION MARK

01 .....  
02 .....  
03 ...00.....  
04 ...00.....  
05 ...00.....  
06 ...00.....  
07 ...00.....  
08 ...00.....  
09 ...00.....  
10 ...00.....  
11 ...00.....  
12 ...00.....  
13 ...00.....  
14 ...00.....  
15 ...00.....  
16 ...00.....  
17 .....  
18 .....  
19 .....  
20 ..0000.....  
21 ..0000.....  
22 ..0000.....  
23 .....  
24 .....

; N=0003 U=0022 QUOTATION MARK

01 .....  
02 .....  
03 .00..00....  
04 .00..00....

```

05  .00..00....
06  .00..00....
07  .00..00....
08  .....
09  .....
10  .....
11  .....
12  .....
13  .....
14  .....
15  .....
16  .....
17  .....
18  .....
19  .....
20  .....
21  .....
22  .....
23  .....
24  .....
; N=0004 U=0023 NUMBER SIGN
01  .....
02  .....
03  .....
04  .....00....
05  ..00.00....
06  ..00.00....
07  ..00.00....
08  ..00.0000..
09  ..0000000..
10  0000000....
11  0000.00....
12  ..00.00....
13  ..00.00....
14  ..00.0000..
15  ..0000000..
16  0000000....
17  0000.00....
18  ..00.00....
19  ..00.00....
20  ..00.00....
21  ..00.....
22  .....
23  .....
24  .....

```

The characters must be in sequential order and must be assigned Unicode character codes. N=0001 is a sequence number in hex and is not used in controlling character generation or order. U=0021 is the Unicode address in hex and the characters must be in ascending Unicode address order.

## File system and the POR.INI file

The ITherm 280 Printer supports a file system to support TransAct Technologies fonts and allow the user to load and link custom fonts.

The POSFile tool provides a Windows interface to the printer and will allow fonts and configuration files to be loaded into the printer. This tool can read and write the POR.INI file, however the TransAct supplied fonts can not be read or deleted from the printer.

TrueType<sup>18</sup> and Compressed Stroke Fonts<sup>19</sup> are supported by the ITherm 280 Printer. User-defined TrueType fonts may be defined and loaded into the printer, however, once in the printer they can not be extracted. (This protects the copyrights on the font.)

The POR.INI file is used to control how fonts are encoded, named, identified and linked, as well as allowing how the font to be printed is controlled. In addition the POR.INI file defines how each legacy font is defined and printed.

The POR.INI file is divided into sections:

- [encoding]  
This section defines how the printer encodes the character set. It may be ASCII with code page, or Unicode. If ASCII is selected the default code page is selected and/or defined in this section.
- [font] This section defines how the scalable fonts are named and generated. You can control the font cache size and partitions, the Hinting, link fonts and font abstractions.
- [bmfont]  
This section defines and abstracts any bitmap font definitions.
- [Legacy]  
This section defines how the previously defined fonts are used to generate legacy fonts for each emulation.

The following is an example of the POR.INI file:

```
; Default System Configuration.
[encoding]
mode = UTF8TXT
;NOTE: A code page is only used in ASCII mode.
;To specify a code page, use one of the following forms:
;CodePage = 437
;CPFile = CP8959-1.cpm
;To remap Unicode characters, define a UniRemap.cpm file.
;UniMapfile = UniRemap.cpm
[font]
;Optionally specify the Cache Partitions
;Fontcache = 320,256,64
;True Type font hinting may be disabled by setting Nohint to 1
;Nohint = 0
;Specify Linked fonts starting with LinkFont1.
;LinkFont1 will be searched first.
;You may specify up to 8 fonts in a linked font.
;if Link Fonts are defined, they will be Font0.
```

<sup>18</sup> Some but not all features of Open Type fonts are supported. Open Type fonts are not recommended.

<sup>19</sup> Compressed Stroke fonts are supplied by MonoType Inc.

```

LinkFont1 = TactMOD.ttf
LinkFont2 = TactWGL.ttf
LinkFont3 = TactGB18030.ccc
;From 1 to 99 fonts may be defined
Font1 = TactMOD.ttf
Font2 = TactWGL.ttf
Font3 = TactGB18030.ccc
Font4 = TactOCR.ttf
;The brush size effects only stroke fonts.
Brush = 100
[legacy]
;EmulationMode = Font,Horizontal,Vertical,Width.
; Where:
; If Font = 0 Use Linkfont else 1-4 above.
; If Font is 100 or greater use BMFont (Font - 100). BMFonts only used
Width.
; Horizontal and Vertical are in 8th points, Width in Dots.
Epson1 = 0,56,72,10
Epson2 = 0,64,72,14
PcOS1 = 0,56,72,10
PcOS2 = 0,64,72,14
PcOS3 = 0,80,80,18
PcOS4 = 0,80,80,20
PcOSOCR = 4,80,80,20
[bmfont]
;There may be up to 8 bitmap fonts.
;Bitmap fonts are fixed sizes and have no options
BMFont0 = chr10x24.bft
BMFont1 = chr13x24.bft
BMFont2 = chr15x24.bft
BMFont3 = chs15x24.bft
BMFont4 = ocr15x24.bft

```

Font1 through Font99 may be defined, and the font number is the alias used by the set font command, e.g. Font23 is selected by doing a select font 23 command. Font 0 is reserved for selecting the linked font.

The printer may contain one default linked font. A linked font is a method of allowing the user to replace characters in a standard font with custom characters, described in more detail in an earlier section. The POR.INI file is one way of defining a linked font. In the above POR.INI file link the link font consists of User, TactWGL, and the TactGB18030 fonts. When a character is to be printed, the user font will be searched followed by TactWGL and then the TactGB18030 font. The first font containing the character will define the character.

Bitmap fonts are not recommended, they should only be used if an exact bitmap is required. Bitmap fonts are not scalable like true type fonts, only the normal 2X, 3X and so on scaling is available. TransAct Technologies can upon request and signing an NDA provide tools to allow the customer to develop there own bitmap fonts. These fonts must be in Unicode order but only need support the specific characters needed in the font. NOTE: When loaded and made available the legacy select font commands should select the bitmap font by adding 100 to the font ID. For example to use BMFont0, select font 100 in the Legacy font definition. (Note: Only the font ID is used from the legacy font definition if a bitmap font is selected.)

Legacy font definitions define the Size, spacing, font, quality and spot size to be used to generate a legacy font. For example the PcOS [esc] I<0> font select command will select PcOS1 font. (Note that the font select and the Font ID are offset by one.) The font size is defined in 1/8<sup>th</sup> point units. This gives a lot of control of the size. Because the ITherm 280 printer prints discreet dots that are relative large (from a font point view), changes in character size will appear to jump. That is small changes in size will not appear to alter the character and them an 1/8<sup>th</sup> point change will make a dramatic change. If you wish to change the font and/or the character size select a size in the middle of the step. Even though small changes don't appear to have an effect, small changes do occur in the font generation and a value in the middle works best. The X and Y Spot size effects how the characters are generated. The spot size is equivalent to selecting a paint brush. A small spot is a small paint brush and therefore requires a lot mot brush strokes to form the character. As the dots printed by the printer are always the same size, defining a small spot will cause more dots to be used to form the character. Depending on how the font was defined, it is advantageous to select a large brush size and affectively reduce the number of dots in the character. There are no real guidelines for selecting Spot size. You have to play with it until you get acceptable results with your font. If you select a high quality print mode. This value can be set to nominal. (Nominal is 100).

---

<b>Function</b>	<b>Select Font</b>	<b>All</b>
<b>ASCII</b>	[ESC] + 3 <ID>	
<b>Hexadecimal</b>	1BH 2BH 31H	
<b>Decimal</b>	<27> <43> <51>	
<b>Description</b>	The [ESC] + 3 command selects the font for printing. This command is used to select a previously loaded font based on its alias.	
<b>Note:</b>	Selecting font 0 will select the linked font. If the selected font does not exist, the previous font will remain in effect.	
<b>Note:</b>	Selecting font 100 will select bit map font 0. 101 is bitmap font 1 and so on. Up to 7 bitmap fonts may be present.	

---

<b>Function</b>	<b>Define a Stacked or Linked Font</b>	<b>All</b>
<b>ASCII</b>	[ESC] + S <ID <sub>1</sub> > <ID <sub>2</sub> > <ID <sub>2</sub> > ... <0>	
<b>Hexadecimal</b>	1BH 2BH 53H	
<b>Decimal</b>	<27> <43> <83>	
<b>Description</b>	The [ESC] + S command defines but does not select a stacked or linked font set. This command will define a linked list of previously loaded and aliased fonts into a linked font stack. The font ID is the same ID as in the select font command. Up to 8 fonts may be linked. The last entry must be 0. If the font does not exist, it will not be made part of the link.	

**Note:** You must select font 0 to activate the linked font.

**Note:** You can not use bitmap fonts as part of a linked font..

---



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<b>Function</b>	<b>Select Font by name</b>	<b>All</b>
<b>ASCII</b>	[ESC] + N <FileName> <0>	
<b>Hexadecimal</b>	1BH 2BH 31H	
<b>Decimal</b>	<27> <43> <51>	
<b>Description</b>	The [ESC] + N command selects the font for printing by file name. This command is used to select a previously loaded font by its file name. If the selected font does not exist, the previous font will remain in effect.	
<b>Note:</b>	This command may be undesirable because it embeds in the application a file name that you may wish to change in the future. By using the Alias ID the font name may change, but the application will remain constant.	
<b>Note:</b>	This command may be used to load and select a bitmap font. If a bitmap font is selected with this command, it will define bitmap font 7 and select it. Once loaded, it may be reselected by selecting font 107.	

---

<b>Function</b>	<b>Initiate Unicode UTF-16BE Encoding</b>	<b>All</b>
<b>ASCII</b>	[ESC] + H	
<b>Hexadecimal</b>	1BH 2BH 48H	
<b>Decimal</b>	<27> <43> <72>	
<b>Description</b>	The [ESC] + H command will put the printer into UTF-16BE character encoding mode of operation. If you wish to access characters above 255, you must select a Unicode encoding such as UTF-16BE.	
	UTF-16 is the most straightforward way to access characters above 255, sending two 8-bit bytes that form a 16-bit address to access the desired character.	
	UTF-16BE uses the big-endian method of sending the two bytes. This method sends the high byte first and then the low byte.	
<b>Note:</b>	Once selected, all information sent to the printer must then use this encoding, even for non-print commands.	

---

<b>Function</b>	<b>Initiate Unicode UTF-16LE Encoding</b>	<b>All</b>
<b>ASCII</b>	[ESC] + L	
<b>Hexadecimal</b>	1BH 2BH 4CH	
<b>Decimal</b>	<27> <43> <76>	
<b>Description</b>	The [ESC] + L command will put the printer into UTF-16LE character encoding mode of operation. If you wish to access characters above 255, You must select a Unicode encoding such as UTF-16LE.	
	UTF-16 is the most straightforward way to access characters above 255, sending two 8-bit bytes that form a 16-bit address to access the desired character.	
	UTF-16LE uses the little-endian method of sending the two bytes. This method sends the low byte first and then the high byte.	
<b>Note:</b>	Once selected, all information sent to the printer must then use this encoding, even for non-print commands.	

---

<b>Function</b>	<b>Initiate Unicode UTF-8 Encoding (MBCS)</b>	<b>All</b>
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---

**ASCII** [ESC] + M  
**Hexadecimal** 1BH 2BH 4DH  
**Decimal** <27> <43> <77>  
**Description** The [ESC] + M command will put the printer into UTF-8 character encoding mode of operation. If you wish to access characters above 255, You must select a Unicode encoding such as UTF-8.

UTF-8 uses a Multiple Byte Character Sequence (MBCS) to identify the desired Unicode character. This encoding method is less straightforward. This method uses unique bit sequences at the MSBs of a byte to determine its location and meaning within the MBCS encoding. See the table below for more information.

**Note:** Once selected, all information sent to the printer must then use this encoding, even for non-print commands.

Scalar Value	1 <sup>st</sup> Byte	2nd Byte	3rd Byte
000000000xxxxxxx	0xxxxxxx		
00000yyyyyxxxxxx	110yyyyy	10xxxxxx	
zzzzyyyyyyxxxxxx	1110zzzz	10yyyyyy	10xxxxxx

**Function** **Initiate Unicode UTF-8 Text only Encoding (MBCS)** **All**  
**ASCII** [ESC] + T  
**Hexadecimal** 1BH 2BH 54H  
**Decimal** <27> <43> <84>  
**Description** The [ESC] + T command will put the printer into UTF-8 Text only character encoding mode of operation. This mode is identical to the UTF-8 mode described above, except commands and there parameters are not UTF encoded. For example the following command would be used to select underline on:  
 [ESC] W 128.  
 If true UTF-8 encoding were in effect, the 128 parameter would be UTF encoded to [ESC] W 194 128. With UTF-8 Text only mode this command is simply [ESC] W 128.

**Note:** This command also applies to graphic data being sent to the printer. The graphic data is a command and not text. It is not UTF-8 encoded.

**Function** **Initiate Normal 8-bit ASCII Character Encoding** **All**  
**ASCII** [ESC] + A  
**Hexadecimal** 1BH 2BH 41H  
**Decimal** <27> <43> <65>  
**Description** The [ESC] + A command will put the printer into normal character encoding mode of operation. One byte = one character. In this mode international characters must be selected by selecting the appropriate code page for translation.

## Font Size and Spacing

The font typically defines the character size and line spacing. The typical font is proportional spaced. That is the spacing between characters varies. This is not always the most desirable mode of operation. To give the programmer some additional control over character spacing and line height, the Accutherm Supreme provides a width and height override command.

The following table converts dots to CPI (Characters Per Inch) points and ¼ points and is useful in calculating point size settings.

Dots 1/203"	Characters per Inch (CPI)	Points 1/72"	¼ Points 1/288"
8	25.38	2.84	11.35
9	22.56	3.19	12.77
10	20.30	3.55	14.19
11	18.45	3.90	15.61
12	16.92	4.26	17.02
13	15.62	4.61	18.44
14	14.50	4.97	19.86
15	13.53	5.32	21.28
16	12.69	5.67	22.70
17	11.94	6.03	24.12
18	11.28	6.38	25.54
19	10.68	6.74	26.96
20	10.15	7.09	28.37
21	9.67	7.45	29.79
22	9.23	7.80	31.21
23	8.83	8.16	32.63
24	8.46	8.51	34.05
25	8.12	8.87	35.47
26	7.81	9.22	36.89
27	7.52	9.58	38.31
28	7.25	9.93	39.72
29	7.00	10.29	41.14
41	4.95	14.54	42.56
48	4.23	17.02	68.10
51	3.98	18.09	72.35
68	2.99	24.12	96.47
101	2.01	35.82	143.29

## Font Size and Spacing command interactions

There are interactions between some of the following commands and some of the legacy font selection commands. These interactions need to be considered when developing an application for this printer.

This printer uses a font rendering engine that relies on the font to provide character size and spacing information. Unfortunately, legacy applications assume all characters are the same and that the character size and spacing is fixed. To force the characters rendered by the font rendering engine to conform to legacy modes of operation, some post generation processing is performed to reposition the characters into a fixed size cell.

The set minimum character height and width ([ESC] + P and [ESC] + p), the set character spacing ([ESC] + I, [ESC] + i, [ESC] + J and [ESC] + j), the set minimum line spacing ([ESC] + V and [ESC] + v), and the legacy font select and spacing commands all interact.

The set minimum character height and width ([ESC] + P and [ESC] + p) commands set character size but in two different ways. In most systems a character point size refers only to the line spacing and indirectly to the character height. That is also true. The vertical character height referenced in these commands refer to the character height including the white space between lines. The horizontal character width is defined by the font. Normally only the character height would be specified and the width would be defined by the font and that's how these commands work if the Width is defined as zero. If the width is defined as zero this is used as a flag to the printer to generate characters as defined by the font and use the character width returned by the font. In effect the vertical point size passed to the font rendering engine is the same as the horizontal value. The added effect of the width being passed as zero is that any enforced horizontal spacing is disabled. IE the effect of the [ESC] + I, [ESC] + i, [ESC] + J and [ESC] + j commands are disabled. If the width is not zero, the [ESC] + I, [ESC] + i, [ESC] + J and [ESC] + j remain in effect and only the resulting character size is changed, the horizontal spacing is not changed.

The legacy [ESC] ! <n> select the print mode effectively issues a set minimum character height and width command followed by a set character spacing command without effecting the pseudo fixed spacing flag.

The pseudo fixed spacing flag is a further complication required for dealing with fonts that are not truly fixed pitch. In some cases a fixed pitch font will have more than one character size depending on what the character is used for. This generally only affects Asian fonts where the ideograms are generally twice as wide as Latin characters. In fixed spacing mode, the printer will put the rendered character at whatever spacing is requested even if they don't fit. If the character is too big, it will overlap the previous and next character. To allow a fixed pitch operation that deals with small and large fixed pitch character, the printer has a pseudo-fixed pitch flag that will increase the spacing in multiples of the requested spacing until it fits.

The following table lists the commands and how they interact.

Command	Zero	Character width	Character height	Cell Width	Pseudo Fixed pitch flag
[ESC] + P, [ESC] + p	Width 0	Same as Height	From command	From Font	No effect

[ESC] + P, [ESC] + p	Width Not Zero	From Command	From command	Based on set character spacing command	Will be used if previously set and character spacing is not being defined by the font
[ESC] + I, [ESC] + i	Value 0	No effect	No effect	From Font	Set Off but has no effect
[ESC] + I, [ESC] + i	Value Not zero	No effect	No effect	From Command	Set Off
[ESC] + J, [ESC] + j	Value 0	No effect	No effect	From Font	Set On but has no effect
[ESC] + J, [ESC] + j	Value Not zero	No effect	No effect	A multiple of the value defined by the command	Set On
[ESC]I <n>		From POR.INI definition	From POR.INI definition	As defined by command	Will be used if previously set.

Function	Set minimum character height and width in points.	All
ASCII	[ESC] + P <w><h>	
Hexadecimal	1BH 2BH 50H	
Decimal	<27> <43> <80>	
Range	w = 0, 4 – 72 h = 4 - 72	

The [ESC] + P command will set the minimum character width or height based on “w” for the width and “h” for height, where “w” and “h” are in points, defined as 1/72<sup>nd</sup> of an inch increments.

If the character width is set to zero, the height will be used for the width and proportional spacing will be used.



**NOTE:** The set pitch command will take precedence unless this command selects 0 width.

Function	Set minimum character height and width in ¼ points.	All
ASCII	[ESC] + p <w><h>	
Hexadecimal	1BH 2BH 70H	
Decimal	<27> <43> <112>	
Range	w = 0, 16 – 255 h = 16 - 255	

The [ESC] + p command will set the minimum character width or height based on “w” for the width and “h” where “w” and “h” are in ¼ points or 1/288<sup>th</sup> of an inch increments. This approximates setting characters by dot.

If the character width is set to zero, the height will be used for the width and proportional spacing will be used.



**NOTE:** The set pitch command will take precedence unless this command selects 0 width.

Function	Set Character spacing in points.	All
ASCII	[ESC] + I <d>	
Hexadecimal	1BH 2BH 49H	
Decimal	<27> <43> <73>	
Range	d = 0, 4 – 72	

The [ESC] + I command will set the character spacing in points, where one point is defined as 1/72<sup>nd</sup> of an inch. This command will force mono-space printing. It will override any character spacing set by the set character height and width commands defined above. This spacing will be enforced until deactivated by setting the value to 0 or if the set character height and width commands use a 0 for the width indicating proportional spacing should be used. This command differs from the [ESC] + J command in that all characters are centered on the fixed cell size. If the character is too big for the cell, it may overlap the previous and next character. The character size is not adjusted to fit the cell.

If d = 0 variable spacing is selected.



**NOTE:** If the current character size is too large for the selected spacing, the characters will overlap. Variable spacing is recommended.

Function	Set Character spacing in ¼ points.	All
ASCII	[ESC] + i <d>	
Hexadecimal	1BH 2BH 69H	
Decimal	<27> <43> <105>	
Range	d = 0, 16 – 255	

The [ESC] + i command will set the character spacing in points, where ¼ point is defined as 1/288<sup>th</sup> of an inch. This command will force mono-space printing. It will override any character spacing set by the set character height and width commands defined above. This spacing will be enforced until deactivated by setting the value to 0 or if the set character height and width commands use a 0 for the width indicating proportional spacing should be used. This command differs from the [ESC] + j command in that all characters are centered on the fixed cell size. If the character is too big for the cell, it may overlap the previous and next character. The character size is not adjusted to fit the cell.

If d = 0 variable spacing is selected.



**NOTE:** If the current character size is too large for the selected spacing, the characters will overlap. Variable spacing is recommended.

Function	Set Character spacing in points with adjustment.	All
ASCII	[ESC] + J <d>	
Hexadecimal	1BH 2BH 4AH	
Decimal	<27> <43> <74>	
Range	d = 0, 4 – 72	

The [ESC] + J command will set the character spacing in points, where one point is defined as 1/72<sup>nd</sup> of an inch. This command will force mono-space printing. It will override any character spacing set by the set character height and width commands defined above. This spacing will be enforced until deactivated by setting the value to 0 or if the set character height and width commands use a 0 for the width indicating proportional spacing should be used. This command differs from the [ESC] + I command in that if the character is too large for the cell, the cell will be expanded in multiples of <d> until the character fits.

If d = 0 variable spacing is selected. However, note that the cell adjustment flag will remain set and if legacy commands are used they will allow the cell to be expanded.



