

ithaca[®]

a product of TRANSACT

iTherm[®] 280 Programmer's Guide



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Change History

Rev E	Removed reference to a non-existent Operator's Guide	June 2005
Rev F	Various updates and improvements	June 2005
Rev G	Added Las Vegas address	Nov 2005
Rev H	Added Periodic status back.	Sept 2007
Rev J	Pg 27, Replaced Cash Drawer Pin Assignment table	Nov 2010
Rev K	Page 4 Warranty 36 months was 24.	Apr 2011

Federal Communications Commission Radio Frequency Interference Statement

The *iTherm*[®] 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*[®] 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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Table of Contents

Change History	i
Federal Communications Commission Radio Frequency Interference Statement	i
Canadian Department of Communications Radio Interference Statement	i
Regulatory Compliance	i
Disclaimer	ii
Copyright.....	ii
Trademarks.....	ii
Table of Contents.....	iii
Figures.....	viii
Tables	viii
Introducing your iTherm[®] 280 Printer	1
About your iTherm [®] 280 Printer.....	3
Who Should Read This Guide?	4
What Is Included in This Guide?.....	4
Warranty Options	4
Technical and Sales support	5
On-line Technical Support	5
Telephone Technical Support.....	5
Return Materials Authorization and Return Policies	6
Service Programs.....	6
Sales Support.....	6
Contact Information	7
iTherm[®] 280 Specifications and Requirements.....	9
iTherm [®] 280 Specifications and Requirements.....	11
iTherm [®] 280 Thermal Printer Models.....	11
Standard Features	11
Optional Features.....	13
General Specifications	14
Printing Specifications	14
Character Pitch.....	14
Character Generation	15
Physical Characteristics	18
Dimensions.....	18
Weight.....	18
Electrical Characteristics	19
Internal AC Powered	19
External Powered DC	19
Thermal Print Head.....	19
Media Specifications	20
Receipt Paper.....	20
Buzzer.....	22
Cover Interlock	22
Display Pass Through	22
Communications Interface.....	23
Parallel Interface.....	23
RS-232 Serial Interface	24

USB Interface	24
Ethernet 10-Base-T adapter	25
802.11b Wireless Interface	25
Cash Drawer	26
Interface Description.....	26
Cash Drawer Pin Assignments	26
Vertical Wall Mount Kit Option.....	28
Setup Procedures	29
Verifying the Configuration	31
Verify the Communications Interface Card.....	31
Changing Interface Cards.....	31
Removing the Old Interface Card	31
Cash Drawer Configuration	32
Configuring the Cash Drawer Interface.....	32
Installing Cables.....	33
Connecting power.....	33
Connecting Communications Cables	34
Verify the Firmware Configuration	35
Installing Paper	35
Installing Windows® Printer Drivers.....	36
Printer Driver Installation for WIN95, 98, Me.....	36
Printer Driver Installation for NT4.0, 2000	36
OPOS drivers Installation Instructions	37
To Install the USB drivers	37
How to Operate the iTherm® 280 Printer	39
How to Operate the iTherm® 280 Printer	41
* Button	41
FEED Button	41
Indicator Lights (LED).....	42
Power Indicator (LED)	42
Error Indicator (LED)	42
Paper Indicator (LED).....	42
Fault Indicators.....	42
Testing the Printer Overview	44
Using Self-Test, Configuration, and Hex Dump Mode.....	44
Hex-dump Mode	46
Level 0 Diagnostics	47
Boot Loader Mode	47
Configuring Your iTherm® 280 Printer	49
Configuration Mode Overview	51
Most Frequent Configuration Incompatibilities	51
How to Change Configuration Settings.....	51
Entering into Configuration Mode	51
Using Configuration Mode	52
Remote Configuration	55
Setting up for Color Paper	55
Custom Color	55
Programming Codes.....	57
Control Codes Overview	59

Nomenclature.....	59
Standard Emulation	60
IPCL Codes	60
EPOS Emulation.....	60
Axiohm	60
Ithaca® Microline Emulation	60
Application Development.....	60
Ithaca Control Codes and Commands.....	61
PcOS Printer Control Codes	61
Quick PcOS Reference Chart	62
Quick PcOS Reference Chart (Alphabetic)	69
Low Level Paper Motion Control.....	74
Horizontal Motion Control	75
Vertical Motion Control	77
Feed to Black Dot	83
Character Pitch.....	85
Character Font	88
Print Rotation Commands.....	105
Rotated Print Summary	108
iTherm® 280 Page Mode	111
Graphic Mode.....	115
Graphics Compression	121
User Store (Graphic Save)	121
User Macros	129
Bar Codes	131
Electronic Journal	142
Unicode and Downloaded Fonts.....	154
Unicode Encoding	154
Miscellaneous Control	159
Remote Power Control	167
Documented Extended Control commands.....	168
Printer Status.....	169
Inquire Commands	170
ESC/POS™ Codes.....	179
Differences between Epson TM T90 and iTherm® 280	179
Supported TM-T88 Commands	181
Undocumented TM-T88 Commands	184
Supported TM-T90 Commands	185
TM-T88 / TM-T90 and ESC/POS™ Command Descriptions.....	190
Print and Feed Commands.....	190
Line Spacing Commands	192
Character Commands	192
Panel Button Commands	201
Paper Sensor Commands	202
Print Position Commands.....	204
Bit-Image Commands.....	208
Status Commands.....	209
Printing Paper Command	215
Page Mode.....	216
Bar Code Commands.....	219
Mechanism Control Commands	222

Miscellaneous Commands	223
Macro Function Commands	229
User-defined Images and Graphics Commands	230
Ithaca [®] Specific iTherm [®] 280 Commands.....	235
Panel Button Commands.....	235
Paper Out/Low Sensor Commands	235
iTherm [®] Citizen Emulation.....	237
iTherm [®] Star Emulation.....	237
iTherm [®] Axiohm Emulation.....	237
iTherm[®] 280 Color Graphics.....	239
Printing Graphics.....	241
Character Graphics	241
APA Graphics.....	244
iTherm [®] 280 Universal Color Graphics	247
Print File Graphics	248
Store Graphics in the printer:.....	249
How universal graphics is done	250
How to use IPCL commands in text strings.....	250
Cautions	251
Universal Color Command Descriptions	252
iTherm [®] 280 Coupon-Cut-Logo Feature	254
Unicode	255
Unicode – A Software Font Solution.....	257
About Unicode.....	258
Memory	258
TransAct's implementation of Unicode in the iTherm [®] 280.	258
iTherm[®] 280 Extended Printer Control.....	261
Communications.....	269
Protocol and Print Buffers	271
USB	274
USB Support	274
TCP/IP	275
Print Server Features Standard Ethernet Connection	275
Supported Protocols	275
User Interface/Configuration	275
Other	275
Parallel Port	276
Parallel Port Protocol.....	276
Printer Buffer Size	277
Parallel Port Inquire and IEEE 1284	277
Parallel Port Plug and Play	279
Serial Port	281
Serial Port Protocol.....	281
Print Buffer Flow	283
Printer Buffer Size	285
Serial Mode Plug and Play	285
Using DSR.....	285
Serial Device Identification	286
Serial Port Inquire.....	287

Display Pass Through	288
Remote Power Control	288
Remote Printer Reset.....	289
Reset in Serial Mode	289
Reset in Parallel Mode.....	289
Miscellaneous Communication Features	290
Power-cycle Recovery	290
Data Pass-through.....	290
Multi-drop Configuration	290
Off-line Active	291
Recovery from Mechanical Errors	292
Programmer's Notes	293
Appendix A: Code Page Definition Table.....	295
Appendix B - ASCII Code Table	297
Appendix C: Ordering Supplies	299
Index	301

Figures

Figure 1 Receipt Printing, Tear off Position	21
Figure 2 Cash Drawer Pin Definitions.....	26
Figure 3 Cash Drawer Selection.....	32
Figure 4 Power and Communications Ports	33
Figure 5 3-pin mini DIN plug.....	34
Figure 6 Page Mode entry Orientations	111
Figure 7 Code 39 full 128 character encoding	133
Figure 8 Expanded Function coding	135
Figure 9 Code 128 encoding values	137
Figure 10 Example of Character Graphics.....	241
Figure 11 Example Commands for a Sample Receipt	242
Figure 12 Sample Receipt.....	243
Figure 13 Receipt with graphics	247
Figure 14 Typical POS System	271
Figure 15 Host to Printer Link.....	272
Figure 16 Printer Communications Buffer Flow	273
Figure 17 Parallel-port Data Timing.....	276
Figure 18 Parallel Port ACK Timing Options.....	277
Figure 19 Serial Port Flow Control Using DTR	281
Figure 20 XON/XOFF Serial Port Flow Control.....	282

Tables

Table 1 Possible Character Pitches.....	14
Table 2 Requested CPI and Resulting CPI.....	15
Table 3 Cell Size for Small, Medium and Large Fonts	15
Table 4 Standard Power Input Requirements.....	19
Table 5 Power Input Requirements with the 24-volt DC Power	19
Table 6: Paper Grades-Monochrome	20
Table 7 Parallel Interface Pin-outs.....	23
Table 8 Serial Interface Pin-outs	24
Table 9 Cash Drawer Pin Assignment.....	27
Table 10 Serial interface pin out.....	34
Table 11 Parallel interface pin out	34
Table 12 Error Blink Codes	43
Table 13 Character Pitch.....	86
Table 14 Inter-character Spacing	87
Table 15 Language Table ID's	91
Table 16 Code Page Definition Table.....	92
Table 17 Euro Character Substitution Matrix	93
Table 18 OCR MA-3.....	98
Table 19 Paper Sensor Commands	163
Table 20 Paper Sensor Commands	164
Table 21 Supported TM-T90 Commands	183
Table 22 Undocumented TM-T90 Commands.....	184
Table 23 Supported EPOS Commands.....	185

Table 24 Select Character Font Table	193
Table 25 International Character Sets	194
Table 26 Character Code Pages	196
Table 27 Character Code Table	197
Table 28 Print Modes	198
Table 29 Rotation Modes	199
Table 30 Paper Sensor Commands	202
Table 31 Paper Sensor Commands	203
Table 32 Print Density Selection.....	208
Table 33 Automatic Status Back (ASB) Values for <n>	209
Table 34 Automatic Status Back (ASB) First Byte (Printer Information)	210
Table 35 Automatic Status Back (ASB) Second Byte (Error Information)	210
Table 36 Automatic Status Back (ASB) Third Byte (Paper Sensor Information).....	211
Table 37 Automatic Status Back (ASB) Fourth Byte (Paper Sensor Information)	211
Table 38 Paper Sensor Status (<n> = 1, 49)	211
Table 39 Drawer Kick-out Connector Status (<n> = 2, 50)	212
Table 40 Values for the Status Function, <n>.....	212
Table 41 Printer Status (<n> = 1)	212
Table 42 Off line Status (<n> = 2)	213
Table 43 Error Status (<n> = 3).....	213
Table 44 Paper Roll Sensor Status (<n> = 4)	213
Table 45 Peripheral Status (<n> = 0, 48).....	214
Table 46 Paper Status.....	214
Table 47 Bar Code System Based on <m>	220
Table 48 Printing Position of HRI Characters	221
Table 49 Font for Human Readable Interpretation (HRI) Characters	221
Table 50 Horizontal size of the bar code	221
Table 51 Printer ID	223
Table 52 Type ID (<n> = 2 or 50)	223
Table 53 Peripheral Device Bit Definitions.....	225
Table 54 Macro Control Bit Definitions	229
Table 55 User-defined Bit-image Resolutions.....	234
Table 56 Parallel-port Timing	277
Table 57 Paper Ordering Information	299
Table 58 Cables Ordering Information.....	299

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chapter 1

Introducing your iTherm[®] 280 Printer

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 12 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**, or by telephone at (607) 257-8901 or (877) 7-ITHACA. Consult the following pages for more details about our support services.

Warranty Options

All iTherm® 280 printers now come with a standard 36-month 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 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 8 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.

Contact Information

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

TransAct Technologies
World Gaming Headquarters
& Western Regional Repair Center
6700 Paradise Road
Suite D
Las Vegas, NV 89119 USA

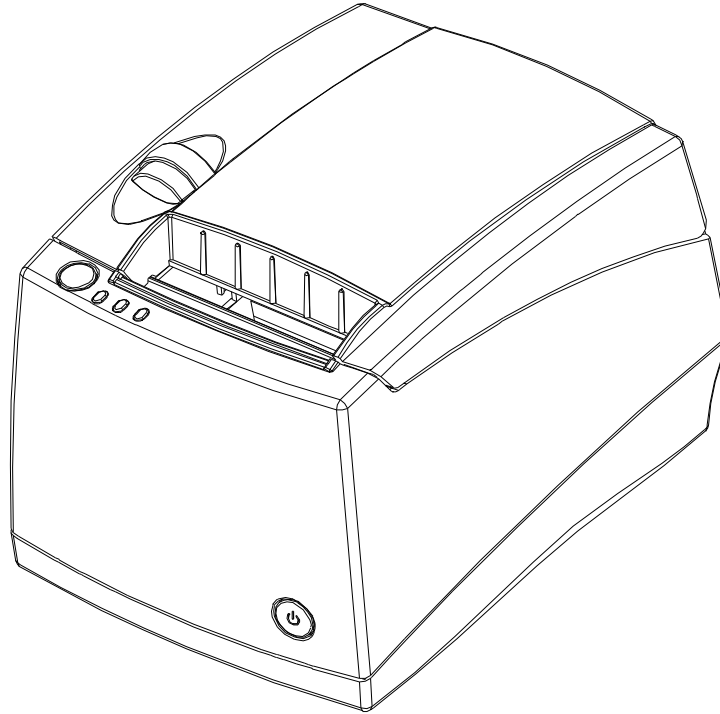
Telephone	(877) 7-ITHACA or (607) 257-8901
Main fax	(607) 257-8922
Sales fax	(607) 257-3868
Technical Support fax	(607) 257-3911
Web site	www.transact-tech.com

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chapter 2

iTherm[®] 280 Specifications and Requirements

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 CPI¹
- Paper Out sensor
- Multiple printer emulations: Ithaca M80/M80+, Ithaca M50/M151 Micro-line, Epson Extended, Epson TM-T88II/III, TM-T90, U200, U300, Axiohm A793/4/5, Citizen and Star
- 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
- 65 Language sets (including Euro symbol)
- 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)



¹ 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.

² 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
- 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

Character Pitch

The iTherm® 280 has 3 basic resident fonts, as well as downloadable fonts. The smallest internal font is a 10 x 24 font and is typically printed in pitches from 16 to 20 characters per inch (CPI). The next larger font is 13 x 24, and is typically printed in pitches from 14 to 16 CPI. The largest font is 15 x 24 and is typically printed in pitches from 10 to 14 CPI.

The printer always prints at 203 dots per inch (dpi). Adding or subtracting space between characters achieves different character pitches. As each dot has a fixed size and position, only specific pitches are possible. The following table defines the fonts and pitches possible with each.

Character Cell (H x W)	10 x 24 Font (W x H)	13 x 24 Font (W x H)	15 x 24 Font (W x H)
Horizontal Width	10 Dots 0.0493 inches	13 Dots 0.0640 inches	15 Dots 0.0739 inches
Vertical Height	24 Dots 0.118 Inches	24 Dots 0.118 Inches	24 Dots 0.118 Inches
Character spacing in Characters per Inch (CPI)			
Pitch at native cell size	20.30	15.62	13.5
5 dot Removed	40.60	25.38	20.30
4 dot Removed	33.83	22.56	18.45
3 dot Removed	29.00	20.30	16.92
2 dot Removed	25.38	18.45	15.62
1 dot Removed	22.56	16.92	14.50
0 dot added	20.30	15.62	13.53
1 dot added	18.45	14.50	12.69
2 dots added	16.92	13.53	11.94
3 dots added	15.62	12.69	11.28
4 dots added	14.50	11.94	10.68
5 dots added	13.53	11.28	10.15
6 dots added	12.69	10.68	9.67

NOTE: Shaded Pitches are not recommended.

Table 1 Possible Character Pitches

Requested CPI	Character Width	Resulting CPI	Requested CPI	Character Width	Resulting CPI
1	203	1.00	16	12	16.92
2	101	2.01	17	12	18.45
3	67	3.03	18	11	18.45
4	50	4.06	19	10	20.30
5	40	5.08	20	10	20.30
6	33	6.15	21	9	22.56
7	29	7.00	22	9	22.56
8	25	8.12	23	8	25.38
9	22	9.23	24	8	25.38
10	20	10.15	25	8	25.38
11	18	11.28	26	7	29.00
12	16	12.69	27	7	29.00
13	15	13.53	28	7	29.00
14	14	14.50	29	7	29.00
15	13	15.62	30	6	33.83

NOTE: Shaded Pitches are not recommended.

Table 2 Requested CPI and Resulting CPI

Character Generation

Standard Print

There are three resident fonts in the printer: Small, Medium, and Large. The cell size for each is different.

Requested CPI	Character Width	Resulting CPI	Requested CPI	Character Width	Resulting CPI
1	203	1.00	16	12	16.92
2	101	2.01	17	12	18.45
3	67	3.03	18	11	18.45
4	50	4.06	19	10	20.30
5	40	5.08	20	10	20.30
6	33	6.15	21	9	22.56
7	29	7.00	22	9	22.56
8	25	8.12	23	8	25.38
9	22	9.23	24	8	25.38
10	20	10.15	25	8	25.38
11	18	11.28	26	7	29.00
12	16	12.69	27	7	29.00
13	15	13.53	28	7	29.00
14	14	14.50	29	7	29.00
15	13	15.62	30	6	33.83

NOTE: Shaded Pitches are not recommended.

Table 3 Cell Size for Small, Medium and Large Fonts

Small 10 x 24 Font

The 10 x 24 small font is defined in a 10 x 24 cell. The characters are typically 22 dots high and 8 dots wide; however to provide readable international characters, some characters are wider. In most cases this font can be printed at 22.5 CPI without having the characters touch. This font is recommended for printing from 16 to 20 CPI.

```

.
01      ...00.....
02      ..0000....
03      ..0000....
04      .00..00...
05      .00..00...
06      .00..00...
07      .00..00...
08      .00..00...
09      00...00..
10      00...00..
11      00...00..
12      00...00..
13      00...00..
14      00000000..
15      00000000..
16      00...00..
17      00...00..
18      00...00..
19      00...00..
20      00...00..
21      00...00..
22      00...00..
23      .....
24      .....

```

Medium 13 x 24 Font

The 13 x 24 medium font is defined in a 13 x 24 cell. The characters are typically 22 dots high and 11 dots wide; however to provide readable international characters, some characters are wider. In most cases this font can be printed at 16.9 CPI without having the characters touch. This font is recommended for printing from 14 to 16 CPI.

```

01      ....000.....
02      ....000.....
03      ....000.....
04      ..00..00....
05      ..00..00....
06      ..00..00....
07      ..00..00....
08      ..00...00....
09      ..00...00....
10      ..00...00....
11      ..00...00....
12      .00....00...
13      .00....00...
14      .00....00...
15      .000000000...
16      .000000000...
17      00.....00..
18      00.....00..
19      00.....00..
20      00.....00..
21      00.....00..
22      00.....00..
23      .....
24      .....

```

Large 15x 24 Font

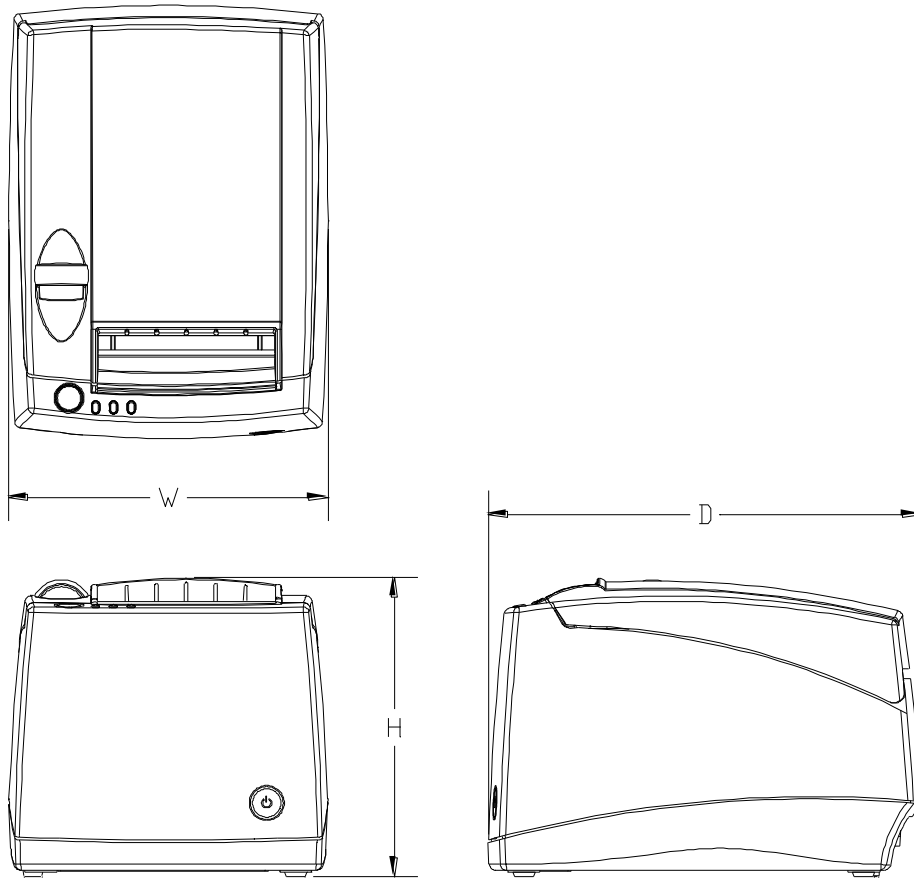
The 15 x 24 medium font is defined in a 15 x 24 cell. The characters are typically 22 dots high and 14 dots wide; however to provide readable international characters, some characters are wider. In most cases this font can be printed at 13.5 CPI without having the characters touch. This font is recommended for printing from 10 to 14 CPI. This font is only available in the Ithaca emulation, and provides a bigger and darker character for better readability.

```
01      ....0000.....
02      ...000000.....
03      ...000000.....
04      ..0000.000....
05      ...000.000....
06      ..000.000....
07      ...000.000....
08      .000...000...
09      ..000...000...
10      .000...000...
11      ..000...000...
12      .000.....000..
13      .000.....000..
14      .000.....000..
15      .000000000000..
16      .000000000000..
17      000.....000.
18      000.....000.
19      000.....000.
20      000.....000.
21      000.....000.
22      000.....000.
23      .....
24      .....
```

Rotated Print

To provide printing flexibility, rotated print is available. Rotated print mode will rotate the print in any of three 90° orientations. The individual characters can be rotated, or a printer buffered mode is available. In printer buffered 90° and 270° rotated mode, the print data is first buffered by the printer, processed (rotated), and then printed.

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 4 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 ²	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 5 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).

