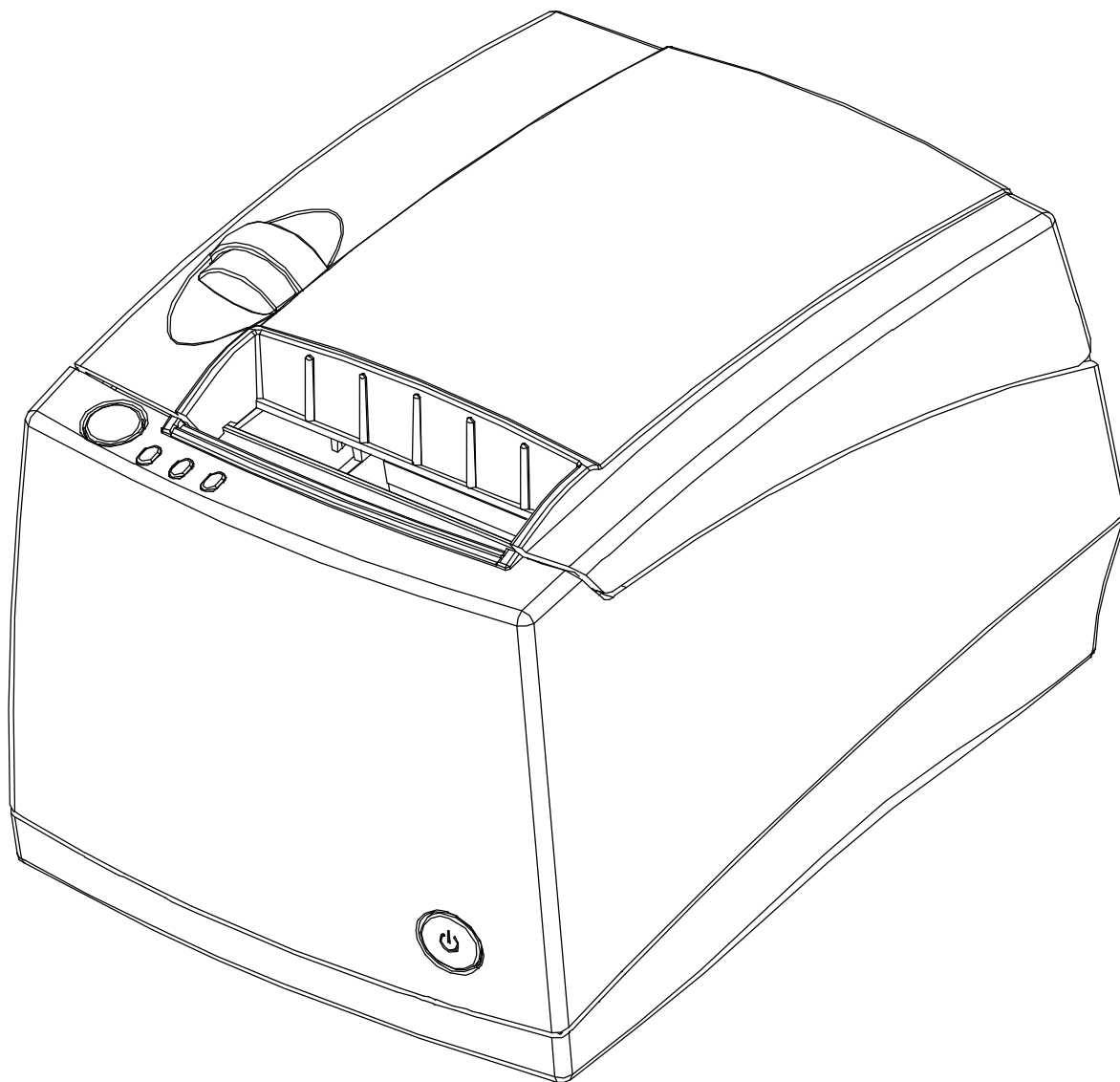


iTherm™ 280

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# PROGRAMMER'S GUIDE



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**ithaca**<sup>®</sup>  
a product of TRANSACT

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Rev A  
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**Change Log**

Rev A Initial Release

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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