**NOTE:** If the current character size is too large for the selected spacing, the cell size will be expanded

Function	Set Character spacing in points with adjustment.	All
ASCII	[ESC] + j <d>	
Hexadecimal	1BH 2BH 6AH	

**Decimal Range** <27> <43> <106>  
 d = 0, 16 – 255

The [ESC] + j command will set the character spacing in points, where ¼ point is defined as 1/288<sup>th</sup> of an inch. This command will force mono-space printing. It will override any character spacing set by the set character height and width commands defined above. This spacing will be enforced until deactivated by setting the value to 0 or if the set character height and width commands use a 0 for the width indicating proportional spacing should be used. This command differs from the [ESC] + i command in that if the character is too large for the cell, the cell will be expanded in multiples of <d> until the character fits.

If d = 0 variable spacing is selected. However, note that the cell adjustment flag will remain set and if legacy commands are used they will allow the cell to be expanded.



**NOTE:** If the current character size is too large for the selected spacing, the characters will overlap. Variable spacing is recommended.

Function	Set minimum Line Spacing in Points	All
<b>ASCII</b>	[ESC] + V <d>	
<b>Hexadecimal</b>	1BH 2BH 56H	
<b>Decimal</b>	<27> <43> <86>	
<b>Range</b>	d = 0, 4 – 72	

The [ESC] + V command will set the line spacing in points, where one point is defined as 1/72<sup>nd</sup> of an inch.

If d = 0 variable spacing is selected.



**NOTE:** This is the minimum spacing. If the character height setting requires a larger spacing, the character height will override this setting.

Function	Set minimum Line Spacing in ¼ Points	All
<b>ASCII</b>	[ESC] + v <d>	
<b>Hexadecimal</b>	1BH 2BH 76H	
<b>Decimal</b>	<27> <43> <118>	
<b>Range</b>	d = 0, 16 – 255	

The [ESC] + v command will set the line spacing in ¼ points, where ¼ point is defined as 1/288<sup>th</sup> of an inch.

**ASCII** [ESC] + v <d>  
**Hexadecimal** 1BH 2BH 76H  
**Decimal** <27> <43> <118>  
**Range** d = 0, 16 – 255

If d = 0 variable spacing is selected.





**NOTE:** This is the minimum spacing. If the character height setting requires a larger spacing, the character height will override this setting.

Function	Set stroke font brush size.	All
ASCII	[ESC] + B <w>	
Hexadecimal	1BH 2BH 42H	
Decimal	<27> <43> <66>	
Range	w = 0, 6 – 200	
Description	The [ESC] + B command will set brush stroke percentage for stroke fonts. If the brush size is set to zero the font design stroke width will be used.	

Values from 6 to 200 represent 0.4 to 12% of the em-width of the font. The default for most fonts is about 3%. The ITherm 280 using the GB18030 font supplied by TransAct Technologies produces the best characters with a brush size of about 100.

**Note:** The default value for the Brush stroke may be set in the POR.INI file.

[ESC] [ P	Set character pitch (Legacy mode command)	PcOS
ASCII	[ESC] [ P <n>	
Hexadecimal	1BH 5BH 50H <n>	
Decimal	<27> <91> <80> <n>	
IPCL	&%F1, &%F2, &%F3, &%F4, &%F5, &%F6, &%F7	
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	<n>	Resulting Characters per Inch	IPCL
1	1.00		16	16.00	
2	2.00		17	17.33	&%F1
3	3.01		18	17.33	
4	4.00		19	18.91	
5	4.95		20	20.8	&%F5
6	5.94		21	20.8	
7	6.93		22	23.11	
8	8.00	&%F7	23	23.11	
9	9.04		24	23.11	&%F4
10	9.90	&%F3	25	23.11	
11	10.95		26	26	
12	12.23	&%F2	27	26	
13	13.00		28	26	
14	13.87		29	29.71	
15	14.86	&%F6	30	29.71	

Table 51 Character Pitch

This command disables any right-side spacing set by the [ESC] V command. It enforces this spacing on the current font selection even if the character is too large for the spacing. In addition, when font changes are made, the character pitch is maintained.

## **Legacy Printer Features that Have Changed**

Because this product employs outline and stroke font character generation, support for several legacy features are changed from standard iThem 280 version.

### **Dynamic code page definition**

Dynamic code page definition is still supported when in ASCII mode, however Unicode is now used for the source character locations.



**chapter**  
**9**

File System

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## File System Interface

The ITherm 280 provides a file system to support fonts, configuration information, user graphics and macros.

There are a number of commands that are provided to support the file system. In general, files need to be opened for read or write, read or written, and then closed. There is a command that will delete a file, and print or return a file directory.

TransAct Technologies provides a Windows® based tool that will interact with the ITherm 280 and provide a drag and drop interface to the file system.

The file system in the ITherm 280 is partitioned into two sections, one for internal system use by the printer, and one for user information.

The system partition is referred to as partition 0. It is reserved for fonts, configurations and code page files. This partition can not be deleted or completely erased. The second partition is for all other information. There is a command that will erase all the files in this partition. The partition where files are placed is determined by the three character extension.

## File System commands

Function	Open File command.	All
<b>ASCII</b>	[ESC] [RS] O < Mode > <space> < Filename ><0>	
<b>Hexadecimal</b>	1BH 1EH 4FH	
<b>Decimal</b>	<27> <30> <79>	
<b>Mode</b>	Mode of operation "r" for read or "w" for write.	
<b>FileName</b>	File name from 1 to 30 characters including a three character extension.	
<b>Description</b>	The [ESC] [RS]O command will select and open a file for the selected operation. If the file being opened for write exists, the existing file will be overwritten. Note that only one file may be open for external operations at any one time.	

The Mode and FileName take the following format and must be null terminated:

r Filename.ext<0>

Valid Modes are:

"r"	Read.
"w"	Write
"w+"	Write Append (Future enhancement)
"ram"	open a RAM file for write.

**Note:** RAM files capability is an option and not available on all products.

File Extensions are any three characters. The following are predefined and reserved for internal use.

Extension	Partition 0= System	Definition

	1= User	
.udf	1	Undefined macro type
.mac	1	Command Macro
.img	1	Graphic image. (Internal format)
.bgp	1	Bitmapped internal graphic
.chr	1	User Character definition
.cfg	0	configuration.
.ttf	0	true type font
.ccc	0	compressed stroke font
.btf	0	Bitmap font definition
.cpm	0	code page map.
.bmp	1	bitmap graphic file
.gph	1	raster graphic file.
.ini	0	System information file
.fcg	0	Field Configuration File
.upd	0	System Update file
.sys	0	Load image
.sy_	0	Compressed load image.

**Note:** All other file extensions will be placed in Partition 1 (user space)

---

**Function**      **Return Free space for Open File.**      **All**

**ASCII**            [ESC] [RS] S

**Hexadecimal** 1BH 1EH 53H

**Decimal**        <27> <30> <83>

**Description**   The [ESC] [RS]S command will return an identifier byte and 4 additional bytes representing a 32 bit value (LSB First) representing the amount of free space in the partition containing the open file.

The format is as follows:

S <B<sub>7-0</sub>><B<sub>15-8</sub>><B<sub>23-16</sub>><B<sub>31-24</sub>>

---

**Function**      **Return Free space for this partition.**      **All**

**ASCII**            [ESC] [RS] s<n>

**Hexadecimal** 1BH 1EH 73H

**Decimal**        <27> <30> <115>

**Where**            n = The partition

**Description**   The [ESC] [RS]s command will return an identifier byte and 4 additional bytes representing a 32 bit value (LSB First) representing the amount of free space in the partition.

The format is as follows:

S <B<sub>7-0</sub>><B<sub>15-8</sub>><B<sub>23-16</sub>><B<sub>31-24</sub>>

---

<b>Function</b>	<b>Close File command.</b>	<b>All</b>
<b>ASCII</b>	[ESC] [RS] C	
<b>Hexadecimal</b>	1BH 1EH 43H	
<b>Decimal</b>	<27> <30> <67>	
<b>Description</b>	The [ESC] [RS]C command will close the currently open file.	

---

<b>Function</b>	<b>Close All Files command.</b>	<b>All</b>
<b>ASCII</b>	[ESC] [RS] K	
<b>Hexadecimal</b>	1BH 1EH 4BH	
<b>Decimal</b>	<27> <30> <75>	
<b>Description</b>	The [ESC] [RS]K command will close the font system and close all currently open files. Internal fonts will be reopened automatically if used.	

---

<b>Function</b>	<b>Delete File command.</b>	<b>All</b>
<b>ASCII</b>	[ESC] [RS] D <Filename><0>	
<b>Hexadecimal</b>	1BH 1EH 44H	
<b>Decimal</b>	<27> <30> <68>	
<b>FileName</b>	File name from 1 to 30 characters including a three character extension, null terminated.	
<b>Description</b>	The [ESC] [RS]D command will select and delete a file.	

**Note:** Some of the system files are protected and can not be deleted.

---

<b>Function</b>	<b>Set/Clear File Attributes command.</b>	<b>All</b>
<b>ASCII</b>	[ESC] [RS] A < Attbs > <space> < Filename ><0>	
<b>Hexadecimal</b>	1BH 1EH 41H	
<b>Decimal</b>	<27> <30> <64>	
<b>Attbs</b>	File attributes to modify.	
<b>FileName</b>	File name from 1 to 30 characters including a three character extension.	

Each file has several attributes associated to it. They include S, R, and H.

Attribute	Syntax	Name	Use
S	+S or -S	System	This is a system file.
R	+R or -R	Read Only	This file cannot be erased or modified.
H	+H or -H	Hidden	This file is hidden and not displayed in the directory listing.

NOTE: Attributes can be combined, however, each needs to have the + or – as a prefix.

To allow these attributes to be set and cleared, the [ESC][RS]A command can be used. The format is as follows:

[ESC][RS]A-R-S FileName<0>

This command will remove the Read only and System attributes from File name.

---

<b>Function</b>	<b>Return the last file command status.</b>	<b>All</b>
-----------------	---	------------

**ASCII** [ESC] [RS] ?  
**Hexadecimal** 1BH 1EH 3FH  
**Decimal** <27> <30> <63>

The [ESC][RS]? Command requests the file system to return the status of the last file operation.

This command, returns an identifier byte, followed by 2 bytes indicating the status results of the last file command. The format will be as follows:

?<Status><Details> or 3F, (47 or 42), <Details>

Where:

Status = 'G' for success and 'B' for Failure

Detail = Detailed status as a binary byte with bit definitions as follows:

Bit	Hex	Decimal	Function
0	01	1	File Open
1	02	2	File in Write Mode
2	04	4	The Read response is shorter than requested and EOF has been encountered.
3	08	8	The file is already open.
4	10	16	The file system has no space for the preceding operation. Could be out of Flash or out of Buffer space.
5	20	32	A write operation has been attempted to a read only file.
6	40	64	File requested was not found
8	80	128	An error has occurred. Other bits may be set that give additional detail. (This bit determines the G or B status in the previous byte)

**Function** Write File command. **All**

**ASCII** [ESC] [RS] W <L<sub>L</sub>><L<sub>H</sub>><... data ..>

**Hexadecimal** 1BH 1EH 57H

**Decimal** <27> <30> <87>

**Description** The [ESC] [RS]W command sends data to the printer to be stored in the file. The <LL><LH> parameters specify the length of data that will follow where the length is LH \* 256 + LL. The data is treated as binary data with no translations.



---

<b>Function</b>	<b>Read File command.</b>	<b>All</b>
<b>ASCII</b>	[ESC] [RS] R <L <sub>L</sub> ><L <sub>H</sub> >	
<b>Hexadecimal</b>	1BH 1EH 52H	
<b>Decimal</b>	<27> <30> <82>	
<b>Description</b>	The [ESC] [RS]R command requests that data be read from the file and returned to the host.	

The <LL><LH> parameters specify the length of data that should be returned where LH \* 256 + LL specifies the number of returned bytes. The data is treated as binary data with no translations. If there is not enough data in the file to make up the requested length, only the available data is returned.

---

<b>Function</b>	<b>Generate and return a file directory report.</b>	<b>All</b>
<b>ASCII</b>	[ESC] [RS] I	
<b>Hexadecimal</b>	1BH 1EH 49H	
<b>Decimal</b>	<27> <30> <73>	
<b>Description</b>	The [ESC] [RS]I command requests that a formatted text directory be returned from the printer. Each line is null terminated.	

---

<b>Function</b>	<b>Erase all files in a partition</b>	<b>All</b>
<b>ASCII</b>	[ESC] [RS] X <p>	
<b>Hexadecimal</b>	1BH 1EH 58H	
<b>Decimal</b>	<27> <30> <88>	
<b>&lt;p&gt;</b>	selects the partition. 0 = System, 1 = User.	
<b>Description</b>	The [ESC] [RS]X command requests that the selected partition be reformatted. Reformatting the system partition <0> is not recommended, as it will erase all fonts and render the printer unusable.	

---

<b>Function</b>	<b>De-fragment the file system.</b>	<b>All</b>
<b>ASCII</b>	[ESC] [RS] F	
<b>Hexadecimal</b>	1BH 1EH 46H	
<b>Decimal</b>	<27> <30> <70>	
<b>Description</b>	The [ESC] [RS]F command forces the file system to go through the file system and clean up deleted file sectors. All sectors flagged for deletion are actually erased and consolidated when this command is issued.	

**Note:** File space is not necessarily freed up by a file delete. Sectors may be marked for deletion but still be present but inactive in the file system. These sectors take up flash space. Each cluster has a fixed number of sectors, and if the number of deleted sectors in a cluster exceed a predefined threshold, the cluster is de-fragmented automatically. This command forces all clusters to be de-fragmented.

Function	Verify files.	All
ASCII	[ESC] [RS] V	
Hexadecimal	1BH 1EH 56H	
Decimal	<27> <30> <86>	
Description	The [ESC] [RS]V opens and reads the VERIFY.CFG file. This file contains a list of all files that are to be validated in the printer and the expected CRC of the file. If all the files verify, this command will return VG followed by it's 2 byte CRC. If any of the files do not verify, the command will return VB followed by it's 2 byte CRC.	

For example the file might look like this:

```
Por.ini 0x06FF
```

Only the Por.ini file will be checked in this example.

An additional and optional feature of this command is that it can verify the CRC of the operating firmware. By adding "Firmware" as a file name, this command will recalculate the Firmware CRC and compare it to the master value. If the recalculation does not match the master value, this command will return a failed response. The file would be as follows to add the Firmware check. By using the master value, this file need not be updated if the firmware is updated.

```
Por.ini 0x06FF
Firmware
```

By knowing the CRC of the Verify.cfg file, the host application can verify that all the other files are correct (and optionally the firmware) without knowing anything about the other files of firmware.

**Note:** The typical printer is not shipped with a Verify.cfg file.

**Note:** This command is not performed as a condition of normal operation. It is up to the host application to refuse to use the printer if this command returns a fail to verify status.

**Note:** if the Verify.cfg file is not present, the verify command will return VB and a 0 CRC.

**chapter**  
**10**

**iTherm<sup>®</sup> 280 Extended Printer Control**

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The iTherm® 280 printer has a number of Extended Control commands that allow an application to better track and maintain the printer. These commands are in all emulations<sup>20</sup>.

The printer maintains a log of printer activity. This activity may be returned to the host with the [ESC]~ T command. This command returns a ~T followed by four binary bits that make up a 32 bit unsigned integer. The description of the command below describes the format in full.

The printer also contains a number of commands that will force the printer to perform specific functions to help maintain the printer or print information about the printer. The functions available are:

- 1) Print Current Configuration
- 2) Print current log totals



**Note:** Each of these commands follow the ESC~ or ESCy format. Other functions are performed by these basic commands. Do not attempt to use any undocumented version of these commands. 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.

---

Function	Read and Return Totals
<b>ASCII</b>	[ESC] ~ T <n>
<b>Hexadecimal</b>	1BH 7EH 54H <n>
<b>Decimal</b>	<27> <126> <84> <n>
<b>Description</b>	This command returns the current statistics for parameter n. The value returned will be ~T<n> with the next 4 bytes being an unsigned integer. For example:
	[ESC]~T<1> Request cover open count
Returns:	~T<1><0><0><1><100> or 256 + 100 or 356 cover opens
Values of n	Request:
0	Black Dots
1	Red Dots
2	Pink Dots
3	Cover Opens
4	Paper Outs
5	Line Feeds
6	Characters Printed
7	Cash Drawer1
8	Cash Drawer2
9	Standby Cycles

<sup>20</sup> The Star emulation does not allow the use of [ESC] y commands for extended diagnostics. The [ESC] y commands are not available.

10	Power Up Resets
11	Watchdog Resets
12	Base Flash Erases
13	Ext Flash Erases
14	Auto Cutter Cycles
15	Init Requests
16	Error Vectors
17	Auto Cutter Faults
18	Power On Time (Min.)
19	System Active Time (Min.)
20	Over Temperature
21	Cutter Re-Home

**Function:** Set Secondary Paper Color**ASCII:** [ESC] ~ R<c> or [ESC] ~ L<c>**Hex:** 1BH 7EH 52H or 1BH 7EH 4CH**Decimal:** <27><126><82> or <27><126><76>

**Description:** This command reconfigures the secondary paper colors. This command should only be use when the colors of the installed paper are changed. This configuration must match the secondary colors as specified by the PJColor program for the color graphics to match the PJColor preview.

[ESC] ~ L<c> sets the left or primary color and [ESC] ~ R<c> sets the right or secondary color.

You can set the Left cartridge to any color and you can set the right cartridge color to any color but black.

Secondary Color	<c> in Decimal	<c> in Hex
RED	1	01H
GREEN	2	02H
BLUE	4	04H



**Note:** These commands change the configuration of the printer that is stored in nonvolatile memory. The values take effect immediately and will remain until changed by these commands or manual configuration. This command should only be used when needed.

**Function      Print Current Configuration and Totals**

**ASCII**            [ESC] y <9> or [ESC] ~ <9>

**Hexadecimal**   1BH 79H 09H

**Decimal**        <27> <121> <9>

**Description**   This command forces the printer to print the current configuration. To function correctly it must be issued with the printer in the proper emulation mode. It is intended to be printed in the default Ithaca® configuration but will print in any configuration.



**Note:** This command must be preceded with an ESC y <8>.

**Function      Print Current Totals**

**ASCII**            [ESC] y <15>

**Hexadecimal**   1BH 79H 0FH

**Decimal**        <27> <121> <15>

**Description**   This command forces the printer to print the current totals log.



**Note:** This command must be preceded with an ESC y <8>.

**Function      Print Current Print Setup Values**

**ASCII**            [ESC] y <20> or [ESC] ~ <20>

**Hexadecimal**   1BH 79H 14H

**Decimal**        <27> <121> <20>

**Description**   This command forces the printer to print the current setup values.



**Note:** This command must be preceded with an ESC y <8>.

**Function:      Set Electronic Journal Print Configuration Control**

**ASCII:**           [ESC] ~ j <n>

**Hex:**            1BH 7EH 6AH

**Decimal:**      <27><126><105>

**Description:** This command reconfigures the electronic journal print mode record separator and manual printing modes

Where n =	76543210	Bit values
	-----X0	Manual Electronic Journal Print mode is Enabled
	-----X1	Manual Electronic Journal Print mode is Disabled
	-----0X	A Record separation line is printed that may contain a record number.
	-----1X	No Record separation line is printed.



**Note:** Both parameters must be set at the same time by this command.



**Note:** The record separation configuration may be set in manual configuration mode. This command will reset the configuration to the value specified here.





**Notes:** This command performs a configuration update, and should not be done on a regular basis.



**Notes:** This command must be preceded with an ESC y <8> to enable it.



A graphic consisting of a horizontal rectangle divided into two sections. The left section is light gray, and the right section is dark gray. The text 'chapter' and '11' is written in white on the dark gray section.

**chapter  
11**

**Communications**

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## Protocol and Print Buffers

The following figure illustrates the communication flow from host computer to printer and from printer to cash drawer.

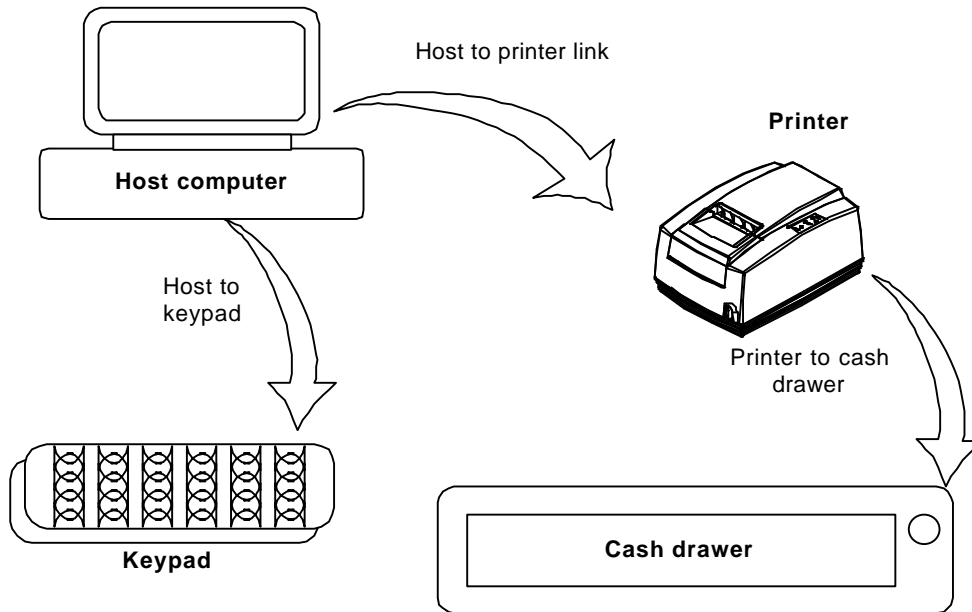


Figure 21 Typical POS System

For the host to printer communication link, the iTherm® 280 printer supports serial or parallel communications. The serial and parallel ports both follow standards developed for the personal computer environment.