² 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 6: 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

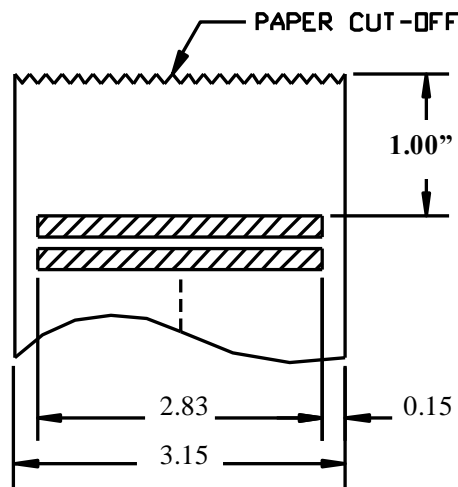


Figure 1 Receipt Printing, Tear off Position

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 7 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 8 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® 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® 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™ 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® 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

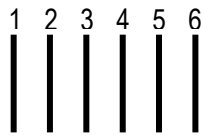
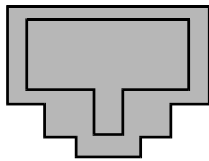
Interface Description

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

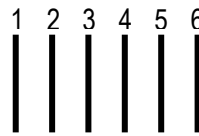
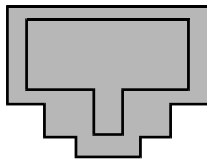
Cash Drawer Pin Assignments

Ithaca



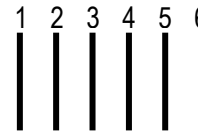
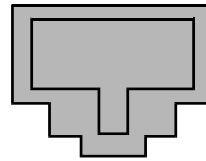
pin 1	CD2-
pin 2	CD1 Sense
pin 3	Ground
pin 4	CD Drive + (+24V)
pin 5	CD1-
pin 6	Not Connected

Epson



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

Star



pin 1	Not Connected
pin 2	CD1-
pin 3	CD Drive + (+24V)
pin 4	CD Drive + (+24V)
pin 5	CD2-
pin 6	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	Ithaca®	Direction	Epson (Standard)	Direction	Star	Direction
	Signal Name		Signal Name		Signal Name	
	pin 1 CD2- pin 2 CD1 Sense pin 3 Ground pin 4 CD Drive +(+24V) pin 5 CD1- pin 6 Not Connected		pin 1 Not Connected pin 2 CD1- pin 3 CD1 Sense pin 4 CD Drive + (+24V) pin 5 CD2- pin 6 Ground		pin 1 Not Connected pin 2 CD1- pin 3 CD Drive +(+24V) pin 4 CD Drive +(+24V) pin 5 CD2- pin 6 CD1 Sense	
1	Drawer 2 kick out drive signal	Output Sink Drive	Not Connected		Not Connected	
2	Drawer 1 open/close signal	Input	Drawer 1 kick out drive signal	Output Sink Drive	Drawer 1 kick out drive signal	Output Sink Drive
3	Signal Ground		Drawer 1 open/close signal	Input	+24V DC	
4	+24V DC		+24V DC		+24V DC	
5	Drawer 1 kick-out drive signal	Output Sink Drive	Drawer 2 kick out drive signal	Output Sink Drive	Drawer 2 kick out drive signal	Output Sink Drive
6	Not Connected		Signal Ground		Drawer 1 open/close signal	Input

Table 9 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.



A horizontal rectangular graphic divided into two sections. The left section is a solid light gray square. The right section is a solid dark gray rectangle containing the text "chapter 3" in white lowercase letters, with the number "3" being significantly larger than the word "chapter".

chapter 3

Setup Procedures

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 32 .

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

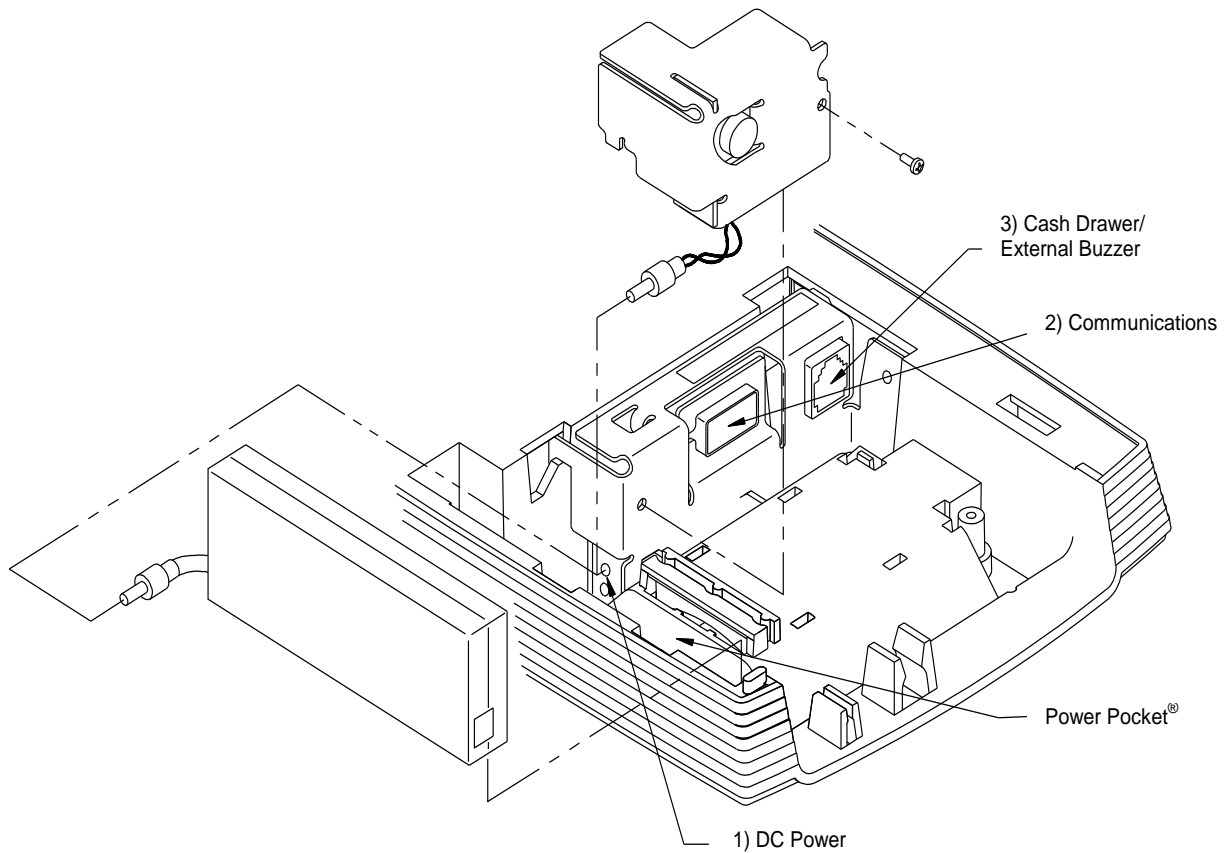


Figure 4 Power and Communications Ports

Three cables are required to be connected to the printer.

1. DC 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.

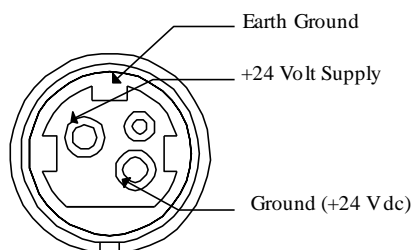


Figure 5 3-pin mini DIN plug

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 10 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 11 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.

Installing Windows® Printer Drivers

Printer Driver Installation for WIN95, 98, Me

1. Insert the “**Windows 95, 98, Me printer driver**” disk into your diskette drive.
2. Click on “**Start**” menu -> “**Settings**” -> “**Printers**”.
3. Double Click on “**Add Printer**” Icon.
4. Select “**Next**”.
5. Select “**Local printer**” and “**Next**”.
6. Click on “**Have Disk**”. If your floppy is A: use A:\ and then “**OK**”.
7. Select the printer you have (i.e. Series iTherm® 280) and then “**Next**”.
8. If you are asked “Keep existing driver” or “Replace existing driver”. Choose “**Replace existing driver**” and then “**Next**”.
9. Select the port the printer is connected to, and then “**Next**”.
10. Select “Yes” or No” for default printer, Printer name should not be altered, so choose “**Next**”.
11. If you wish, you can print a test page. Due to the narrow paper stock that this printer uses, and the margins Windows chooses, there will not be enough room to print all the images of the test page. Some of the large text will word-wrap and be truncated.
12. Select “**Finish**”. The printer driver is now installed.
13. If you selected “Replace existing driver”, reboot your machine to ensure all components are installed.

Printer Driver Installation for NT4.0, 2000

1. Insert the “**Windows NT, 2000 printer driver**” floppy disk into your diskette drive.
2. Click on “**Start**” menu -> “**Settings**” -> “**Printers**”.
3. Double-click on the “**Add Printer**” Icon.
4. Select “**My Computer**” and “**Next**”.
5. Select the port the printer will be connected to, and then “**Next**”.
6. Click on “**Have Disk**”. If your floppy is A: use A:\ and then “**OK**”.
7. Select the printer you have (i.e. Series iTherm® 280) and then “**Next**”.
8. If you are asked “Keep existing driver” or “Replace existing driver”. Choose “**Replace existing driver**” and then “**Next**”.
9. Printer name should not be altered, so choose “**Next**”.
10. Select “**Not Shared**” “**Next**”.
11. If you wish, you can print a test page. Due to the narrow paper stock that this printer uses, and the margins Windows chooses, there will not be enough room to print all the images of the test page. Some of the large text will word wrap and be truncated.
12. Select “**Finish**”. The printer driver is now installed.
13. If you selected “Replace existing driver”, reboot your machine to ensure all components are installed.

OPOS drivers Installation Instructions

1. Run Setup OPOS.exe.
2. The communications will be defaulted to "COM2". If the communication port is not setup at installation, the first time the printer service object Open method is called, a Com port setup dialog will be displayed.
3. After running Setup.exe there will be an OPOS setup utility in the OPOS program group/start menu, and also in the Windows Control Panel. Use this utility to set up the OPOS printer "driver" and cash drawer "driver".

To Install the USB drivers

1. Ensure that USB is enabled in your system's BIOS. To verify that USB is enabled, click on "Start", "Settings", "Control Panel". Double click "System" and select the "Device Manager". If you see "Universal Serial Bus controllers" in the list, USB is enabled. Check your PC's documentation for more information about USB if needed.
2. Ensure that power is applied to the printer and plug in the USB cable to both the PC and printer.
3. Follow the on screen directions. Please note that several drivers are installed in this process. Therefore the "Found new hardware" prompt will appear several times. If the system needs a file, direct it to the location of the USB driver install disk (usually the floppy drive).

See "readme.txt" or "usbman.htm" on the install disk for more information.

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chapter 4

How to Operate the iTherm[®] 280 Printer

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 mode³.

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.

³ 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:

Fully-recoverable faults	Paper out or cover open
Semi-recoverable faults	Head jam
Non-recoverable faults	Component failure

Fully-recoverable and Status

A fully-recoverable error will restart printing exactly where it stopped when the error occurred. Printing will resume after error has been properly addressed. A *status recoverable* error is very similar to a *fully-recoverable* error. Additionally, status is used to display when the printer consumables may need replacing.

Semi-recoverable

A semi-recoverable error is determined by whether or not the printer has to be shut off and turned back on while attending to the problem. The amount of information lost is dependent on the type of error and the state of the information being processed.

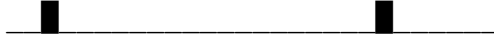
Non-recoverable

A non-recoverable error produces information loss.

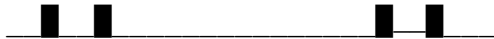
Error Blink Codes

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.

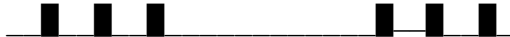
1 Blink (1 blink, pause)



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 12 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.

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chapter 5

Configuring Your iTherm[®] 280 Printer

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, un-slashed 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.

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chapter 6

Programming Codes

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.
- <n₁> <n₂> Indicates that there are two parameters, <n₁> and <n₂>, where both can have values from zero to 255.
- <m₁> <m₂> Is an Ithaca® Printer Control Language (IPCL) parameter consisting of two digits where <m₁> and <m₂> are ASCII characters from zero to nine. The parameter is combined to form a value from zero to 99. If <m₃> 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 <m₁> <m₂> 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 297) 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/POS⁴ 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

⁴ 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
Low Level paper Motion				
Line feed.	[LF]	0AH	&%LF	74
Carriage return.	[CR]	0DH	&%CR	74
Horizontal Motion				
Back space.	[BS]	08H	&%BS	75
Horizontal tab.	[HT]	09H	&%HT	75
Set horizontal tab stops.	[ESC] D <n ₁ > <n ₂ > ... <n _i > <0>	1BH,44H	none	75
Set horizontal position.	[ESC] n <n ₁ > <n ₂ >	1BH,6EH	&%HP<m ₁ > <m ₂ > <m ₃ >	76
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}	76
Reset horizontal and vertical tab stops.	[ESC] R	1BH,52H	&%HV	76
Set left/right print margins. n ₁ = Left margin, n ₂ = Right margin	[ESC] X <n ₁ ><n ₂ >	1BH,58H	none	159
Vertical Motion				
Perform a fine line feed.	[ESC] J <n>	1BH,4AH	&%FM <m ₁ > <m ₂ > <m ₃ >	77
Set 1/8-inch line spacing.	[ESC] 0	1BH,30H	&%ST	78
Set 7/72-inch line spacing.	[ESC] 1	1BH,31H	&%SG	78
Begin variable line spacing. (Enable [ESC] A <n>).	[ESC] 2	1BH,32H	none	79
Set variable line spacing to n/216 inch.	[ESC] 3 <n>	1BH,33H	&%SV <m ₁ > <m ₂ > <m ₃ >	77
Set variable line spacing to n/72 inch.	[ESC] A <n>	1BH,41H	none	78
Feed <n> lines at current spacing.	[ESC] d <n>	1BH,64H	&%FL <m ₁ > <m ₂ >	79
Set vertical tab stops.	[ESC] B <n ₁ > <n ₂ > <n ₃ >...<n _i > 0	1BH,42H	none	80
Vertical tab.	[VT]	0BH	&%VT	80
Form feed.	[FF]	0CH	&%FF	81
Feed to black dot	[ESC][VT]	1BH,0BH	None	83
Set top of form.	[ESC] 4	1BH,34H	&%TF	81
Set form length in lines.	[ESC] C <n>	1BH,43H	&%SL <m ₁ > <m ₂ >	81
Begin auto line feed. (n=0, end n=1)	[ESC] 5 <n>	1BH,35H	&%CA {n=0} &%MA {n=1}	82
Set form length in inches.	[ESC] C [NUL] <n>	1BH,43H	&%SI <m ₁ > <m ₂ >	81
Reverse line feed.	[ESC]]	1BH,5DH	&%LR	82

Description	ASCII	Hex	IPCL equivalent code	Page
Character Pitch				
Begin 10 CPI character pitch.	[DC2]	12H	&%F3	85
Begin 12 CPI character pitch.	[ESC] :	1BH,3AH	&%F2	85
Begin 17 CPI character pitch.	[SI]	0FH	&%F1	85
Set character pitch.	[ESC] [P <n>	1BH,5BH, 50H	&%F<n>	86
Set inter-character spacing.	[ESC] V <n>	1BH,56H	none	87
Begin 24 CPI character pitch	[ESC][SI]	1BH,0FH	&%F4	85
Character Font				
Begin 12 x 12 draft print.	[ESC] # <0>	1BH,23H, 00H	&%QT	88
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}	88
Begin rotated font. (See command description).	[ESC] P <n>	1BH,50H	&%RI &%RF &%RN	89
Select character code page.	[ESC] [T <n ₁ > <n ₁ >	1BH,5BH, 54H	&%CP <m ₁ > <m ₂ > <m ₃ > <m ₄ >	91
Insert Euro character.	[ESC] [C <n>	1BH,5BH, 43H	&%EU	93
Print control character.	[ESC] ^ <n>	1BH,5EH	&%CC <m ₁ > <m ₂ > <m ₃ >	93
Redefine character set.	[ESC] [S ...	1BH,5BH, 53H...		94
Define user-defined characters.	[ESC] = <y> <c ₁ > <c ₂ >...	1BH,3DH	none	95
Enable user-defined characters.	[ESC] > <n>	1BH,3EH	none	96
Enable OCR characters.	[ESC] y <11>	1BH,79H, 0BH	&%YX011	96
Disable OCR characters.	[ESC] y <12>	1BH,79H, 0CH	&%YX012	96
Cancel user-defined characters.	[ESC] \$	1BH,24H	none	96
Character Attributes				
Select color.	[ESC] c <n>	1BH,63H	&%CL <m ₁ >	99
Begin one-line double-wide print.	[SO]	0EH	&%MW	99
Cancel one-line double-wide print.	[DC4]	14H	&%MN	99
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}	100
Enable/disable overscore. n=0 End n=1 Begin	[ESC] _ <n>	1BH,5FH	&%CO {n=0} &%MO {n=1}	100

Description	ASCII	Hex	IPCL equivalent code	Page
Begin underline mode. n = 0 End n = 1 Begin	[ESC] - <n>	1BH,2DH	&%CU {n=0} &%MU {n=1}	102
Begin enhanced print.	[ESC] G	1BH,47H	&%ME	102
End enhanced print.	[ESC] H	1BH,48H	&%CE	102
Begin emphasized print.	[ESC] E	1BH,45H	&%MM	102
End emphasized print.	[ESC] F	1BH,46H	&%CM	103
Set print style. (See command description.)	[ESC] [@ ...	1BH,5BH, 40H...	&%DH &%SH	101
Select superscript.	[ESC] S <0>	1BH,53H, 00H	&%SP	103
Select subscript.	[ESC] S <1>	1BH,53H, 01H	&%SB	103
End superscript or subscript.	[ESC] T	1BH,54H	&%SE	103
Begin italics.	[ESC] % G	1BH,25H, 47H	&%MI	104
End italics.	[ESC] % H	1BH,25H, 48H	&%CI	104
Rotated Print				
Begin rotated print. (See Rotated Print Summary on page 108.)	[ESC] r <n>	1BH,72H	&%RX	106
Set rotated print line length.	[ESC] s <n>	1BH,73H	&%RL <m ₁ > <m ₂ > <m ₃ >	110
Set rotated print line spacing.	[ESC] u <n ₁ > ...	1BH,75H	none	110
Page Mode				
Select page mode	[ESC] t <n>	1BH,74H	&%PM <m ₁ >	112
Set page mode page position	[ESC] o <n ₁ > ...	1BH,6FH		114
Exit page mode	[FF]	0CH	&%FF	114
APA Graphics				
Print single-density graphics. <n ₁ >=0...255 <n ₂ >=0...3 len=<n ₁ > + 256 * <n ₂ >	[ESC] K <n ₁ > <n ₂ >	1BH,4BH	none	115
Print half-speed double-density graphics.	[ESC] L <n ₁ > <n ₂ >	1BH,4CH	none	115
Print full-speed double-density graphics.	[ESC] Y <n ₁ > <n ₂ >	1BH,59H	none	116
Print quad-density graphics.	[ESC] Z <n ₁ > <n ₂ >	1BH,5AH	none	116
Select bidirectional or unidirectional print. n=0 Bidirectional n=1 Unidirectional	[ESC] U <n>	1BH,55H	&%GU {n=1} &%GB {n=0}	117
Print graphics in mode <m>.	[ESC] * <m> <n ₁ > <n ₂ >	1BH,2AH	none	116
Reassign graphic mode.	[ESC] ? <m><n>	1BH,3FH	none	117

Description	ASCII	Hex	IPCL equivalent code	Page
Two Color Graphics				
Process horizontal graphics data.	[ESC] h <color> <length> <format> <data>	1BH,68H	none	119
Set horizontal graphic mode.	[ESC] * <m> <0> <0>	1BH,2AH	none	120
User Store				
Begin named macro record.	[ESC] [US] b <Name..> <0>	1BH,1FH, 62H	&%UB <Name..><0>	124
Save macro data in user store.	[ESC] [US] m <Name..> <0>	1BH,1FH, 6DH	&%UM <Name..><0>	125
End named macro record.	[ESC] [US] e <Name..> <0>	1BH,1FH, 65H	&%UG <Name..><0>	125
Load item from user store.	[ESC] [US] l <Name..> <0>	1BH,1FH, 6CH	&%UL <Name..><0>	126
Save user-defined characters.	[ESC] [US] c <Name..> <0>	1BH,1FH, 63H	&%UC <Name..><0>	125
Run macro data from user store.	[ESC] [US] r <Name..> <0>	1BH,1FH, 72H	&%UR <Name..><0>	126
Flag item as a start-up macro.	[ESC] [US] s <Name..> <0>	1BH,1FH, 6DH	&%US <Name..><0>	126
Delete item from user store.	[ESC] [US] d <Name..> <0>	1BH,1FH, 64H	&%UD <Name..><0>	127
Flush information from user store.	[ESC] [US] f ALL <0>	1BH,1FH, 66H,00H	&%UF	127
Transfer user store to extended user store	[ESC] [US] t ALL <0>	1BH,1FH, 66H,00H	&%UF	127
Report on user store.	[ESC] [US] q <Name..> <0>	1BH,1FH, 72H	&%UQ <Name..><0>	128
Return a report on user store	[ESC] [US] ? <Name..> <0>	1BH,1FH, 72H	&%UQ <Name..><0>	128
Process user macro.	[ESC] g <0>	1BH,67H, 00H	&%GP	130
Start macro record.	[ESC] g <1>	1BH,67H, 01H	&%GS	130
Stop macro record.	[ESC] g <2>	1BH,67H, 02H	&%GE	130
Stop macro record and save.	[ESC] g <3>	1BH, 67H, 03H	&%GW	130

Description	ASCII	Hex	IPCL equivalent code	Page
Bar Codes				
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}	131
PDF 417 bar code control	[ESC] [EM] E <f> <v>	1BH 19H 45H	none	139
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 ₁ ><m ₂ >	140
Set bar code width	[ESC] [EM] W <n>	1BH 19H 57H	&%BW <m>	140
Set bar code justification, HRI print mode, and print direction.	[ESC] [EM] J <n>	1BH,19H, 4AH	&%BJ<m ₁ >< m ₂ >	140
Electronic Journal				
Electronic journal initialize and set password	[ESC][GS]I <Password> <0>	1BH 1DH 49H	%&EI	144
Electronic journal erase the electronic journal	[ESC][GS]E <Password> <0>	1BH 1DH 45H	&%EC	144
Print the electronic journal	[ESC][GS]P< S _p > <S _r >< L _p > <L _r >	1BH 1DH 50H	&%EP	145
Report the electronic journal	[ESC][GS]R< S _p > < S _r >< L _p > <L _r >	1BH 1DH 52H	&%EQ	145
Electronic journal begin entry	ESC]I <3>	1BH 6CH	%&EB	
Electronic journal suspend entry	[ESC]I <2>	1BH 6CH	&%ES	153
Electronic journal resume entry	[ESC]I <1>	1BH 6CH	&%ER	153
Electronic journal end entry	[ESC]I <0>	1BH 6CH	&%EE	153
Electronic journal mode begin (journal station)	[ESC]{	1BH 7BH	None	152
Unicode				
Set font ID	[ESC] + 1 <low byte> <high byte>	1BH 2BH 31H	none	154
Set font descriptor	[ESC] + 2	1BH 2BH 32H	none	155

Description	ASCII	Hex	IPCL equivalent code	Page
Select font	[ESC] + 3 <low byte> <high byte>	1BH 2BH 31H	none	155
Set character code ID	[ESC] + 4 <low byte> <high byte>	1BH 2BH 34H	none	155
Send character definition	[ESC] + 5 <low byte length> <high byte length>	1BH 2BH 35H	none	156
Delete current selected soft font	[ESC] + 6	1BH 2BH 36H	none	156
Delete all soft fonts	[ESC] + 7	1BH 2BH 37H	none	156
Query soft/RAM font information	[ESC] + Q	1BH 2BH 51H	none	156
Copy soft font from RAM to user memory/flash memory.	[ESC] + U	1BH 2BH 55H	none	156
Initiate Unicode UTF-16BE encoding	[ESC] + H	1BH 2BH 48H	none	157
Initiate Unicode UTF-16LE encoding	[ESC] + L	1BH 2BH 4CH	none	157
Initiate Unicode UTF-8 encoding (MBCS)	[ESC] + M	1BH 2BH 4DH	none	158
Initiate normal 8-bit character encoding	[ESC] + A	1BH 2BH 41H	none	158
Miscellaneous Commands				
Disable paper out sensor.	[ESC] 8	1BH,38H	&%PF	159
Enable paper out sensor.	[ESC] 9	1BH,39H	&%PO	159
Set left/right margins. n ₁ = Left margin n ₂ = Right margin	[ESC] X <n ₁ ><n ₂ >	1BH,58H	none	159
Clear print buffer.	[CAN]	18H	&%RP	160
Query marker.	[ESC] q <n>	1BH,71H	none	160
Open cash drawer. n=1 Cash Drawer 1 n=2 Cash Drawer 2	[ESC] x <n>	1BH,78H	&%D1 {n=1} &%D2 {n=2}	161
Perform Auto Cut	[ESC] v	1BH,76H	&%FC	161
Audio alert.	[BEL]	07H	&%BL	162
Configure audio alert.	[ESC] [BEL] <n ₁ > <n ₂ > <n ₃ >	1BH,07H	none	162
Print suppress and data pass through.	[ESC] < <n>	1BH,3CH	&%PT <n>	164
Initialize printer.	[ESC] @	1BH,40H	none	161
Enable paper error mode operation.	[ESC] p <n>	1BH,70H	&%PE <m ₁ > <m ₂ >	162