<b>Disclaimer</b>	<b>iii</b>
<b>Federal Communications Commission Radio Frequency Interference Statement</b>	<b>iii</b>
<b>Canadian Department of Communications Radio Interference Statement</b>	<b>iii</b>
<b>Regulatory Compliance</b>	<b>iii</b>
<b>Table of Contents</b>	<b>iv</b>
<b>Table of Tables</b>	<b>xi</b>
<b>Table of Figures</b>	<b>xii</b>
<b>Table of Flow Charts</b>	<b>xii</b>
<b>GENERAL DESCRIPTION ITherm™ 280 THERMAL RECEIPT PRINTER</b>	<b>1</b>
<b>iTherm™ 280 Thermal Printer Models</b>	<b>1</b>
<b>Standard Features</b>	<b>1</b>
<b>Optional Features</b>	<b>2</b>
<b>Receipt Printer</b>	<b>3</b>
<b>GENERAL SPECIFICATIONS</b>	<b>3</b>
<b>Printing Specifications</b>	<b>3</b>
Character Pitch	3
Character Generation	5
Standard Print	5
Small 10 x 24 Font	5
Medium 13 x 24 Font	6
Large 15x 24 Font	6
Rotated Print	6
<b>Physical Characteristics</b>	<b>7</b>
Dimensions	7
Weight	7
<b>Electrical Characteristics</b>	<b>8</b>
Internal AC Powered	8
External Powered DC	8
<b>Thermal Print Head</b>	<b>8</b>
<b>Media Specifications</b>	<b>9</b>
Receipt Paper	9
Thermal Paper Grades (Monochrome)	9
Thermal Paper Grades (color)	9
Paper Out	10
Paper Low	10
Receipt Printing, Auto Cutter Position	11
<b>Cash Drawer Drivers</b>	<b>11</b>
Interface Description	11
Cash Drawer Pin Assignments	11
<b>Buzzer</b>	<b>12</b>
<b>Cover Interlock</b>	<b>12</b>
<b>Display Pass Through</b>	<b>12</b>

<b>Interface Adapters</b>	<b>13</b>
Parallel Interface Adapters	13
Interface signals and pin definitions	13
Signal Levels	13
Serial Interface	14
Serial Port Features	14
Serial Port Pin-out	14
Signal levels	14
USB Interface	14
Standard USB Interface	14
<b>Vertical Wall Mount Kit Option</b>	<b>14</b>
<b>CUSTOMER SUPPORT</b>	<b>1</b>
<b>Service Information</b>	<b>1</b>
<b>Warranty Information</b>	<b>1</b>
TransAct Product Support	1
<b>Return Materials Authorization and Return Policies</b>	<b>1</b>
<b>Shipping Printers</b>	<b>1</b>
<b>Where Can You Find More Information?</b>	<b>1</b>
Our Internet Support and Sales Services	1
TransAct Product Support	2
Internet Support	2
Operator's Guide	2
<b>Contacting TransAct's Ithaca Facility</b>	<b>3</b>
Technical Support	3
Sales	3
<b>SETUP PROCEDURES</b>	<b>4</b>
<b>Verifying the configuration</b>	<b>4</b>
Verify the communications interface card	4
Parallel Interface	4
Serial Interface	4
USB Interface	4
Changing Interface Cards	4
Configuring the Cash Drawer Interface	5
<b>Installing cables</b>	<b>5</b>
Connecting power	5
Internal Supply	5
External Supply	6
Connecting Communications Cables	6
Serial	6
Parallel	6
USB	6
Verify the Firmware Configuration	7
<b>Installing Paper</b>	<b>7</b>
<b>Installing Windows™ Printer Drivers</b>	<b>8</b>
Printer Driver Installation Instructions for WIN95, 98, Me	8
Printer Driver Installation Instructions for NT4.0, 2000	8
OPOS drivers Installation Instructions	9
To Install the USB drivers	9
<b>OPERATIONAL CONTROLS</b>	<b>10</b>