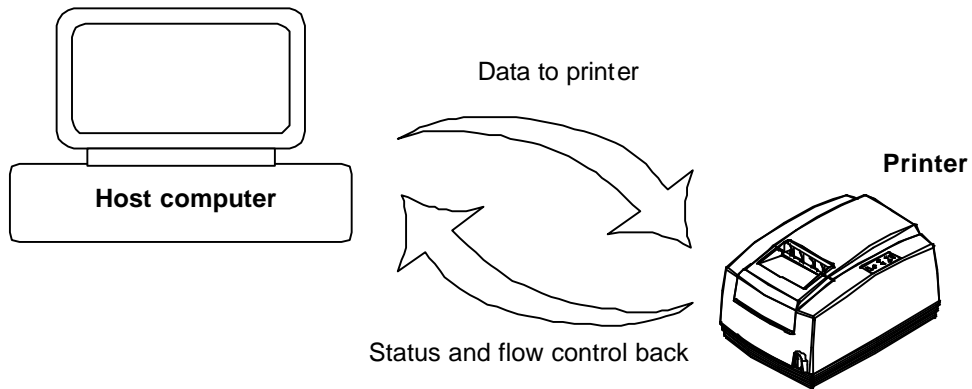


Figure 22 Host to Printer Link

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 iTherm<sup>®</sup> 280 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.

The communication port is either the serial port hardware or the parallel port hardware and the associated communication software driver.

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).

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.

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.

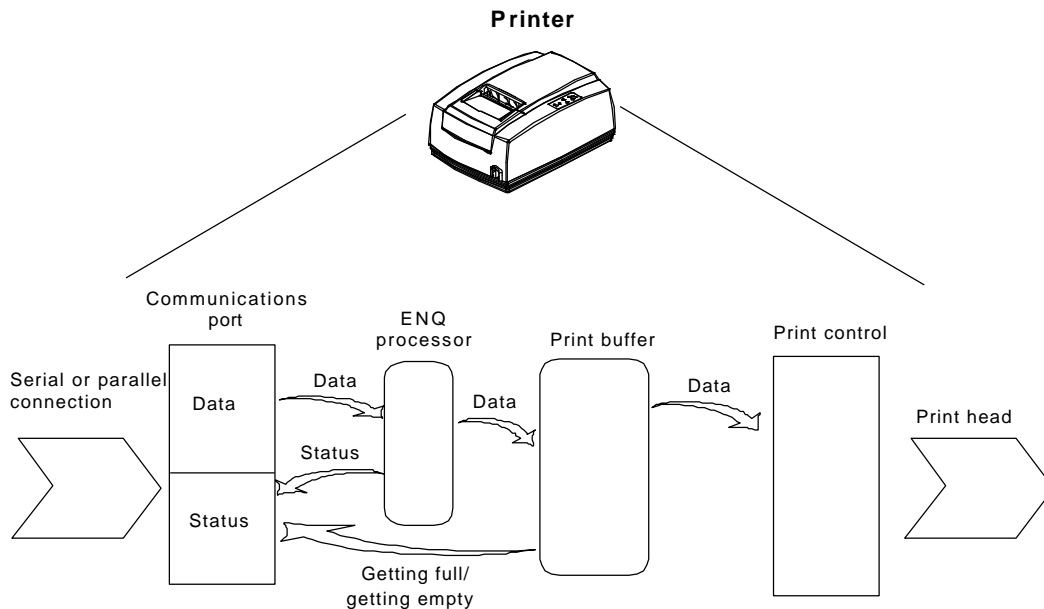


Figure 23 Printer Communications Buffer Flow

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 iTherm® 280 printer has a configurable input buffer. The printer can be configured to allow from 40 to 8196 bytes of input buffer. Consequently, up to 8196 characters (or control codes) can be sent to the printer before they are interpreted and printed. In effect, the host computer can get 8196 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 2048, 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.

## USB

USB stands for Universal Serial Bus. It was originally conceived in the early 90's and officially recognized by Compaq, Intel, Microsoft and NEC. The development of USB has been slow, however, with the release of Windows 95 SR2 development accelerated. Windows 2000 now fully supports USB as do Windows 98 SE, and Windows Me. A technical discussion of USB is beyond the scope of this document. If you would like more information about USB, visit the USB web site at [www.usb.org](http://www.usb.org).

## USB Support

POS printers are different from typical Windows printers in several ways. Microsoft has recognized these differences and has been working with the USB Device Working Group to generate a set of standards that would abstract all point-of-sale devices at the application level. At this time a workable standard for POS is years away. So while Microsoft is interested in POS in the long term, Microsoft's immediate goal is to enable POS USB devices a way that is compatible with existing service objects.

In order to support USB POS devices under the existing software architecture, Microsoft is providing the POSUSB driver model to allow USB POS devices to interface as serial COM ports to service object DLLs.

The Transact USB Printer interface is based on this Microsoft POSUSB driver model. It provides full bi-directional interface to the printer and allows most existing applications to interface to the USB Ithaca<sup>®</sup> iTherm<sup>®</sup> 280 as if it were on a serial COM port. In addition we have allowed the printer to register as a composite device. This allows the printer to appear in the system as a USB print device as well as a COM port. If you are using a windows printer driver (ours or the Generic driver) you can assign the printer to the USB port.

We hope that supporting the USB Ithaca iTherm<sup>®</sup> 280 as a composite device provides the best of both worlds to our customer.

The USB Driver is available from customer support and by download from our web site.

Transact has written a POSPrinter.OCX ActiveX that will allow you to easily interface to our printers. It is used by all of our demonstration programs. This OCX is available for use with customer applications. It works with printers installed on Serial COM ports, LPT ports, TCP/IP and USB. A USB compatible version is available from customer support or from our web site.



## TCP/IP

A 10-BaseT Ethernet adapter is available for the Ithaca iTherm® 280 printer. This Wired Ethernet Adapter provides a fast and easiest way to network and share printers in your system. Ethernet provides a consistent common connection between printers and computers using standard protocols supported by Windows® 95, 98, Me, NT, 2000, XP, as well as many other platforms. Ethernet is probably the most common networking medium, and thus allows printers to be easily added, moved and removed with inexpensive common cabling and off the self components.

### Print Server Features Standard Ethernet Connection

- 10 Mbps Speed
- 10 Base T RJ45 network connection
- Network Traffic LED indicator
- Configured through networked PC Web Browser
- Works with Virtually All Major Operating Systems
- Integrated into the Printer
- Large RAM Buffer for fast continuous printing
- 512K Flash Memory for Future Upgrades

### Supported Protocols

- Line Printer Daemon Protocol (LPR)
- Port 9100 (RAW)
- The TFTP Protocol (Revision 2)
- Telnet COM Port
- Hypertext Transfer Protocol (for configuration)

### User Interface/Configuration

- HTTP/Web Interface
- Login Page
- Configuration Page
  - IP Address / Subnet Mask
  - Auto-IP, DHCP, Static IP...
  - Printer Textual Name (User Defined)
  - Printer Location String (User Defined)
  - Protocols Enabled/Disabled, Port
  - LPR, Port 9100, Telnet
- Adapter Firmware Update

### Other

- Push Button for Initial IP Address reset and adapter reset.
- Self-Diagnostics
- Firmware Upgrade via TFTP and HTTP

For more information and a users guide refer to the *Transact Ethernet Users Guide* (100-05072).

## Parallel Port

### Parallel Port Protocol

The iTherm® 280 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.

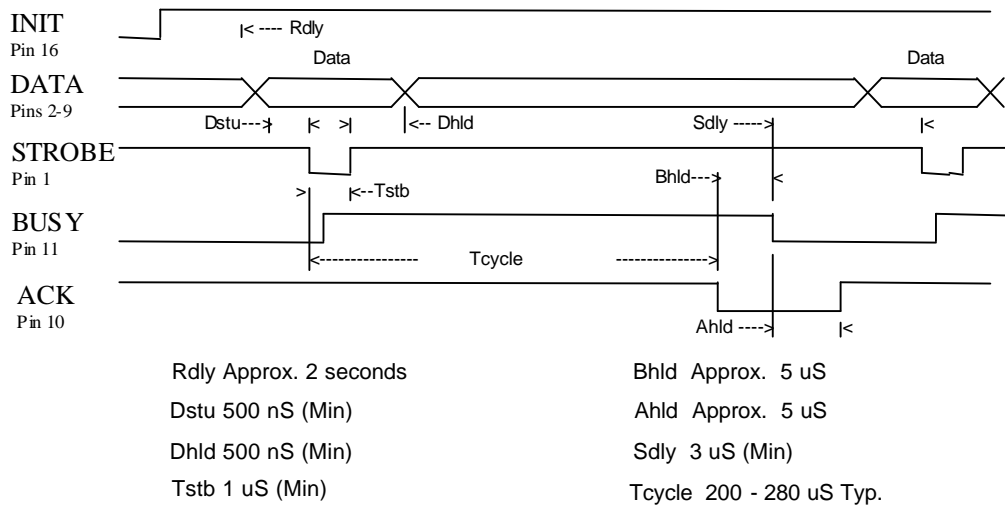


Figure 24 Parallel-port Data Timing

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.

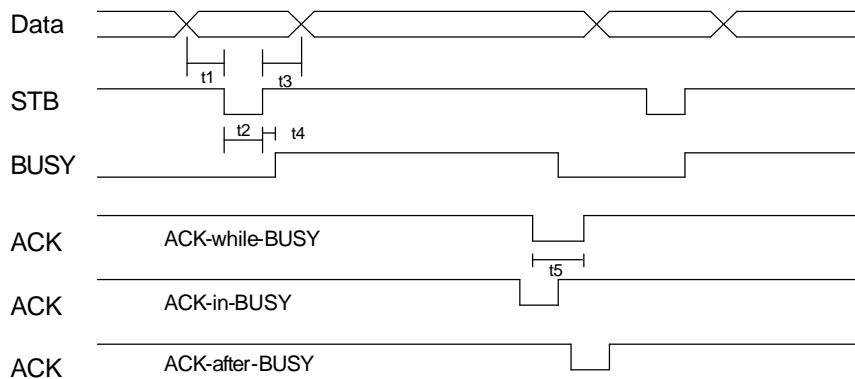


Figure 25 Parallel Port ACK Timing Options

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 52 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 iTherm® 280 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 and IEEE 1284

The iTherm® 280 printer supports the IEEE 1284 bidirectional parallel peripheral interface standard. The IEEE 1284 standard provides for a bidirectional link on the parallel port. The iTherm® 280 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. at [www.ieee.org](http://www.ieee.org).

### IEEE 1284 Response Buffer

The iTherm® 280 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 iTherm® 280 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 iTherm® 280 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 iTherm® 280 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:M280CL,IPCL;  
 CLS:PRINTER;MDL M280 PcOS;  
 DES:Ithaca M280;  
 REV:x.xx;OPTS;\$9xyz

**PnP ID:** LPTENUM\Ithaca-Perph.M280\_P4D21

**Device Description:** Ithaca M280

Device Class: Printer

#### OPTS Field Description

OPTS;\$6XYZ

where X is a model definition. X will be 3 if the printer is in the native iTherm® 280 emulation. 5 indicates that the printer is in some other emulation. Y and Z are bit fields that designate the options attached to the printer.

Bit	Y	Z
Bit 0	Color Support active	0
Bit 1	Undefined	Knife module attached
Bit 2	Undefined	0
Bit 3	0	0
Bits 4-5	1	1
Bits 6-7	0	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<sup>21</sup> bytes of data after it indicates that it is not ready. Figure 26 Serial Port Flow Control Using DTR illustrates how the Ready/Busy protocol works, and Figure 27 XON/XOFF Serial Port Flow Control illustrates how the XON/XOFF protocol works.

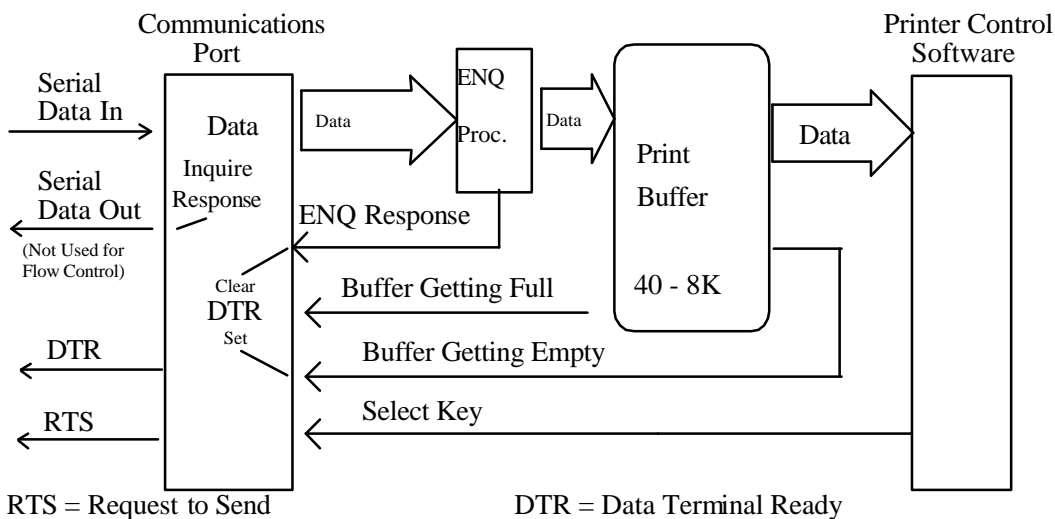
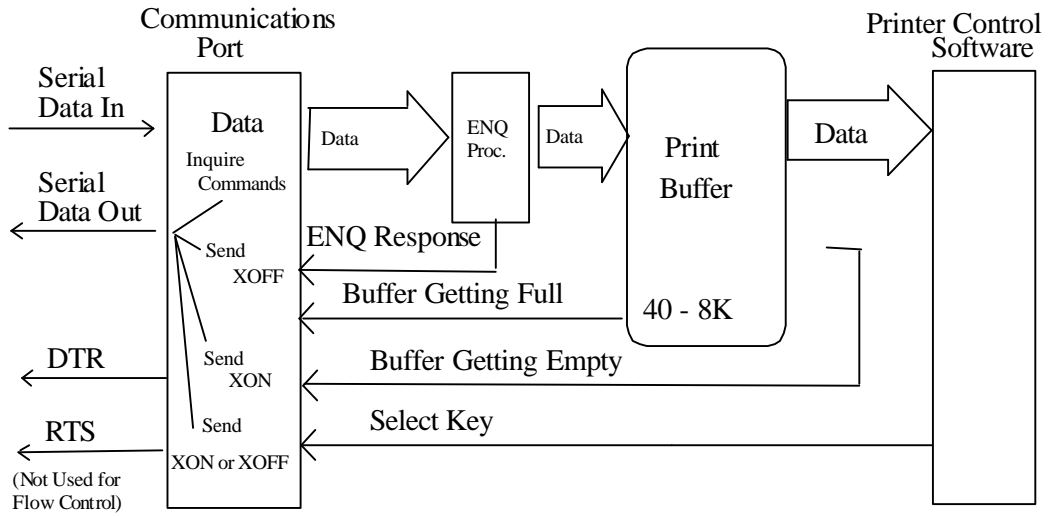


Figure 26 Serial Port Flow Control Using DTR

<sup>21</sup> 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

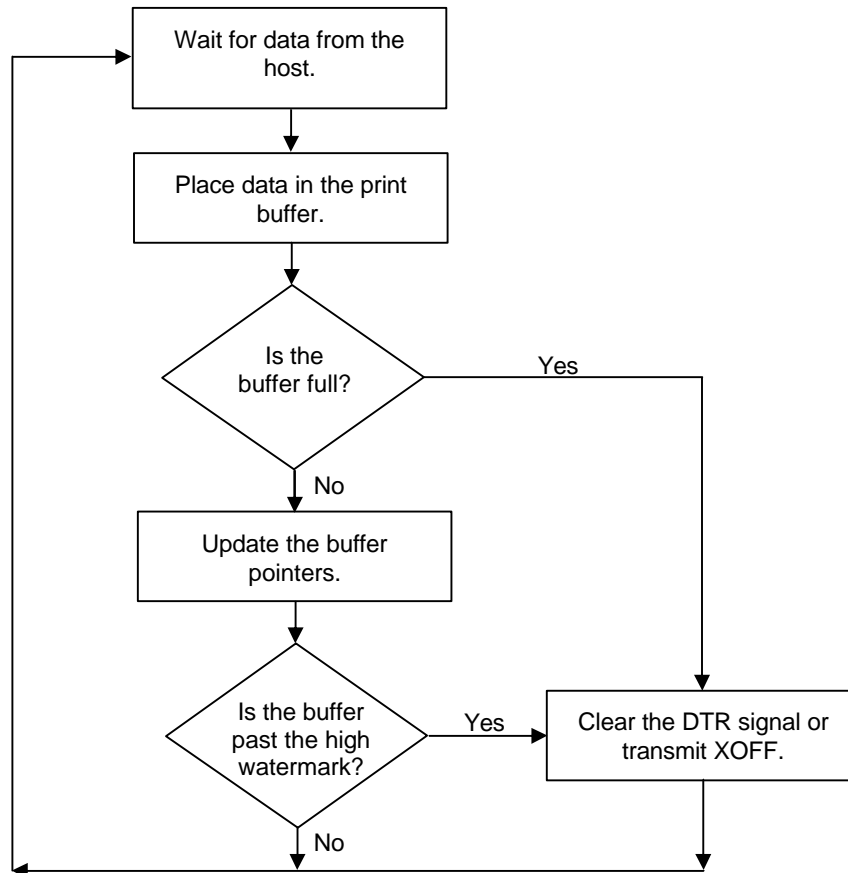
DTR = Data Terminal Ready

Figure 27 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.

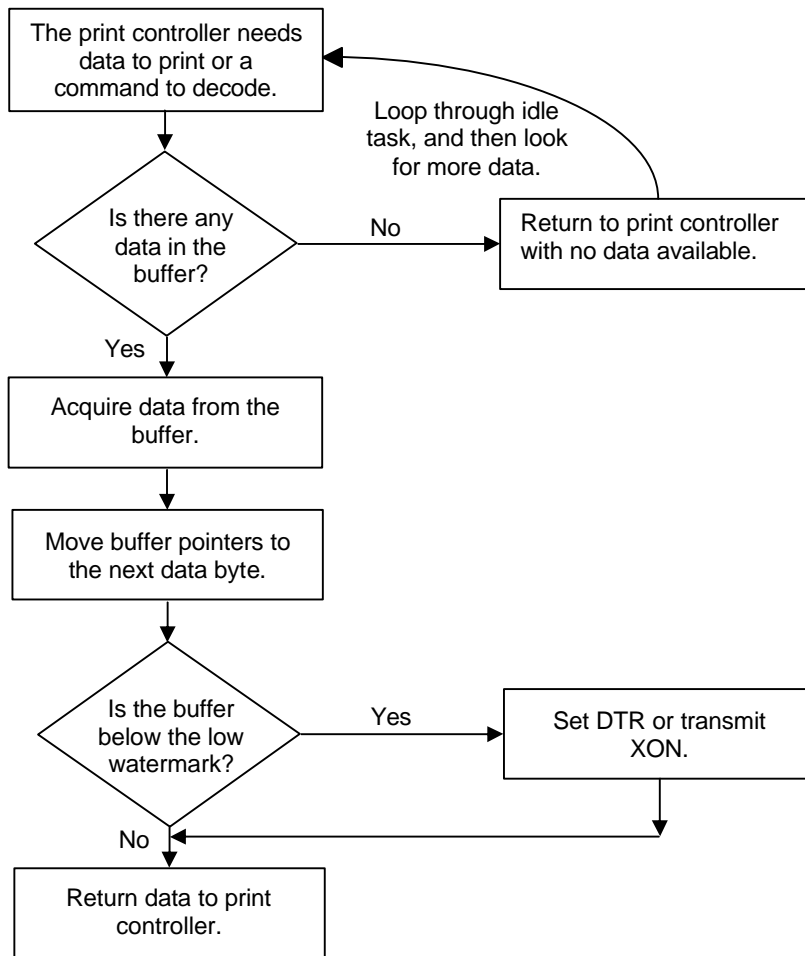


Flow Chart 1 Serial Buffer Operation

At the top of this flow chart, 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 iTherm® 280 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 iTherm® 280 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 iTherm® 280 Printer follows.

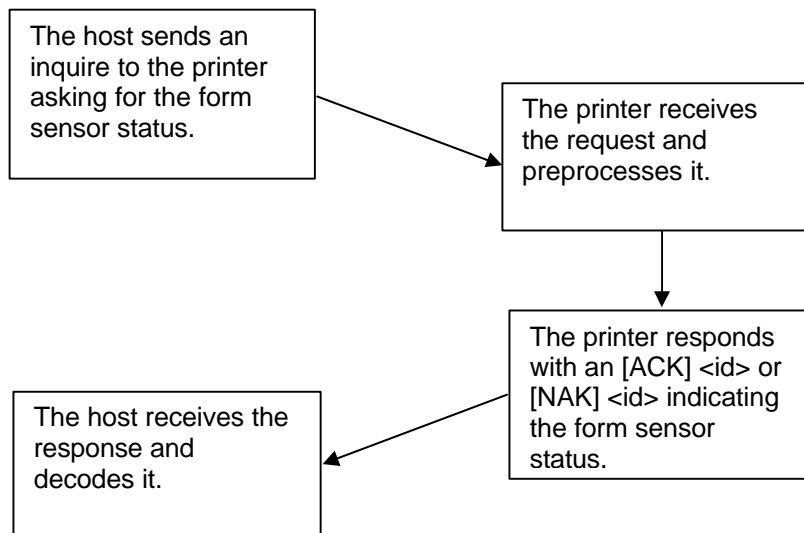
028H	Start of ASCII response
0,1	PnP Rev
'IPR0210'	Unique ID (IPR plus revision level)
\PRINTER	Printer
\M280 PcOS	Model
\SC:	19200,N,8,1
Serial Configuration:	Baud, Parity, Bits, Stop Bits
xxH	Check-sum
029H	End PnP



**Note:** The model field may be altered to generate PnP ID's other than "M280 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.