Description	ASCII	Hex	IPCL equivalent code	Page
Enable dynamic response	[ESC] w <n>	1BH,77H	none	147
Begin multi-drop control.	[SOH] <n>	01H	none	168
Enable Periodic status back	[ESC][EM]P<n>	1BH, 19H, 50H	None	177
Control Periodic status back	[ESC][EM]p<n>	1BH, 19H, 70H	None	177
Inquire status. (Refer to command descriptions.)	[ENQ] <n>	05H	none	170
Inquire cash drawer 1 status	[ENQ] <1>	05H01H	none	170
Extended Diagnostics				
Set control feature commands.	[ESC] y <n>	1BH,79H	&%Y0 - 9 or &%YX<m1> <m2><m3> (for numbers >9)	165
Extended diagnostics.	[ESC] ~ <n>	1BH,7EH	none	166

Quick PcOS Reference Chart (Alphabetic)

Description	ASCII	Hex	IPCL equivalent code	Page
Begin multi-drop control	[SOH] <n>	01H	none	168
Inquire status (Refer to command descriptions.)	[ENQ] <n>	05H	none	170
Audio alert	[BEL]	07H	&%BL	162
Back space	[BS]	08H	&%BS	75
Horizontal tab	[HT]	09H	&%HT	75
Line feed	[LF]	0AH	&%LF	74
Vertical tab	[VT]	0BH	&%VT	80
Form feed	[FF]	0CH	&%FF	81
Exit page mode	[FF]	0CH	&%FF	114
Carriage return	[CR]	0DH	&%CR	74
Begin one-line double-wide print	[SO]	0EH	&%MW	99
Begin 17 CPI character pitch	[SI]	0FH	&%F1	85
Begin 10 CPI character pitch	[DC2]	12H	&%F3	85
Cancel one-line double-wide print	[DC4]	14H	&%MN	99
Clear print buffer	[CAN]	18H	&%RP	160
Configure audio alert	[ESC] [BEL] <n ₁ > <n ₂ > <n ₃ >	1BH,07H	none	162
Feed to black dot	[ESC][VT]	1BH,0BH	None	83
Begin 24 CPI character pitch	[ESC][SI]	1BH,0FH	&%F4	85
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 ₁ ><m ₂ >	140
Electronic journal erase the electronic journal	[ESC][GS]E <Password>< 0>	1BH 1DH 45H	&%EC	144
Electronic journal initialize and set password	[ESC][GS]I <Password>< 0>	1BH 1DH 49H	%&EI	144
Set bar code justification, HRI print mode, and print direction	[ESC] [EM] J <n>	1BH,19H, 4AH	&%BJ<m ₁ >< m ₂ >	140
Print the electronic journal	[ESC][GS]P< S _p > <S _h >< L _p >< L _h >	1BH 1DH 50H	&%EP	145
Report the electronic journal	[ESC][GS]R< S _p > < S _h >< L _p >< L _h >	1BH 1DH 52H	&%EQ	145
Return a report on user store	[ESC] [US] ? <Name..> <0>	1BH,1FH, 72H	&%UQ <Name..> <0>	128
Begin named macro record	[ESC] [US] b <Name..> <0>	1BH,1FH, 62H	&%UB <Name..> <0>	124
Save user-defined characters	[ESC] [US] c <Name..> <0>	1BH,1FH, 63H	&%UC <Name..> <0>	125

Description	ASCII	Hex	IPCL equivalent code	Page
Delete item from user store	[ESC] [US] d <Name..> <0>	1BH,1FH, 64H	&%UD <Name..> <0>	127
End named macro record	[ESC] [US] e <Name..> <0>	1BH,1FH, 65H	&%UG <Name..> <0>	125
Flush information from user store	[ESC] [US] f ALL <0> or EXT <0>	1BH,1FH, 66H,00H	&%UF	127
Load item from user store	[ESC] [US] l <Name..> <0>	1BH,1FH, 6CH	&%UL <Name..> <0>	126
Save macro data in user store	[ESC] [US] m <Name..> <0>	1BH,1FH, 6DH	&%UM <Name..> <0>	125
Report on user store	[ESC] [US] q <Name..> <0>	1BH,1FH, 72H	&%UQ <Name..> <0>	128
Run macro data from user store	[ESC] [US] r <Name..> <0>	1BH,1FH, 72H	&%UR <Name..> <0>	126
Flag item as a start-up macro	[ESC] [US] s <Name..> <0>	1BH,1FH, 6DH	&%US <Name..> <0>	126
Transfer user store to extended user store	[ESC] [US] t ALL <0>	1BH,1FH, 66H,00H	&%UF	127
Begin 12 x 12 draft print	[ESC] # <0>	1BH,23H, 00H	&%QT	88
Cancel user-defined characters	[ESC] \$	1BH,24H	none	96
Begin italics	[ESC] % G	1BH,25H, 47H	&%MI	104
End italics	[ESC] % H	1BH,25H, 48H	&%CI	104
Set horizontal graphic mode	[ESC] * <m> <0> <0>	1BH,2AH	none	120
Print graphics in mode <m>	[ESC] * <m> <n ₁ > <n ₂ >	1BH,2AH	none	116
Begin underline mode n = 0 End n = 1 Begin	[ESC] - <n>	1BH,2DH	&%CU {n=0} &%MU {n=1}	102
Set 1/8-inch line spacing	[ESC] 0	1BH,30H	&%ST	78
Set 7/72-inch line spacing	[ESC] 1	1BH,31H	&%SG	78
Begin variable line spacing (Enable [ESC] A <n>)	[ESC] 2	1BH,32H	none	79
Set variable line spacing to n/216 inch	[ESC] 3 <n>	1BH,33H	&%SV <m ₁ > <m ₂ > <m ₃ >	77
Set top of form	[ESC] 4	1BH,34H	&%TF	81
Begin auto line feed n=0 End n=1	[ESC] 5 <n>	1BH,35H	&%CA {n=0} &%MA {n=1}	82

Description	ASCII	Hex	IPCL equivalent code	Page
Disable paper out sensor	[ESC] 8	1BH,38H	&%PF	159
Enable paper out sensor	[ESC] 9	1BH,39H	&%PO	159
Begin 12 CPI character pitch	[ESC] :	1BH,3AH	&%F2	85
Print suppress and data pass through	[ESC] <n>	1BH,3CH	&%PT <n>	164
Define user-defined characters	[ESC] = <y> <c ₁ > <c ₂ >...	1BH,3DH	none	95
Enable user-defined characters	[ESC] > <n>	1BH,3EH	none	96
Reassign graphic mode	[ESC] ? <m><n>	1BH,3FH	none	117
Initialize printer	[ESC] @	1BH,40H	none	161
Set variable line spacing to n/72 inch	[ESC] A <n>	1BH,41H	none	78
Set vertical tab stops	[ESC] B <n ₁ > <n ₂ > <n ₃ >...<n _i > 0	1BH,42H	none	80
Set form length in lines	[ESC] C <n>	1BH,43H	&%SL <m ₁ > <m ₂ >	81
Set form length in inches	[ESC] C [NUL] <n>	1BH,43H	&%SI <m ₁ > <m ₂ >	81
Set horizontal tab stops	[ESC] D <n ₁ > <n ₂ > ... <n _i > <0>	1BH,44H	none	75
Begin emphasized print	[ESC] E	1BH,45H	&%MM	102
End emphasized print	[ESC] F	1BH,46H	&%CM	103
Begin enhanced print	[ESC] G	1BH,47H	&%ME	102
End enhanced print	[ESC] H	1BH,48H	&%CE	102
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}	88
Perform a fine line feed	[ESC] J <n>	1BH,4AH	&%FM <m ₁ > <m ₂ > <m ₃ >	77
Print single-density graphics <n ₁ >=0...255 <n ₂ >=0...3 len=<n ₁ > + 256 * <n ₂ >	[ESC] K <n ₁ > <n ₂ >	1BH,4BH	none	115
Print half-speed double-density graphics	[ESC] L <n ₁ > <n ₂ >	1BH,4CH	none	115
Perform a fine line feed in reverse	[ESC] M <n>	1BH,4DH	&%FR <m ₁ > <m ₂ > <m ₃ >	82
Begin rotated font (See command description).	[ESC] P <n>	1BH,50H	&%RI &%RF &%RN	89
Reset horizontal and vertical tab stops	[ESC] R	1BH,52H	&%HV	76
Select superscript	[ESC] S <0>	1BH,53H, 00H	&%SP	103
Select subscript	[ESC] S <1>	1BH,53H, 01H	&%SB	103
End superscript or subscript	[ESC] T	1BH,54H	&%SE	103

Description	ASCII	Hex	IPCL equivalent code	Page
Select bi-directional or unidirectional print n=0 Bi-directional n=1 Unidirectional	[ESC] U <n>	1BH,55H	&%GU {n=1} &%GB {n=0}	117
Set inter-character spacing	[ESC] V <n>	1BH,56H	none	87
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}	100
Set left/right print margins n ₁ = Left margin n ₂ = Right margin	[ESC] X <n ₁ ><n ₂ >	1BH,58H	none	159
Print full-speed double-density graphics	[ESC] Y <n ₁ > <n ₂ >	1BH,59H	none	116
Print quad-density graphics	[ESC] Z <n ₁ > <n ₂ >	1BH,5AH	none	116
Set print style (See command description.)	[ESC] [@ ...	1BH,5BH, 40H...	&%DH &%SH	101
Insert euro character	[ESC] [C <n>	1BH,5BH, 43H	&%EU	93
Set character pitch	[ESC] [P <n>	1BH,5BH, 50H	&%F<n>	86
Redefine character set	[ESC] [S ...	1BH,5BH, 53H...		94
Select character code page	[ESC] [T <n ₁ > <n ₁ >	1BH,5BH, 54H	&%CP <m ₁ > <m ₂ > <m ₃ > <m ₄ >	91
Reverse line feed	[ESC]]	1BH,5DH	&%LR	82
Print control character	[ESC] ^ <n>	1BH,5EH	&%CC <m ₁ > <m ₂ > <m ₃ >	93
Enable/disable overscore n=0 End n=1 Begin	[ESC] _ <n>	1BH,5FH	&%CO {n=0} &%MO {n=1}	100
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}	76
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}	131
Select color	[ESC] c <n>	1BH,63H	&%CL <m ₁ >	99

Description	ASCII	Hex	IPCL equivalent code	Page
Feed <n> lines at current spacing	[ESC] d <n>	1BH,64H	&%FL <m ₁ > <m ₂ >	79
Feed <n> lines at current spacing in reverse	[ESC] e <n>	1BH,65H	&%FB <m ₁ > <m ₂ >	79
Process user macro	[ESC] g <0>	1BH,67H, 00H	&%GP	130
Start macro record	[ESC] g <1>	1BH,67H, 01H	&%GS	130
Stop macro record	[ESC] g <2>	1BH,67H, 02H	&%GE	130
Stop macro record and save	[ESC] g <3>	1BH, 67H, 03H	&%GW	130
Process horizontal graphics data	[ESC] h <color> <length> <format> <data>	1BH,68H	none	119
Electronic journal begin entry	ESC|i <3>	1BH 6CH	%&EB	
Electronic journal suspend entry	[ESC|i <2>	1BH 6CH	&%ES	153
Electronic journal resume entry	[ESC|i <1>	1BH 6CH	&%ER	153
Electronic journal end entry	[ESC|i <0>	1BH 6CH	&%EE	153
Set horizontal position	[ESC] n <n ₁ > <n ₂ >	1BH,6EH	&%HP<m ₁ > <m ₂ > <m ₃ >	76
Set page mode page position	[ESC] o <n ₁ > ...	1BH,6FH	&%PY<m ₁ > <m ₂ >	114
Enable paper error mode operation	[ESC] p <n>	1BH,70H	&%PE <m ₁ > <m ₂ >	162
Query marker	[ESC] q <n>	1BH,71H	none	160
Begin/end rotated print	[ESC] r <n>	1BH,72H	&%RX	106
Set rotated print line length	[ESC] s <n>	1BH,73H	&%RL	110
Select page mode	[ESC] t <n>	1BH,74H	&%PM <m ₁ >	112
Perform auto cut	[ESC] v	1BH,76H	&%FC	161
Enable dynamic response	[ESC] w <n>	1BH,77H	none	147
Open cash drawer n=1 Cash Drawer 1 n=2 Cash Drawer 2	[ESC] x <n>	1BH,78H	&%D1 {n=1} &%D2 {n=2}	161
Set control feature commands	[ESC] y <n>	1BH,79H	&%Y0 - 9 or &%YX<m ₁ > <m ₂ ><m ₃ > (for numbers >9)	165
Enable OCR characters	[ESC] y <11>	1BH,79H, 0BH	&%YX011	96
Disable OCR characters	[ESC] y <12>	1BH,79H, 0CH	&%YX012	96
Electronic journal mode begin (Journal station)	[ESC]{	1BH 7BH	None	152
Extended diagnostics	[ESC] ~ <n>	1BH,7EH	none	166

Low Level Paper Motion Control

Print/Paper Motion

[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.

[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 <n₁> <n₂> <n₃> ... <n_i> 0
Hexadecimal 1BH 44H <n₁> <n₂> <n₃> ... <n_i> 00H
Decimal <27> <68> <n₁> <n₂> <n₃> ... <n_i> <0>
IPCL none
EPOS [ESC] D <n₁> <n₂> <n₃> ... <n_i> 0

Description The [ESC] D <n₁> <n₂> <n₃> ... <n_i> 0 command sets tab stops at the character columns specified by <n>. The end of the settings is specified by a <0>. All previously set tabs will be cleared. The restore-default procedure other than to 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.

[ESC] R Reset horizontal and vertical tab stops

ASCII [ESC] R
Hexadecimal 1BH 52H
Decimal <27> <82>
IPCL &%HV
EPOS none

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

[ESC] a Set Justification

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

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

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

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



Note: The justify commands do not affect graphics.

[ESC] n Set horizontal position

ASCII [ESC] n <n₁> <n₂>
Hexadecimal 1BH 6EH <n₁> <n₂>
Decimal <27> <110> <n₁> <n₂>
IPCL &%HP <m₁> <m₂> <m₃>
EPOS [ESC]\$ <n₁> <n₂>

Description The [ESC] <n> <n₁> <n₂> command sets the print position to <n₁> + <n₂> * 256 in 1/196 inches.

Vertical Motion Control

[ESC] j Perform a fine line feed

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

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

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

ASCII	[ESC] 3 <n>
Hexadecimal	1BH 33H <n>
Decimal	<27> <51> <n>
IPCL	&%SV <m1> <m2> <m3>
EPOS	[ESC] 3 <n>

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



Note: 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

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

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

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

ASCII [ESC] d <n>
Hexadecimal 1BH 64H <n>
Decimal <27> <100> <n>
IPCL &%FL <m1> <m2>
EPOS [ESC] d

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



Note: 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

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

[VT]	Vertical tab
ASCII	[VT]
Hexadecimal	0BH
Decimal	<11>
IPCL	&%VT
EPOS	(VT)
Description	The printer sets a line counter to the top of the form at reset and when a set top of form command is issued. By setting vertical tab stops, various form positions can be reached with a [VT] operation.

[ESC] B	Set vertical tab stops
ASCII	[ESC] B <n ₁ > <n ₂ > <n ₃ > ... <n _i > 0
Hexadecimal	1BH 42H <n ₁ > <n ₂ > <n ₃ > ... <n _i > 00H
Decimal	<27> <66> <n ₁ > <n ₂ > <n ₃ > ... <n _i > <0>
IPCL	none
EPOS	[ESC] B <n ₁ > <n ₂ > <n ₃ > ... <n _i > 0
Description	The [ESC] B <n ₁ > <n ₂ > <n ₃ > ... <n _i > 0 command sets tab stops at line positions specified by <n>. The end of the setting is specified by a <0>. All previously set tabs will be cleared. If n _n is less than n _{n-1} , then the command is in error, and all of the following information is printed. In other words, tab stops must be entered sequentially in order to be accepted. A total of 64 tab stops can be specified. (The power on default is a vertical tab on every line).

[ESC] R	Reset horizontal and vertical tab stops
ASCII	[ESC] R
Hexadecimal	1BH 52H
Decimal	<27> <82>
IPCL	&%HV
EPOS	none
Description	The [ESC] R command resets horizontal and vertical tab stops to power up configuration. The power up horizontal default is every eight spaces, i.e., 9, 17, 25, etc. The vertical default is every line.

[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 <m₁> <m₂>
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 <m₁> <m₂>
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® 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.

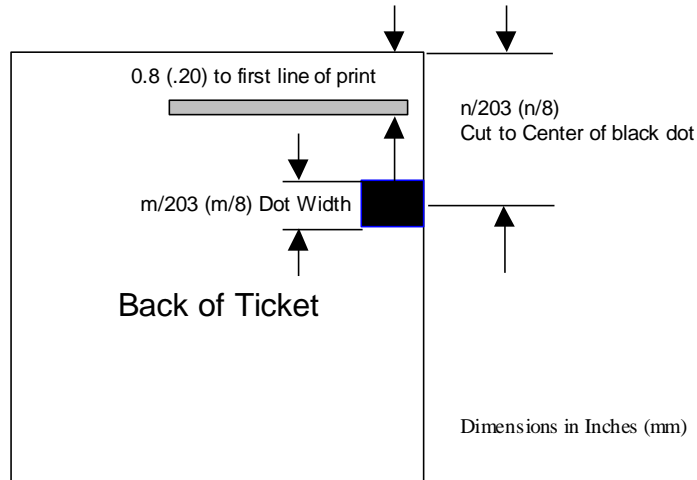
Function	Feed to Black Dot
ASCII	[ESC][VT]<n>
Hexadecimal	!BH,0BH,<n>
Decimal	<27><11><n>
IPCL	None
EPOS	[GS][VT]<n>
Where n	<n> is the number of inches to feed while looking for the black marker.
Description	The [ESC][VT] command performs feeds the paper until the black dot is positioned as configured. The iTherm keeps track of the location of the black dot and will feed paper until the black dot is positioned as configured. 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.

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	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. 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.

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 13 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

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

Description The [ESC] V <n> command sets 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 14 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 supports 65 different international character sets. In IBM and EPOS printers, there are two ways of selecting a character set. One way substitutes international characters in the upper 128 characters of a standard character set. The substitution technique supports a few different countries. However, as more and more countries were added, too many characters were being replaced, 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. In IBM mode, there are 19 character sets and 60 code pages. In EPOS mode, there are 57 character sets and five code pages.⁵

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 code page select command has not been extended because there is no EPOS definition beyond the first six ID's.

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

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

[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.

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

<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 15 Language Table ID's

[ESC] [T Select character code page

- ASCII** [ESC] [T <n_h> <n_l>
- Hexadecimal** 1BH 5BH 54H <n_h> <n_l>
- Decimal** <27> <91> <84> <n_h> <n_l>
- IPCL** &%CP <m₁> <m₂> <m₃> <m₄>
- EPOS** [ESC] t <n>

Description The [ESC] [T <n_h> <n_l> command selects character code page <n_h> <n_l>. The iTherm® 280 Printer supports many code pages. The following code pages are supported.

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

862	Hebrew NC (862)	3,94	3H,05EH
863	Canada French	3,95	3H,05FH
865	Norway	3,97	3H,061H
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 Croatian I	3,248	3H,0F8H
1017	Serbo Croatian 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 16 Code Page Definition Table



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.

[ESC] ^ Print control character

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

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

[ESC] [C Insert Euro character

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

Description The [ESC] [C <n> command allows an application to replace any character in the currently active character set with the Euro character. The character to be replaced is defined by <n>. For example, if the currently active character set is CP 850 (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 17 Euro Character Substitution Matrix

[ESC] [S Redefine character set

ASCII	[ESC] [S <L _L > <L _H > <B _C > <T _{1L} ><T _{1H} > <T _{2L} ><T _{2H} > <T _{3L} ><T _{3H} > ...<T _{nL} ><T _{nH} >
Hexadecimal	1BH 5BH 53H ...
Decimal	<27> <91> <83> ...
IPCL	none

Description The [ESC] [S <L_L> <L_H> <B_C> <T_{1L}><T_{1H}> <T_{2L}><T_{2H}> <T_{3L}><T_{3H}> ... <T_{nL}><T_{nH}> command allows an application to replace or redefine the active character set mapping in the printer, where <L_L> <L_H> defines the total length of the following data:

- <L_L> + 256 * <L_H> = 1 + 2 * the total number of characters to be replaced;
- <B_C> is the first character in the active map to be replaced
- <T_{1H}> <T_{1L}>⁶ 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. Over 500 printable master characters are defined in the printer. For example, to redefine the character map for the 35th character and replace it with internal master character 346, the redefine character set command is used as follows:

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

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

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



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

[ESC] = Define user-defined characters

ASCII	[ESC] = <y> <c ₁ > <c ₂ > [<x ₁ > <d ₁ > ... d(y x x ₁)] ... [<x _k > <d ₁ > ... d (y x x _k)]
Hexadecimal	1BH 3DH <y> ...
Decimal	<27> <51> <y> ...
Range	y = 2 or 3 32 ≤ c ₁ ≤ c ₂ ≤ 126 0 ≤ x ≤ 12 (12 x 12 font) 0 ≤ x ≤ 14 (12 x 14 font) 0 ≤ x ≤ 16 (24 x 16 font) 0 ≤ d ₁ ... d (y x x) ≤ 255
IPCL	none

Description The [ESC] = <y> <c₁> <c₂> [<x₁> <d₁> ... d(y x x₁)] ... [<x_k> <d₁> ... d (y x x_k)] command defines user-defined characters from character code <c₁> to <c₂>. <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 <c₁> and <c₂>. 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.

[ESC] y <11> Enable OCR characters

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

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



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



Note 2: The characters printed by the iTherm® 280 Printer follow the format defined in the ANSI X3.111-1986 Standard. They should be printed in ten or 12 cpi. By enabling enhanced print, the characters have improved definition but print at a slower speed.

[ESC] y <12> Disable OCR characters

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

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



Note: Any character definitions defined by the redefine character set command are also replaced by the [ESC] y <12> command, documented in the section Character Attribute Commands

OCR Characters

Character	Name	Location Hex, Dec	ASCII Equivalent
0	Number 0	30H,48	0
1	Number 1	31H,49	1
2	Number 2	32H,50	2
3	Number 3	33H,51	3
4	Number 4	34H,52	4
5	Number 5	35H,53	5
6	Number 6	36H,54	6
7	Number 7	37H,55	7
8	Number 8	38H,56	8
9	Number 9	39H,57	9
A	Letter A	41H,65	A
B	Letter B	42H, 66	B
C	Letter C	43H,67	C
D	Letter D	44H,68	D
E	Letter E	45H, 69	E
F	Letter F	46H, 70	F
G	Letter G	47H, 71	G
H	Letter H	48H, 72	H
I	Letter I	49H, 73	I
J	Letter J	4AH, 74	J
K	Letter K	4BH, 75	K
L	Letter L	4CH, 76	L
M	Letter M	4DH,77	M
N	Letter N	4EH,78	N
O	Letter O	4FH, 79	O
P	Letter P	50H,80	P
Q	Letter Q	51H, 81	Q
R	Letter R	52H,82	R
S	Letter S	53H, 83	S
T	Letter T	54H, 84	T
U	Letter U	55H,85	U
V	Letter V	56H, 86	V
W	Letter W	57H, 87	W
X	Letter X	58H,88	X
Y	Letter Y	59H,89	Y
Z	Letter Z	5AH, 90	Z
∘	Symbol Hook	7EH,126	~
⊙	Symbol Chair	60H,96	`
→	Symbol Fork	5FH,95	_
+	Plus Sign	2BH,43	+
-	Minus Sign	2DH,45	-
.	Period	2EH,46	.
/	Slant	2FH,47	/
₹	Dollar Sign	24H,36	\$
>	Greater Than Sign	3EH,62	>
“	Quotation Mark	22H,34	“

Table 18 OCR MA-3

Character Attributes

[ESC] c Select color

ASCII [ESC] c <n>
Hexadecimal 1BH 63H <n>
Decimal <27> <99> <n>
IPCL &%CL <m₁>
EPOS none

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

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

[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 over-score

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 over-score print mode. All subsequent text, leading spaces, and trailing spaces are over-scored. [ESC] _ <0> ends the mode.