<b>How to Operate the iTherm™ 280 Printer</b>	<b>10</b>
* <b>Button</b>	<b>10</b>
<b>FEED Button</b>	<b>10</b>
<b>Indicator Lights (LED)</b>	<b>11</b>
The three iTherm™ 280 indicator lights are:	11
Power Indicator (LED)	11
Error Indicator (LED)	11
Paper Indicator (LED)	11
<b>Fault Indicators</b>	<b>11</b>
Three types of faults exist	11
Fully-recoverable and Status	12
Semi-recoverable	12
Non-recoverable	12
<b>Testing the Printer Overview</b>	<b>12</b>
Using Self-Test, Configuration, and Hex Dump Mode	12
Entering Self-Test, Configuration, and Hex Dump Mode	13
Testing the printer	13
TEST-Receipt	13
TEST-Head Test	13
Maintaining the Electronic Journal	13
Configuring Options	13
TEST- Configuration	13
Hex-dump Mode	14
Factory Test	14
Level 0 Diagnostics	14
Level 0 diagnostics perform the following tasks:	14
Cold Power On	14
Boot Loader Mode	15
<b>CHANGING THE CONFIGURATION OF THE ITherm™ 280</b>	<b>16</b>
<b>Configuration Mode Overview</b>	<b>16</b>
Manual Configuration	16
Most Frequent Configuration Incompatibilities	16
Parallel Printer	16
Serial Printer	16
<b>How to Change Configuration Settings</b>	<b>16</b>
Entering into Configuration Mode	16
<b>Using Configuration Mode</b>	<b>17</b>
<b>Remote Configuration</b>	<b>20</b>
<b>PROGRAMMING CONTROLS</b>	<b>21</b>
<b>Control Codes Overview</b>	<b>21</b>
<b>Nomenclature</b>	<b>21</b>
Standard Emulation	22
IPCL Codes	22
EPOS Emulation	22
Axiohm	22
Ithaca® Microline Emulation	22
<b>Application Development</b>	<b>22</b>
<b>Ithaca Control Codes and Commands</b>	<b>23</b>

PcOS Printer Control Codes	23
Quick PcOS Reference Chart By Function	24
Quick PcOS Reference Chart (Alphabetic)	29
Low Level Paper Motion Control	33
Print/Paper Motion	33
Horizontal Motion Control	34
Vertical Motion Control	36
Character Pitch	41
Character Font	44
Character sets and Code Pages	46
OCR Characters	53
Character Attribute Commands	54
Print Zone Control	58
Print Rotation Commands	59
Rotated Print Summary	60
Rotated Print Length Format	60
iTherm 280 Page Mode	61
How to use page mode	61
Page Definition	61
Auto-cutter and page mode	61
Mechanism commands in page mode	61
Stopping page mode definition	61
Printing the page	61
iTherm™ 280 Graphics	65
Standard APA Graphics	65
Extended APA Graphics	66
Horizontal Graphics (Color Graphics)	68
Graphics Compression	69
Bit wise RLE	69
Same-As-Previous Compression	70
User Store (Graphic Save)	70
Defining Macros	70
User-Store Commands	72
User Macros	75
Programming Considerations	75
Legacy Macro Commands	76
Bar Codes	77
Interleaved 2 of 5	77
Code 39	78
Code 128	78
UPC A	78
UPC E	78
EAN-13	79
EAN-8	79
Code 93	79
Codabar	79
Electronic Journal	81
Configuring the Electronic Journal	81
Electronic Journal Security	81
Initializing the Electronic Journal	82
Electronic Journal Configuration and Reporting Commands	82
Printing/Reporting and Resetting the Electronic Journal	84
Entering and using Journal Print Mode	84
Journal Print Mode Options	85
Initialize Journal	85
Print Complete Journal.	85