## 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 are:

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 pass 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.

## Remote Power Control

The iTherm® 280 Printer has a remote power control command that instructs it to enter OFF. When the command is issued, the printer performs print cartridge maintenance and enters OFF. Unlike pushing the \* button, remote power mode leaves the communications active. All commands except the exit power down command are ignored.

---

<b>[ESC] y</b>	<b>Remote Power Control</b>	
<b>ASCII</b>	[ESC] y <n>	
<b>Hexadecimal</b>	1BH 79H <n>	
<b>Decimal</b>	<27> <121> <n>	
<b>IPCL</b>	&%YX17 or &%YX18	
<b>EPOS</b>	[ESC] y <n>	
<b>Where n</b>	17	Requests the printer to enter remote OFF
	18	Requests the printer to exit remote OFF

**Description** Inquiry (ENQ) commands are accepted and answered in remote power down mode. The printer reactivates if the \* button is pressed or a power up command is received.

**Note:** 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 \* button must be pushed to return the printer to full operation.

**Note:** This command is not available in STAR mode.

## 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 is as 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 re-calibrated.
- 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.

## 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 iTherm<sup>®</sup> 280 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 initial configuration.

### Data Pass-through

The iTherm<sup>®</sup> 280 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.

### Multi-drop Configuration

The iTherm<sup>®</sup> 280 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.

## Recovery from Mechanical Errors

The Ithaca Inquire commands and the Epson [DLE][ENQ] and [DLE][EOT] commands allow most printer error status to be read and in some cases recovery attempted. Paper jams and auto-cutter faults can be recovered, however, any data not previously printed will be lost.

If the application is to support error recovery, the application should use the appropriate status request commands to query the printer periodically. If an error response is such that the fault is recoverable, the host application should interact with the operator and request that the fault be corrected. (IE. Clear Paper Jam) When the operator indicates that the problem has been corrected, the host can issue a reset request.

If a serious error occurs, the printer will halt and enter fault error mode. If the fault is such that the printer can maintain communications with the host, the print status request and response system will remain active. The status of the system will however remain static, i.e. the status responses will reflect the state of the system when the fault occurred.

There are errors that cannot be reported to the host system. These errors are such that the integrity of the printer do not allow continued operation. That is there is no way to report the error. These errors occur (for the most part) during power up diagnostics. They are as follows:

### **EEPROM READ ERROR**

#### **Power up only**

The Internal EEPROM is not readable or the check sum is bad.

Pressing the Power Button will attempt to rewrite the configuration information.

This may leave the printer configured incorrectly.

### **EEPROM WRITE ERROR**

#### **Power up/down and Configuration only**

The Internal EEPROM is defective. There is no recovery.

### **SOFTWARE ERROR VECTOR**

#### **Can occur at any time.**

These errors can occur during operation. They signal a serious problem with the system. In most cases this error will also generate a Watch Dog reset. A power cycle will generally recover normal printer operation. An ESD event or a firmware bug generally causes these errors. The printer maintains an error log, this log contains additional information about the fault and is printed during manual configuration. The information in this log should be reported to Transact to identify the exact cause of the fault.

### **USERSTORE FORMAT ERROR**

#### **Power up or User Store Write Operations**

The User Store data in FLASH has an invalid format. Pressing the Power Button will erase the user store and reformat it. This can be caused by a firmware update.

### **FLASH WRITE ERROR**

#### **Power up or User Store Write Operation.**

The Program Flash has failed. There is no recovery from this error.

### **COM ADAPTER ERROR**

#### **Power up only**

The communications interface card is not supported by the firmware or is missing. There is no recovery.

## 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 (of the 9 pin connector) are outputs from the printer. If any one of these signals is grounded or back driven, the other two outputs will be degraded.

The best time to configure the printer by the host with remote configuration is during system setup or software update.



## Appendix A: Internal Code Pages

Code Page	Country Code/Language Set	Decimal <n <sub>1</sub> > <n <sub>2</sub> >	Hex <n <sub>1</sub> > <n <sub>2</sub> >
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
437	USA	1,181	1H,0B5H
737	Greek	2,225	2H,0E1H
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
866	Cyrillic II-866	3,98	3H,062H
1004	ISO8859	3,236	3H,0ECH
1250	Windows 1250 Central Europe	4,226	4H,0E2H
1251	Windows 1251 Cyrillic	4,227	4H,0E3H
1252	Windows 1252 Latin 1	4,228	4H,0E4H
1253	Windows 1253 Greek	4,229	4H,0E5H
1254	Windows 1254 Turkish	4,230	4H,0E6H
1257	Windows 1257 Baltic	4,233	4H,0E9H
28591	ISO8859-1 Latin 1	111,175	6FH,AFH
28592	ISO8859-2 Latin 2	111,176	6FH,B0H
28593	ISO8859-3 Latin 3	111,177	6FH,B1H
28594	ISO8859-4 Baltic 4	111,178	6FH,B2H
28595	ISO8859-5 Cyrillic	111,179	6FH,B3H
28597	ISO8859-7 Greek	111,181	6FH,B5H
28599	ISO8859-9 Turkish	111,183	6FH,B7H
28605	ISO8859-15 Latin 9	111,189	6FH,BDH

Note: The [ESC]! Select international character set command uses Code Pages 64-81 and represent old DOS code page maps. They are provided to support of legacy applications.

They are not recommended for new applications.

## Appendix B - ASCII Code Table

Hex	Decimal	ASCII	Hex	Decimal	ASCII	Hex	Decimal	ASCII	Hex	Decimal	ASCII
00	0	NULL	20	32	(SP)	40	64	@	60	96	`
01	1	SOH	21	33	!	41	65	A	61	97	a
02	2	STX	22	34	"	42	66	B	62	98	b
03	3	ETX	23	35	#	43	67	C	63	99	c
04	4	EOT	24	36	\$	44	68	D	64	100	d
05	5	ENQ	25	37	%	45	69	E	65	101	e
06	6	ACK	26	38	&	46	70	F	66	102	f
07	7	BEL	27	39	'	47	71	G	67	103	g
08	8	BS	28	40	(	48	72	H	68	104	h
09	9	HT	29	41	)	49	73	I	69	105	i
0A	10	LF	2A	42	*	4A	74	J	6A	106	j
0B	11	VT	2B	43	+	4B	75	K	6B	107	k
0C	12	FF	2C	44	,	4C	76	L	6C	108	l
0D	13	CR	2D	45	-	4D	77	M	6D	109	m
0E	14	SO	2E	46	.	4E	78	N	6E	110	n
0F	15	SI	2F	47	/	4F	79	O	6F	111	o
10	16	DLE	30	48	0	50	80	P	70	112	p
11	17	DC1	31	49	1	51	81	Q	71	113	q
12	18	DC2	32	50	2	52	82	R	72	114	r
13	19	DC3	33	51	3	53	83	S	73	115	s
14	20	DC4	34	52	4	54	84	T	74	116	t
15	21	NAK	35	53	5	55	85	U	75	117	u
16	22	SYN	36	54	6	56	86	V	76	118	v
17	23	ETB	37	55	7	57	87	W	77	119	w
18	24	CAN	38	56	8	58	88	X	78	120	x
19	25	EM	39	57	9	59	89	Y	79	121	y
1A	26	SUB	3A	58	:	5A	90	Z	7A	122	z
1B	27	ESC	3B	59	;	5B	91	[	7B	123	{
1C	28	FS	3C	60	<	5C	92	\	7C	124	
1D	29	GS	3D	61	=	5D	93	]	7D	125	}
1E	30	RS	3E	62	>	5E	94	^	7E	126	~
1F	31	US	3F	63	?	5F	95	_	7F	127	(sp)

## Appendix C: Unicode Character Addresses

**Note:** This information is based on the Unicode 3.0 Standard. For specific character locations see the Unicode standard.

**Note:** The Accutherm Supterme does not contain all possible Unicode characters. The default character sets are defined by the WGL4 and GB18030 standards.

Unicode Range		Use
0x0000	0x007F	C0 Controls and Basic Latin
0x0000	0x001F	C0 controls
0x0020	0x007F	ASCII
0x0080	0x00FF	C1 Controls and Latin-1 Supplement
0x00A0	0x00FF	Latin1
0x0100	0x017F	Latin Extended-A
0x0180	0x024F	Latin Extended-B
0x0250	0x02AF	IPA Extensions
0x02B0	0x02FF	Spacing Modifier Letters
0x0300	0x036F	Combining Diacritical Marks
0x0370	0x03FF	Greek
0x0400	0x04FF	Cyrillic
0x0500	0x052F	Unassigned zone 0500-052F
0x0530	0x058F	Armenian
0x0590	0x05FF	Hebrew
0x0600	0x06FF	Arabic
0x0700	0x08FF	Unassigned 0700-08FF
0x0900	0x097F	Devanagari. Based on ISCII 1988
0x0980	0x09FF	Bengali. Based on ISCII 1988
0x0A00	0x0A7F	Gurmukhi. Based on ISCII 1988
0x0A80	0x0AFF	Gujarati. Based on ISCII 1988
0x0B00	0x0B7F	Oriya. Based on ISCII 1988
0x0B80	0x0BFF	Tamil. Based on ISCII 1988
0x0C00	0x0C7F	Telugu. Based on ISCII 1988
0x0C80	0x0CFF	Kannada. Based on ISCII 1988
0x0D00	0x0D7F	Malayalam. Based on ISCII 1988
0x0D80	0x0DFF	Unassigned zone 0D80-0DFF
0x0D80	0x0DFF	Sinhala (Pre-Unicode 2.0)
0x0E00	0x0E7F	Thai. Based on TIS 620-2529
0x0E80	0x0EFF	Lao. Based on TIS 620-2529
0x0F00	0x0F7F	Burmese (Pre-Unicode 2.0)
0x0F00	0x0FBF	Tibetan
0x0F80	0x0FFF	Khmer (Pre-Unicode 2.0)
0x1000	0x105F	Tibetan (Pre-Unicode 2.0)
0x1060	0x109F	Mongolian (Pre-Unicode 2.0)
0x10A0	0x10FF	Georgian
0x1100	0x11FF	Hangul Jamo
0x1100	0x11F9	Korean combining alphabet
0x1200	0x137F	Ethiopian (Post-Unicode 2.0)
0x13A0	0x13FF	Cherokee (Post-Unicode 2.0)
0x1400	0x167F	Canadian Syllabics (Post-Unicode 2.0)
0x16A0	0x1DFF	Unassigned zone 16A0-1DFF
0x1E00	0x1EFF	Latin Extended Additional
0x1F00	0x1FFF	Greek Extended
0x2000	0x206F	General Punctuation

0x2070	0x209F	Superscripts and Subscripts
0x20A0	0x20CF	Currency Symbols
0x20D0	0x20FF	Combining Diacritical Marks for Symbols
0x2100	0x214F	Letter like Symbols
0x2150	0x218F	Number Forms
0x2190	0x21FF	Arrows
0x2200	0x22FF	Mathematical Operators
0x2300	0x23FF	Miscellaneous Technical
0x2400	0x243F	Control Pictures
0x2440	0x245F	Optical Character Recognition
0x2460	0x24FF	Enclosed Alphanumerics
0x2500	0x257F	Box Drawing
0x2580	0x259F	Block Elements
0x25A0	0x25FF	Geometric Shapes
0x2600	0x26FF	Miscellaneous Symbols
0x2700	0x27BF	Dingbats
0x27C0	0x27FF	Unassigned zone 27C0-27FF
0x2800	0x28FF	Braille Pattern Symbols (Post-Unicode 2.0)
0x2900	0x2FFF	Unassigned zone 2900-2FFF
0x3000	0x303F	CJK Symbols and Punctuation
0x3040	0x309F	Hiragana
0x30A0	0x30FF	Katakana
0x3100	0x312F	Bopomofo
0x3130	0x318F	Hangul Compatibility Jamo. Based on KSC 5601
0x3190	0x319F	Kanbun
0x31A0	0x31FF	Unassigned zone 31A0-31FF
0x3200	0x32FF	Enclosed CJK Letters and Months
0x3300	0x33FF	CJK Compatibility
0x3400	0x4DFF	CJK Unified Ideograph Extension A (Post-Unicode 2.0)
0x4E00	0x9FA5	CJK Unified Ideographs
0x9FA6	0xABFF	Unassigned zone 9FA6-ABFF
0xAC00	0xD7A3	Hangul Syllables
0xD7A4	0xD7FF	Unassigned zone D7A4-D7FF
0xD800	0xDB7F	High Surrogates
0xDB80	0xDBFF	Private Use High Surrogates
0xDC00	0xDFFF	Low Surrogates
0xE000	0xF8FF	Private Use Area
0xF900	0FAFF	CJK Compatibility Ideographs
0xFB00	0FB4F	Alphabetic Presentation Forms
0xFB50	0FDFF	Arabic Presentation Forms-A
0xFE20	0FE2F	Combining Half Marks
0xFE30	0FE4F	CJK Compatibility Forms
0xFE50	0FE6F	Small Form Variants
0xFE70	0FEFF	Arabic Presentation Forms-B
0xFEFF	0FEFF	Special
0xFF00	0FFEF	Half width and Full width Forms
0xFFFF0	0FFFF	Specials
0xFFFF0	0FFFFD	Specials
0xFFFFE	0FFFF	Not character codes



## Appendix D: WGL4.0 Character Addresses

There are 654 Characters in this set.

0020	space
0021	exclamation mark
0022	quotation mark
0023	number sign
0024	dollar sign
0025	percent sign
0026	ampersand
0027	apostrophe
0028	left parenthesis
0029	right parenthesis
002a	asterisk
002b	plus sign
002c	comma
002d	hyphen-minus
002e	period
002f	slash
0030	digit zero
0031	digit one
0032	digit two
0033	digit three
0034	digit four
0035	digit five
0036	digit six
0037	digit seven
0038	digit eight
0039	digit nine
003a	colon
003b	semicolon
003c	less-than sign
003d	equals sign
003e	greater-than sign
003f	question mark
0040	commercial at
0041	Latin capital letter a
0042	Latin capital letter b
0043	Latin capital letter c
0044	Latin capital letter d
0045	Latin capital letter e
0046	Latin capital letter f
0047	Latin capital letter g
0048	Latin capital letter h
0049	Latin capital letter i
004a	Latin capital letter j
004b	Latin capital letter k
004c	Latin capital letter l
004d	Latin capital letter m
004e	Latin capital letter n
004f	Latin capital letter o
0050	Latin capital letter p
0051	Latin capital letter q
0052	Latin capital letter r
0053	Latin capital letter s
0054	Latin capital letter t
0055	Latin capital letter u
0056	Latin capital letter v
0057	Latin capital letter w
0058	Latin capital letter x
0059	Latin capital letter y
005a	Latin capital letter z
005b	left square bracket
005c	backslash
005d	right square bracket
005e	circumflex accent
005f	underline
0060	grave accent
0061	Latin small letter a
0062	Latin small letter b
0063	Latin small letter c
0064	Latin small letter d
0065	Latin small letter e
0066	Latin small letter f
0067	Latin small letter g
0068	Latin small letter h
0069	Latin small letter i
006a	Latin small letter j
006b	Latin small letter k
006c	Latin small letter l
006d	Latin small letter m
006e	Latin small letter n
006f	Latin small letter o
0070	Latin small letter p
0071	Latin small letter q
0072	Latin small letter r
0073	Latin small letter s
0074	Latin small letter t
0075	Latin small letter u
0076	Latin small letter v
0077	Latin small letter w
0078	Latin small letter x
0079	Latin small letter y
007a	Latin small letter z
007b	left curly bracket
007c	vertical line
007d	right curly bracket
007e	tilde
00a0	no-break space
00a1	inverted exclamation mark
00a2	cent sign
00a3	pound sign
00a4	currency sign
00a5	yen sign
00a6	broken bar
00a7	section sign
00a8	diaeresis
00a9	copyright sign
00aa	feminine ordinal indicator
00ab	left guillemet
00ac	not sign
00ad	soft hyphen
00ae	registered trade mark sign
00af	macron, overline
00b0	degree sign
00b1	plus-minus sign
00b2	superscript two
00b3	superscript three
00b4	acute accent
00b5	micro sign
00b6	paragraph sign
00b7	middle dot, kana conjunctive
00b8	cedilla
00b9	superscript one
00ba	masculine ordinal indicator
00bb	right guillemet
00bc	vulgar fraction one quarter
00bd	vulgar fraction one half
00be	vulgar fraction three quarters
00bf	inverted question mark
00c0	Latin capital letter a with grave accent
00c1	Latin capital letter a with acute accent
00c2	Latin capital letter a with circumflex accent
00c3	Latin capital letter a with tilde
00c4	Latin capital letter a with diaeresis
00c5	Latin capital letter a with ring above
00c6	Latin capital letter a with e
00c7	Latin capital letter c with cedilla
00c8	Latin capital letter e with grave accent
00c9	Latin capital letter e with acute accent
00ca	Latin capital letter e with circumflex accent
00cb	Latin capital letter e with diaeresis
00cc	Latin capital letter i with grave accent
00cd	Latin capital letter i with acute accent
00ce	Latin capital letter i with circumflex accent
00cf	Latin capital letter i with diaeresis
00d0	Latin capital letter eth
00d1	Latin capital letter n with tilde
00d2	Latin capital letter o with grave accent
00d3	Latin capital letter o with acute accent
00d4	Latin capital letter o with circumflex accent
00d5	Latin capital letter o with tilde
00d6	Latin capital letter o with diaeresis
00d7	multiplication sign
00d8	Latin capital letter o with oblique stroke
00d9	Latin capital letter u with grave accent
00da	Latin capital letter u with acute accent
00db	Latin capital letter u with circumflex accent
00dc	Latin capital letter u with diaeresis
00dd	Latin capital letter y with acute accent
00de	Latin capital letter thorn
00df	Latin small letter sharp s
00e0	Latin small letter a with grave accent
00e1	Latin small letter a with acute accent