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

[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

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

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

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

Print Rotation Commands

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

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

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

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

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

[ESC] r Begin rotated print

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

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

76543210	Function
----xx00	End rotated print
----xx01	Rotate 90°
----0010	Rotate 180°
----xx11	Rotate 270°
----x1xx	Use line formatting

When n = 1 or 9, the print mode is rotated 90°. Print data is entered normally from left to right, top to bottom. When an end rotated print ([ESC] r <0>) command is received, the printer formats and prints the data.

When n = 5 or 13, the print mode is rotated by 90° with formatting. The command differs from the [ESC] r <1> command because the line length is determined not by the longest line entered but by the line length set by the [ESC] s command. If input extends past the end of a line, it wraps around to the next line.

When n = 3 or 11, the print mode is rotated 270° according to the currently stored format parameters.

When n = 7 or 15, the print mode is rotated 270° according to the currently stored format parameters. The [ESC] r <7> command differs from the [ESC] r <3> command by spacing out the lines to the line length specified by the [ESC] s command. If input extends past the end of a line, it wraps around to the following line.

When n = 2, the print mode is rotated 180°. All subsequent lines are rotated 180° and positioned at the opposite margin. All normal fonts and modes are available in 180° rotated mode. Format and font bits are ignored, and the command remains in effect until rotation is cancelled with an end rotated print ([ESC] r <0>) or a station select command.



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



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



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



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

Rotated Print Summary

[ESC] r <1> Begin 90° rotated print

Not available in page mode

ASCII [ESC] r <1>
Hexadecimal 1BH 72H 01H
Decimal <27> <114> <1>
IPCL &%R1

[ESC] r <5> Begin 90° rotated print with line formatting

Not available in page mode

ASCII [ESC] r <5>
Hexadecimal 1BH 72H 05H
Decimal <27> <114> <5>
IPCL &%R5

[ESC] r <3> Begin 270° rotated print

Not available in page mode

ASCII [ESC] r <3>
Hexadecimal 1BH 72H 03H
Decimal <27> <114> <3>
IPCL &%R3

[ESC] r <7> Begin 270° rotated print with line formatting

Not available in page mode

ASCII [ESC] r <7>
Hexadecimal 1BH 72H 07H
Decimal <27> <114> <7>
IPCL &%R7
EPOS [ESC] T <1>

[ESC] r <9> Begin 90° rotated print with two pass font

Not available in page mode

ASCII [ESC] r <9>
Hexadecimal 1BH 72H 09H
Decimal <27> <114> <2>
IPCL &%R9 or &%RX09
EPOS none

[ESC] r <13> Begin 90° rotated print with two pass font and line formatting

Not available in page mode

ASCII [ESC] r <13>
Hexadecimal 1BH 72H 0BH
Decimal <27> <114> <13>
IPCL &%RX13
EPOS none

[ESC] r <11> Begin 270° rotated print with two pass font

Not available in page mode

ASCII [ESC] r <11>
Hexadecimal 1BH 72H 0BH
Decimal <27> <114> <11>
IPCL &%RX11
EPOS none

[ESC] r <15> Begin 270° rotated print with two pass font and line formatting

Not available in page mode

ASCII [ESC] r <15>
Hexadecimal 1BH 72H 0FH
Decimal <27> <114> <15>
IPCL &%RX15
EPOS [ESC] T <1>

[ESC] r <0> End rotated print

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

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

[ESC] s Set rotated print line length

Not available in page mode

ASCII	[ESC] s <n>
Hexadecimal	1BH 73H <n>
Decimal	<27> <115> <n>
IPCL	&%RL <m ₁ > <m ₂ > <m ₃ >
EPOS	none

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

[ESC] u Set rotated print line spacing

Not available in page mode

ASCII	[ESC] u <n ₁ > <m ₁ > <n ₂ > <m ₂ > ... <n _i > <m _i > <0>
Hexadecimal	1BH 75H <n ₁ > <m ₁ > <n ₂ > <m ₂ > ... <n _i > <m _i > 00H
Decimal	<27> <117> <n ₁ > <m ₁ > <n ₂ > <m ₂ > ... <n _i > <m _i > <0>
IPCL	none
EPOS	none

Description The [ESC] u <n₁> <m₁> <n₂> <m₂> ... <n_i> <m_i> <0> command adjusts the line spacing for each rotated print line, where n_i is the line number and m_i is the spacing, in 1/8-inch intervals, between lines. The n_i value can be from one to 40, while the value of m_i can be from one to 255. For the first print line, the distance is calculated from the left margin. If n_i or m_i is zero, the command is terminated. Any unspecified spacing is set to 1/8 inch. The values are used as a template for all subsequently rotated print. On power up, spacing is preset to 1/8 inch or eight lines per inch for all lines. The command is only effective during 90° and 270° rotated modes. It remains in effect until a new table is received or until the printer is power cycled. An [ESC] u <0> sets all lines to 1/8 inch. The table can be overridden by [LF] or [ESC] J <n> commands for rotated print data.

iTherm® 280 Page Mode

The iTherm® 280 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 (placing data on the page)
- 2) Printing 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.

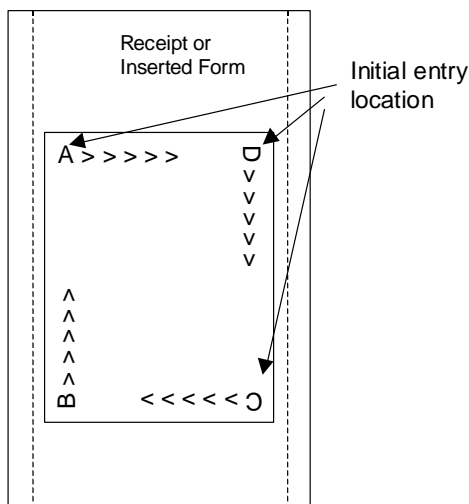


Figure 6 Page Mode entry Orientations

Auto-cutter and page mode

You may embed an auto-cutter command with in a page definition, provided the page will be printed on the receipt station. 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 effect the printed result. For example, the bell and cash drawer commands will be processed as they are received.

Stopping page mode definition

Several things will stop a page mode definition.

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

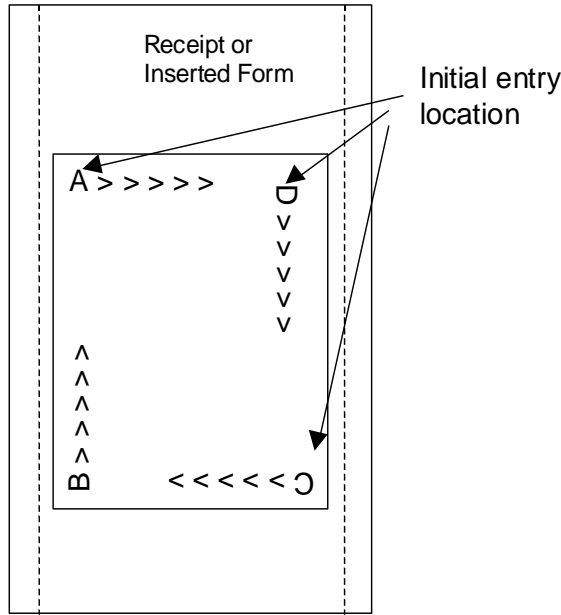
Printing the page

The [FF] command starts the printing process.

Printing starts at the current left margin and 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>
Hexadecimal	1BH 74H<x>
Decimal	<27><116><x>
IPCL	&%PM<x ₁ >
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 station select	No	This command is like a station select and is not active. You 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.

Function	Set Page Mode Entry Position
ASCII	[ESC] o <X _L ><X _H ><Y _L ><Y _H ><F>
Hexadecimal	1BH 6FH <X _L ><X _H ><Y _L ><Y _H ><F>
Decimal	<27><111><X _L ><X _H > <Y _L ><Y _H ><F>
EPOS	[ESC] W
Description	<p>This command sets 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>$Y = Y_h * 256 + Y_l$ dots from the top</p> <p>$X = X_h * 256 + X_l$ 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 this is <1> the command is processed as a relative position command. If this is <0>, then the command is interpreted as an absolute position command.</p>



Note: 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]
Hexadecimal	0CH
Decimal	<12>
IPCL	&%FF
EPOS	[FF]
Description	<p>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.</p>



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

[ESC] K Print single-density graphics (60h x 72v dpi)

ASCII [ESC] K <n₁> <n₂>
Hexadecimal 1BH 4BH <n₁> <n₂>
Decimal <27> <75> <n₁> <n₂>
IPCL none

Description The [ESC] K <n₁> <n₂> command prints <n₁> + 256 * <n₂> bytes of single-density graphics (60 dpi).

[ESC] L Print half-speed double-density graphics (120h x 72v dpi)

ASCII [ESC] L <n₁> <n₂>
Hexadecimal 1BH 4CH <n₁> <n₂>
Decimal <27> <76> <n₁> <n₂>
IPCL none

Description The [ESC] L <n₁> <n₂> command prints <n₁> + 256 * <n₂> bytes of double-density graphics (120 dpi) at half speed, allowing full and half dots to be printed.

[ESC] Y Print full-speed double-density graphics (120h x 72v dpi)

ASCII [ESC] Y <n₁> <n₂>
Hexadecimal 1BH 59H <n₁> <n₂>
Decimal <27> <89> <n₁> <n₂>
IPCL none

Description The [ESC] Y <n₁> <n₂> command prints <n₁> + 256 * <n₂> 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 <n₁> <n₂>
Hexadecimal 1BH 5AH <n₁> <n₂>
Decimal <27> <90> <n₁> <n₂>
IPCL none

Description The [ESC] Z <n₁> <n₂> command prints <n₁> + 256 * <n₂> 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> <n₁> <n₂>
Hexadecimal 1BH 2AH <m> <n₁> <n₂>
Decimal <27> <42> <m> <n₁> <n₂>
IPCL none

Description The [ESC] * <m> <n₁> <n₂> command selects one of three graphic modes as specified by <m>.

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

[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>	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 through 13 should be selected for horizontal graphics.

Example

Command	Comment
[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.

Function	Begin named macro record
ASCII	[ESC] [US] b <Name..> <0> Then send the data to be recorded. The printer does not process the data. The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 128.
Function	End name macro record
ASCII	[ESC] [US] e <Name..> <0> The second way to define macros is to use [ESC] g commands to define the macro, and then the save macro data command to save the data. The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 128.
Function	Start macro record
ASCII	[ESC] g <1>Then send the data to be recorded. (The data is processed and printed).
Function	Stop macro record
ASCII	[ESC] g <2>Then save the macro.
Function	Save macro data
ASCII	[ESC] [US] m <Name..><0> Saving User-defined Characters. To save user-defined characters, first define the character set.

Function	Define user-defined characters
ASCII	<p>[ESC] = <y> <c₁> <c₂> [x₁ d₁ ... d(y x x₁)] ... [x_k d₁ ... d(y x x_k)]</p> <p>Second, save the definition in the nonvolatile flash memory with the appropriate command.</p> <p>Save the definition. Note the "Save user-defined characters" command saves all three character definitions.</p>

Function	Save user-defined characters
ASCII	<p>[ESC] [US] c <Name..> <0></p> <p>Third, load the character set or load and run the macro.</p> <p>To restore the character definitions, issue a load item command with the name of the character set to be loaded.</p> <p>The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 128.</p>

Function	Load item from user store
ASCII	<p>[ESC] [US] l <Name..> <0></p> <p>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.</p> <p>To help maintain the user-store area, the following commands can be used.</p> <p>The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 128.</p>

Function	Flag as a start-up macro
ASCII	<p>[ESC] [US] s <Name..> <0></p> <p>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.</p> <p>The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 128.</p>

Function	Remove item from user store
ASCII	<p>[ESC] [US] e <Name..> <0></p> <p>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 128.</p>

Function	Flush information from user store
ASCII	[ESC] [US] f ALL <0> Base User Store
or	[ESC] [US] f EXT <0> Extended User Store.
Description	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 128.

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



Note: 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 128.

User-Store Commands

Function	Begin named macro record
ASCII	[ESC] [US] b <Name..> <0>
Hexadecimal	1BH 1FH 62H
Decimal	<27> <31> <98>
IPCL	&%UB <Name..> <0>
EPOS	none
Description	The [ESC] [US] b <Name..> <0> command erases the current macro, initializes the macro buffer structure, and redirects the following data to the macro buffer. It uses the <Name..> field as a reference. If the name already exists in the flash user store, the command is ignored. The command must be followed by the "End name macro record" command with the same name. If the data that follows is larger than the macro buffer (about 16K), the macro definition is terminated without saving any data. The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 128.

Function	End named macro record
ASCII	[ESC] [US] e <Name..> <0>
Hexadecimal	1BH 1FH 65H
Decimal	<27> <31> <101>
IPCL	&%UG <Name..> <0>
EPOS	none
Description	<p>The [ESC] [US] e <Name..> <0> command ends the macro record operation and saves the macro to flash. It uses the <Name..> field to verify the command end and must match the "Begin named macro record" command. If the name already exists in the flash user store or the macro memory is exceeded, the command is valid, and the <Name..> field prints. If there is not enough room in the flash user store for the macro, the save is not performed, but the macro buffer is valid.</p> <p>The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 128.</p>

Function	Save macro data in user store
ASCII	[ESC] [US] m <Name..> <0>
Hexadecimal	1BH 1FH 6DH
Decimal	<27> <31> <109>
IPCL	&%UM <Name..> <0>
EPOS	[GS] -...<Name..> <0> is from one to 15 characters and must be null terminated.
Description	<p>The [ESC] [US] m <Name..> <0> command saves the current macro buffer structure into the flash user-store area. It uses the <Name..> field as a reference name. If the name already exists in the flash user store, the command does not store the data.</p> <p>The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 128.</p>

Function	Save user-defined characters
ASCII	[ESC] [US] c <Name..> <0>
Hexadecimal	1BH 1FH 63H
Decimal	<27> <31> <99>
IPCL	&%UC <Name..><0>
EPOS	[GS] 6<Name..> <0> is from one to 15 characters and must be null terminated.
Description	<p>The [ESC] [US] c <Name..> <0> command saves the current user-defined character structure in the flash user-save storage area. It uses the <Name..> field as a reference. If the name already exists in the flash user store, the command will not store the data.</p> <p>The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 128.</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 <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT>n> on page 128.

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 <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 128.

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 <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 128

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 128.

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 128.

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 128.

Function Report on user store

ASCII	[ESC] [US] q <0>	Print a user store report
Or	[ESC] [US] ? <0>	Return a formatted user store report
Hexadecimal	1BH 1FH 71H	
Decimal	<27> <31> <113>	
IPCL	&%UQ <Name..> <0>	
EPOS	[GS] 3	
Description	The [ESC] [US] q <Name..> <0> command prints a status report. The file name is ignored and may be omitted. The NUL must be present. The intention of the command is to aid in macro development. The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 128.	



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

Function Redefine User Store Termination Character

ASCII	[ESC] [EM] T <n>
Hexadecimal	1BH 19H 54H <n>
Decimal	<27> <25> <84> <n>
IPCL	&%UT <n>
EPOS	None
Description	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 (in addition to the <0>) for the terminator. The value of n may be from 0 to 255. The default value for the second terminator is &. If this command redefines the terminator to something other than &, the & will no longer function.
Example	If &%UT% were sent to the printer, the user store command to run macro "Demo" would be &%URDemo%.

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 16K⁷ bytes long. All commands⁸ 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.

⁷ The actual buffer is smaller because of the overhead.

⁸ 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
ASCII	[ESC] b <n> {information} [ETX]
Hexadecimal	1BH 62H <n> ... 03H
Decimal	<27> <98> <n> ... <3>
IPCL	&%25 ... [CR] Interleaved 2 of 5 &%39 ... [CR] Code 39 &%12 ... [CR] Code 128 &%28 .<m ₁ > <m ₂ > 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
EPOS	[ESC] b <n> or [GS] k <n>
Description	The [ESC] b <n> {information} [ETX] command prints information as a bar code. The bar code is centered on the print zone.
Where n =	0 Interleaved 2 of 5 Numeric (0-9) only; must be even number of digits 1 Code 39 26 uppercase letters (A-Z); 10 digits (0-9) (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



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® 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 8th 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 7 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 8 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 8.

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 8 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 9 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 ratio 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 ₁ > <m ₂ >		
EPOS	none		
The power on default is center justified with HRI characters not printed.			
Description	The [ESC] [EM] J <n> command selects the operation of the bar code justification, HRI characters, and print direction.		
Where n bits	n	IPCL	76543210
			-----xx
			Justified
	0	00	-----00
			Left
	1	01	-----01
			Center
	2	02	-----10
			Right
			--xx----
			HRI characters
	0	00	--00----
			Not printed
	16	16	--01----
			Printed above the bar code
	32	32	--10----
			Printed below the bar code
	48	48	--11----
			Printed above and below the bar code
			-x-----
			Vertical print mode. (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® 280 has the capability to store electronic journal⁹ 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® 280 has about¹⁰ 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 147). 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.

⁹ It must be noted that the iTherm® 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.

¹⁰ 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® 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® 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.

Function	Print the Electronic Journal
ASCII	[ESC][GS]P< S _i >< S _h >< L _i >< L _h >
Hexadecimal	1BH 1DH 50H < S _i >< S _h >< L _i >< L _h >
Decimal	<27> <29><80> < S _i >< S _h >< L _i >< L _h >
IPCL	&%EP <S> <L> (L and S are 4 digits ie. 00100020 for 20 records starting at 10)
EPOS	
Description	This command prints all or part of the electronic journal. <S _h >*256 + <S _i > specifies the first record to be printed and <L _h >*256 + <L _i > specifies the number of records to print. If <L _h >*256 + <L _i > 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.

Function	Report the Electronic Journal
ASCII	[ESC][GS]R< S _i >< S _h >< L _i >< L _h >
Hexadecimal	1BH 1DH 52H < S _i >< S _h >< L _i >< L _h >
Decimal	<27> <29><82> < S _i >< S _h >< L _i >< L _h >
IPCL	&%EQ <S> <L> (L and S are 4 digits ie. 00100020 for 20 records starting at 10)
EPOS	
Description	This command reports all or part of the electronic journal. <S _h >*256 + <S _i > specifies the first record to be printed and <L _h >*256 + <L _i > specifies the number of records to report. If <L _h >*256 + <L _i > 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]

Function Set the Electronic Journal Record Header**ASCII** [ESC][GS]F<String %d><0>**Hexadecimal** 1BH 1DH 46H**Decimal** <27> <29><70>**IPCL** None**EPOS****Description** This command allows the record separator that is printed between records to be changed. The default format is:

\r\nRecord %d\r\n

Where: \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.

Function Print/Report an Electronic Journal Log**ASCII** [ESC][GS]L Print the report**Or** [ESC][GS]I Return the report**Hexadecimal** 1BH 1DH 4CH or 6CH**Decimal** <27> <29><76> or <108>**IPCL** &%UL (No IPCL for returning the report)**EPOS****Description** 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_H><n_L>
 [NAK] EJ is not active. It is either off, not initialized or full. If n_H*256 + n_L is not zero, the EJ is available but not initialized and n_H*256 + n_L is the available space in K (1024) bytes.
 or
 [ACK]<25><42><n_H><n_L>
 [ACK] the EJ is active and available and n_H*256 + n_L 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

Where Bit	0	Cash Drawer 0	ACK/NAK <1>
	1	Cash Drawer 1	ACK/NAK <2>
	2	Paper low status	ACK/NAK <3>
	3	Paper out status	ACK/NAK <4>
	4	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® 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]| <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]| <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]| <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]| <0>
Hexadecimal 1BH 6CH<0>
Decimal <27> <108><0>
IPCL &%EE
EPOS

Description This command ends a carbon copy journal entry.

Unicode and Downloaded Fonts

The iTherm® 280 Printer supports Unicode encoding. This Unicode support is exclusive to the downloaded fonts.

You must have downloaded and selected the downloaded font before you can reference the font via Unicode encoding. See the following group of commands for how to select and use a download font.

There is a font downloading utility available from TransAct, call your sales person or tech support for more information.



WARNING: You must have proper rights to use a font in this manner. **Do not** download a font to the printer if you do not have the right to use the font as a downloaded printer font.

The commands that control access to the downloaded fonts are all in the group that starts as “[ESC]+” commands. Other commands that manipulate the resident fixed pitch fonts do not apply to the downloaded fonts described in this section. If commands that reference internal fonts or change the pitch are selected, the downloaded font will be deactivated and the last used internal font selected.

To access characters located above 255 you must use a Unicode encoding method.

Unicode Encoding

UTF-16 is the most straightforward way to access characters above 255. UTF-16 is basically 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.

UTF-16LE uses the little-endian method of sending the two bytes. This method sends the low byte first and then the high byte.

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.

Scalar Value	1 st Byte	2 nd Byte	3 rd Byte
00000000xxxxxxx	0xxxxxxx		
00000yyyyyxxxxxx	110yyyyy	10xxxxxx	
Zzzzyyyyyyxxxxxx	1110zzzz	10yyyyyy	10xxxxxx

Function Set Font ID

ASCII [ESC] + 1 <low byte> <high byte>
Hexadecimal 1BH 2BH 31H
Decimal <27> <43> <49>
Description The [ESC] + 1 command sets the download font ID. This command is used to set the font ID before sending/downloading character definitions. This command does NOT select the font for printing. This command is not used during normal printing use of the printer.

Function **Set Font Descriptor**

ASCII [ESC] + 2
Hexadecimal 1BH 2BH 32H
Decimal <27> <43> <50>
Description The [ESC] + 2 command is used to send a font header/descriptor to the printer. The first byte of the descriptor is the length of the header description. This length must be 64. The format of this font header uses the "HP PCL Soft Font Design" version 4 (PCL4). The description of PLC Soft Font technology is not discussed here. Not all of the values in the header are used, but they should be set to a reasonable value in case they are used in future implementations. . This command is not used during normal printing use of the printer.



NOTE: There is a font downloading utility available from TransAct. Call TransAct sales or technical support for more information.



WARNING: You must have proper rights to use a font in this manner. **Do not** download a font to the printer if you do not have the right to use the font as a downloaded printer font.

Function **Select Font**

ASCII [ESC] + 3 <low byte> <high byte>
Hexadecimal 1BH 2BH 31H
Decimal <27> <43> <51>
Description The [ESC] + 3 command selects the downloaded font for printing. This command is used to select the previously downloaded font for printing.

Function **Set Character Code ID**

ASCII [ESC] + 4 <low byte> <high byte>
Hexadecimal 1BH 2BH 34H
Decimal <27> <43> <52>
Description The [ESC] + 4 command sets the download character ID. This command is used to set the character ID before sending/downloading the character's definition. This command is not used during normal printing use of the printer.

Function Send Character Definition**ASCII** [ESC] + 5 <low byte length> <high byte length>**Hexadecimal** 1BH 2BH 35H**Decimal** <27> <43> <53>**Description** The [ESC] + 5 command is sent before sending the character definition. The format of this character definition uses the "HP PCL Soft Font Design" version 4 (PCL4). The description of PLC Soft Font technology is not discussed here. Not all of the values in the character definition are used, but they should be set to a reasonable value in case they are used in future implementations. This command is not used during normal printing use of the printer.

Function Delete Current Selected Soft Font**ASCII** [ESC] + 6**Hexadecimal** 1BH 2BH 36H**Decimal** <27> <43> <54>**Description** The [ESC] + 6 command deletes the current selected font from RAM. It will not delete a font from flash memory for from ROM**NOTE:** This command will reselect the last used internal font. If another soft font is to be used, it must be selected.