00e2	Latin small letter a with circumflex accent
00e3	Latin small letter a with tilde
00e4	Latin small letter a with diaeresis
00e5	Latin small letter a with ring above
00e6	Latin small letter a with e
00e7	Latin small letter c with cedilla
00e8	Latin small letter e with grave accent
00e9	Latin small letter e with acute accent
00ea	Latin small letter e with circumflex accent
00eb	Latin small letter e with diaeresis
00ec	Latin small letter i with grave accent
00ed	Latin small letter i with acute accent
00ee	Latin small letter i with circumflex accent
00ef	Latin small letter i with diaeresis
00f0	Latin small letter eth
00f1	Latin small letter n with tilde
00f2	Latin small letter o with grave accent
00f3	Latin small letter o with acute accent
00f4	Latin small letter o with circumflex accent
00f5	Latin small letter o with tilde
00f6	Latin small letter o with diaeresis
00f7	division sign
00f8	Latin small letter o with oblique stroke
00f9	Latin small letter u with grave accent
00fa	Latin small letter u with acute accent
00fb	Latin small letter u with circumflex accent
00fc	Latin small letter u with diaeresis
00fd	Latin small letter y with acute accent
00fe	Latin small letter thorn
00ff	Latin small letter y with diaeresis
0100	Latin capital letter a with macron
0101	Latin small letter a with macron
0102	Latin capital letter a with breve
0103	Latin small letter a with breve
0104	Latin capital letter a with ogonek
0105	Latin small letter a with ogonek
0106	Latin capital letter c with acute accent
0107	Latin small letter c with acute accent
0108	Latin capital letter c with circumflex
0109	Latin small letter c with circumflex
010a	Latin capital letter c with dot above
010b	Latin small letter c with dot above
010c	Latin capital letter c with caron
010d	Latin small letter c with caron
010e	Latin capital letter d with hacek
010f	Latin small letter d with hacek
0110	Latin capital letter d with stroke
0111	Latin small letter d with stroke
0112	Latin capital letter e with macron
0113	Latin small letter e with macron
0114	Latin capital letter e with breve
0115	Latin small letter e with breve
0116	Latin capital letter e with dot above
0117	Latin small letter e with dot above
0118	Latin capital letter e with ogonek
0119	Latin small letter e with ogonek
011a	Latin capital letter e with hacek
011b	Latin small letter e with hacek
011c	Latin capital letter g with circumflex
011d	Latin small letter g with circumflex
011e	Latin capital letter g with breve
011f	Latin small letter g with breve
0120	Latin capital letter g with dot above
0121	Latin small letter g with dot above
0122	Latin capital letter g with cedilla
0123	Latin small letter g with cedilla
0124	Latin capital letter h with circumflex
0125	Latin small letter h with circumflex
0126	Latin capital letter h with stroke
0127	Latin small letter h with stroke
0128	Latin capital letter i with tilde
0129	Latin small letter i with tilde
012a	Latin capital letter i with macron
012b	Latin small letter i with macron
012c	Latin capital letter i with breve
012d	Latin small letter i with breve
012e	Latin capital letter i with ogonek
012f	Latin small letter i with ogonek
0130	Latin capital letter i without dot above
0131	Latin small letter i without dot above
0132	Latin capital ligature ij
0133	Latin small ligature ij
0134	Latin capital letter j with circumflex
0135	Latin small letter j with circumflex
0136	Latin capital letter k with cedilla
0137	Latin small letter k with cedilla
0138	Latin small letter kra
0139	Latin capital letter l with acute accent
013a	Latin small letter l with acute accent
013b	Latin capital letter l with cedilla
013c	Latin small letter l with cedilla
013d	Latin capital letter l with hacek
013e	Latin small letter l with hacek
013f	Latin capital letter l with middle dot
0140	Latin small letter l with middle dot
0141	Latin capital letter l with stroke
0142	Latin small letter l with stroke
0143	Latin capital letter n with acute accent
0144	Latin small letter n with acute accent
0145	Latin capital letter n with cedilla
0146	Latin small letter n with cedilla
0147	Latin capital letter n with hacek
0148	Latin small letter n with hacek
0149	Latin small letter n preceded by apostrophe
014a	Latin capital letter eng
014b	Latin small letter eng
014c	Latin capital letter o with macron
014d	Latin small letter o with macron
014e	Latin capital letter o with breve
014f	Latin small letter o with breve
0150	Latin capital letter o with double acute accent
0151	Latin small letter o with double acute accent
0152	Latin capital ligature o with e
0153	Latin small ligature o with e
0154	Latin capital letter r with acute accent
0155	Latin small letter r with acute accent
0156	Latin capital letter r with cedilla
0157	Latin small letter r with cedilla
0158	Latin capital letter r with hacek
0159	Latin small letter r with hacek
015a	Latin capital letter s with acute accent
015b	Latin small letter s with acute accent
015c	Latin capital letter s with circumflex
015d	Latin small letter s with circumflex
015e	Latin capital letter s with cedilla
015f	Latin small letter s with cedilla
0160	Latin capital letter s with hacek
0161	Latin small letter s with hacek
0162	Latin capital letter t with cedilla
0163	Latin small letter t with cedilla
0164	Latin capital letter t with hacek
0165	Latin small letter t with hacek
0166	Latin capital letter t with stroke
0167	Latin small letter t with stroke
0168	Latin capital letter u with tilde
0169	Latin small letter u with tilde
016a	Latin capital letter u with macron
016b	Latin small letter u with macron
016c	Latin capital letter u with breve
016d	Latin small letter u with breve
016e	Latin capital letter u with ring above
016f	Latin small letter u with ring above
0170	Latin capital letter u with double acute accent
0171	Latin small letter u with double acute accent
0172	Latin capital letter u with ogonek
0173	Latin small letter u with ogonek
0174	Latin capital letter w with circumflex
0175	Latin small letter w with circumflex
0176	Latin capital letter y with circumflex
0177	Latin small letter y with circumflex
0178	Latin capital letter y with diaeresis
0179	Latin capital letter z with acute accent
017a	Latin small letter z with acute accent
017b	Latin capital letter z with dot above
017c	Latin small letter z with dot above
017d	Latin capital letter z with hacek
017e	Latin small letter z with hacek
017f	Latin small letter long s
0192	Latin small letter script f, florin sign
01fa	Latin capital letter a with ring above and acute
01fb	Latin small letter a with ring above and acute
01fc	Latin capital ligature ae with acute
01fd	Latin small ligature ae with acute
01fe	Latin capital letter o with stroke and acute
01ff	Latin small letter o with stroke and acute
02c6	nonspacing circumflex accent
02c7	modifier letter hacek
02c9	modifier letter macron
02d8	breve
02d9	dot above
02da	ring above
02db	ogonek
02dc	nonspacing tilde
02dd	modifier letter double prime

0384	Greek tonos
0385	Greek dialytika tonos
0386	Greek capital letter alpha with tonos
0387	Greek ano teleia
0388	Greek capital letter epsilon with tonos
0389	Greek capital letter eta with tonos
038a	Greek capital letter iota with tonos
038c	Greek capital letter omicron with tonos
038e	Greek capital letter upsilon with tonos
038f	Greek capital letter omega with tonos
0390	Greek small letter iota with dialytika and tonos
0391	Greek capital letter alpha
0392	Greek capital letter beta
0393	Greek capital letter gamma
0394	Greek capital letter delta
0395	Greek capital letter epsilon
0396	Greek capital letter zeta
0397	Greek capital letter eta
0398	Greek capital letter theta
0399	Greek capital letter iota
039a	Greek capital letter kappa
039b	Greek capital letter lamda
039c	Greek capital letter mu
039d	Greek capital letter nu
039e	Greek capital letter xi
039f	Greek capital letter omicron
03a0	Greek capital letter pi
03a1	Greek capital letter rho
03a3	Greek capital letter sigma
03a4	Greek capital letter tau
03a5	Greek capital letter upsilon
03a6	Greek capital letter phi
03a7	Greek capital letter chi
03a8	Greek capital letter psi
03a9	Greek capital letter omega
03aa	Greek capital letter iota with dialytika
03ab	Greek capital letter upsilon with dialytika
03ac	Greek small letter alpha with tonos
03ad	Greek small letter epsilon with tonos
03ae	Greek small letter eta with tonos
03af	Greek small letter iota with tonos
03b0	Greek small letter upsilon with dialytika and tonos
03b1	Greek small letter alpha
03b2	Greek small letter beta
03b3	Greek small letter gamma
03b4	Greek small letter delta
03b5	Greek small letter epsilon
03b6	Greek small letter zeta
03b7	Greek small letter eta
03b8	Greek small letter theta
03b9	Greek small letter iota
03ba	Greek small letter kappa
03bb	Greek small letter lamda
03bc	Greek small letter mu
03bd	Greek small letter nu
03be	Greek small letter xi
03bf	Greek small letter omicron
03c0	Greek small letter pi
03c1	Greek small letter rho
03c2	Greek small letter final sigma
03c3	Greek small letter sigma
03c4	Greek small letter tau
03c5	Greek small letter upsilon
03c6	Greek small letter phi
03c7	Greek small letter chi
03c8	Greek small letter psi
03c9	Greek small letter omega
03ca	Greek small letter iota with dialytika
03cb	Greek small letter upsilon with dialytika
03cc	Greek small letter omicron with tonos
03cd	Greek small letter upsilon with tonos
03ce	Greek small letter omega with tonos
0401	Cyrillic capital letter io
0402	Cyrillic capital letter dje
0403	Cyrillic capital letter gje
0404	Cyrillic capital letter ukrainian ie
0405	Cyrillic capital letter dze
0406	Cyrillic capital letter byelorussian-ukrainian i
0407	Cyrillic capital letter yi
0408	Cyrillic capital letter je
0409	Cyrillic capital letter lje
040a	Cyrillic capital letter nje
040b	Cyrillic capital letter tshe
040c	Cyrillic capital letter kje
040e	Cyrillic capital letter short u
040f	Cyrillic capital letter dzhe
0410	Cyrillic capital letter a
0411	Cyrillic capital letter be
0412	Cyrillic capital letter ve
0413	Cyrillic capital letter ghe
0414	Cyrillic capital letter de
0415	Cyrillic capital letter ie
0416	Cyrillic capital letter zhe
0417	Cyrillic capital letter ze
0418	Cyrillic capital letter i
0419	Cyrillic capital letter short i
041a	Cyrillic capital letter ka
041b	Cyrillic capital letter el
041c	Cyrillic capital letter em
041d	Cyrillic capital letter en
041e	Cyrillic capital letter o
041f	Cyrillic capital letter pe
0420	Cyrillic capital letter er
0421	Cyrillic capital letter es
0422	Cyrillic capital letter te
0423	Cyrillic capital letter u
0424	Cyrillic capital letter ef
0425	Cyrillic capital letter ha
0426	Cyrillic capital letter tse
0427	Cyrillic capital letter che
0428	Cyrillic capital letter sha
0429	Cyrillic capital letter shcha
042a	Cyrillic capital letter hard sign
042b	Cyrillic capital letter yeru
042c	Cyrillic capital letter soft sign
042d	Cyrillic capital letter e
042e	Cyrillic capital letter yu
042f	Cyrillic capital letter ya
0430	Cyrillic small letter a
0431	Cyrillic small letter be
0432	Cyrillic small letter ve
0433	Cyrillic small letter ghe
0434	Cyrillic small letter de
0435	Cyrillic small letter ie
0436	Cyrillic small letter zhe
0437	Cyrillic small letter ze
0438	Cyrillic small letter i
0439	Cyrillic small letter short i
043a	Cyrillic small letter ka
043b	Cyrillic small letter el
043c	Cyrillic small letter em
043d	Cyrillic small letter en
043e	Cyrillic small letter o
043f	Cyrillic small letter pe
0440	Cyrillic small letter er
0441	Cyrillic small letter es
0442	Cyrillic small letter te
0443	Cyrillic small letter u
0444	Cyrillic small letter ef
0445	Cyrillic small letter ha
0446	Cyrillic small letter tse
0447	Cyrillic small letter che
0448	Cyrillic small letter sha
0449	Cyrillic small letter shcha
044a	Cyrillic small letter hard sign
044b	Cyrillic small letter yeru
044c	Cyrillic small letter soft sign
044d	Cyrillic small letter e
044e	Cyrillic small letter yu
044f	Cyrillic small letter ya
0451	Cyrillic small letter io
0452	Cyrillic small letter dje
0453	Cyrillic small letter gje
0454	Cyrillic small letter ukrainian ie
0455	Cyrillic small letter dze
0456	Cyrillic small letter byelorussian-ukrainian i
0457	Cyrillic small letter yi
0458	Cyrillic small letter je
0459	Cyrillic small letter lje
045a	Cyrillic small letter nje
045b	Cyrillic small letter tshe
045c	Cyrillic small letter kje
045e	Cyrillic small letter short u
045f	Cyrillic small letter dzhe
0490	Cyrillic capital letter ghe with upturn
0491	Cyrillic small letter ghe with upturn
1e80	Latin capital letter w with grave
1e81	Latin small letter w with grave
1e82	Latin capital letter w with acute
1e83	Latin small letter w with acute
1e84	Latin capital letter w with diaeresis
1e85	Latin small letter w with diaeresis
1ef2	Latin capital letter y with grave
1ef3	Latin small letter y with grave

2013	en dash
2014	em dash
2015	horizontal bar
2017	double low line
2018	left single quotation mark
2019	right single quotation mark
201a	single low-9 quotation mark
201b	single high-reversed-9 quotation mark
201c	left double quotation mark
201d	right double quotation mark
201e	double low-9 quotation mark
2020	dagger
2021	double dagger
2022	bullet
2026	horizontal ellipsis
2030	per mille sign
2032	prime
2033	double prime
2039	single left-pointing angle quotation mark
203a	single right-pointing angle quotation mark
203c	double exclamation mark
203e	overline
2044	fraction slash
207f	superscript Latin small letter n
20a3	french franc sign
20a4	lira sign
20a7	peseta sign
20ac	euro currency symbol
2105	care of
2113	script small l
2116	numero sign
2122	trademark sign
2126	ohm sign
212e	estimated symbol
215b	vulgar fraction one eighth
215c	vulgar fraction three eighths
215d	vulgar fraction five eighths
215e	vulgar fraction seven eighths
2190	leftwards arrow
2191	upwards arrow
2192	rightwards arrow
2193	downwards arrow
2194	left right arrow
2195	up down arrow
21a8	up down arrow with base
2202	partial differential
2206	increment
220f	n-ary product
2211	n-ary summation
2212	minus sign
2215	division slash
2219	bullet operator
221a	square root
221e	infinity
221f	right angle
2229	intersection
222b	integral
2248	almost equal to
2260	not equal to
2261	identical to
2264	less-than or equal to
2265	greater-than or equal to
2302	house
2310	reversed not sign
2320	top half integral
2321	bottom half integral
2500	box drawings light horizontal
2502	box drawings light vertical
250c	box drawings light down and right
2510	box drawings light down and left
2514	box drawings light up and right
2518	box drawings light up and left
251c	box drawings light vertical and right
2524	box drawings light vertical and left
252c	box drawings light down and horizontal
2534	box drawings light up and horizontal
253c	box drawings light vertical and horizontal
2550	box drawings double horizontal
2551	box drawings double vertical
2552	box drawings down single and right double
2553	box drawings down double and right single
2554	box drawings double down and right
2555	box drawings down single and left double
2556	box drawings down double and left single
2557	box drawings double down and left
2558	box drawings up single and right double
2559	box drawings up double and right single
255a	box drawings double up and right
255b	box drawings up single and left double
255c	box drawings up double and left single
255d	box drawings double up and left
255e	box drawings vertical single and right double
255f	box drawings vertical double and right single
2560	box drawings double vertical and right
2561	box drawings vertical single and left double
2562	box drawings vertical double and left single
2563	box drawings double vertical and left
2564	box drawings down single and horizontal double
2565	box drawings down double and horizontal single
2566	box drawings double down and horizontal
2567	box drawings up single and horizontal double
2568	box drawings up double and horizontal single
2569	box drawings double up and horizontal
256a	box drawings vertical single and horizontal double
256b	box drawings vertical double and horizontal single
256c	box drawings double vertical and horizontal
2580	upper half block
2584	lower half block
2588	full block
258c	left half block
2590	right half block
2591	light shade
2592	medium shade
2593	dark shade
25a0	black square
25a1	white square
25aa	black small square
25ab	white small square
25ac	black rectangle
25b2	black up-pointing triangle
25ba	black right-pointing pointer
25bc	black down-pointing triangle
25c4	black left-pointing pointer
25ca	lozenge
25cb	white circle
25cf	black circle
25d8	inverse bullet
25d9	inverse white circle
25e6	white bullet
263a	white smiling face
263b	black smiling face
263c	white sun with rays
2640	female sign
2642	male sign
2660	black spade suit
2663	black club suit
2665	black heart suit
2666	black diamond suit
266a	eighth note
266b	Beamed eighth notes
f001	fi ligature
f002	fl ligature
fb01	Fi ligature
fb02	FI ligature

Note: This information is based on the Microsoft's Typography web page

## Appendix E: GB18030 Character Addresses

There are 28575 Characters in this set.

UNICODE	CHARACTER
0020	SPACE
0021	EXCLAMATION MARK
0022	QUOTATION MARK
0023	NUMBER SIGN
0024	DOLLAR SIGN
0025	PERCENT SIGN
0026	AMPERSAND
0027	APOSTROPHE
0028	LEFT PARENTHESIS
0029	RIGHT PARENTHESIS
002A	ASTERISK
002B	PLUS SIGN
002C	COMMA
002D	HYPHEN-MINUS
002E	FULL STOP
002F	SOLIDUS
0030	DIGIT ZERO
0031	DIGIT ONE
0032	DIGIT TWO
0033	DIGIT THREE
0034	DIGIT FOUR
0035	DIGIT FIVE
0036	DIGIT SIX
0037	DIGIT SEVEN
0038	DIGIT EIGHT
0039	DIGIT NINE
003A	COLON
003B	SEMICOLON
003C	LESS-THAN SIGN
003D	EQUALS SIGN
003E	GREATER-THAN SIGN
003F	QUESTION MARK
0040	COMMERCIAL AT
0041	LATIN CAPITAL LETTER A
0042	LATIN CAPITAL LETTER B
0043	LATIN CAPITAL LETTER C
0044	LATIN CAPITAL LETTER D
0045	LATIN CAPITAL LETTER E
0046	LATIN CAPITAL LETTER F
0047	LATIN CAPITAL LETTER G
0048	LATIN CAPITAL LETTER H
0049	LATIN CAPITAL LETTER I
004A	LATIN CAPITAL LETTER J
004B	LATIN CAPITAL LETTER K
004C	LATIN CAPITAL LETTER L
004D	LATIN CAPITAL LETTER M
004E	LATIN CAPITAL LETTER N
004F	LATIN CAPITAL LETTER O
0050	LATIN CAPITAL LETTER P
0051	LATIN CAPITAL LETTER Q
0052	LATIN CAPITAL LETTER R
0053	LATIN CAPITAL LETTER S
0054	LATIN CAPITAL LETTER T
0055	LATIN CAPITAL LETTER U
0056	LATIN CAPITAL LETTER V
0057	LATIN CAPITAL LETTER W
0058	LATIN CAPITAL LETTER X
0059	LATIN CAPITAL LETTER Y
005A	LATIN CAPITAL LETTER Z
005B	LEFT SQUARE BRACKET
005C	REVERSE SOLIDUS
005D	RIGHT SQUARE BRACKET
005E	CIRCUMFLEX ACCENT
005F	LOW LINE
0060	GRAVE ACCENT
0061	LATIN SMALL LETTER A
0062	LATIN SMALL LETTER B
0063	LATIN SMALL LETTER C
0064	LATIN SMALL LETTER D
0065	LATIN SMALL LETTER E
0066	LATIN SMALL LETTER F
0067	LATIN SMALL LETTER G
0068	LATIN SMALL LETTER H
0069	LATIN SMALL LETTER I
006A	LATIN SMALL LETTER J
006B	LATIN SMALL LETTER K
006C	LATIN SMALL LETTER L
006D	LATIN SMALL LETTER M
006E	LATIN SMALL LETTER N
006F	LATIN SMALL LETTER O

0070	LATIN SMALL LETTER P
0071	LATIN SMALL LETTER Q
0072	LATIN SMALL LETTER R
0073	LATIN SMALL LETTER S
0074	LATIN SMALL LETTER T
0075	LATIN SMALL LETTER U
0076	LATIN SMALL LETTER V
0077	LATIN SMALL LETTER W
0078	LATIN SMALL LETTER X
0079	LATIN SMALL LETTER Y
007A	LATIN SMALL LETTER Z
007B	LEFT CURLY BRACKET
007C	VERTICAL LINE
007D	RIGHT CURLY BRACKET
007E	TILDE
007F	<CONTROL>
00A4	CURRENCY SIGN
00A7	SECTION SIGN
00A8	DIAERESIS
00B0	DEGREE SIGN
00B1	PLUS-MINUS SIGN
00B7	MIDDLE DOT
00D7	MULTIPLICATION SIGN
00E0	LATIN SMALL LETTER A WITH GRAVE
00E1	LATIN SMALL LETTER A WITH ACUTE
00E8	LATIN SMALL LETTER E WITH GRAVE
00E9	LATIN SMALL LETTER E WITH ACUTE
00EA	LATIN SMALL LETTER E WITH CIRCUMFLEX
00EC	LATIN SMALL LETTER I WITH GRAVE
00ED	LATIN SMALL LETTER I WITH ACUTE
00F2	LATIN SMALL LETTER O WITH GRAVE
00F3	LATIN SMALL LETTER O WITH ACUTE
00F7	DIVISION SIGN
00F9	LATIN SMALL LETTER U WITH GRAVE
00FA	LATIN SMALL LETTER U WITH ACUTE
00FC	LATIN SMALL LETTER U WITH DIAERESIS
0101	LATIN SMALL LETTER A WITH MACRON
0113	LATIN SMALL LETTER E WITH MACRON
011B	LATIN SMALL LETTER E WITH CARON
012B	LATIN SMALL LETTER I WITH MACRON
0144	LATIN SMALL LETTER N WITH ACUTE
0148	LATIN SMALL LETTER N WITH CARON
014D	LATIN SMALL LETTER O WITH MACRON
016B	LATIN SMALL LETTER U WITH MACRON
01CE	LATIN SMALL LETTER A WITH CARON
01D0	LATIN SMALL LETTER I WITH CARON
01D2	LATIN SMALL LETTER O WITH CARON
01D4	LATIN SMALL LETTER U WITH CARON
01D6	LATIN SMALL LETTER U WITH DIAERESIS AND MACRON
01D8	LATIN SMALL LETTER U WITH DIAERESIS AND ACUTE
01DA	LATIN SMALL LETTER U WITH DIAERESIS AND CARON
01DC	LATIN SMALL LETTER U WITH DIAERESIS AND GRAVE
0251	LATIN SMALL LETTER ALPHA
0261	LATIN SMALL LETTER SCRIPT G
02C7	CARON (MANDARIN CHINESE THIRD TONE)
02C9	MODIFIER LETTER MACRON (MANDARIN CHINESE FIRST TONE)
02CA	MODIFIER LETTER ACUTE ACCENT (MANDARIN CHINESE SECOND TONE)
02CB	MODIFIER LETTER GRAVE ACCENT (MANDARIN CHINESE FOURTH TONE)
02D9	DOT ABOVE (MANDARIN CHINESE LIGHT TONE)
0391	GREEK CAPITAL LETTER ALPHA
0392	GREEK CAPITAL LETTER BETA
0393	GREEK CAPITAL LETTER GAMMA
0394	GREEK CAPITAL LETTER DELTA
0395	GREEK CAPITAL LETTER EPSILON
0396	GREEK CAPITAL LETTER ZETA
0397	GREEK CAPITAL LETTER ETA
0398	GREEK CAPITAL LETTER THETA
0399	GREEK CAPITAL LETTER IOTA
039A	GREEK CAPITAL LETTER KAPPA
039B	GREEK CAPITAL LETTER LAMDA
039C	GREEK CAPITAL LETTER MU
039D	GREEK CAPITAL LETTER NU
039E	GREEK CAPITAL LETTER XI
039F	GREEK CAPITAL LETTER OMICRON