Function Delete All Soft Fonts**ASCII** [ESC] + 7**Hexadecimal** 1BH 2BH 37H**Decimal** <27> <43> <55>**Description** The [ESC] + 7 command deletes all the soft fonts from RAM. It will not delete a font from flash memory for from ROM**NOTE:** This command will reselect the last used internal font.

Function Query Soft/RAM Font Information**ASCII** [ESC] + Q**Hexadecimal** 1BH 2BH 51H**Decimal** <27> <43> <81>**Return** 64 bytes of font header.**Description** The [ESC] + Q command will return the raw font header data for the currently selected font.

Function Copy Soft Font from RAM to User memory/flash memory.**ASCII** [ESC] + U**Hexadecimal** 1BH 2BH 55H**Decimal** <27> <43> <85>**Description** The [ESC] + U command will copy the currently selected soft font from RAM to user/flash memory to make the font permanent.

Function Initiate Unicode UTF-16BE Encoding**ASCII** [ESC] + H**Hexadecimal** 1BH 2BH 48H**Decimal** <27> <43> <72>**Description** 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.

You must select a downloaded font, as described in this section, before issuing this command.

UTF-16 is the most straightforward way to access characters above 255. UTF-16 is basically 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.



NOTE: All information sent to the printer must now use this encoding, even for non-print commands.

Function Initiate Unicode UTF-16LE Encoding**ASCII** [ESC] + L**Hexadecimal** 1BH 2BH 4CH**Decimal** <27> <43> <76>**Description** 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.

You must select a downloaded font, as described in this section, before issuing this command.

UTF-16 is the most straightforward way to access characters above 255. UTF-16 is basically 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.



NOTE: All information sent to the printer must now use this encoding, even for non-print commands.

Function	Initiate Unicode UTF-8 Encoding (MBCS)
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.

You must select a downloaded font, as described in this section, before issuing this command.

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: All information sent to the printer must now use this encoding, even for non-print commands.

Scalar Value	1 st Byte	2nd Byte	3rd Byte
00000000xxxxxx x	0xxxxxxx		
0000yyyyxxxxxx	110yyyyy	10xxxxxx	
zzzyyyyyxxxxxx	1110zzzz	10yyyyyy	10xxxxxx

Function	Initiate Normal 8-bit Character Encoding
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.

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 <n₁> <n₂>
Hexadecimal 1BH 58H <n₁> <n₂>
Decimal <27> <88> <n₁> <n₂>
IPCL none
EPOS [ESC] I, [ESC] Q

Description The [ESC] X <n₁> <n₂> command sets left and right print margins in characters from the home position. Where n₁ = left margin and n₂ = 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

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

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

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

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

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

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



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



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

[ESC] v Perform Auto Cut

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

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



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

[ESC] @ 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.

[BEL] Audio alert

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

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

Description The [ESC] [BEL] <n₁> <n₂> <n₃> 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] <n₁> <n₂> <n₃> command allows the sound to be altered.

Where <n₁> is the number of alert cycles
 <n₂> is the on time of the alert cycle in ten Ms intervals
 <n₃> is the off time of the alert cycle in ten Ms intervals

[ESC] p 5 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] 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 $0 \leq n \leq 255$

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 19 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 $0 \leq n \leq 255$

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 20 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

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

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

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

Description The [ESC] ~ <n> commands are extended diagnostics commands. They must all be preceded with an enabling command. These commands (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

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

ASCII	[ENQ] <11>
Hexadecimal	05H 0BH
Decimal	<5> <11>
Function	Has the printer been power cycled since the last request?
Response	ACK <11> (06H 0BH) Printer has been power cycled since the last [ENQ] <11>
	NAK <5> (15H 0BH) Printer has not power cycled since the last [ENQ] <11>

Description The first time after a 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

ASCII	[ENQ] <14>
Hexadecimal	05H 0EH
Decimal	<5> <14>
Function	Error status
Response	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> <r₁> <r₂>...**Where** <15> is the echo of the command ID.<n> is the number of return bytes + 40 (28H)
(to prevent confusion with XON/XOFF).<r₁>: 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]<22> to identify the specific error and [ENQ]<10> to recover

bit 5 = 0

bit 6 = 1 always

bit 7 = 0 always

<r₂>: 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> <r₁> <r₂>...

Where <20> is the echo of command ID.
 <n> is the number of return bytes + 40 (28H) (to prevent confusion with XON/XOFF).
 <r₁>:
 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
 <r₂>:
 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
 <r₃>:
 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
 <r₄>:
 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
 <r₅>: Percentage of ink remaining on Head 1 (0-100) + 40 (28H)
 <r₆>: Percentage of ink remaining on Head 2 (0-100) + 40 (28H)
 <r₇>: Current multi-head alignment (0-16, 8 = 0 offset)

[ENQ] <21> Inquire printer ID

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

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

```
MFG:Ithaca-Periph.;
CMD:PJ1000CL,IPCL;
CLS:PRINTER;
MDL:1000 PcOS;
DES:Ithaca-Peripherals iTherm® 280;
REV:PE1200-01.16
OPTS:$20xy
```

Where x is a bit field defined as follows:

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

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

ASCII	[ENQ] <22>
Hexadecimal	05H 17H
Decimal	<5> <22>
Function	The [ENQ] <22> command reports on the error status.
Response	[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).
- <r₁>**: 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><n₁><n₂><n₃>

Where <24> Is the echo of command
<n₁> Secondary Pen Color 0 = Not installed, 1 = Red, 2 = Green, 4 = Blue
<n₂> Primary Pen Color 1 = Red, 2 = Green, 4 = Blue 16 = Black
<n₃> 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 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	190
CR	0DH	Print and carriage return	190
ESC d	1BH,64H	Print and feed <n> lines	190
ESC J	1BH,4AH	Print and feed paper <n> vertical units	191
Line Spacing Commands			
Command		Name	Page
ESC 2	1BH,32H	Select default line spacing, 1/6 lpi	192
ESC 3	1BH,33H	Set line spacing	192
Character Commands			
Command		Name	Page
ESC SP	1BH,20H	Set right-side character spacing	192
ESC !	1BH,21H	Select print mode(s)	198
ESC %	1BH,25H	Select/cancel user-defined character sets	192
ESC &	1BH,26H	Define user-defined characters	193
ESC -	1BH,2DH	Turn underline mode on/off	198
ESC ?	1BH,3FH	Cancel user-defined characters	193
ESC E	1BH,45H	Turn emphasized mode on/off	198
ESC G	1BH,47H	Turn double-strike mode on/off	199
ESC M	1BH,4DH	Select character font	193
ESC R	1BH,52H	Select an international character set	194
ESC V	1BH,56H	Turn on/off 90° rotation mode	199
ESC t	1BH,74H	Select character code table	197
ESC {	1BH,7BH	Turn upside-down printing mode on/off	199
GS !	1DH,21H	Select character size	200
GS B	1DH,42H	Turn white/black reverse printing mode on/off	197
Panel Button Commands			
Command		Name	Page
ESC c 5	1BH,63H, 35H	Enable/disable panel buttons	201
Paper Sensor Commands			
Command		Name	Page
ESC c 4	1BH,63H, 34H	Select paper sensor(s) to stop printing	202
ESC c 3	1BH,63H, 33H	Select paper sensor(s) to output paper out signals	203

Supported TM-T88 Commands

Print Position Commands			
Command		Name	Page
HT	09H	Set horizontal tab positions	205
ESC \$	1BH,24H	Set absolute print position	204
ESC D	1BH,44H	Set horizontal tab positions	206
ESC \	1BH,5CH	Set relative print position	204
ESC a	1BH,61H	Select justification	205
GS L	1DH,4CH	Set left margin	206
GS T	1DH,54H	Set print position to the beginning of the line	204
GS W	1DH,57H	Set printing area width	206
Bit-image Command			
Command		Name	Page
ESC *	1BH,2AH	Select bit-image mode	208
GS v 0	1DH,76H,30 H	Print raster bit image	208
Status Commands			
Command		Name	Page
DLE EOT	10H,04H	Real-time status transmission	212
DLE ENQ	10H,05H	Real-time status request to printer	212
GS a	1DH,61H	Enable/disable Automatic Status Back (ASB)	209
GS r	1DH,72H	Transmit status	211
Bar Code Commands			
Command		Name	Page
GS H	1DH,48H	Select printing position of HRI characters	221
GS f	1DH,66H	Select font HRI characters	221
GS h	1DH,68H	Set bar code height	220
GS k	1DH,6BH	Print bar code	219
GS w	1DH,77H	Set bar code width	219
Mechanism Control Commands			
Command		Name	Page
GS V	1DH,56H	Select cut mode and cut paper	222

Supported TM-T88 Commands

Miscellaneous Commands			
Command		Name	Page
DLE DC4 <1>	10H,14H,01H	Generate pulse in real-time	224
DLE DC4 <2>	10H,14H,02H	Execute power-off sequence	224
DLE DC4 <8>	10H,14H,08H	Clear buffers	225
ESC =	1BH,3DH	Select peripheral device status	225
ESC @	1BH,40H	Initialize printer	223
ESC p	1BH,70H	Generate pulse	224
GS (A	1DH,28H,41 H	Enter Test Mode	227
GS I	1DH,49H	Transmit printer ID	223
GS P	1DH,50H	Set horizontal and vertical motion units	223
GS b	1DH,62H	Turns smoothing mode on/off	200
GS c	1DH,63H	Print counter	227
GS g 0	1DH,67H,30 H	Initialize maintenance counter	227
GS g 2	1DH,67H,32 H	Transmit maintenance counter value	228
Macro Function Commands			
Command		Name	Page
GS :	1DH,3AH	Start/end macro definition	229
GS ^ r t m	1DH,5EH	Execute macro	229
Page Mode Commands			
Command		Name	Page
FF	0CH	Print and return to standard mode	81
CAN	18H	Cancel print data in page mode	216
ESC FF	1BH,0CH	Print data in page mode	219
ESC L	1BH,4CH	Select Page mode	217
ESC S	1BH,53H	Switches from page mode to standard mode	217
ESC T	1BH,54H	Select print direction in page mode	217
ESC W	1BH,57H	Set printing area in page mode	217
GS \$	1DH,24H	Set absolute vertical print position in page mode	219
GS \	1DH,5CH	Set relative vertical print position in page mode	219
User-defined Memory Commands			
Command		Name	Page
GS *	1DH,2AH	Define single user-defined bit-image	233
GS /	1DH,2FH	Print single user-defined bit-image	234

Table 21 Supported TM-T90 Commands

Undocumented TM-T88 Commands

Command	Name	
ESC l	Auto Cut	222
ESC m	Auto Cut	222
ESC u	Transmit Peripheral Device Status	213
ESC v	Transmit Paper status	214

Table 22 Undocumented TM-T90 Commands

Supported TM-T90 Commands

Print and Feed Commands			
Command		Name	Page
LF	0AH	Print and line feed	190
CR	0DH	Print and carriage return	190
ESC d	1BH,64H	Print and feed <n> lines	190
ESC e	1BH,65H	Print and reverse feed <n> lines	190
ESC J	1BH,4AH	Print and feed paper <n> vertical units	191
ESC K	1BH,4BH	Print and reverse feed [<n> x (1/144)] inches	191
ESC j	1BH,6AH	Print and reverse feed	191
Line Spacing Command			
Command		Name	Page
ESC 2	1BH,32H	Select default line spacing, 1/6 lpi	192
ESC 3	1BH,33H	Set line spacing	192
Character Commands			
Command		Name	Page
ESC SP	1BH,20H	Set right-side character spacing	192
ESC !	1BH,21H	Select print mode(s)	198
ESC %	1BH,25H	Select/cancel user-defined character sets	192
ESC &	1BH,26H	Define user-defined characters	193
ESC -	1BH,2DH	Turn underline mode on/off	198
ESC 4	1BH,34H	Set italics mode	200
ESC 5	1BH,35H	Reset italics mode	200
ESC ?	1BH,3FH	Cancel user-defined characters	193
ESC E	1BH,45H	Turn emphasized mode on/off	198
ESC G	1BH,47H	Turn on/off double-strike mode	199
ESC M	1BH,4DH	Select character font	193
ESC R	1BH,52H	Select an international character set	194
ESC V	1BH,56H	Turn on/off 90° rotation mode	199
ESC [T	1BH,5BH, 54H	Select character code table	195
ESC ^	1BH,5EH	Print control character	197
ESC r	1BH,72H	Select color	197
ESC t	1BH,74H	Select character code table	197
ESC {	1BH,7BH	Turn on/off upside-down printing mode	199
GS !	1DH,21H	Set character size	200
GS #	1DH,23H	Insert euro character	197
GS B	1DH,42H	Turn white/black reverse printing mode on/off	197
Panel Button Commands			
Command		Name	Page
ESC c 5	1BH,63H, 35H	Enable/disable panel buttons	201

Table 23 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.	202
ESC c 3	1BH,63H, 33H	Select paper sensor(s) to output paper out signals.	203
ESC c 1	1BH, 63H, 31H	Select paper types for command settings	216
ESC c 0	1BH, 63H, 30H	Select paper types for printing	215
Print Position Commands			
Command		Name	Page
BS	08H	Set back space	205
HT	09H	Set horizontal tab positions	205
ESC \$	1BH,24H	Set absolute print position	204
ESC <	1BH,3CH	Return home	207
ESC D	1BH,44H	Set horizontal tab positions	206
ESC Q	1BH,51H	Set right margin in characters	207
ESC U	1BH,55H	Turn on/off unidirectional printing mode	206
ESC \	1BH,5CH	Set relative print position	204
ESC a	1BH,61H	Select justification	205
ESC I	1BH,6CH	Set left right margin in characters	207
GS L	1DH,4CH	Set left margin	206
GS T	1DH,54H	Set print position to the beginning of the line	204
GS W	1DH,57H	Set printing area width	206
Bit-image Commands			
Command		Name	Page
ESC *	1BH,2AH	Select bit-image mode	208
GS v 0	1DH,76H,30H	Print raster bit image	208
Status Commands			
Command		Name	Page
DLE EOT	10H,04H	Transmit real-time status	212
DLE ENQ	10H,05H	Real-time status request to printer	226
ESC u	1BH, 75H	Transmit peripheral status	213
ESC v	1BH, 76H	Transmit paper status	214
GS a	1DH,61H	Enable/disable automatic status back (ASB)	209
GS r	1DH,72H	Transmit status	211

Supported TM-T90 Commands

Bar Code Commands			
Command		Name	Page
GS H	1DH,48H	Select printing position of HRI characters	221
GS f	1DH,66H	Select font HRI characters	221
GS h	1DH,68H	Set bar code height	220
GS k	1DH,6BH	Print bar code	219
GS w	1DH,77H	Set bar code width	219
Mechanism Control Commands			
Command		Name	Page
GS V	1DH,56H	Select cut mode and cut paper	222
ESC I	1BH,69H	Set partial knife cut	222
ESC m	1BH,69H	Set partial knife cut	193
BEL	07H	Sound buzzer	222
ESC BEL	1BH,07H	Sound buzzer	222
Miscellaneous Commands			
Command		Name	Page
DLE DC4 <1>	10H,14H,01H	Generate pulse in real-time	224
DLE DC4 <2>	10H,14H,02H	Execute power-off sequence	224
DLE DC4 <8>	10H,14H,08H	Clear buffers	225
ESC =	1BH,3DH	Select peripheral device status	225
ESC @	1BH,40H	Initialize printer	223
ESC p	1BH,70H	Generate pulse	224
GS (A	1DH, 28H,41H	Enter test mode	227
GS I	1DH,49H	Transmit printer ID	223
GS P	1DH,50H	Set horizontal and vertical motion units	223
GS b	1DH,62H	Turns smoothing mode on/off	200
GS c	1DH,63H	Print counter	227
GS g 0	1DH,67H,30H	Initialize maintenance counter	227
GS g 2	1DH,67H,32H	Transmit maintenance counter value	228
Macro Function Commands			
Command		Name	Page
GS :	1DH,3AH	Start/end macro definition	229
GS ^ r t m	1DH,5EH	Execute macro	229
GS _	1DH,5FH	Delete start-up macro definition	230
Page Mode Commands			
Command		Name	Page
FF	0CH	Print and return to standard mode	81
CAN	18H	Cancel print data in page mode	160
ESC FF	1BH,0CH	Print data in page mode	219
ESC L	1BH,4CH	Select Page mode	217
ESC S	1BH,53H	Switches from page mode to standard mode	217
ESC T	1BH,54H	Select print direction in page mode	217
ESC W	1BH,57H	Set printing area in page mode	217
GS \$	1DH,24H	Set absolute vertical print position in page mode	219

GS \	1DH,5CH	Set relative vertical print position in page mode	219
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Supported TM-T90 Commands

User-defined Memory Commands			
Command		Name	Page
GS - <Name> ...	1DH,2DH, <Name> ...	Define user-defined bit image	230
GS 0 <Name> ... <m>	1DH,30H, <Name> ...	Print user-defined bit image	232
GS 1 <Name> ...	1DH,31H, <Name> ...	Erase single entry from nonvolatile memory	232
GS *	1DH,2AH	Define single user-defined bit-image	233
GS /	1DH,2FH	Print single user-defined bit-image	234
GS 3	1DH,33H	Query nonvolatile memory pool information	234
GS 5	1DH,35H	Erase all entries from nonvolatile memory	232
GS 6	1DH,36H	Save user-defined character set	234
GS 7	1DH,37H	Select user-defined character set	234

Extended Electronic Journal Commands

Electronic Journal Commands			
Command		Name	Page
[ESC][GS]I <Password><0>	1BH 1DH 49H	Electronic journal initialize and set password	144
[ESC][GS]E <Password><0>	1BH 1DH 45H	Electronic journal erase the electronic journal	144
[ESC][GS]P< S _i > <S _h >< L _i >< L _h >	1BH 1DH 50H	Print the electronic journal	145
[ESC][GS]R< S _i > < S _h >< L _i >< L _h >	1BH 1DH 52H	Report the electronic journal	145

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 ≤ n ≤ 255

Description The [ESC] d <n> command prints the data in the print buffer and feeds <n> lines. The amount of paper fed per line is based on the value set using the line spacing command. The maximum paper feed amount is 40 inches. The default setting of the paper feed amount is 1/6 inch.

Function Print and Reverse Feed<n> Lines

ASCII [ESC] e <n>

Hexadecimal 1BH 65H <n>

Decimal <27> <101> <n>

Range 0 ≤ n ≤ 255

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

Function **Print and Feed Paper****ASCII** [ESC] J <n>**Hexadecimal** 1BH 4AH <n>**Decimal** <27> <74> <n>**Range** 0 ≤ n ≤ 255**Description** The [ESC] J <n> command prints the data in the print buffer and feeds the paper [$n \times (1/144)$] 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 ≤ n ≤ 48**Description** The [ESC] K <n> command prints the data in the print buffer and feeds the paper [$\langle n \rangle \times (1/144)$] 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 ≤ n ≤ 48**Description** The [ESC] j command prints the data in the print buffer and feeds the paper one line in reverse.

Line Spacing Commands

Function **Select Default Line Spacing**

ASCII [ESC] 2

Hexadecimal 1BH 32H

Decimal <27> <50>

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

Function **Set Line Spacing**

ASCII [ESC] 3 <n>

Hexadecimal 1BH 33H <n>

Decimal <27> <51> <n>

Range $0 \leq n \leq 255$

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

Character Commands

Function **Set Right-Side Character Spacing**

ASCII [ESC] SP <n>

Hexadecimal 1BH 20H <n>

Decimal <27> <32> <n>

Range $0 \leq n \leq 255$

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

Function **Select/Cancel User-Defined Character Set**

ASCII [ESC] % <n>

Hexadecimal 1BH 25H <n>

Decimal <27> <37> <n>

Range $0 \leq n \leq 255$

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 ≤ c₁ ≤ c₂ ≤ 126

0 ≤ x ≤ 12 (9 x 9 font)

0 ≤ x ≤ 9 (7 x 9 font)

0 ≤ d₁ ... d(y x x) ≤ 255

Description The [ESC] & <y> <c₁₂₁ d₁ ... d(y x x₁)] ... [x_k d₁ ... d(y x x_k)] command defines user-defined characters from character code <c₁₂₁₂

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 24 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 CW1	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 25 International Character Sets

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

Code Page	Country	Decimal <nh> <nl>	Hex <nh> <nl>
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 _h > <n _l >	Hex <n _h > <n _l >
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 26 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 27 Character Code Table

Function Select Print Mode(s)**ASCII** [ESC] ! <n>**Hexadecimal** 1BH 21H <n>**Decimal** <27> <33> <n>**Range** $0 \leq n \leq 255$ **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 28 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** $0 \leq n \leq 255$ **Description** The [ESC] E <n> command turns on or off emphasized mode. When the least significant bit (LSB) of <n> = 1, emphasized mode is turned on; when it is 0, emphasized mode is turned off. The default setting is <n> = 0. Emphasized and double-strike printing appear the same.

Function Turn ON/OFF Double-Strike Mode**ASCII** [ESC] G <n>**Hexadecimal** 1BH 47H <n>**Decimal** <27> <71> <n>**Range** $0 \leq n \leq 255$ **Description** The [ESC] G <n> command turns on or off double-strike mode. When the least significant bit (LSB) of <n> = 1, double-strike mode is turned on; when it is 0, double-strike mode is turned off. The default setting is <n> = 0. Double-strike and emphasized printing appear the same.**Function Turn ON/OFF Upside-Down Print Mode****ASCII** [ESC] { <n>**Hexadecimal** 1BH 7BH <n>**Decimal** <27> <123> <n>**Range** $0 \leq n \leq 255$ **Description** The [ESC] { <n> turns on or off upside-down printing mode. When the least significant bit of <n> = 1, upside-down printing mode is turned on; when it is 0, upside-down printing mode is turned off. The default setting is <n> = 0. When upside-down mode is turned on, the printer prints 180° rotated characters from right to left. The line printing order is not reversed, so the order of the data transmitted is important. The command is enabled only when input at the beginning of a line.**Function Turn ON/OFF 90° Rotation Mode****ASCII** ESC V <n>**Hexadecimal** 1BH 56H <n>**Decimal** <27> <86> <n>**Range** <n> = 0, 1, 2, 48, 49, 50**Description** The ESC V <n> command turns on/off 90° clockwise rotation mode. The command is only enabled in standard mode. In page mode, an internal flag is activated, and the command is enabled when the printer returns to standard mode.

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

Table 29 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 30 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 31 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_l> <n_h>
Decimal <29> <84> <n_l> <n_h>
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_l> <n_h>
Hexadecimal 1BH 24H <n_l> <n_h>
Decimal <27> <36> <n_l> <n_h>
Range 0 ≤ n_l ≤ 255
 0 ≤ n_h ≤ 255

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

Function Set Relative Print Position

ASCII [ESC] \ <n_l> <n_h>
Hexadecimal 1BH 5CH <n_l> <n_h>
Decimal <27> <92> <n_l> <n_h>
Range 0 ≤ n_l ≤ 255
 0 ≤ n_h ≤ 255

Description The ESC \ <n_l> <n_h> command sets the print starting position based on the current position and the distance from the current position to [(n_l + n_h × 256) × horizontal unit]. When standard 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.

Function Set Horizontal Tab Positions

ASCII [ESC] D <n₁> ... <n_k> NUL
Hexadecimal 1BH 44H <n₁> ... <n_k> 00
Decimal <27> <68> <n₁> ... <n_k> <0>
Range 1 ≤ n ≤ 255
 0 ≤ k ≤ 32

Description The [ESC] D <n₁> ... <n_k> NUL command sets the horizontal tab positions. <n> specifies the column number for setting a horizontal tab position. The command deletes any previously set, horizontal tab positions. Up to 32 tab positions can be set. The default tab positions are at intervals of eight characters for 7 x 9 font.

Function Set Left Margin

ASCII GS L <n_l> <n_h>
Hexadecimal 1DH 4CH <n_l> <n_h>
Decimal <29> <76> <n_l> <n_h>
Range 0 ≤ n_l ≤ 255
 0 ≤ n_h ≤ 255

Description The GS L <n_l> <n_h> command sets the left margin using n_l and n_h. The left margin is set to [(n_l + n_h × 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.