03A0	GREEK CAPITAL LETTER PI
03A1	GREEK CAPITAL LETTER RHO
03A3	GREEK CAPITAL LETTER SIGMA
03A4	GREEK CAPITAL LETTER TAU
03A5	GREEK CAPITAL LETTER UPSILON
03A6	GREEK CAPITAL LETTER PHI
03A7	GREEK CAPITAL LETTER CHI
03A8	GREEK CAPITAL LETTER PSI
03A9	GREEK CAPITAL LETTER OMEGA
03B1	GREEK SMALL LETTER ALPHA
03B2	GREEK SMALL LETTER BETA
03B3	GREEK SMALL LETTER GAMMA
03B4	GREEK SMALL LETTER DELTA
03B5	GREEK SMALL LETTER EPSILON
03B6	GREEK SMALL LETTER ZETA
03B7	GREEK SMALL LETTER ETA
03B8	GREEK SMALL LETTER THETA
03B9	GREEK SMALL LETTER IOTA
03BA	GREEK SMALL LETTER KAPPA
03BB	GREEK SMALL LETTER LAMDA
03BC	GREEK SMALL LETTER MU
03BD	GREEK SMALL LETTER NU
03BE	GREEK SMALL LETTER XI
03BF	GREEK SMALL LETTER OMICRON
03C0	GREEK SMALL LETTER PI
03C1	GREEK SMALL LETTER RHO
03C3	GREEK SMALL LETTER SIGMA
03C4	GREEK SMALL LETTER TAU
03C5	GREEK SMALL LETTER UPSILON
03C6	GREEK SMALL LETTER PHI
03C7	GREEK SMALL LETTER CHI
03C8	GREEK SMALL LETTER PSI
03C9	GREEK SMALL LETTER OMEGA
0401	CYRILLIC CAPITAL LETTER IO
0410	CYRILLIC CAPITAL LETTER A
0411	CYRILLIC CAPITAL LETTER BE
0412	CYRILLIC CAPITAL LETTER VE
0413	CYRILLIC CAPITAL LETTER GHE
0414	CYRILLIC CAPITAL LETTER DE
0415	CYRILLIC CAPITAL LETTER IE
0416	CYRILLIC CAPITAL LETTER ZHE
0417	CYRILLIC CAPITAL LETTER ZE
0418	CYRILLIC CAPITAL LETTER I
0419	CYRILLIC CAPITAL LETTER SHORT I
041A	CYRILLIC CAPITAL LETTER KA
041B	CYRILLIC CAPITAL LETTER EL
041C	CYRILLIC CAPITAL LETTER EM
041D	CYRILLIC CAPITAL LETTER EN
041E	CYRILLIC CAPITAL LETTER O
041F	CYRILLIC CAPITAL LETTER PE
0420	CYRILLIC CAPITAL LETTER ER
0421	CYRILLIC CAPITAL LETTER ES
0422	CYRILLIC CAPITAL LETTER TE
0423	CYRILLIC CAPITAL LETTER U
0424	CYRILLIC CAPITAL LETTER EF
0425	CYRILLIC CAPITAL LETTER HA
0426	CYRILLIC CAPITAL LETTER TSE
0427	CYRILLIC CAPITAL LETTER CHE
0428	CYRILLIC CAPITAL LETTER SHA
0429	CYRILLIC CAPITAL LETTER SHCHA
042A	CYRILLIC CAPITAL LETTER HARD SIGN
042B	CYRILLIC CAPITAL LETTER YERU
042C	CYRILLIC CAPITAL LETTER SOFT SIGN
042D	CYRILLIC CAPITAL LETTER E
042E	CYRILLIC CAPITAL LETTER YU
042F	CYRILLIC CAPITAL LETTER YA
0430	CYRILLIC SMALL LETTER A
0431	CYRILLIC SMALL LETTER BE
0432	CYRILLIC SMALL LETTER VE
0433	CYRILLIC SMALL LETTER GHE
0434	CYRILLIC SMALL LETTER DE
0435	CYRILLIC SMALL LETTER IE
0436	CYRILLIC SMALL LETTER ZHE
0437	CYRILLIC SMALL LETTER ZE
0438	CYRILLIC SMALL LETTER I
0439	CYRILLIC SMALL LETTER SHORT I
043A	CYRILLIC SMALL LETTER KA
043B	CYRILLIC SMALL LETTER EL
043C	CYRILLIC SMALL LETTER EM
043D	CYRILLIC SMALL LETTER EN
043E	CYRILLIC SMALL LETTER O
043F	CYRILLIC SMALL LETTER PE
0440	CYRILLIC SMALL LETTER ER
0441	CYRILLIC SMALL LETTER ES
0442	CYRILLIC SMALL LETTER TE
0443	CYRILLIC SMALL LETTER U
0444	CYRILLIC SMALL LETTER EF

0445	CYRILLIC SMALL LETTER HA
0446	CYRILLIC SMALL LETTER TSE
0447	CYRILLIC SMALL LETTER CHE
0448	CYRILLIC SMALL LETTER SHA
0449	CYRILLIC SMALL LETTER SHCHA
044A	CYRILLIC SMALL LETTER HARD SIGN
044B	CYRILLIC SMALL LETTER YERU
044C	CYRILLIC SMALL LETTER SOFT SIGN
044D	CYRILLIC SMALL LETTER E
044E	CYRILLIC SMALL LETTER YU
044F	CYRILLIC SMALL LETTER YA
0451	CYRILLIC SMALL LETTER IO
2010	HYPHEN
2013	EN DASH
2014	EM DASH
2015	HORIZONTAL BAR
2016	DOUBLE VERTICAL LINE
2018	LEFT SINGLE QUOTATION MARK
2019	RIGHT SINGLE QUOTATION MARK
201C	LEFT DOUBLE QUOTATION MARK
201D	RIGHT DOUBLE QUOTATION MARK
2025	TWO DOT LEADER
2026	HORIZONTAL ELLIPSIS
2030	PER MILLE SIGN
2032	PRIME
2033	DOUBLE PRIME
2035	REVERSED PRIME
203B	REFERENCE MARK
20AC	EURO SIGN
2103	DEGREE CELSIUS
2105	CARE OF
2109	DEGREE FAHRENHEIT
2116	NUMERO SIGN
2121	TELEPHONE SIGN
2160	ROMAN NUMERAL ONE
2161	ROMAN NUMERAL TWO
2162	ROMAN NUMERAL THREE
2163	ROMAN NUMERAL FOUR
2164	ROMAN NUMERAL FIVE
2165	ROMAN NUMERAL SIX
2166	ROMAN NUMERAL SEVEN
2167	ROMAN NUMERAL EIGHT
2168	ROMAN NUMERAL NINE
2169	ROMAN NUMERAL TEN
216A	ROMAN NUMERAL ELEVEN
216B	ROMAN NUMERAL TWELVE
2170	SMALL ROMAN NUMERAL ONE
2171	SMALL ROMAN NUMERAL TWO
2172	SMALL ROMAN NUMERAL THREE
2173	SMALL ROMAN NUMERAL FOUR
2174	SMALL ROMAN NUMERAL FIVE
2175	SMALL ROMAN NUMERAL SIX
2176	SMALL ROMAN NUMERAL SEVEN
2177	SMALL ROMAN NUMERAL EIGHT
2178	SMALL ROMAN NUMERAL NINE
2179	SMALL ROMAN NUMERAL TEN
2190	LEFTWARDS ARROW
2191	UPWARDS ARROW
2192	RIGHTWARDS ARROW
2193	DOWNWARDS ARROW
2196	NORTH WEST ARROW
2197	NORTH EAST ARROW
2198	SOUTH EAST ARROW
2199	SOUTH WEST ARROW
2208	ELEMENT OF
220F	N-ARY PRODUCT
2211	N-ARY SUMMATION
2215	DIVISION SLASH
221A	SQUARE ROOT
221D	PROPORTIONAL TO
221E	INFINITY
221F	RIGHT ANGLE
2220	ANGLE
2223	DIVIDES
2225	PARALLEL TO
2227	LOGICAL AND
2228	LOGICAL OR
2229	INTERSECTION
222A	UNION
222B	INTEGRAL
222E	CONTOUR INTEGRAL
2234	THEREFORE
2235	BECAUSE
2236	RATIO
2237	PROPORTION
223D	REVERSED TILDE (LAZY S)
2248	ALMOST EQUAL TO

224C	ALL EQUAL TO
2252	APPROXIMATELY EQUAL TO OR THE IMAGE OF
2260	NOT EQUAL TO
2261	IDENTICAL TO
2264	LESS-THAN OR EQUAL TO
2265	GREATER-THAN OR EQUAL TO
2266	LESS-THAN OVER EQUAL TO
2267	GREATER-THAN OVER EQUAL TO
226E	NOT LESS-THAN
226F	NOT GREATER-THAN
2295	CIRCLED PLUS
2299	CIRCLED DOT OPERATOR
22A5	UP TACK
22BF	RIGHT TRIANGLE
2312	ARC
2460	CIRCLED DIGIT ONE
2461	CIRCLED DIGIT TWO
2462	CIRCLED DIGIT THREE
2463	CIRCLED DIGIT FOUR
2464	CIRCLED DIGIT FIVE
2465	CIRCLED DIGIT SIX
2466	CIRCLED DIGIT SEVEN
2467	CIRCLED DIGIT EIGHT
2468	CIRCLED DIGIT NINE
2469	CIRCLED NUMBER TEN
2474	PARENTHESIZED DIGIT ONE
2475	PARENTHESIZED DIGIT TWO
2476	PARENTHESIZED DIGIT THREE
2477	PARENTHESIZED DIGIT FOUR
2478	PARENTHESIZED DIGIT FIVE
2479	PARENTHESIZED DIGIT SIX
247A	PARENTHESIZED DIGIT SEVEN
247B	PARENTHESIZED DIGIT EIGHT
247C	PARENTHESIZED DIGIT NINE
247D	PARENTHESIZED NUMBER TEN
247E	PARENTHESIZED NUMBER ELEVEN
247F	PARENTHESIZED NUMBER TWELVE
2480	PARENTHESIZED NUMBER THIRTEEN
2481	PARENTHESIZED NUMBER FOURTEEN
2482	PARENTHESIZED NUMBER FIFTEEN
2483	PARENTHESIZED NUMBER SIXTEEN
2484	PARENTHESIZED NUMBER SEVENTEEN
2485	PARENTHESIZED NUMBER EIGHTEEN
2486	PARENTHESIZED NUMBER NINETEEN
2487	PARENTHESIZED NUMBER TWENTY
2488	DIGIT ONE FULL STOP
2489	DIGIT TWO FULL STOP
248A	DIGIT THREE FULL STOP
248B	DIGIT FOUR FULL STOP
248C	DIGIT FIVE FULL STOP
248D	DIGIT SIX FULL STOP
248E	DIGIT SEVEN FULL STOP
248F	DIGIT EIGHT FULL STOP
2490	DIGIT NINE FULL STOP
2491	NUMBER TEN FULL STOP
2492	NUMBER ELEVEN FULL STOP
2493	NUMBER TWELVE FULL STOP
2494	NUMBER THIRTEEN FULL STOP
2495	NUMBER FOURTEEN FULL STOP
2496	NUMBER FIFTEEN FULL STOP
2497	NUMBER SIXTEEN FULL STOP
2498	NUMBER SEVENTEEN FULL STOP
2499	NUMBER EIGHTEEN FULL STOP
249A	NUMBER NINETEEN FULL STOP
249B	NUMBER TWENTY FULL STOP
2500	BOX DRAWINGS LIGHT HORIZONTAL
2501	BOX DRAWINGS HEAVY HORIZONTAL
2502	BOX DRAWINGS LIGHT VERTICAL
2503	BOX DRAWINGS HEAVY VERTICAL
2504	BOX DRAWINGS LIGHT TRIPLE DASH HORIZONTAL
2505	BOX DRAWINGS HEAVY TRIPLE DASH HORIZONTAL
2506	BOX DRAWINGS LIGHT TRIPLE DASH VERTICAL
2507	BOX DRAWINGS HEAVY TRIPLE DASH VERTICAL
2508	BOX DRAWINGS LIGHT QUADRUPLE DASH HORIZONTAL
2509	BOX DRAWINGS HEAVY QUADRUPLE DASH HORIZONTAL
250A	BOX DRAWINGS LIGHT QUADRUPLE DASH VERTICAL
250B	BOX DRAWINGS HEAVY QUADRUPLE DASH VERTICAL
250C	BOX DRAWINGS LIGHT DOWN AND RIGHT
250D	BOX DRAWINGS DOWN LIGHT AND RIGHT HEAVY
250E	BOX DRAWINGS DOWN HEAVY AND RIGHT LIGHT
250F	BOX DRAWINGS HEAVY DOWN AND RIGHT
2510	BOX DRAWINGS LIGHT DOWN AND LEFT
2511	BOX DRAWINGS DOWN LIGHT AND LEFT HEAVY

2512	BOX DRAWINGS DOWN HEAVY AND LEFT LIGHT
2513	BOX DRAWINGS HEAVY DOWN AND LEFT
2514	BOX DRAWINGS LIGHT UP AND RIGHT
2515	BOX DRAWINGS UP LIGHT AND RIGHT HEAVY
2516	BOX DRAWINGS UP HEAVY AND RIGHT LIGHT
2517	BOX DRAWINGS HEAVY UP AND RIGHT
2518	BOX DRAWINGS LIGHT UP AND LEFT
2519	BOX DRAWINGS UP LIGHT AND LEFT HEAVY
251A	BOX DRAWINGS UP HEAVY AND LEFT LIGHT
251B	BOX DRAWINGS HEAVY UP AND LEFT
251C	BOX DRAWINGS LIGHT VERTICAL AND RIGHT
251D	BOX DRAWINGS VERTICAL LIGHT AND RIGHT HEAVY
251E	BOX DRAWINGS UP HEAVY AND RIGHT DOWN LIGHT
251F	BOX DRAWINGS DOWN HEAVY AND RIGHT UP LIGHT
2520	BOX DRAWINGS VERTICAL HEAVY AND RIGHT LIGHT
2521	BOX DRAWINGS DOWN LIGHT AND RIGHT UP HEAVY
2522	BOX DRAWINGS UP LIGHT AND RIGHT DOWN HEAVY
2523	BOX DRAWINGS HEAVY VERTICAL AND RIGHT
2524	BOX DRAWINGS LIGHT VERTICAL AND LEFT
2525	BOX DRAWINGS VERTICAL LIGHT AND LEFT HEAVY
2526	BOX DRAWINGS UP HEAVY AND LEFT DOWN LIGHT
2527	BOX DRAWINGS DOWN HEAVY AND LEFT UP LIGHT
2528	BOX DRAWINGS VERTICAL HEAVY AND LEFT LIGHT
2529	BOX DRAWINGS DOWN LIGHT AND LEFT UP HEAVY
252A	BOX DRAWINGS UP LIGHT AND LEFT DOWN HEAVY
252B	BOX DRAWINGS HEAVY VERTICAL AND LEFT
252C	BOX DRAWINGS LIGHT DOWN AND HORIZONTAL
252D	BOX DRAWINGS LEFT HEAVY AND RIGHT DOWN LIGHT
252E	BOX DRAWINGS RIGHT HEAVY AND LEFT DOWN LIGHT
252F	BOX DRAWINGS DOWN LIGHT AND HORIZONTAL HEAVY
2530	BOX DRAWINGS DOWN HEAVY AND HORIZONTAL LIGHT
2531	BOX DRAWINGS RIGHT LIGHT AND LEFT DOWN HEAVY
2532	BOX DRAWINGS LEFT LIGHT AND RIGHT DOWN HEAVY
2533	BOX DRAWINGS HEAVY DOWN AND HORIZONTAL
2534	BOX DRAWINGS LIGHT UP AND HORIZONTAL
2535	BOX DRAWINGS LEFT HEAVY AND RIGHT UP LIGHT
2536	BOX DRAWINGS RIGHT HEAVY AND LEFT UP LIGHT
2537	BOX DRAWINGS UP LIGHT AND HORIZONTAL HEAVY
2538	BOX DRAWINGS UP HEAVY AND HORIZONTAL LIGHT
2539	BOX DRAWINGS RIGHT LIGHT AND LEFT UP HEAVY
253A	BOX DRAWINGS LEFT LIGHT AND RIGHT UP HEAVY
253B	BOX DRAWINGS HEAVY UP AND HORIZONTAL
253C	BOX DRAWINGS LIGHT VERTICAL AND HORIZONTAL
253D	BOX DRAWINGS LEFT HEAVY AND RIGHT VERTICAL LIGHT
253E	BOX DRAWINGS RIGHT HEAVY AND LEFT VERTICAL LIGHT
253F	BOX DRAWINGS VERTICAL LIGHT AND HORIZONTAL HEAVY
2540	BOX DRAWINGS UP HEAVY AND DOWN HORIZONTAL LIGHT
2541	BOX DRAWINGS DOWN HEAVY AND UP HORIZONTAL LIGHT
2542	BOX DRAWINGS VERTICAL HEAVY AND HORIZONTAL LIGHT
2543	BOX DRAWINGS LEFT UP HEAVY AND RIGHT DOWN LIGHT
2544	BOX DRAWINGS RIGHT UP HEAVY AND LEFT DOWN LIGHT
2545	BOX DRAWINGS LEFT DOWN HEAVY AND RIGHT UP LIGHT
2546	BOX DRAWINGS RIGHT DOWN HEAVY AND LEFT UP LIGHT
2547	BOX DRAWINGS DOWN LIGHT AND UP HORIZONTAL HEAVY
2548	BOX DRAWINGS UP LIGHT AND DOWN HORIZONTAL HEAVY
2549	BOX DRAWINGS RIGHT LIGHT AND LEFT VERTICAL HEAVY
254A	BOX DRAWINGS LEFT LIGHT AND RIGHT VERTICAL HEAVY
254B	BOX DRAWINGS HEAVY VERTICAL AND HORIZONTAL
2550	BOX DRAWINGS DOUBLE HORIZONTAL
2551	BOX DRAWINGS DOUBLE VERTICAL
2552	BOX DRAWINGS DOWN SINGLE AND RIGHT DOUBLE
2553	BOX DRAWINGS DOWN DOUBLE AND RIGHT SINGLE

2554	BOX DRAWINGS DOUBLE DOWN AND RIGHT
2555	BOX DRAWINGS DOWN SINGLE AND LEFT DOUBLE
2556	BOX DRAWINGS DOWN DOUBLE AND LEFT SINGLE
2557	BOX DRAWINGS DOUBLE DOWN AND LEFT
2558	BOX DRAWINGS UP SINGLE AND RIGHT DOUBLE
2559	BOX DRAWINGS UP DOUBLE AND RIGHT SINGLE
255A	BOX DRAWINGS DOUBLE UP AND RIGHT
255B	BOX DRAWINGS UP SINGLE AND LEFT DOUBLE
255C	BOX DRAWINGS UP DOUBLE AND LEFT SINGLE
255D	BOX DRAWINGS DOUBLE UP AND LEFT
255E	BOX DRAWINGS VERTICAL SINGLE AND RIGHT DOUBLE
255F	BOX DRAWINGS VERTICAL DOUBLE AND RIGHT SINGLE
2560	BOX DRAWINGS DOUBLE VERTICAL AND RIGHT
2561	BOX DRAWINGS VERTICAL SINGLE AND LEFT DOUBLE
2562	BOX DRAWINGS VERTICAL DOUBLE AND LEFT SINGLE
2563	BOX DRAWINGS DOUBLE VERTICAL AND LEFT
2564	BOX DRAWINGS DOWN SINGLE AND HORIZONTAL DOUBLE
2565	BOX DRAWINGS DOWN DOUBLE AND HORIZONTAL SINGLE
2566	BOX DRAWINGS DOUBLE DOWN AND HORIZONTAL
2567	BOX DRAWINGS UP SINGLE AND HORIZONTAL DOUBLE
2568	BOX DRAWINGS UP DOUBLE AND HORIZONTAL SINGLE
2569	BOX DRAWINGS DOUBLE UP AND HORIZONTAL
256A	BOX DRAWINGS VERTICAL SINGLE AND HORIZONTAL DOUBLE
256B	BOX DRAWINGS VERTICAL DOUBLE AND HORIZONTAL SINGLE
256C	BOX DRAWINGS DOUBLE VERTICAL AND HORIZONTAL
256D	BOX DRAWINGS LIGHT ARC DOWN AND RIGHT
256E	BOX DRAWINGS LIGHT ARC DOWN AND LEFT
256F	BOX DRAWINGS LIGHT ARC UP AND LEFT
2570	BOX DRAWINGS LIGHT ARC UP AND RIGHT
2571	BOX DRAWINGS LIGHT DIAGONAL UPPER RIGHT TO LOWER LEFT
2572	BOX DRAWINGS LIGHT DIAGONAL UPPER LEFT TO LOWER RIGHT
2573	BOX DRAWINGS LIGHT DIAGONAL CROSS
2581	LOWER ONE EIGHTH BLOCK
2582	LOWER ONE QUARTER BLOCK
2583	LOWER THREE EIGHTHS BLOCK
2584	LOWER HALF BLOCK
2585	LOWER FIVE EIGHTHS BLOCK
2586	LOWER THREE QUARTERS BLOCK
2587	LOWER SEVEN EIGHTHS BLOCK
2588	FULL BLOCK
2589	LEFT SEVEN EIGHTHS BLOCK
258A	LEFT THREE QUARTERS BLOCK
258B	LEFT FIVE EIGHTHS BLOCK
258C	LEFT HALF BLOCK
258D	LEFT THREE EIGHTHS BLOCK
258E	LEFT ONE QUARTER BLOCK
258F	LEFT ONE EIGHTH BLOCK
2593	DARK SHADE
2594	UPPER ONE EIGHTH BLOCK
2595	RIGHT ONE EIGHTH BLOCK
25A0	BLACK SQUARE
25A1	WHITE SQUARE
25B2	BLACK UP-POINTING TRIANGLE
25B3	WHITE UP-POINTING TRIANGLE
25BC	BLACK DOWN-POINTING TRIANGLE
25BD	WHITE DOWN-POINTING TRIANGLE
25C6	BLACK DIAMOND
25C7	WHITE DIAMOND
25CB	WHITE CIRCLE
25CE	BULLSEYE
25CF	BLACK CIRCLE
25E2	BLACK LOWER RIGHT TRIANGLE
25E3	BLACK LOWER LEFT TRIANGLE
25E4	BLACK UPPER LEFT TRIANGLE
25E5	BLACK UPPER RIGHT TRIANGLE
2605	BLACK STAR
2606	WHITE STAR
2609	SUN
2640	FEMALE SIGN
2642	MALE SIGN
2FF0	IDEOGRAPHIC DESCRIPTION CHARACTER LEFT TO RIGHT
2FF1	IDEOGRAPHIC DESCRIPTION CHARACTER ABOVE TO BELOW