Function Set Printing Area Width

ASCII GS W <n_l> <n_h>
Hexadecimal 1DH 57H <n_l> <n_h>
Decimal <29> <87> <n_l> <n_h>
Range 0 ≤ n_l ≤ 255
 0 ≤ n_h ≤ 255

Description The printing area width is set to [(n_l + n_h × 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.

Function Turn ON/OFF Uni-Directional Printing Mode

ASCII [ESC] U <n>
Hexadecimal 1BH 55H <n>
Decimal <27> <85> <n>
Range 0 ≤ n ≤ 255

Description The [ESC] U <n> command turns on/off unidirectional printing mode. When the least significant bit (LSB) of <n> = 1, unidirectional printing is turned on. When LSB = 0, unidirectional printing is turned off, and 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_l> <n_h> <d_l> ... <d_k> command selects a bit-image mode using <m> for the number of dots specified by $(n_l + n_h \times 256)$ 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 32 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 33 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 34 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 ¹¹
	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 35 Automatic Status Back (ASB) Second Byte (Error Information)

¹¹ 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 36 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 37 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** $1 \leq n \leq 2$ $49 \leq n \leq 50$

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

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

Table 39 Drawer Kick-out Connector Status (<n> = 2, 50)

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

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 40 Values for the Status Function, <n>

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

Table 41 Printer Status (<n> = 1)

Bit	Off/On	Hexl	Decimal	Status
0	Off	00H	<0>	Not used; fixed to off
1	On	02H	<2>	Not used; fixed to on
2	-	-	-	Undefined
3	Off	00H	<0>	Paper is not being fed by the 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 42 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 ¹²
	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 43 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 44 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.

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

Bit	Off/On	Hex	Decimal	Status
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 45 Peripheral Status (<n> = 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 46 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 144. 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 <t₁><t₂>
Hexadecimal 1BH 66H <t₁><t₂>
Decimal <27> <116> <t₁><t₂>
Range $0 \leq t_1 \leq 15$
 $0 \leq t_2 \leq 64$

Description ESC f *t*₁ *t*₂ sets the time that the printer waits for validation paper to be inserted to *t*₁ × 1 minutes, and the time from detection of the validation to the start of printing to *t*₂ × 0.1 seconds. When *t*₁=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*₁=0, *t*₂=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

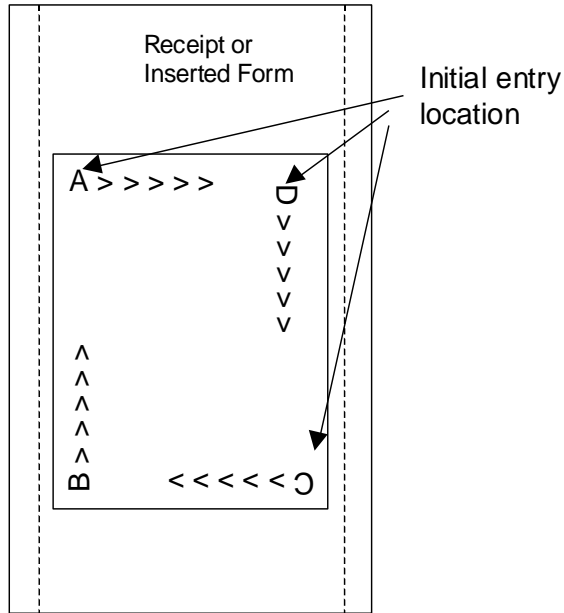
This command may also be issued during page definition. When issued in page mode it resets the orientation and entry position but does not cause the currently defined image to be erased or printed.

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.

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

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

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

Bar Code Commands

Function	Print Bar Code
¹ ASCII	GS k <m> <d ₁ > ... <d _k > NUL Mode 1 <m> between 0 and 6
Hexadecimal	1DH 6BH <m> <d ₁ > ... <d _k > 00
Decimal	<29> <107> <m> <d ₁ > ... <d _k > 0
² ASCII	GS k <m> <n> <d ₁ > ... <d _n > Mode 2 <m> between 65 and 73 <n> = Length of <d>
Hexadecimal	1DH 6BH <m> <n> <d ₁ > ... <d _n >
Decimal	<29> <107> <m> <n> <d ₁ > ... <d _n >
Range	¹ 0 ≤ m ≤ 6 (k and d depend on the bar code system used.) ² 65 ≤ m ≤ 73 (n and d depend on the bar code system used.)
Description	The GS k <m> <d ₁ > ... <d _k > 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 47 Bar Code System Based on <m>

[Description for ¹]

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

[Description for ²]

<n> indicates the number of bytes of bar code data to be processed immediately following <n>. 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 48 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 49 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 50 Horizontal size of the bar code

Mechanism Control Commands

Function **Select cut mode and cut paper**

ASCII [GS] V <m> <n>

Hexadecimal 1DH 56H <m> <n>

Decimal <29> <86> <m> <n>

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

Function **Partial knife cut**

ASCII [ESC] i

Hexadecimal 1BH 69H

Decimal <27> <105>

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

Function **Perform a partial knife cut**

ASCII [ESC] m

Hexadecimal 1BH 6DH

Decimal <27> <109>

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

Function **Sound buzzer**

ASCII [BEL]

Hexadecimal 07H

Decimal <07>

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

Function **Sound buzzer**

ASCII [ESC] BEL

Hexadecimal 1BH 07H

Decimal <27> <07>

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

Miscellaneous Commands

Function Set Horizontal and Vertical Motion Units

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 ¹³
3,51	ROM version ID	2H or 2D.

Table 51 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 52 Type ID (<n> = 2 or 50)

¹³ 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.

Function **Generate Pulse****ASCII** [ESC] p <m> <t₁> <t₂>**Hexadecimal** 1BH 70H <m> <t₁> <t₂>**Decimal** <27> <112> <m> <t₁> <t₂>**Range** <m> = 0, 1, 48, 490 ≤ t₁ ≤ 2550 ≤ t₂ ≤ 255

Description The [ESC] p <m> <t₁> <t₂> command sends a pulse (on time = <t₁> x 2 msec) to the specified connector pin. When <m> = 1 or 48, the pulse is sent to drawer-kick-out connector pin 2. When <m> = 0 or 48, the pulse is sent to drawer-kick-out connector pin 2; when <m> = 1 or 49, the pulse is sent to drawer-kick-out connector pin 5.

Function **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 ≤ m ≤ 8

0 ≤ t ≤ 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> **Hexadecimal** 10H 14H <2> <a> **Decimal** <16> <20> <2> <a> **Range** a = 1

b = 8

Description The [DLE] [DC4] <2> <a> 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 ≤ n ≤ 3
Description	The [ESC] = <n> command selects the device to which the host computer sends data, based on the value of <n> listed below.

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

Table 53 Peripheral Device Bit Definitions



Note: Epson Customer display is not supported by the iTherm® 280 printer.

Function	Real-Time Request to Printer	
ASCII	[DLE] [ENQ] <n>	
Hexadecimal	10H 05H <n>	
Decimal	<16> <5> <n>	
Range	<n> = 0, 2	
Description	The [DLE] ENQ <n> command responds to a request from the host computer specified by <n> as shown below. The command is also executed when the printer is disabled. When the printer stops printing due to a paper-end condition, <n> = 0 is only effective when the printer is waiting for on-line recovery from the time the paper roll is inserted to the time the printer goes on-line. The on-line recovery wait time is confirmed by the printer status of ASB or the [DLE] EOT command. <n> = 2 is only effective when a recoverable error occurs. The printer can recover from an error without turning off the power. Whether an error occurs or not can be confirmed by the ASB status or the error status of the [DLE] EOT command.	
Where <n>	0	Recovers to on-line
	2	Recovers from an error after clearing the receive and print buffers



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 Enter Test Mode**ASCII** [GS] (A <2> <0> <n> <m>**Hexadecimal** 1DH 28H 41H <2> <0> <n> <m>**Decimal** <29> <40> <65> <2> <0> <n> <m>**Description** This command places the printer into test mode based on the parameters <n> and <m>.**Where <n>** 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**Where <m>** 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.**Function Print counter****ASCII** [GS] c:**Hexadecimal** 1DH 63H**Decimal** <29> <99>**Description** Sets the serial counter value in the print buffer and increments or decrements the counter value.

- 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

Function Initialize maintenance counter**ASCII** [GS] g 0 m nl nh:**Hexadecimal** 1DH 67H 30H**Decimal** <29> <103> <48>**Description** 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.

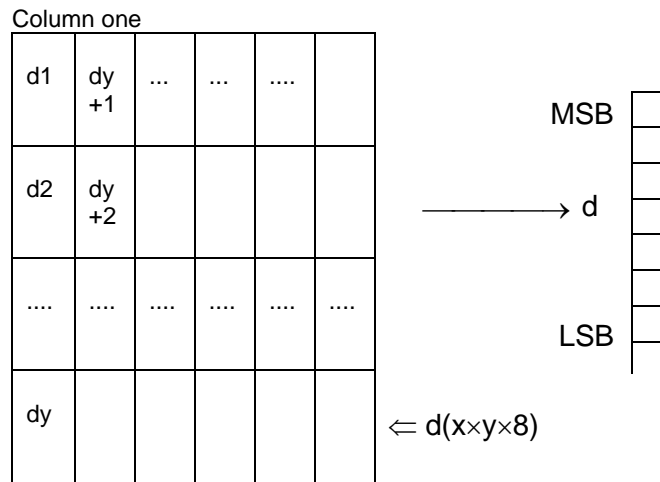
Bit	Off/On	Hexl	Decimal	Function
0	Off	00	0	Macro executes r times continuously with the interval specified by t
	On	01	1	FEED Button controlled operation with time interval t
1-4	-	-	-	Undefined
5	On	20	32	Value given by r is ignored and macro is run infinitely
6	On	40	64	Save start-up macro definition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

Table 54 Macro Control Bit Definitions

Function	Delete Start-Up Macro Definition
ASCII	GS _
Hexadecimal	1DH 5FH
Decimal	<29> <95>
Description	The GS _ command deletes a start-up macro definition previously created by the GS ^ command. If a start-up macro was not previously defined, the command will be ignored.