2FF2	IDEOGRAPHIC DESCRIPTION CHARACTER LEFT TO MIDDLE AND RIGHT
2FF3	IDEOGRAPHIC DESCRIPTION CHARACTER ABOVE TO MIDDLE AND BELOW
2FF4	IDEOGRAPHIC DESCRIPTION CHARACTER FULL SURROUND
2FF5	IDEOGRAPHIC DESCRIPTION CHARACTER SURROUND FROM ABOVE
2FF6	IDEOGRAPHIC DESCRIPTION CHARACTER SURROUND FROM BELOW
2FF7	IDEOGRAPHIC DESCRIPTION CHARACTER SURROUND FROM LEFT
2FF8	IDEOGRAPHIC DESCRIPTION CHARACTER SURROUND FROM UPPER LEFT
2FF9	IDEOGRAPHIC DESCRIPTION CHARACTER SURROUND FROM UPPER RIGHT
2FFA	IDEOGRAPHIC DESCRIPTION CHARACTER SURROUND FROM LOWER LEFT
2FFB	IDEOGRAPHIC DESCRIPTION CHARACTER OVERLAID
3000	IDEOGRAPHIC SPACE
3001	IDEOGRAPHIC COMMA
3002	IDEOGRAPHIC FULL STOP
3003	DITTO MARK
3005	IDEOGRAPHIC ITERATION MARK
3006	IDEOGRAPHIC CLOSING MARK
3007	IDEOGRAPHIC NUMBER ZERO
3008	LEFT ANGLE BRACKET
3009	RIGHT ANGLE BRACKET
300A	LEFT DOUBLE ANGLE BRACKET
300B	RIGHT DOUBLE ANGLE BRACKET
300C	LEFT CORNER BRACKET
300D	RIGHT CORNER BRACKET
300E	LEFT WHITE CORNER BRACKET
300F	RIGHT WHITE CORNER BRACKET
3010	LEFT BLACK LENTICULAR BRACKET
3011	RIGHT BLACK LENTICULAR BRACKET
3012	POSTAL MARK
3013	GETA MARK
3014	LEFT TORTOISE SHELL BRACKET
3015	RIGHT TORTOISE SHELL BRACKET
3016	LEFT WHITE LENTICULAR BRACKET
3017	RIGHT WHITE LENTICULAR BRACKET
301D	REVERSED DOUBLE PRIME QUOTATION MARK
301E	DOUBLE PRIME QUOTATION MARK
3021	HANGZHOU NUMERAL ONE
3022	HANGZHOU NUMERAL TWO
3023	HANGZHOU NUMERAL THREE
3024	HANGZHOU NUMERAL FOUR
3025	HANGZHOU NUMERAL FIVE
3026	HANGZHOU NUMERAL SIX
3027	HANGZHOU NUMERAL SEVEN
3028	HANGZHOU NUMERAL EIGHT
3029	HANGZHOU NUMERAL NINE
303E	IDEOGRAPHIC VARIATION INDICATOR
3041	HIRAGANA LETTER SMALL A
3042	HIRAGANA LETTER A
3043	HIRAGANA LETTER SMALL I
3044	HIRAGANA LETTER I
3045	HIRAGANA LETTER SMALL U
3046	HIRAGANA LETTER U
3047	HIRAGANA LETTER SMALL E
3048	HIRAGANA LETTER E
3049	HIRAGANA LETTER SMALL O
304A	HIRAGANA LETTER O
304B	HIRAGANA LETTER KA
304C	HIRAGANA LETTER GA
304D	HIRAGANA LETTER KI
304E	HIRAGANA LETTER GI
304F	HIRAGANA LETTER KU
3050	HIRAGANA LETTER GU
3051	HIRAGANA LETTER KE
3052	HIRAGANA LETTER GE
3053	HIRAGANA LETTER KO
3054	HIRAGANA LETTER GO
3055	HIRAGANA LETTER SA
3056	HIRAGANA LETTER ZA
3057	HIRAGANA LETTER SI
3058	HIRAGANA LETTER ZI
3059	HIRAGANA LETTER SU
305A	HIRAGANA LETTER ZU
305B	HIRAGANA LETTER SE
305C	HIRAGANA LETTER ZE
305D	HIRAGANA LETTER SO
305E	HIRAGANA LETTER ZO
305F	HIRAGANA LETTER TA
3060	HIRAGANA LETTER DA
3061	HIRAGANA LETTER TI



3062	HIRAGANA LETTER DI
3063	HIRAGANA LETTER SMALL TU
3064	HIRAGANA LETTER TU
3065	HIRAGANA LETTER DU
3066	HIRAGANA LETTER TE
3067	HIRAGANA LETTER DE
3068	HIRAGANA LETTER TO
3069	HIRAGANA LETTER DO
306A	HIRAGANA LETTER NA
306B	HIRAGANA LETTER NI
306C	HIRAGANA LETTER NU
306D	HIRAGANA LETTER NE
306E	HIRAGANA LETTER NO
306F	HIRAGANA LETTER HA
3070	HIRAGANA LETTER BA
3071	HIRAGANA LETTER PA
3072	HIRAGANA LETTER HI
3073	HIRAGANA LETTER BI
3074	HIRAGANA LETTER PI
3075	HIRAGANA LETTER HU
3076	HIRAGANA LETTER BU
3077	HIRAGANA LETTER PU
3078	HIRAGANA LETTER HE
3079	HIRAGANA LETTER BE
307A	HIRAGANA LETTER PE
307B	HIRAGANA LETTER HO
307C	HIRAGANA LETTER BO
307D	HIRAGANA LETTER PO
307E	HIRAGANA LETTER MA
307F	HIRAGANA LETTER MI
3080	HIRAGANA LETTER MU
3081	HIRAGANA LETTER ME
3082	HIRAGANA LETTER MO
3083	HIRAGANA LETTER SMALL YA
3084	HIRAGANA LETTER YA
3085	HIRAGANA LETTER SMALL YU
3086	HIRAGANA LETTER YU
3087	HIRAGANA LETTER SMALL YO
3088	HIRAGANA LETTER YO
3089	HIRAGANA LETTER RA
308A	HIRAGANA LETTER RI
308B	HIRAGANA LETTER RU
308C	HIRAGANA LETTER RE
308D	HIRAGANA LETTER RO
308E	HIRAGANA LETTER SMALL WA
308F	HIRAGANA LETTER WA
3090	HIRAGANA LETTER WI
3091	HIRAGANA LETTER WE
3092	HIRAGANA LETTER WO
3093	HIRAGANA LETTER N
309B	KATAKANA-HIRAGANA VOICED SOUND MARK
309C	KATAKANA-HIRAGANA SEMI-VOICED SOUND MARK
309D	HIRAGANA ITERATION MARK
309E	HIRAGANA VOICED ITERATION MARK
30A1	KATAKANA LETTER SMALL A
30A2	KATAKANA LETTER A
30A3	KATAKANA LETTER SMALL I
30A4	KATAKANA LETTER I
30A5	KATAKANA LETTER SMALL U
30A6	KATAKANA LETTER U
30A7	KATAKANA LETTER SMALL E
30A8	KATAKANA LETTER E
30A9	KATAKANA LETTER SMALL O
30AA	KATAKANA LETTER O
30AB	KATAKANA LETTER KA
30AC	KATAKANA LETTER GA
30AD	KATAKANA LETTER KI
30AE	KATAKANA LETTER GI
30AF	KATAKANA LETTER KU
30B0	KATAKANA LETTER GU
30B1	KATAKANA LETTER KE
30B2	KATAKANA LETTER GE
30B3	KATAKANA LETTER KO
30B4	KATAKANA LETTER GO
30B5	KATAKANA LETTER SA
30B6	KATAKANA LETTER ZA
30B7	KATAKANA LETTER SI
30B8	KATAKANA LETTER ZI
30B9	KATAKANA LETTER SU
30BA	KATAKANA LETTER ZU
30BB	KATAKANA LETTER SE
30BC	KATAKANA LETTER ZE
30BD	KATAKANA LETTER SO
30BE	KATAKANA LETTER ZO
30BF	KATAKANA LETTER TA
30C0	KATAKANA LETTER DA
30C1	KATAKANA LETTER TI

30C2	KATAKANA LETTER DI
30C3	KATAKANA LETTER SMALL TU
30C4	KATAKANA LETTER TU
30C5	KATAKANA LETTER DU
30C6	KATAKANA LETTER TE
30C7	KATAKANA LETTER DE
30C8	KATAKANA LETTER TO
30C9	KATAKANA LETTER DO
30CA	KATAKANA LETTER NA
30CB	KATAKANA LETTER NI
30CC	KATAKANA LETTER NU
30CD	KATAKANA LETTER NE
30CE	KATAKANA LETTER NO
30CF	KATAKANA LETTER HA
30D0	KATAKANA LETTER BA
30D1	KATAKANA LETTER PA
30D2	KATAKANA LETTER HI
30D3	KATAKANA LETTER BI
30D4	KATAKANA LETTER PI
30D5	KATAKANA LETTER HU
30D6	KATAKANA LETTER BU
30D7	KATAKANA LETTER PU
30D8	KATAKANA LETTER HE
30D9	KATAKANA LETTER BE
30DA	KATAKANA LETTER PE
30DB	KATAKANA LETTER HO
30DC	KATAKANA LETTER BO
30DD	KATAKANA LETTER PO
30DE	KATAKANA LETTER MA
30DF	KATAKANA LETTER MI
30E0	KATAKANA LETTER MU
30E1	KATAKANA LETTER ME
30E2	KATAKANA LETTER MO
30E3	KATAKANA LETTER SMALL YA
30E4	KATAKANA LETTER YA
30E5	KATAKANA LETTER SMALL YU
30E6	KATAKANA LETTER YU
30E7	KATAKANA LETTER SMALL YO
30E8	KATAKANA LETTER YO
30E9	KATAKANA LETTER RA
30EA	KATAKANA LETTER RI
30EB	KATAKANA LETTER RU
30EC	KATAKANA LETTER RE
30ED	KATAKANA LETTER RO
30EE	KATAKANA LETTER SMALL WA
30EF	KATAKANA LETTER WA
30F0	KATAKANA LETTER WI
30F1	KATAKANA LETTER WE
30F2	KATAKANA LETTER WO
30F3	KATAKANA LETTER N
30F4	KATAKANA LETTER VU
30F5	KATAKANA LETTER SMALL KA
30F6	KATAKANA LETTER SMALL KE
30FC	KATAKANA-HIRAGANA PROLONGED SOUND MARK
30FD	KATAKANA ITERATION MARK
30FE	KATAKANA VOICED ITERATION MARK
3105	BOPOMOFO LETTER B
3106	BOPOMOFO LETTER P
3107	BOPOMOFO LETTER M
3108	BOPOMOFO LETTER F
3109	BOPOMOFO LETTER D
310A	BOPOMOFO LETTER T
310B	BOPOMOFO LETTER N
310C	BOPOMOFO LETTER L
310D	BOPOMOFO LETTER G
310E	BOPOMOFO LETTER K
310F	BOPOMOFO LETTER H
3110	BOPOMOFO LETTER J
3111	BOPOMOFO LETTER Q
3112	BOPOMOFO LETTER X
3113	BOPOMOFO LETTER ZH
3114	BOPOMOFO LETTER CH
3115	BOPOMOFO LETTER SH
3116	BOPOMOFO LETTER R
3117	BOPOMOFO LETTER Z
3118	BOPOMOFO LETTER C
3119	BOPOMOFO LETTER S
311A	BOPOMOFO LETTER A
311B	BOPOMOFO LETTER O
311C	BOPOMOFO LETTER E
311D	BOPOMOFO LETTER EH
311E	BOPOMOFO LETTER AI
311F	BOPOMOFO LETTER EI
3120	BOPOMOFO LETTER AU
3121	BOPOMOFO LETTER OU
3122	BOPOMOFO LETTER AN
3123	BOPOMOFO LETTER EN

3124	BOPOMOFO LETTER ANG
3125	BOPOMOFO LETTER ENG
3126	BOPOMOFO LETTER ER
3127	BOPOMOFO LETTER I
3128	BOPOMOFO LETTER U
3129	BOPOMOFO LETTER IU
3220	PARENTHESED IDEOGRAPH ONE
3221	PARENTHESED IDEOGRAPH TWO
3222	PARENTHESED IDEOGRAPH THREE
3223	PARENTHESED IDEOGRAPH FOUR
3224	PARENTHESED IDEOGRAPH FIVE
3225	PARENTHESED IDEOGRAPH SIX
3226	PARENTHESED IDEOGRAPH SEVEN
3227	PARENTHESED IDEOGRAPH EIGHT
3228	PARENTHESED IDEOGRAPH NINE
3229	PARENTHESED IDEOGRAPH TEN
3231	PARENTHESED IDEOGRAPH STOCK
32A3	CIRCLED IDEOGRAPH CORRECT
338E	SQUARE MG
338F	SQUARE KG
339C	SQUARE MM
339D	SQUARE CM
339E	SQUARE KM
33A1	SQUARE M SQUARED
33C4	SQUARE CC
33CE	SQUARE KM CAPITAL
33D1	SQUARE LN
33D2	SQUARE LOG
33D5	SQUARE MIL
3400-4DB5	CJK UNIFIED IDEOGRAPH EXTENSION A
4E00-9FA5	CJK UNIFIED IDEOGRAPH
E78D-E796	PRIVATE USE AREA
E7C7-E7C8	PRIVATE USE AREA
E815-E864	PRIVATE USE AREA
F92C	CJK COMPATIBILITY IDEOGRAPH-F92C
F979	CJK COMPATIBILITY IDEOGRAPH-F979
F995	CJK COMPATIBILITY IDEOGRAPH-F995
F9E7	CJK COMPATIBILITY IDEOGRAPH-F9E7
F9F1	CJK COMPATIBILITY IDEOGRAPH-F9F1
FA0C	CJK COMPATIBILITY IDEOGRAPH-FA0C
FA0D	CJK COMPATIBILITY IDEOGRAPH-FA0D
FA0E	CJK COMPATIBILITY IDEOGRAPH-FA0E
FA0F	CJK COMPATIBILITY IDEOGRAPH-FA0F
FA11	CJK COMPATIBILITY IDEOGRAPH-FA11
FA13	CJK COMPATIBILITY IDEOGRAPH-FA13
FA14	CJK COMPATIBILITY IDEOGRAPH-FA14
FA18	CJK COMPATIBILITY IDEOGRAPH-FA18
FA1F	CJK COMPATIBILITY IDEOGRAPH-FA1F *
FA20	CJK COMPATIBILITY IDEOGRAPH-FA20
FA21	CJK COMPATIBILITY IDEOGRAPH-FA21
FA23	CJK COMPATIBILITY IDEOGRAPH-FA23 *
FA24	CJK COMPATIBILITY IDEOGRAPH-FA24
FA27	CJK COMPATIBILITY IDEOGRAPH-FA27
FA28	CJK COMPATIBILITY IDEOGRAPH-FA28
FA29	CJK COMPATIBILITY IDEOGRAPH-FA29
FE30	PRESENTATION FORM FOR VERTICAL TWO DOT LEADER
FE31	PRESENTATION FORM FOR VERTICAL EM DASH
FE33	PRESENTATION FORM FOR VERTICAL LOW LINE
FE34	PRESENTATION FORM FOR VERTICAL WAVY LOW LINE
FE35	PRESENTATION FORM FOR VERTICAL LEFT PARENTHESIS
FE36	PRESENTATION FORM FOR VERTICAL RIGHT PARENTHESIS
FE37	PRESENTATION FORM FOR VERTICAL LEFT CURLY BRACKET
FE38	PRESENTATION FORM FOR VERTICAL RIGHT CURLY BRACKET
FE39	PRESENTATION FORM FOR VERTICAL LEFT TORTOISE SHELL BRACKET
FE3A	PRESENTATION FORM FOR VERTICAL RIGHT TORTOISE SHELL BRACKET
FE3B	PRESENTATION FORM FOR VERTICAL LEFT BLACK LENTICULAR BRACKET
FE3C	PRESENTATION FORM FOR VERTICAL RIGHT BLACK LENTICULAR BRACKET
FE3D	PRESENTATION FORM FOR VERTICAL LEFT DOUBLE ANGLE BRACKET
FE3E	PRESENTATION FORM FOR VERTICAL RIGHT DOUBLE ANGLE BRACKET
FE3F	PRESENTATION FORM FOR VERTICAL LEFT ANGLE BRACKET
FE40	PRESENTATION FORM FOR VERTICAL RIGHT ANGLE BRACKET
FE41	PRESENTATION FORM FOR VERTICAL LEFT CORNER BRACKET

FE42	PRESENTATION FORM FOR VERTICAL RIGHT CORNER BRACKET
FE43	PRESENTATION FORM FOR VERTICAL LEFT WHITE CORNER BRACKET
FE44	PRESENTATION FORM FOR VERTICAL RIGHT WHITE CORNER BRACKET
FE49	DASHED OVERLINE
FE4A	CENTRELINE OVERLINE
FE4B	WAVY OVERLINE
FE4C	DOUBLE WAVY OVERLINE
FE4D	DASHED LOW LINE
FE4E	CENTRELINE LOW LINE
FE4F	WAVY LOW LINE
FE50	SMALL COMMA
FE51	SMALL IDEOGRAPHIC COMMA
FE52	SMALL FULL STOP
FE54	SMALL SEMICOLON
FE55	SMALL COLON
FE56	SMALL QUESTION MARK
FE57	SMALL EXCLAMATION MARK
FE59	SMALL LEFT PARENTHESIS
FE5A	SMALL RIGHT PARENTHESIS
FE5B	SMALL LEFT CURLY BRACKET
FE5C	SMALL RIGHT CURLY BRACKET
FE5D	SMALL LEFT TORTOISE SHELL BRACKET
FE5E	SMALL RIGHT TORTOISE SHELL BRACKET
FE5F	SMALL NUMBER SIGN
FE60	SMALL AMPERSAND
FE61	SMALL ASTERISK
FE62	SMALL PLUS SIGN
FE63	SMALL HYPHEN-MINUS
FE64	SMALL LESS-THAN SIGN
FE65	SMALL GREATER-THAN SIGN
FE66	SMALL EQUALS SIGN
FE68	SMALL REVERSE SOLIDUS
FE69	SMALL DOLLAR SIGN
FE6A	SMALL PERCENT SIGN
FE6B	SMALL COMMERCIAL AT
FF01	FULLWIDTH EXCLAMATION MARK
FF02	FULLWIDTH QUOTATION MARK
FF03	FULLWIDTH NUMBER SIGN
FF04	FULLWIDTH DOLLAR SIGN
FF05	FULLWIDTH PERCENT SIGN
FF06	FULLWIDTH AMPERSAND
FF07	FULLWIDTH APOSTROPHE
FF08	FULLWIDTH LEFT PARENTHESIS
FF09	FULLWIDTH RIGHT PARENTHESIS
FF0A	FULLWIDTH ASTERISK
FF0B	FULLWIDTH PLUS SIGN
FF0C	FULLWIDTH COMMA
FF0D	FULLWIDTH HYPHEN-MINUS
FF0E	FULLWIDTH FULL STOP
FF0F	FULLWIDTH SOLIDUS
FF10	FULLWIDTH DIGIT ZERO
FF11	FULLWIDTH DIGIT ONE
FF12	FULLWIDTH DIGIT TWO
FF13	FULLWIDTH DIGIT THREE
FF14	FULLWIDTH DIGIT FOUR
FF15	FULLWIDTH DIGIT FIVE
FF16	FULLWIDTH DIGIT SIX
FF17	FULLWIDTH DIGIT SEVEN
FF18	FULLWIDTH DIGIT EIGHT
FF19	FULLWIDTH DIGIT NINE
FF1A	FULLWIDTH COLON
FF1B	FULLWIDTH SEMICOLON
FF1C	FULLWIDTH LESS-THAN SIGN
FF1D	FULLWIDTH EQUALS SIGN
FF1E	FULLWIDTH GREATER-THAN SIGN
FF1F	FULLWIDTH QUESTION MARK
FF20	FULLWIDTH COMMERCIAL AT
FF21	FULLWIDTH LATIN CAPITAL LETTER A
FF22	FULLWIDTH LATIN CAPITAL LETTER B
FF23	FULLWIDTH LATIN CAPITAL LETTER C
FF24	FULLWIDTH LATIN CAPITAL LETTER D
FF25	FULLWIDTH LATIN CAPITAL LETTER E
FF26	FULLWIDTH LATIN CAPITAL LETTER F
FF27	FULLWIDTH LATIN CAPITAL LETTER G
FF28	FULLWIDTH LATIN CAPITAL LETTER H
FF29	FULLWIDTH LATIN CAPITAL LETTER I
FF2A	FULLWIDTH LATIN CAPITAL LETTER J
FF2B	FULLWIDTH LATIN CAPITAL LETTER K
FF2C	FULLWIDTH LATIN CAPITAL LETTER L
FF2D	FULLWIDTH LATIN CAPITAL LETTER M
FF2E	FULLWIDTH LATIN CAPITAL LETTER N
FF2F	FULLWIDTH LATIN CAPITAL LETTER O
FF30	FULLWIDTH LATIN CAPITAL LETTER P
FF31	FULLWIDTH LATIN CAPITAL LETTER Q

FF32	FULLWIDTH LATIN CAPITAL LETTER R
FF33	FULLWIDTH LATIN CAPITAL LETTER S
FF34	FULLWIDTH LATIN CAPITAL LETTER T
FF35	FULLWIDTH LATIN CAPITAL LETTER U
FF36	FULLWIDTH LATIN CAPITAL LETTER V
FF37	FULLWIDTH LATIN CAPITAL LETTER W
FF38	FULLWIDTH LATIN CAPITAL LETTER X
FF39	FULLWIDTH LATIN CAPITAL LETTER Y
FF3A	FULLWIDTH LATIN CAPITAL LETTER Z
FF3B	FULLWIDTH LEFT SQUARE BRACKET
FF3C	FULLWIDTH REVERSE SOLIDUS
FF3D	FULLWIDTH RIGHT SQUARE BRACKET
FF3E	FULLWIDTH CIRCUMFLEX ACCENT
FF3F	FULLWIDTH LOW LINE
FF40	FULLWIDTH GRAVE ACCENT
FF41	FULLWIDTH LATIN SMALL LETTER A
FF42	FULLWIDTH LATIN SMALL LETTER B
FF43	FULLWIDTH LATIN SMALL LETTER C
FF44	FULLWIDTH LATIN SMALL LETTER D
FF45	FULLWIDTH LATIN SMALL LETTER E
FF46	FULLWIDTH LATIN SMALL LETTER F
FF47	FULLWIDTH LATIN SMALL LETTER G
FF48	FULLWIDTH LATIN SMALL LETTER H
FF49	FULLWIDTH LATIN SMALL LETTER I
FF4A	FULLWIDTH LATIN SMALL LETTER J
FF4B	FULLWIDTH LATIN SMALL LETTER K

FF4C	FULLWIDTH LATIN SMALL LETTER L
FF4D	FULLWIDTH LATIN SMALL LETTER M
FF4E	FULLWIDTH LATIN SMALL LETTER N
FF4F	FULLWIDTH LATIN SMALL LETTER O
FF50	FULLWIDTH LATIN SMALL LETTER P
FF51	FULLWIDTH LATIN SMALL LETTER Q
FF52	FULLWIDTH LATIN SMALL LETTER R
FF53	FULLWIDTH LATIN SMALL LETTER S
FF54	FULLWIDTH LATIN SMALL LETTER T
FF55	FULLWIDTH LATIN SMALL LETTER U
FF56	FULLWIDTH LATIN SMALL LETTER V
FF57	FULLWIDTH LATIN SMALL LETTER W
FF58	FULLWIDTH LATIN SMALL LETTER X
FF59	FULLWIDTH LATIN SMALL LETTER Y
FF5A	FULLWIDTH LATIN SMALL LETTER Z
FF5B	FULLWIDTH LEFT CURLY BRACKET
FF5C	FULLWIDTH VERTICAL LINE
FF5D	FULLWIDTH RIGHT CURLY BRACKET
FF5E	FULLWIDTH TILDE
FFE0	FULLWIDTH CENT SIGN
FFE1	FULLWIDTH POUND SIGN
FFE2	FULLWIDTH NOT SIGN
FFE3	FULLWIDTH MACRON *
FFE4	FULLWIDTH BROKEN BAR
FFE5	FULLWIDTH YEN SIGN

## Appendix F Windows 1252 Latin 1

Windows 1252 Latin 1 to Unicode translation

ASCII	Unicode	Character
0x00	0x0000	NULL
0x01	0x0001	START OF HEADING
0x02	0x0002	START OF TEXT
0x03	0x0003	END OF TEXT
0x04	0x0004	END OF TRANSMISSION
0x05	0x0005	ENQUIRY
0x06	0x0006	ACKNOWLEDGE
0x07	0x0007	BELL
0x08	0x0008	BACKSPACE
0x09	0x0009	HORIZONTAL TABULATION
0x0A	0x000A	LINE FEED
0x0B	0x000B	VERTICAL TABULATION
0x0C	0x000C	FORM FEED
0x0D	0x000D	CARRIAGE RETURN
0x0E	0x000E	SHIFT OUT
0x0F	0x000F	SHIFT IN
0x10	0x0010	DATA LINK ESCAPE
0x11	0x0011	DEVICE CONTROL ONE
0x12	0x0012	DEVICE CONTROL TWO
0x13	0x0013	DEVICE CONTROL THREE
0x14	0x0014	DEVICE CONTROL FOUR
0x15	0x0015	NEGATIVE ACKNOWLEDGE
0x16	0x0016	SYNCHRONOUS IDLE
0x17	0x0017	END OF TRANSMISSION BLOCK
0x18	0x0018	CANCEL
0x19	0x0019	END OF MEDIUM
0x1A	0x001A	SUBSTITUTE
0x1B	0x001B	ESCAPE
0x1C	0x001C	FILE SEPARATOR
0x1D	0x001D	GROUP SEPARATOR
0x1E	0x001E	RECORD SEPARATOR
0x1F	0x001F	UNIT SEPARATOR
0x20	0x0020	SPACE
0x21	0x0021	EXCLAMATION MARK
0x22	0x0022	QUOTATION MARK
0x23	0x0023	NUMBER SIGN
0x24	0x0024	DOLLAR SIGN
0x25	0x0025	PERCENT SIGN
0x26	0x0026	AMPERSAND
0x27	0x0027	APOSTROPHE
0x28	0x0028	LEFT PARENTHESIS
0x29	0x0029	RIGHT PARENTHESIS
0x2A	0x002A	ASTERISK
0x2B	0x002B	PLUS SIGN
0x2C	0x002C	COMMA
0x2D	0x002D	HYPHEN-MINUS
0x2E	0x002E	FULL STOP
0x2F	0x002F	SOLIDUS
0x30	0x0030	DIGIT ZERO
0x31	0x0031	DIGIT ONE
0x32	0x0032	DIGIT TWO
0x33	0x0033	DIGIT THREE
0x34	0x0034	DIGIT FOUR
0x35	0x0035	DIGIT FIVE
0x36	0x0036	DIGIT SIX
0x37	0x0037	DIGIT SEVEN
0x38	0x0038	DIGIT EIGHT
0x39	0x0039	DIGIT NINE
0x3A	0x003A	COLON
0x3B	0x003B	SEMICOLON
0x3C	0x003C	LESS-THAN SIGN
0x3D	0x003D	EQUALS SIGN
0x3E	0x003E	GREATER-THAN SIGN
0x3F	0x003F	QUESTION MARK
0x40	0x0040	COMMERCIAL AT
0x41	0x0041	LATIN CAPITAL LETTER A
0x42	0x0042	LATIN CAPITAL LETTER B
0x43	0x0043	LATIN CAPITAL LETTER C
0x44	0x0044	LATIN CAPITAL LETTER D
0x45	0x0045	LATIN CAPITAL LETTER E
0x46	0x0046	LATIN CAPITAL LETTER F
0x47	0x0047	LATIN CAPITAL LETTER G
0x48	0x0048	LATIN CAPITAL LETTER H
0x49	0x0049	LATIN CAPITAL LETTER I
0x4A	0x004A	LATIN CAPITAL LETTER J
0x4B	0x004B	LATIN CAPITAL LETTER K
0x4C	0x004C	LATIN CAPITAL LETTER L
0x4D	0x004D	LATIN CAPITAL LETTER M
0x4E	0x004E	LATIN CAPITAL LETTER N
0x4F	0x004F	LATIN CAPITAL LETTER O
0x50	0x0050	LATIN CAPITAL LETTER P
0x51	0x0051	LATIN CAPITAL LETTER Q
0x52	0x0052	LATIN CAPITAL LETTER R
0x53	0x0053	LATIN CAPITAL LETTER S
0x54	0x0054	LATIN CAPITAL LETTER T
0x55	0x0055	LATIN CAPITAL LETTER U
0x56	0x0056	LATIN CAPITAL LETTER V
0x57	0x0057	LATIN CAPITAL LETTER W
0x58	0x0058	LATIN CAPITAL LETTER X
0x59	0x0059	LATIN CAPITAL LETTER Y
0x5A	0x005A	LATIN CAPITAL LETTER Z
0x5B	0x005B	LEFT SQUARE BRACKET
0x5C	0x005C	REVERSE SOLIDUS
0x5D	0x005D	RIGHT SQUARE BRACKET
0x5E	0x005E	CIRCUMFLEX ACCENT
0x5F	0x005F	LOW LINE
0x60	0x0060	GRAVE ACCENT
0x61	0x0061	LATIN SMALL LETTER A
0x62	0x0062	LATIN SMALL LETTER B
0x63	0x0063	LATIN SMALL LETTER C
0x64	0x0064	LATIN SMALL LETTER D
0x65	0x0065	LATIN SMALL LETTER E
0x66	0x0066	LATIN SMALL LETTER F
0x67	0x0067	LATIN SMALL LETTER G
0x68	0x0068	LATIN SMALL LETTER H
0x69	0x0069	LATIN SMALL LETTER I
0x6A	0x006A	LATIN SMALL LETTER J
0x6B	0x006B	LATIN SMALL LETTER K
0x6C	0x006C	LATIN SMALL LETTER L
0x6D	0x006D	LATIN SMALL LETTER M
0x6E	0x006E	LATIN SMALL LETTER N
0x6F	0x006F	LATIN SMALL LETTER O
0x70	0x0070	LATIN SMALL LETTER P
0x71	0x0071	LATIN SMALL LETTER Q
0x72	0x0072	LATIN SMALL LETTER R
0x73	0x0073	LATIN SMALL LETTER S
0x74	0x0074	LATIN SMALL LETTER T
0x75	0x0075	LATIN SMALL LETTER U
0x76	0x0076	LATIN SMALL LETTER V
0x77	0x0077	LATIN SMALL LETTER W
0x78	0x0078	LATIN SMALL LETTER X
0x79	0x0079	LATIN SMALL LETTER Y
0x7A	0x007A	LATIN SMALL LETTER Z
0x7B	0x007B	LEFT CURLY BRACKET
0x7C	0x007C	VERTICAL LINE
0x7D	0x007D	RIGHT CURLY BRACKET
0x7E	0x007E	TILDE
0x7F	0x007F	DELETE
0x80	0x20AC	EURO SIGN
0x81	0x0000	
0x82	0x201A	SINGLE LOW-9 QUOTATION MARK
0x83	0x0192	LATIN SMALL LETTER F WITH HOOK
0x84	0x201E	DOUBLE LOW-9 QUOTATION MARK
0x85	0x2026	HORIZONTAL ELLIPSIS
0x86	0x2020	DAGGER
0x87	0x2021	DOUBLE DAGGER
0x88	0x02C6	MODIFIER LETTER CIRCUMFLEX ACCENT
0x89	0x2030	PER MILLE SIGN
0x8A	0x0160	LATIN CAPITAL LETTER S WITH CARON

0x8B	0x2039	SINGLE LEFT-POINTING ANGLE QUOTATION MARK
0x8C	0x0152	LATIN CAPITAL LIGATURE OE
0x8D	0x0000	
0x8E	0x017D	LATIN CAPITAL LETTER Z WITH CARON
0x8F	0x0000	
0x90	0x0000	
0x91	0x2018	LEFT SINGLE QUOTATION MARK
0x92	0x2019	RIGHT SINGLE QUOTATION MARK
0x93	0x201C	LEFT DOUBLE QUOTATION MARK
0x94	0x201D	RIGHT DOUBLE QUOTATION MARK
0x95	0x2022	BULLET
0x96	0x2013	EN DASH
0x97	0x2014	EM DASH
0x98	0x02DC	SMALL TILDE
0x99	0x2122	TRADE MARK SIGN
0x9A	0x0161	LATIN SMALL LETTER S WITH CARON
0x9B	0x203A	SINGLE RIGHT-POINTING ANGLE QUOTATION MARK
0x9C	0x0153	LATIN SMALL LIGATURE OE
0x9D	0x0000	
0x9E	0x017E	LATIN SMALL LETTER Z WITH CARON
0x9F	0x0178	LATIN CAPITAL LETTER Y WITH DIAERESIS
0xA0	0x00A0	NO-BREAK SPACE
0xA1	0x00A1	INVERTED EXCLAMATION MARK
0xA2	0x00A2	CENT SIGN
0xA3	0x00A3	POUND SIGN
0xA4	0x00A4	CURRENCY SIGN
0xA5	0x00A5	YEN SIGN
0xA6	0x00A6	BROKEN BAR
0xA7	0x00A7	SECTION SIGN
0xA8	0x00A8	DIAERESIS
0xA9	0x00A9	COPYRIGHT SIGN
0xAA	0x00AA	FEMININE ORDINAL INDICATOR
0xAB	0x00AB	LEFT-POINTING DOUBLE ANGLE QUOTATION MARK
0xAC	0x00AC	NOT SIGN
0xAD	0x00AD	SOFT HYPHEN
0xAE	0x00AE	REGISTERED SIGN
0xAF	0x00AF	MACRON
0xB0	0x00B0	DEGREE SIGN
0xB1	0x00B1	PLUS-MINUS SIGN
0xB2	0x00B2	SUPERSCRIP TWO
0xB3	0x00B3	SUPERSCRIP THREE
0xB4	0x00B4	ACUTE ACCENT
0xB5	0x00B5	MICRO SIGN
0xB6	0x00B6	PILCROW SIGN
0xB7	0x00B7	MIDDLE DOT
0xB8	0x00B8	CEDILLA
0xB9	0x00B9	SUPERSCRIP ONE
0xBA	0x00BA	MASCULINE ORDINAL INDICATOR
0xBB	0x00BB	RIGHT-POINTING DOUBLE ANGLE QUOTATION MARK
0xBC	0x00BC	VULGAR FRACTION ONE QUARTER
0xBD	0x00BD	VULGAR FRACTION ONE HALF
0xBE	0x00BE	VULGAR FRACTION THREE QUARTERS
0xBF	0x00BF	INVERTED QUESTION MARK
0xC0	0x00C0	LATIN CAPITAL LETTER A WITH GRAVE
0xC1	0x00C1	LATIN CAPITAL LETTER A WITH ACUTE
0xC2	0x00C2	LATIN CAPITAL LETTER A WITH CIRCUMFLEX
0xC3	0x00C3	LATIN CAPITAL LETTER A WITH TILDE
0xC4	0x00C4	LATIN CAPITAL LETTER A WITH DIAERESIS
0xC5	0x00C5	LATIN CAPITAL LETTER A WITH RING ABOVE
0xC6	0x00C6	LATIN CAPITAL LETTER AE
0xC7	0x00C7	LATIN CAPITAL LETTER C WITH CEDILLA
0xC8	0x00C8	LATIN CAPITAL LETTER E WITH GRAVE
0xC9	0x00C9	LATIN CAPITAL LETTER E WITH ACUTE
0xCA	0x00CA	LATIN CAPITAL LETTER E WITH CIRCUMFLEX
0xCB	0x00CB	LATIN CAPITAL LETTER E WITH DIAERESIS
0xCC	0x00CC	LATIN CAPITAL LETTER I WITH GRAVE
0xCD	0x00CD	LATIN CAPITAL LETTER I WITH ACUTE
0xCE	0x00CE	LATIN CAPITAL LETTER I WITH CIRCUMFLEX
0xCF	0x00CF	LATIN CAPITAL LETTER I WITH DIAERESIS
0xD0	0x00D0	LATIN CAPITAL LETTER ETH
0xD1	0x00D1	LATIN CAPITAL LETTER N WITH TILDE
0xD2	0x00D2	LATIN CAPITAL LETTER O WITH GRAVE
0xD3	0x00D3	LATIN CAPITAL LETTER O WITH ACUTE
0xD4	0x00D4	LATIN CAPITAL LETTER O WITH CIRCUMFLEX
0xD5	0x00D5	LATIN CAPITAL LETTER O WITH TILDE
0xD6	0x00D6	LATIN CAPITAL LETTER O WITH DIAERESIS
0xD7	0x00D7	MULTIPLICATION SIGN
0xD8	0x00D8	LATIN CAPITAL LETTER O WITH STROKE
0xD9	0x00D9	LATIN CAPITAL LETTER U WITH GRAVE
0xDA	0x00DA	LATIN CAPITAL LETTER U WITH ACUTE
0xDB	0x00DB	LATIN CAPITAL LETTER U WITH CIRCUMFLEX
0xDC	0x00DC	LATIN CAPITAL LETTER U WITH DIAERESIS
0xDD	0x00DD	LATIN CAPITAL LETTER Y WITH ACUTE
0xDE	0x00DE	LATIN CAPITAL LETTER THORN
0xDF	0x00DF	LATIN SMALL LETTER SHARP S
0xE0	0x00E0	LATIN SMALL LETTER A WITH GRAVE
0xE1	0x00E1	LATIN SMALL LETTER A WITH ACUTE
0xE2	0x00E2	LATIN SMALL LETTER A WITH CIRCUMFLEX
0xE3	0x00E3	LATIN SMALL LETTER A WITH TILDE
0xE4	0x00E4	LATIN SMALL LETTER A WITH DIAERESIS
0xE5	0x00E5	LATIN SMALL LETTER A WITH RING ABOVE
0xE6	0x00E6	LATIN SMALL LETTER AE
0xE7	0x00E7	LATIN SMALL LETTER C WITH CEDILLA
0xE8	0x00E8	LATIN SMALL LETTER E WITH GRAVE
0xE9	0x00E9	LATIN SMALL LETTER E WITH ACUTE
0xEA	0x00EA	LATIN SMALL LETTER E WITH CIRCUMFLEX
0xEB	0x00EB	LATIN SMALL LETTER E WITH DIAERESIS
0xEC	0x00EC	LATIN SMALL LETTER I WITH GRAVE
0xED	0x00ED	LATIN SMALL LETTER I WITH ACUTE
0xEE	0x00EE	LATIN SMALL LETTER I WITH CIRCUMFLEX
0xEF	0x00EF	LATIN SMALL LETTER I WITH DIAERESIS
0xF0	0x00F0	LATIN SMALL LETTER ETH
0xF1	0x00F1	LATIN SMALL LETTER N WITH TILDE
0xF2	0x00F2	LATIN SMALL LETTER O WITH GRAVE
0xF3	0x00F3	LATIN SMALL LETTER O WITH ACUTE
0xF4	0x00F4	LATIN SMALL LETTER O WITH CIRCUMFLEX
0xF5	0x00F5	LATIN SMALL LETTER O WITH TILDE
0xF6	0x00F6	LATIN SMALL LETTER O WITH DIAERESIS
0xF7	0x00F7	DIVISION SIGN
0xF8	0x00F8	LATIN SMALL LETTER O WITH STROKE
0xF9	0x00F9	LATIN SMALL LETTER U WITH GRAVE
0xFA	0x00FA	LATIN SMALL LETTER U WITH ACUTE
0xFB	0x00FB	LATIN SMALL LETTER U WITH CIRCUMFLEX
0xFC	0x00FC	LATIN SMALL LETTER U WITH DIAERESIS
0xFD	0x00FD	LATIN SMALL LETTER Y WITH ACUTE
0xFE	0x00FE	LATIN SMALL LETTER THORN
0xFF	0x00FF	LATIN SMALL LETTER Y WITH DIAERESIS



## Appendix G: Ordering Supplies

iTherm® supplies can be ordered easily direct from the TransAct website ([www.transact-tech.com](http://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.

Receipt Paper	Type	Dimensions	Stock Number
Black Monochrome Thermal	One-Ply, 24 rolls per box	3.125" wide x 4" diameter	100-04410
Red Color Thermal	One-Ply, 24 rolls per box Red/Black	3.125" wide x 4" diameter	100-04400
Blue Color Thermal	One-Ply, 24 rolls per box Blue/Black	3.125" wide x 4" diameter	100-04401
Green Color Thermal	One-Ply, 24 rolls per box Green/Black	3.125" wide x 4" diameter	100-04402

NOTE: Green Thermal paper may not be available. Contact Transact Sales for availability.

Table 53 Paper Ordering Information

Cables	Stock Number
<b>110V Power Cable (USA)</b>	98-02174
<b>220V Power Cable (Australia)</b>	98-02178
<b>230V Power Cable (International)</b>	98-02175
<b>230V Power Cable (IND/South Africa)</b>	98-02179
<b>240V Power Cable (UK)</b>	98-02176
<b>Parallel Communication Cable</b> 25-pin male to 25-pin male 36-pin Centronics to 25-pin male	253-9800007 253-9800002
<b>Serial Communication Cable</b> 9-pin Female to 9-pin Female 9-pin Female to 25-pin Female	10-2020 10-2021

Table 54 Cables Ordering Information

Domestic and International power cables available. Call for more information

### Drivers Available:

Windows® 95/98/Me Print Driver and Documentation	98-9171
Windows® 2000/NT 4.0 Print Driver and Documentation	98-9172
OPOS Print Driver Manual	100-9730
OPOS Print Driver Disk 1 / Disk 2	100-9731 / 100-9732
Software Developer's Toolkit (CD-ROM)	100-02440





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