User-defined Images and Graphics Commands

Function	Define user-defined bit image
ASCII	GS - <Name..> <0> x y d ₁ ... d(x x y x 8)
Hexadecimal	1DH 2DH <Name..> <0> x y d ₁ ... d(x x y x 8)
Decimal	<29> <45> <Name..> <0> x y d ₁ ... d(x x y x 8)
Range	1 ≤ x ≤ 255 1 ≤ y ≤ 255 0 ≤ d ≤ 255 <Name> = a 15-byte maximum length name to identify the image
Description	GS - defines a bit-image for storage in the nonvolatile memory pool. The printer maintains an area of flash memory specifically designated for multiple bit-image storage. The area can contain as many bit-images as its size permits. (A printout of the amount of nonvolatile memory remaining can be obtained by performing a printer self test.) Each image is uniquely identified by the name given to it by the <Name> parameter. The name of the bit-image can be from one to 15 bytes long and contain any alphanumeric characters as well as spaces. The format of the bit-image is identical to that defined by the GS * command. The GS _ command must be entered in standard mode only at the beginning of a print line. Any image may be up to 2048 bytes long. If the size of the image is larger than the space remaining in the nonvolatile buffer, the image will not be saved. When the last byte of bit-image data is received and there is ample space in the nonvolatile buffer for the bit-image, the bit image will be saved. The following basic example demonstrates how to define an 8-bit x 8-bit block with the name "MY IMAGE". A representation of the format of a downloaded bit-image is depicted below.



```
PRINT #1, CHR$(29),CHR$(45),
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>

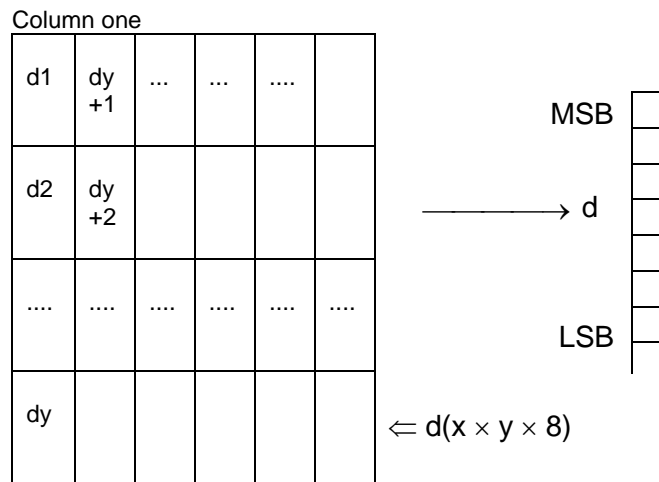
Description GS 5 erases the entire contents of the nonvolatile memory pool and frees up the memory for new entries.

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 d₁ ... d(x x y x 8)
Hexadecimal 1DH 2AH x y d₁ ... d(x x y x 8)
Decimal <29> <42> x y d₁ ... d(x x y x 8)
Range 1 ≤ x ≤ 255
 1 ≤ y ≤ 48
 0 ≤ d ≤ 255

Description The GS * x y d₁ ... d(x x y x 8) command defines a single downloaded bit-image using the number of dots specified by x and y in the RAM buffer area (volatile memory). The number of dots in the horizontal direction is x x 8. The number of dots in the vertical direction is y x 8. If (x x y x 8) exceeds the size of the buffer, the image is truncated. d indicates bit-image data and specifies a bit printed to one and not printed to zero. After a downloaded bit-image is defined, it may be saved to the nonvolatile flash storage buffer using the ESC ' command where it remains indefinitely. Otherwise, the image remains in the RAM buffer where it is available until ESC @ or ESC & is executed; the power is turned off; or the printer is reset. A representation of the format of a downloaded bit-image is depicted below.



Function Print single user-defined bit-image**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 55 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 168.

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.



A horizontal rectangular graphic divided into two sections. The left section is a light gray square. The right section is a dark gray rectangle containing the text "chapter 7" in white lowercase letters, with the number "7" being significantly larger than the word "chapter".

chapter 7

iTherm[®] 280 Color Graphics

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 10 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 11 Example Commands for a Sample Receipt

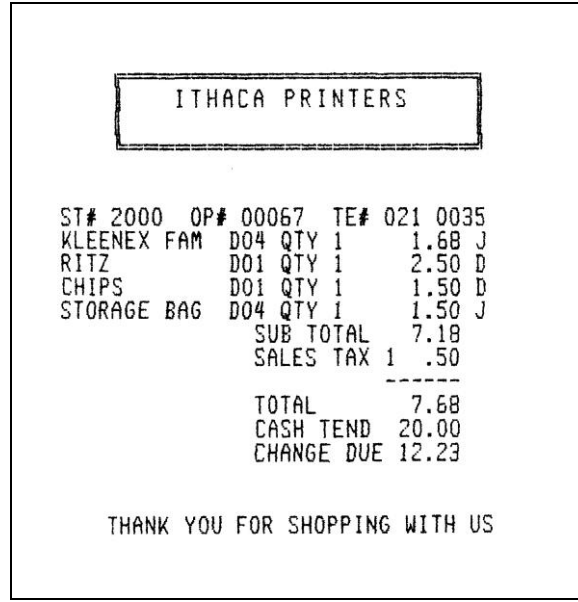


Figure 12 Sample Receipt

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 red 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 image¹⁴.

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 processor¹⁴ in the PJColor program. The program can print the image or generate a printable file.

¹⁴ Ithaca® Color Image Processor is patent pending



Figure 13 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 PJColor¹⁵ 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.

¹⁵ 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® 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® 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 Left Pen or 1,2,3 for Right Pen
&%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.

&%UQ&	Report on user store
IPCL	&%UQ&
Description	The &%UQ& command prints a status report. The intention of the command is to aid in universal graphic development.

&%UT<n>	Redefine User Store Termination Character
IPCL	&%UT<n>
Description	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.
Example	If &%UT% were sent to the printer the User Store command to run universal graphic "Demo" would be &%URDemo%.

&%CL	Set Print Color
IPCL	&%CL <n>
Description	This command allows various colors to be selected on printer emulations that do not support color text.
Where n:	0 Print with the Left cartridge (Typically Black) 1, 2, 3 Print with the Right cartridge (Typically Red, Blue, or Green)

&%UA	Cycle Auto-Cutter
IPCL	&%UA <m ₁ > <m ₂ > <m ₃ >
Description	This command feeds m/96 inches of paper and cycles the auto cutter.
Where m:	$m = m_1 * 100 + m_2 * 10 + m_3$

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 horizontal rectangular header with a dark gray background and a thin black border. The text "chapter 8" is written in a white, lowercase, sans-serif font. The number "8" is significantly larger than the word "chapter".

chapter 8

Unicode

Unicode – A Software Font Solution

In the beginning there was five. Five bits of information per character. In the beginning this was enough (barely). For with five bits you could represent 32 different characters. This is how the Electro-mechanical Teletype received the characters it was to print.

But soon people wanted both upper and lower case characters and other symbols. So in the second age of electronic communication we advanced to seven bits of data to represent the characters we wanted to communicate to electronic devices. Now we had 127 different characters we could use, both upper and lower case and many symbols.

Surely this is enough, now we can rest...

“This is good, but I am Spanish and I need to communicate a ‘c’ cedilla character.”
Hmmm, we can add a bit, now we will use eight bits of data and we can have up to 255 characters that we can use. This is good, now we use eight bits, a byte.

But then... “I am Greek, I am Russian, I am Arabic...” was heard, “We need to use characters that we are familiar with.”

What can be done to accommodate these languages? We will create code pages, one for each language. Now with these code pages each language will have its own 255 characters that that language can use. This is the third age of electronic communication; code pages.

Surely this is enough, now we can rest...

In a land far, far away, there are a people that use characters so different to us that they do not look like characters at all, more like mini-pictures. And they have over 13,000 different characters.

Now, the fullness of time has come and we need to unify all these languages and symbol sets into one coherent system, we will call it “Unicode”. Unicode code will use two bytes, 16 bits, to communicate characters to and from electronic devices. Now we can communicate more than 65,000 different characters and symbols.

Surely this is enough, so we rest.

About Unicode

Unicode is a way of mapping all characters and symbols in use by modern languages. A Unicode character consists of two bytes. These two bytes, 16 bits, allows us to represent more than 65,000 characters.

Most legacy computing devices use one byte to represent a character or symbol. This single byte design causes a problem when we want to use Unicode to represent characters. Some steps have been taken to accommodate this two byte character representation. One, is the creation of a new operating system using a New Technology. This new technology uses 16 bit data values to represent textual data. This new technology works well to manipulate data on a computer, but legacy communication technology only transmits data via a byte (8 bits) at a time.

MBCS (Multiple Byte Character Set) to the rescue, sometimes referred to as DBCS (Double Byte Character Set). This is a way of encoding the Unicode data so that an electronic device that uses bytes will not get confused when working with a Unicode character.

Memory

A full Unicode font would have more than 50,000 characters. If each character was 16-dots wide and-16 dots tall, each character would require 32 bytes of memory. $32 \times 50,000 = 1,600,000$ bytes to store all the characters' images. This is a very conservative estimate, in reality, many characters take 32 dots wide and 32 dots high to represent the image of the character. A 32-dot by 32-dot character image uses 128 bytes of memory. $128 \times 50,000 = 6,400,000$ bytes of memory to store all the characters.

Even though memory is much cheaper than in the past, 6.4MB is too big.

TransAct's implementation of Unicode in the iTherm® 280.

Since each printer is likely not to need all the characters of all languages, we don't need to store all the 50,000+ characters. Also, many applications will desire a custom font style (i.e. Fixed pitch, Arial, Script...).

To address both these criteria (custom font style and sub set of Unicode characters), We have implemented a way to download any kind of font to the iTherm® 280. Different sizes and styles are supported, as well as fixed and variable pitch. The only real limit is the amount of memory the printer has.

TransAct has created a font download utility program that runs on Windows 2000 and Windows XP. This utility is available upon request. You must agree to use this utility with fonts that you have the right to download to a printer. Contact your salesperson for more information.



WARNING: You must have proper rights to use a font in this manner.
Do not download a font to the printer if you do not have the right to use the font as a downloaded printer font.

A horizontal rectangular graphic divided into two sections. The left section is a light gray square. The right section is a dark gray rectangle containing the text "chapter 9" in white lowercase letters, with the "9" being significantly larger than the word "chapter".

chapter 9

iTherm[®] 280 Extended Printer Control

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 emulations¹⁶.

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
ASCII	[ESC] ~ T <n>
Hexadecimal	1BH 7EH 54H <n>
Decimal	<27> <126> <84> <n>
Description	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

¹⁶ 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 horizontal rectangular graphic divided into two sections. The left section is a light gray square. The right section is a dark gray rectangle containing the text "chapter 10" in white, lowercase letters, with the number "10" being significantly larger than the word "chapter".

chapter 10

Communications

Protocol and Print Buffers

The following figure illustrates the communication flow from host computer to printer and from printer to cash drawer.

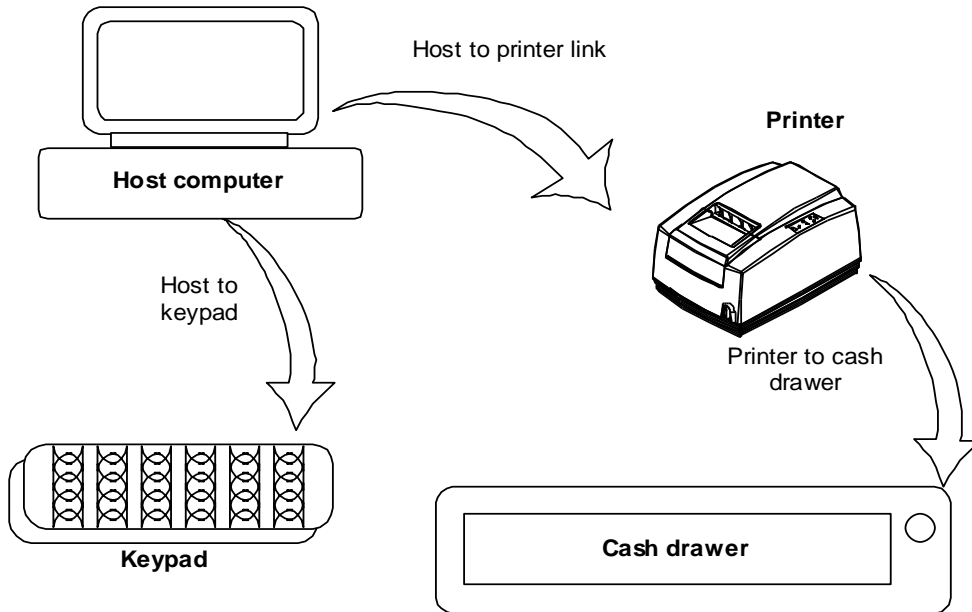


Figure 14 Typical POS System

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.

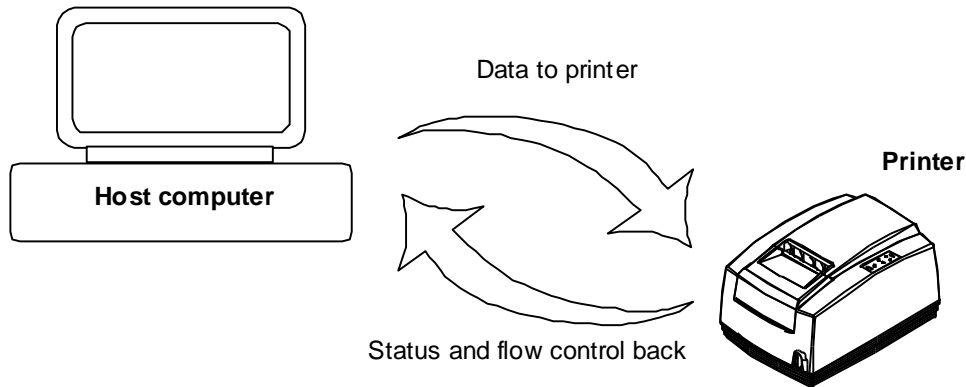


Figure 15 Host to Printer Link

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® 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.

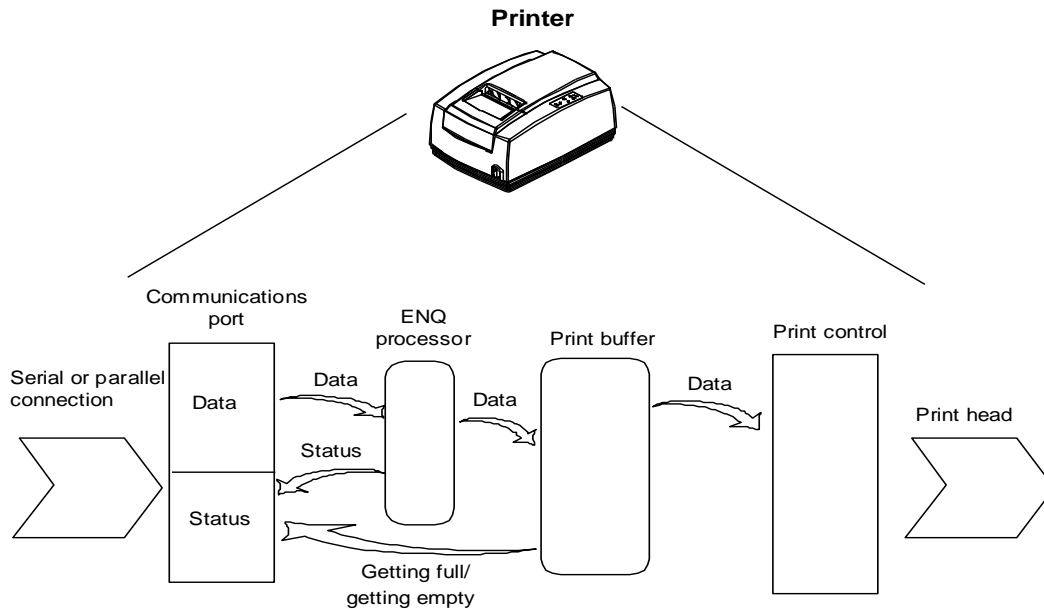


Figure 16 Printer Communications Buffer Flow

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.

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® iTherm® 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® 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.

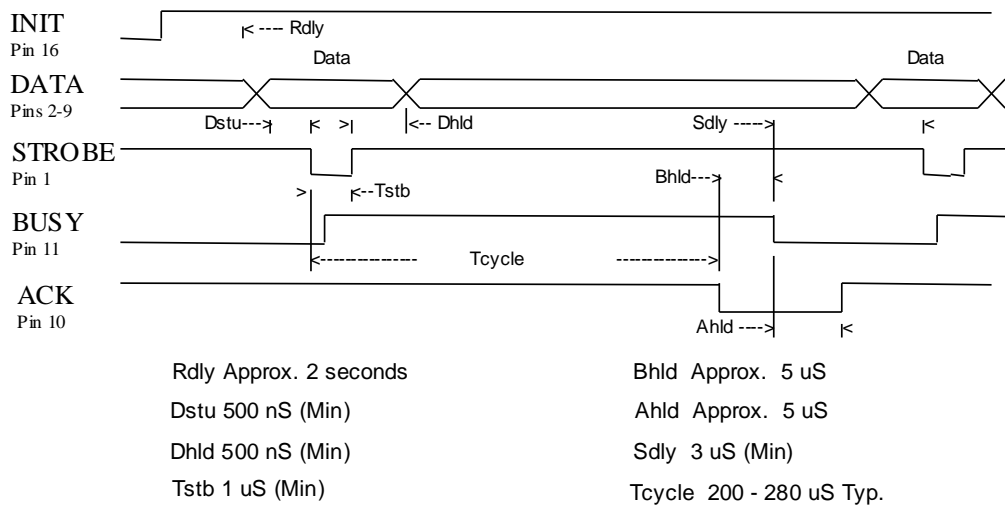


Figure 17 Parallel-port Data Timing

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.

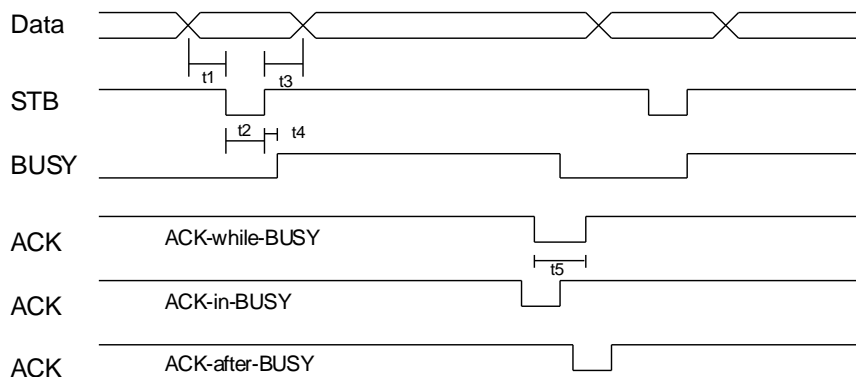


Figure 18 Parallel Port ACK Timing Options

Legend	Time Interval	Minimum	Maximum
t1	DATA Setup to STB	0.5 uS	
t2	STB Width	0.5 uS	500 uS
t3	DATA Hold after STB	0.5 uS	
t4	BUSY Delay after STB	0	0.5 uS
t5	ACK Pulse Width	2.5 uS	

Table 56 Parallel-port Timing

Note: Altered STB timing to take data on the falling edge of STB can be generated as a factory option.

Printer Buffer Size

The 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.

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 255¹⁷ bytes of data after it indicates that it is not ready. Figure 19 Serial Port Flow Control Using DTR illustrates how the Ready/Busy protocol works, and Figure 20 XON/XOFF Serial Port Flow Control illustrates how the XON/XOFF protocol works.

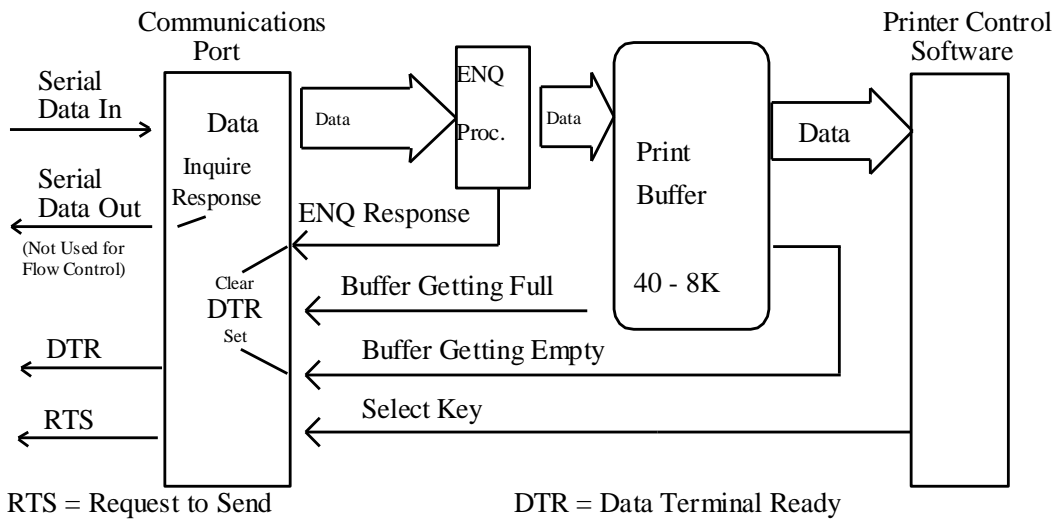
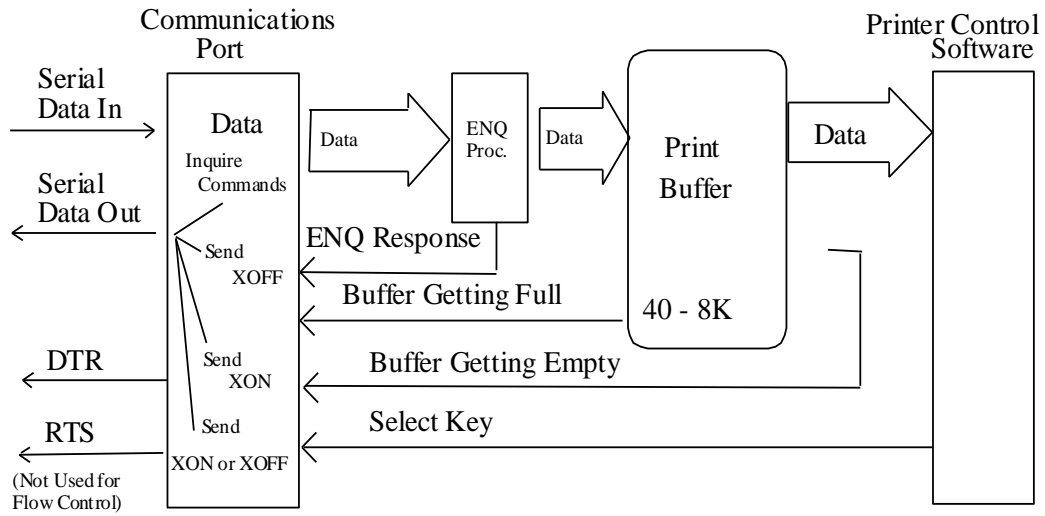


Figure 19 Serial Port Flow Control Using DTR

¹⁷ 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.



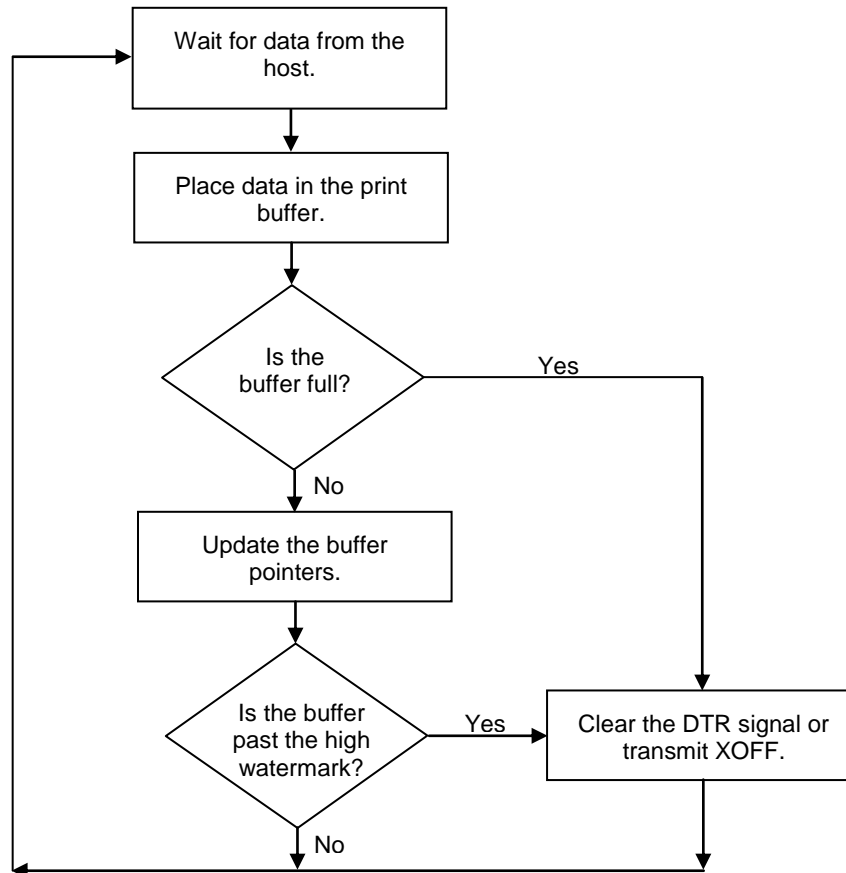
RTS = Request to Send

DTR = Data Terminal Ready

Figure 20 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.

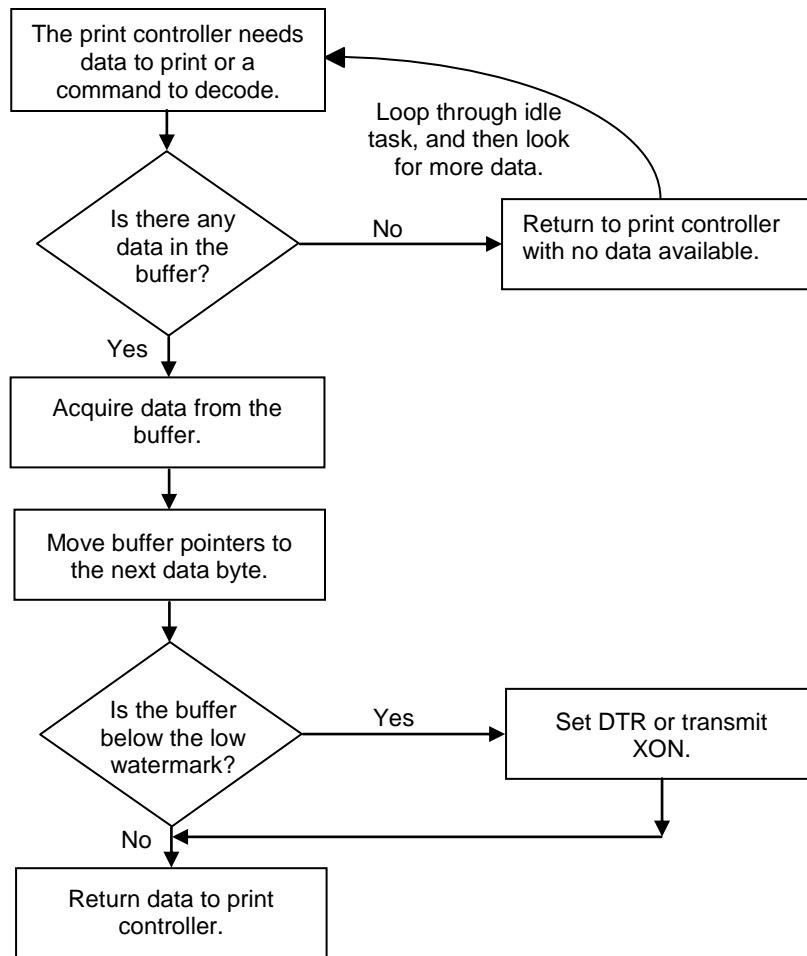


Flow Chart 1 Serial Buffer Operation

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.

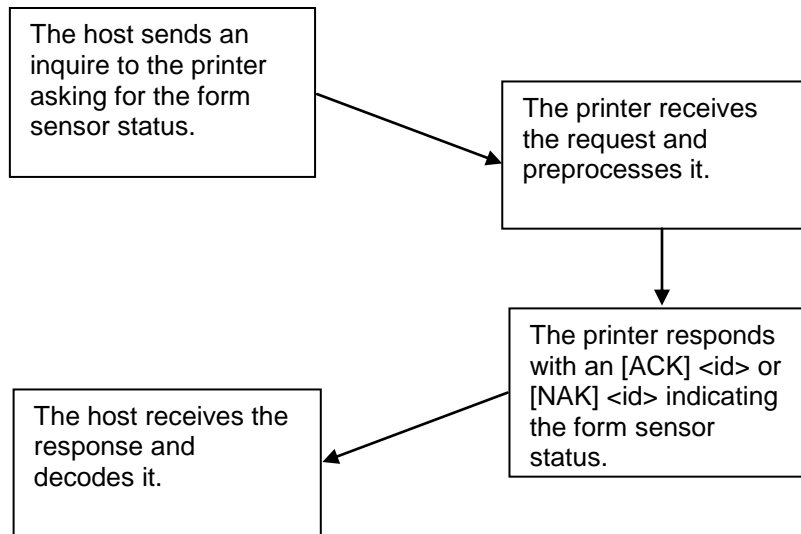
028H	Start of ASCII response
0,1	PnP Rev
'IPR0210'	Unique ID (IPR plus revision level)
\PRINTER	Printer
\M280 PcOS	Model
\SC:	19200,N,8,1
Serial Configuration:	Baud, Parity, Bits, Stop Bits
xxH	Check-sum
029H	End PnP



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.

[ESC] y	Remote Power Control	
ASCII	[ESC] y <n>	
Hexadecimal	1BH 79H <n>	
Decimal	<27> <121> <n>	
IPCL	&%YX17 or &%YX18	
EPOS	[ESC] y <n>	
Where n	17	Requests the printer to enter remote 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® 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® 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® 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: Code Page Definition Table

Code Page	Country Code/ Language Set	Decimal <n1><n2>	Hex <n1><n2>	ASCII <n1> <n2> <n3>	Epson ID
64	USA (Slashed 0)	0,64	0H,040H	0,0,6,4	NA
65	USA (Unslashed 0)	0,65	0H,041H	0,0,6,5	NA
66	British	0,66	0H,042H	0,0,6,6	3
67	German	0,67	0H,043H	0,0,6,7	2
68	French	0,68	0H,044H	0,0,6,8	NA
69	Swedish I	0,69	0H,045H	0,0,6,9	5
70	Danish I	0,70	0H,046H	0,0,7,0	NA
71	Norwegian	0,71	0H,047H	0,0,7,1	NA
72	Dutch	0,72	0H,048H	0,0,7,2	14
73	Italian	0,73	0H,049H	0,0,7,3	NA
74	French Canadian	0,74	0H,04AH	0,0,7,4	13
75	Spanish I	0,75	0H,04BH	0,0,7,5	NA
76	Swedish II	0,76	0H,04CH	0,0,7,6	15
77	Swedish III	0,77	0H,04DH	0,0,7,7	16
78	Swedish IV	0,78	0H,04EH	0,0,7,8	17
79	Turkish	0,79	0H,04FH	0,0,7,9	18
80	Swiss I	0,80	0H,050H	0,0,8,0	19
81	Swiss II	0,81	0H,051H	0,0,8,1	20
91	Welsh	0,91	0H,05BH	0,0,9,1	NA
93	Arabic	0,93	0H,05DH	0,0,9,3	93
437	USA	1,181	1H,0B5H	0,4,3,7	0
774	Baltic	3,6	3H,006H	0,7,7,4	74
850	Multilingual	3,82	3H,052H	0,8,5,0	26
852	East European Latin II	3,84	3H,054H	0,8,5,2	46
855	Cyrillic I	3,87	3H,057H	0,8,5,5	44
857	Turkey	3,89	3H,059H	0,8,5,7	57
860	Portugal	3,92	3H,05CH	0,8,6,0	28
861	Icelandic	3,93	3H,05DH	0,8,6,1	73
862	Hebrew NC	3,94	3H,05EH	0,8,6,2	60
863	Canada French	3,95	3H,05FH	0,8,6,3	43
865	Norway	3,97	3H,061H	0,8,6,5	27
866	Cyrillic II	3,98	3H,062H	0,8,6,6	45
869	Greek_869	3,101	3H,065H	0,8,6,9	47
895	Kamenicky (MJK)	3,127	3H,07FH	0,8,9,5	55

Code Page	Country Code/ Language Set	Decimal <n1><n2>	Hex <n1><n2>	ASCII <n1> <n2> <n3>	Epson ID
1008	Greek 437	3,240	3H,0F0H	1,0,0,8	38
1009	Greek 928	3,241	3H,0F1H	1,0,0,9	39
1011	Greek 437 Cyprus	3,243	3H,0F3H	1,0,1,1	41
1012	Turkey	3,244	3H,0F4H	1,0,1,2	29
1014	Polska Mazovia	3,246	3H,0F6H	1,0,1,4	22
1015	ISO Latin 2	3,247	3H,0F7H	1,0,1,5	23
1016	Serbo Croatian I	3,248	3H,0F8H	1,0,1,6	24
1017	Serbo Croatian II	3,249	3H,0F9H	1,0,1,7	25
1018	ECMA-94	3,250	3H,0FAH	1,0,1,8	42
1019	Windows East Europe	3,251	3H,0FBH	1,0,1,9	49
1020	Windows Greek	3,252	3H,0FCH	1,0,2,1	50
1021	Latin 5 Windows Turkey	3,253	3H,0FDH	1,0,2,2	51
1022	Windows Cyrillic	3,254	3H,0FEH	1,0,2,4	52
1024	Hungarian CWI	4,0	4H,000H	1,0,2,5	54
1026	ISO Latin 4	4,2	4H,002H	1,0,2,6	56
1027	Ukrainian	4,3	4H,003H	1,0,2,7	66
1028	Roman-8	4,4	4H,004H	1,0,2,8	58
1029	ISO Latin 6	4,5	4H,005H	1,0,2,9	67
1031	Hebrew OC	4,7	4H,007H	1,0,3,0	61
1032	Windows Hebrew	4,8	4H,008H	1,0,3,2	62
1033	KBL-Lithuanian	4,9	4H,009H	1,0,3,3	63
1034	Windows Baltic	4,10	4H,00AH	1,0,3,4	68
1035	Cyrillic-Latvian	4,11	4H,00BH	1,0,3,5	69
1072	Bulgarian	4,48	4H,030H	1,0,7,2	72
NA	French				1
NA	Danish I				4
NA	Italian				6
NA	Spanish I				7
NA	Japanese				8
NA	Norwegian				9
NA	Danish II				10
NA	Spanish II				11
NA	Latin American				12

Appendix B - ASCII Code Table

Hex	Decimal	ASCII	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: Ordering Supplies

iTherm® supplies can be ordered easily direct from the TransAct website (www.transact-tech.com) or our telephone number within the US toll free: (877) 7ithaca. (other inquires: (607) 257-8901). When calling by phone, please ask for the Sales Department.

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 57 Paper Ordering Information

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

Table 58 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

Index

- [BEL] Audio alert, 161, 162
- [BEL] Sound buzzer, 221
- [BS] Insert back space, 75
- [BS] Set back space, 204
- [CAN] Clear print buffer, 160
- [CR] Print and carriage return, 189
- [CR] Set carriage return, 74
- [DC2] Begin 10 cpi, 85
- [DC4] End one-line double-wide print, 99
- [DLE] [DC4] <1> <m> <t> Generate pulse in real time, 223
- [DLE] [DC4] <2> <a> Executes the printer power-off sequence, 223
- [DLE] [DC4] <8> d1...d7 Clear Buffer(s), 223
- [DLE] ENQ <n> Real-time request to printer, 225
- [DLE] EOT <n> Transmit real-time status, 211
- [ENQ] <1> Inquire Cash Drawer 1 status, 170
- [ENQ] <10> Request printer reset, 171
- [ENQ] <11> Request printer power cycle status, 172
- [ENQ] <14> Inquire mechanical error status, 172
- [ENQ] <15> Inquire printer state, 173
- [ENQ] <20> Inquire all printer status, 174
- [ENQ] <21> Inquire printer ID, 175
- [ENQ] <22> Inquire Error Status, 176
- [ENQ] <23> Inquire user-store status, 177
- [ENQ] <3> Inquire receipt paper low status, 170
- [ENQ] <4> Inquire receipt paper out status, 171
- [ENQ] <8> Inquire cover open status, 171
- [ENQ] <9> Inquire buffer status, 171
- [ENQ] <n> Inquire printer status, 170
- [ESC] - <1> Begin underline, 100, 102
- [ESC] - <n> Turn on/off underline mode, 197
- [ESC] \ <n_i> <n_h> Set relative print position, 203
- [ESC] ! <n> Select international character set, 90, 155, 156, 157, 158
- [ESC] ! <n> Select print mode(s), 197
- [ESC] # <0> Begin 12 x 12 draft print, 88
- [ESC] \$ <n_i> <n_h> Set absolute print position, 203
- [ESC] \$ <n_i> <n_h> Set print position to beginning, 203
- [ESC] \$ Cancel user-defined characters, 96
- [ESC] % <n> Select/cancel user-defined character set, 191
- [ESC] % G Begin italics, 104
- [ESC] % H End italics, 104
- [ESC] & <y> <c1> <c2> ... Define user-defined characters, 192
- [ESC] * <m> <0> <0> Set horizontal graphics mode, 120
- [ESC] * <m> <n₁> <n₂> Print graphics in mode <m>, 116
- [ESC] * <m> <n> <n_h> <dl> ... <dk> Select bit-image mode, 207
- [ESC] ? <m> <n> Reassign graphic mode, 117
- [ESC] ? <n> Cancel user-defined characters, 192
- [ESC] @ Initialize the printer, 161, 222
- [ESC] [@ ... Double-wide, double-high italics, 101
- [ESC] [C <n> Insert Euro character, 93
- [ESC] [P <n> Set character pitch, 86
- [ESC] [S... Redefine character set, 94
- [ESC] [T <n_h> <n_i> Select character code page, 91
- [ESC] [BEL] <n₁> <n₂> <n₃> Audio alert control, 162
- [ESC] [EM] B <n> Set bar code height, 140
- [ESC] [EM] J <n> Set bar code justification and HRI modes, 141
- [ESC] [SI] Begin 24 cpi, 85
- [ESC] [US] 1 <Name..> <0> Load item process, 123
- [ESC] [US] b <Name..> <0> Begin named macro record, 122, 124
- [ESC] [US] c <Name..> <0> Save user-defined characters, 123, 125
- [ESC] [US] d <Name..> <0> Delete item from user store, 127
- [ESC] [US] e <Name..> <0> End name macro record, 125
- [ESC] [US] e <Name..> <0> Remove item from user store, 123
- [ESC] [US] e <Name..> <0> Stop name macro record, 122
- [ESC] [US] f ALL <0> Flush user store, 124, 127
- [ESC] [US] l <Name> <0> Load macro/character, 126
- [ESC] [US] m <Name..> <0> Save macro data, 125
- [ESC] [US] m <Name..> Save macro data, 122
- [ESC] [US] q <Name..> <0> Query user store, 128
- [ESC] [US] r <Name> <0> Run macro data, 126
- [ESC] [US] s <Name..> <0> Flag as a start-up macro, 123
- [ESC] [US] s <Name..> <0> Flag start-up macro, 126
- [ESC]] Reverse line feed, 82
- [ESC] ^ <n> Print control character, 93, 196
- [ESC] { <n> Turn on/off upside-down print mode, 198
- [ESC] { Electronic Journal Begin, 152
- [ESC] < <n> Enable data pass through, 164
- [ESC] < <n> Enable print suppress, 164
- [ESC] < Return home, 206
- [ESC] <n> <n₁> <n₂> Set horizontal position, 76
- [ESC] = <n> Select peripheral device status, 224
- [ESC] = <y> <c₁> <c₂> ... Define user-defined characters, 95
- [ESC] = y c₁ c₂... Define user-defined characters, 123
- [ESC] > <n> Enable user-defined characters, 96
- [ESC] 0 Set line spacing to 27/216 inch, 78
- [ESC] 1 <n> Set left margin, 206
- [ESC] 1 Set line spacing to 7/72 inch, 78
- [ESC] 2 Enable variable line spacing, 79
- [ESC] 2 Select default line spacing, 191
- [ESC] 3 <n> Set line spacing, 191
- [ESC] 3 <n> Set line spacing to n/216 inch, 77
- [ESC] 4 Begin italics, 199
- [ESC] 4 Set top of form, 81
- [ESC] 5 <01> Begin auto line feed, 82
- [ESC] 5 End italics, 199
- [ESC] 8 Disable paper out sensor, 159
- [ESC] 9 Enable paper out sensor, 159
- [ESC] a <n> Select justification, 204
- [ESC] a <n> Set justification, 76

- [ESC] A <n> Set variable line spacing to n/72 inch, 78
- [ESC] b <n> ... Print bar code, 131, 139, 177, 178
- [ESC] B <n₁> <n₂> ... <n_i> 0 Set vertical tab stops, 80
- [ESC] Begin 12 cpi, 85
- [ESC] BEL Sound buzzer, 221
- [ESC] C [NUL] <n> Set form length in inches, 81
- [ESC] c <n> Select color, 99
- [ESC] C <n> Set form length in lines, 81
- [ESC] c 3 <n> Select paper sensor(s) to output paper-end signals, 202, 234
- [ESC] c 4 <n> Select paper sensor(s) to stop printing, 201, 234
- [ESC] c 5 <n> Enable/disable paper feed, 200, 234
- [ESC] d <n> Feed <n> lines at current spacing, 79
- [ESC] d <n> Print and feed <n> lines, 189
- [ESC] D <n₁> <n₂> <n₃> ... <n_i> 0 Set horizontal tab stops, 75
- [ESC] D <n₁> ... <n_k> NUL Set horizontal tab positions, 205
- [ESC] e <n> Print and reverse feed <n> lines, 189
- [ESC] E <n> Turn on/off emphasized mode, 197
- [ESC] E Begin emphasized print, 102
- [ESC] F End emphasized print, 103
- [ESC] f Select receipt station, 112, 114
- [ESC] g <0> Process user macro, 130
- [ESC] g <1> Start macro record, 122, 130
- [ESC] g <2> Stop macro record, 122, 130
- [ESC] g <3> Stop macro record and save, 130
- [ESC] G <n> Turn on/off double-strike mode, 198
- [ESC] G Begin enhanced print, 102
- [ESC] h <color> <length> <format> <data> Process color graphics, 119
- [ESC] h <color> <length> <format> <data> Process horizontal graphics, 119
- [ESC] H End enhanced print, 102
- [ESC] I <n> Set print quality mode, 88
- [ESC] i Partial knife cut, 221
- [ESC] J <n> Fine line feed, 77
- [ESC] J <n> Fine linefeed, 144, 145, 146, 147
- [ESC] J <n> Print and feed paper, 190
- [ESC] j Print and reverse feed, 190
- [ESC] K <n> Print and reverse feed <n> lines, 190
- [ESC] K <n₁> <n₂> Print single-density graphics, 115
- [ESC] L <n₁> <n₂> Print half-speed double-density graphics, 115
- [ESC] l Electronic Journal Carbon Copy, 153
- [ESC] M <n> Select character font table, 192
- [ESC] m Perform a partial knife cut, 221
- [ESC] p <m> <t₁> <t₂> Generate pulse, 223
- [ESC] P <n> Begin rotated font, 89
- [ESC] p 3 <n> Select paper sensor(s) to output paper-end signals, 163
- [ESC] p 4 <n> Select paper sensor(s) to stop printing, 163
- [ESC] p 5 <n> Enable/disable paper feed, 162
- [ESC] q <n> Query marker, 160
- [ESC] Q <n> Set right margin, 206
- [ESC] r <0> End rotated print, 109
- [ESC] r <1> Rotate 90°, 108
- [ESC] r <11> Rotate 270° with two pass font, 109
- [ESC] r <13> Rotate 90° with two pass font and line formatting, 108
- [ESC] r <15> Rotate 270° with two pass font and line formatting, 109
- [ESC] r <3> Rotate 270°, 108
- [ESC] r <5> Rotate 90° with line formatting, 108
- [ESC] r <7> Rotate 270° with line formatting, 108
- [ESC] r <9> Rotate 90° with two pass font, 108
- [ESC] r <n> Rotate 90°, 180°, or 270°, 106
- [ESC] R <n> Select an international character set, 193
- [ESC] r <n> Turn color mode on/off, 196
- [ESC] R Reset horizontal and vertical tab stops, 76, 80
- [ESC] S <0> Select superscript, 103
- [ESC] S <1> Select subscript, 103
- [ESC] s <n> Set rotated print line length, 110
- [ESC] SP <n> Set right-side character spacing, 191
- [ESC] t <n> Select character code table, 196
- [ESC] T End superscript or subscript, 103
- [ESC] U <0> Begin bi-directional print, 118
- [ESC] U <1> Begin unidirectional print, 117
- [ESC] U <n> Turn on/off unidirectional printing mode, 205
- [ESC] u <n₁> <n₂> Set rotated print line spacing, 110
- [ESC] V <n> Set intercharacter spacing, 87
- [ESC] V <n> Turn on/off 90° rotation mode, 198
- [ESC] W <n> Double-wide, double-high mode, 100
- [ESC] w <n> Enable dynamic response, 147
- [ESC] x <n> Open cash drawer, 161
- [ESC] X <n₁> <n₂> Set left/right print margin, 159
- [ESC] y <11> OCR character enable, 96
- [ESC] y <12> OCR character disable, 97
- [ESC] y <n> Set feature control, 165
- [ESC] Y <n₁> <n₂> Print full-speed double-density graphics, 116
- [ESC] Z <n₁> <n₂> Print quad-density graphics, 116
- [FF] Set form feed, 81, 83
- [GS] \ <n₁> <n_i> Set relative vertical print position in page mode, 218
- [GS] a <n> Enable/disable Automatic Status Back, 208
- [GS] b <n> Turns smoothing on/off, 199
- [GS] c Print counter, 226
- [GS] g 0 Initialize maintenance counter, 226
- [GS] g 2 Transmits maintenance counter, 227
- [GS] I <n> Transmit printer ID, 222
- [GS] P x y Set horizontal and vertical motion units, 222
- [GS] r <n> Transmit status, 210
- [GS] Start/end macro definition, 228
- [GS] V <m> <n> Select cut mode and cut paper, 221
- [HT] Set horizontal tab, 75, 204
- [LF] Print and line feed, 189
- [LF] Set line feed, 74
- [SI] Begin 17 cpi, 85
- [SO] Begin one-line double-wide print, 99
- [SOH] <n> Begin multi-drop control, 168
- [VT] Set vertical tab, 80
- 10 CPI Character Pitch, Beginning, 85
- 12 CPI Character Pitch, Beginning, 85
- 12 x 12 Draft Print Mode, Beginning, 88
- 17 CPI Character Pitch, Beginning, 85
- 24 CPI Character Pitch, Beginning, 85

- APA Graphics, Printing, 116
- Appendix A
 - Ordering Supplies, 297
- Application Development, 60
- Audio Alert, Configuring, 162
- Auido alert, 162
- Auto cut, Performing, 161
- Auto Line Feed, Beginning, 82
- Automatic Status back, Enable/Disable, 208
- Back Space, 75
- Bar Code Commands, 218
- Bar Code, Print, 131, 139, 177, 178
- Bar Code, Set height, 140
- Bar Code, Set Justification, Print Direction, 141
- Bar Codes, 131
- Begin Italics, 104
- Bi-directional Printing, Beginning, 118
- Bit Image Mode, Selecting, 207
- Bit-Image Command**, 207
- Boot Loader Mode, 47
- Buffer**, 276
- Carriage Return, 74
- Cash Drawer 1 Status, Inquire, 170
- Cash drawer, Opening, 161
- Change User Store Terminator, 128
- Changing Interface Cards, 31
- Character attributes, 99
- Character Code Page, Setting, 91
- Character Code table, Selecting, 194
- Character Code Table, Selecting, 196
- Character Commands**, 191
- Character Pitch, Setting, 86
- Character Set, Redefining, 94
- Character Spacing, Setting, 191
- Clear Buffer(s), 223
- Code Page Definitions, 293
- Color Graphics**, 243
- Color Mode, Turning on/off, 196
- Commands, User-store, 124
- Communication**
 - Features**, 288
 - Parallel Port**, 274
 - Serial Port**, 279
- Communications Interface**, 23
- Configuration**
 - Remote**, 55
- Configuration Control, Extending, 166
- Configuration Mode
 - Overview, 51
- Connecting Communication Cables, 34
- Connecting Power, 33
- Control Character, Printing, 93
- Control Codes**
 - Overview**, 59
- Control Codes and Commands**, 61
- Control Feature, Setting, 165
- Cover Open Status, Inquire, 171
- Current Requirements, 23
- Cut Mode/Cut paper, Selecting, 221
- Data pass-through, 288
- Display Pass Through, 24, 286
- Display pass-through, 288
- Double Density Graphics, Full-Speed Printing, 116
- Double Density Graphics, Half-Speed Printing, 115
- Double Strike Mode, On/Off, 198
- Dynamic Response, Enable, 147
- Emphasized Mode, On/Off, 197
- Emphasized Print Mode, Beginning, 102
- Emphasized Print Mode, Ending, 103
- End Italics, 104
- Enhanced Print Mode, Ending, 102
- Enhanced print, Beginning, 102
- Entering Configuration Mode, 51
- Entering Self-Test Mode, 44
- EPOS**
 - Codes**, 179
 - command summary**, 185
 - EPOS 90° Rotation Mode, On/Off, 198
 - EPOS Absolute Print Position, Setting, 203
 - EPOS Back Space, Setting, 204
 - EPOS Bar Code Height, Setting, 219
 - EPOS Bar Code, Printing, 218
 - EPOS Character Size, Setting, 199
 - EPOS Control Character, Printing, 196
 - EPOS Emulation, 60
 - EPOS Euro Character, Insert, 196
 - EPOS Execute Macro, 228
 - EPOS HRI Characters, Selecting Font, 220
 - EPOS HRI Characters-Printing Position, Selecting, 219
 - EPOS Italics, Beginning, 199
 - EPOS Italics, Ending, 199
 - EPOS Knife Cut-Partial, 221
 - EPOS Knife Cut-Partial, Performing, 221
 - EPOS Macro Definition, Start/End, 228
 - EPOS margin-eft, Setting, 206
 - EPOS Margin-left, Setting, 205
 - EPOS Margin-Right, Setting, 206
 - EPOS Motion Units, Setting, 222
 - EPOS Nonvolatile Memory, Erasing All Entries, 231
 - EPOS Nonvolatile Memory, Erasing Single Entry, 231
 - EPOS Page Mode Commands**, 215
 - EPOS Paper Error Signal Control, 234
 - EPOS Printing Area Width, Setting, 205
 - EPOS Query Nonvolatile Memory Pool Information, 233
 - EPOS Relative Print Position, Setting, 203
 - EPOS Relative Vertical Print Position in page mode, Setting, 218
 - EPOS Set Print to beginning of print line, 203
 - EPOS Sound Buzzer, 221
 - EPOS Startup Macro Definition, Deleting, 229
 - EPOS Unidirectional Printing Mode, On/Off, 205
 - EPOS User Defined Bit Image, Define, 232
 - EPOS User Defined Bit Image, Defining, 229
 - EPOS User Defined Bit Image, Printing, 231, 233
 - EPOS User Defined Character Set, Saving, 233
 - EPOS User Defined Character Set, Selecting, 233
 - EPOS, Print and Reverse Feed, 190
 - Error Status, Inquire, 176
 - ESC [T <n_i> <n_j> Select character code table, 194
 - Euro Character, Inserting, 93
 - Executes power-off sequence, 223
 - Extended APA Graphics, 116

- Extended Diagnostics
 - Hex-Dump, 46
- Firmware Configuration, 35
- Flow control
 - Data Terminal Ready (DTR), 279
 - Ready/Busy, 279
 - XON/XOFF, 279
- Form Feed, 81, 83
- Form Length, Setting Inches, 81
- Form Length, Setting Lines, 81
- Forming characters, 15
- Generate Pulse, 223
- Generate Pulse in real time, 223
- Graphic**
 - Mode**, 115
- Graphic Data, Processing, 119
- Graphic Mode, Reassigning, 117
- Graphic mode, Set Horizontal, 120
- Graphic save, 121
- Graphics
 - all-points-addressable (APA)**, 242
 - Character**, 239
 - color, 119
 - horizontal, 119
 - Horizontal**, 242
 - printing**, 239
- GS - <Name..> <0> x y d₁...d(x y x 8) Define user-defined bit image, 229
- GS ! <n> Set character size, 199
- GS # <n> Insert Euro character, 196
- GS * x y d₁ ... d(x y x 8) Define single user-defined bit-image, 232
- GS / <m> Print single user-defined bit-image, 233
- GS ^ r t m Execute macro, 228
- GS _ Delete start-up macro definition, 229
- GS 0 <Name..> <0> Print user-defined bit image, 231
- GS 1 <Name..> <0> Erase single entry from nonvolatile memory, 231
- GS 3 Query nonvolatile memory pool information, 233
- GS 5 Erase all entries from nonvolatile memory pool, 231
- GS 6 <Name..> <0> Save user-defined character set, 233
- GS 7 <Name..> <0> Select user-defined character set, 233
- GS f <n> Select font for HRI characters, 220
- GS H <n> Select printing position of HRI characters, 219
- GS h <n> Set bar code height, 219
- GS k <m> <d₁> ... <d_k> NUL Print bar code, 218
- GS L <n_l> <n_h> Set left margin, 205
- GS w <n> Set bar code width, 220
- GS W <n_l> <n_h> Set printing area width, 205
- Home, Returning, 206
- Horizontal Motion Control**, 75
- Horizontal Position, Setting, 76
- Horizontal Tab**, 75
- Horizontal Tab Positions, Setting, 205
- Horizontal tab Stops, Setting, 75
- Horizontal Tab, Setting, 204
- IEEE 1284 buffer, Clearing, 171
- Indicator Lights**, 42
- Indicators**
 - Fault**, 42
- Initialize maintenance counter, 226
- Initialize the Printer, 161, 222
- Ink Cartridges
 - Ordering, 297
- Inquire Commands**, 170
- Installing Cables, 33
- Installing New Interface Cards**, 32
- Installing OPOS Printer Drivers, 37
- Installing Paper**, 35
- Installing Printer Drivers, 36
- Installing USB Printer Drivers, 37
- Intercharacter Spacing, Setting, 87
- International Character Set, Selecting, 90, 155, 156, 157, 158, 193
- International Character Sets**, 193
- IPCL Codes, 60
- Ithaca Specific iTherm™ 280 Commands, 234
- Justification, Selecting, 204
- Justification, Setting, 76
- LED indicator
 - error, 42
 - paper, 42
 - power, 42
- Level 0 diagnostics**, 47
- Line feed, 74
- Line Feed Button**, 41
- Line Feed, Performing, 77
- Line Feed, Reverse, 82
- Line Spacing Commands**, 191
- Line Spacing, Enabling, 79
- Line Spacing, Feeding Lines, 79
- Line Spacing, Select Default, 191
- Line Spacing, Set at 2 ½, 16-inch and 7/72 inch, 78
- Line Spacing, Set-1/8 inch, 78
- Line Spacing, Set-n/216 inch, 77
- Line Spacing, Setting, 191
- Line Spacing-Variable, Setting, 78
- Mechanical Error Status, Inquire, 172
- Macro Data, Run from user Store, 126
- Macro Data, Saving, 122
- Macro Data, Saving in user Store, 125
- Macro Record, Beginning, 122
- Macro Record, Ending, 125
- Macro Record, Ending name, 122
- Macro Record, Start, 130
- Macro Record, Starting, 122, 124
- Macro Record, Stop, 130
- Macro Record, Stop and Save, 130
- Macro Record, Stopping, 122
- Macro, Flag on Startup, 126
- Macro-Function Commands**, 228
- Mechanism Control Commands**, 221
- Microline Emulation, 60
- Miscellaneous Commands**, 222
- Multidrop configuration, 288
- Multi-Drop Control, Beginning, 168
- Multiline Mode, 100
- OCR character
 - disable, 97

- enable, 96
- OCR Character, Disable, 97
- OCR Characters, Enabling, 96
- OFF Button, 41
- Off-line active, 289
- One Line/Double Wide Print, Beginning, 99
- One Line/Double Wide Print, Canceling, 99
- Output Paper end Signals, Selecting Paper Sensors, 163, 202
- Panel Button Commands, 200
- paper Feed, Enable, Disable, 162, 200
- Paper Feed, Enable/Disable, 234
- Paper Low Sensor, 234
- Paper Motion, 74
- Paper Out Sensor, disable, 159
- Paper Out Sensor, enabling, 159
- Paper Out Status, Inquire, 171
- Paper Sensor Commands, 201
- Paper Sensors, Selecting to Stop Printing, 163, 201
- Parallel Interface Connector, 34
- Parallel port timing, 274
- PcOS Control Codes**, 61
- PcOS Quick Reference Chart, 62
- Peripheral Device Status, Selecting, 224
- Plug and Play
 - parallel, 277
 - Serial, 283
- Power Control, Remote, 167, 286
- Power Cycle Status, Inquire, 172
- Power-cycle recovery, 288
- Print**
 - rotation**, 105
 - Print and Carriage Return, 189
 - Print and Feed Lines, 189
 - Print and Feed Paper, 190
 - Print and Line Feed, 189
 - Print and Reverse Feed Lines, 189, 190
 - Print Buffer Flow, 281
 - Print Buffer Size, 283
 - Print buffer, control, 160
 - Print buffers**, 269
 - Print counter, 226
 - Print Current Configuration, 264
 - Print Current totals, 264
 - Print margins, setting, 159
 - Print Modes, Selecting, 197
 - Print Position Commands, 203
 - Print Quality Mode, Setting, 88
 - Print Style, Setting, 101
 - Print Suppress/Data Pass Through, Enabling, 164
 - Printer Care, 41
 - Printer ID, Inquire, 175
 - Printer Reset, Requesting, 171
 - Printer State, Inquire, 173
 - Printer Status, 169
 - Printer Status, Inquire, 170, 174
 - Process User Macro, 130
 - Programmer's Notes**, 291
 - Programming Considerations, 129
 - Quad Density Graphics, Printing, 116
 - Query marker, 160
 - Read and return Totals, 261
 - Real Time Status, Transmitting, 211
 - real-time Request to Printer, 225
 - Recovery from Mechanical Errors, 290
 - Regulatory Compliance, i
 - Remote Power Control**, 167, 286
 - Remote Reset**, 287
 - Removing Old Interface Cards, 31, 32
 - Rotated Font, Beginning, 89
 - Rotated Print, 270°, 108
 - Rotated Print, 270° with 2 Pass Font, 109
 - Rotated Print, 270° with 2 Pass Font and line formatting, 109
 - Rotated Print, 270° with Line Formatting, 108
 - Rotated Print, 90°, 108
 - Rotated Print, 90° with 2 Pass Font and Line Formatting, 108
 - Rotated Print, 90° with Line Formatting, 108
 - Rotated Print, Begin 90° with 2 pass font, 108
 - Rotated Print, Beginning, 106
 - Rotated Print, Ending, 109
 - Rotated Print, Line Length, 110
 - Rotated Print, Line Spacing, 110
 - Select Character Font Table, 192
 - Select Color, 99
 - Select Subscript, 103
 - Select Superscript, 103
 - Self-Test
 - Using, 44
 - Serial Device Identification, 284
 - Serial Interface Communication, 24
 - Serial Interface Connector, 34
 - Serial port
 - flow control, 279
 - Serial Port
 - Inquire, 285
 - Signal Levels, 23
 - Single Density Graphics, Printing, 115
 - Specifications and Requirements, 11
 - Standard APA Graphics, 115
 - Standard Emulation, 60
 - Start up Macro, Flagging, 123
 - Status Commands**, 208
 - Status Inquire, 169
 - Status, Inquire Receipt Paper Low, 170
 - Superscript and Subscript, 103
 - Supplies
 - Ink Cartridges, 297
 - Ordering Cables, 297
 - Ordering Paper, 297
 - Tab Stops, Resetting, 76, 80
 - Testing the Printer, 44
 - TM T90 and EPOS Command Descriptions**, 189
 - TM-90**
 - Command Summary**, 181
 - Top of Form, Setting, 81
 - Transmit Printer ID, 222
 - Transmit Status, 210
 - Transmits maintenance counter, 227
 - Turns smoothing on/off, 199
 - Underline Mode, On/Off, 197
 - Underline, Beginning, 100, 102
 - Unicode**, 255

- Unidirectional Printing, Beginning, 117
- Upside down Print Mode, On/Off, 198
- USB Interface Connector, 35
- User Defined Character Set, Selecting, 191
- User Defined Character, Saving, 123, 125
- User Defined Characters, Canceling, 96, 192
- User Defined Characters, Defining, 95, 123, 192
- User Defined Characters, Enabling, 96
- User macros**, 129
- User store, 121
- User Store Status, Inquire, 177
- User Store, Delete item, 127
- User Store, Flush Information, 124, 127
- User Store, Load item, 126
- User Store, Loading item, 123
- User Store, Removing Item, 123
- User Store, Report, 128
- User Store, Reporting, 124
- User-Defined Memory Commands**, 229
- Using Configuration Mode, 52
- Using DSR, 283
- Verify Cash Drawer Interface**, 32
- Vertical Tab, 80
- Vertical Tab Stops, Setting, 80