Erase Complete Journal.	85
Printing part of the journal.	85
Security	85
Electronic Journal Entries	86
Journal mode	88
Carbon Copy Journal Mode	89
Auto Journal	90
Unicode and Downloaded Fonts	92
Unicode Encoding	92
Miscellaneous Commands	96
General Control	96
Documented Extended Configuration and Control commands	101
Remote Power Control	101
Printer Status	102
Status Inquire	102
Serial and USB Mode Inquire	102
IEEE 1284 Mode Inquire	103
Dynamic Response Mode	103
Inquire Commands	103
Ithaca® Series 50 Compatibility Commands	112
<b>ESC/POS™ Codes (EPOS)</b>	<b>113</b>
Differences between Epson TM T90 and iTherm™ 280	113
<b>Page Mode</b>	<b>113</b>
<b>Undocumented Epson Commands</b>	<b>113</b>
<b>Real-time Status</b>	<b>113</b>
<b>Supported TM-T88 Commands</b>	<b>114</b>
<b>Undocumented TM-T88 Commands</b>	<b>116</b>
<b>Supported TM-T90 Commands</b>	<b>117</b>
<b>Extended Electronic Journal Commands</b>	<b>121</b>
<b>TM-T88 / TM-T90 and ESCPOS Command Descriptions</b>	<b>122</b>
<b>Print and Feed Commands</b>	<b>122</b>
<b>Line Spacing Commands</b>	<b>124</b>
<b>Character Commands</b>	<b>124</b>
<b>International Character Sets</b>	<b>126</b>
<b>Panel Button Commands</b>	<b>133</b>
<b>Paper Sensor Commands</b>	<b>134</b>
<b>Print Position Commands</b>	<b>136</b>
<b>Bit-Image Commands</b>	<b>139</b>
<b>Status Commands</b>	<b>140</b>
<b>Printing Paper Command</b>	<b>146</b>
<b>Page Mode</b>	<b>147</b>
<b>Bar Code Commands</b>	<b>150</b>
<b>Mechanism Control Commands</b>	<b>153</b>
<b>Miscellaneous Commands</b>	<b>154</b>

<b>Macro Function Commands</b>	<b>159</b>
<b>User-defined Images and Graphics Commands</b>	<b>160</b>
<b>Ithaca® Specific iTherm™ 280 Commands</b>	<b>164</b>
Panel Button Commands	164
Paper Out/Low Sensor Commands	164
<b>ITHERM™ 280 EXTENDED PRINTER CONTROL</b>	<b>165</b>
<b>POSJET® COLOR GRAPHICS</b>	<b>168</b>
<b>Printing Graphics</b>	<b>168</b>
Character Graphics	168
APA Graphics	171
Procedure for APA graphics:	171
Color Graphics	172
Procedure for color horizontal graphics:	173
<b>iTherm™ 280 Universal Color Graphics</b>	<b>174</b>
Print File Graphics	174
To generate a print file.	174
Store Graphics in the printer:	174
To Store a graphic in the printer	175
Print a stored graphic.	175
Generate a file to store graphics into a printer	175
How universal graphics is done	175
How to use IPCL commands in text strings	176
Load and store named graphic image	176
Recall and print stored named graphic image	176
Cautions	176
Universal Color Command Descriptions	177
<b>iTherm™ 280 Coupon-Cut-Logo Feature</b>	<b>179</b>
<b>UNICODE</b>	<b>180</b>
<b>History</b>	<b>180</b>
Unicode	181
Memory	181
<b>Ithaca's implementation of Unicode in the Itherm 280.</b>	<b>181</b>
<b>COMMUNICATIONS</b>	<b>182</b>
<b>Protocol and Print Buffers</b>	<b>182</b>
<b>USB</b>	<b>185</b>
USB Support	185
<b>Parallel Port</b>	<b>185</b>
Parallel Port Protocol	185
Printer Buffer Size	187
Parallel Port Inquire and IEEE 1284	187
IEEE 1284 Response Buffer	187
Mode 4	187
Mode 0	188
Time-outs	189
Active State	189
Inquire Responses	189
Parallel Port Plug and Play	189
The Plug and Play response follows.	189

<b>Serial Port</b>	<b>190</b>
Serial Port Protocol	190
Print Buffer Flow	192
Printer Buffer Size	194
Serial Mode Plug and Play	194
Using DSR	194
Serial Device Identification	195
Serial Port Inquire	196
<b>Display Pass Through</b>	<b>197</b>
The Restrictions and Considerations for Pass through	197
<b>Remote Power Control</b>	<b>197</b>
<b>Remote Printer Reset</b>	<b>197</b>
Reset in Serial Mode	197
Reset in Parallel Mode	198
<b>Miscellaneous Communication Features</b>	<b>199</b>
Power-cycle Recovery	199
Data Pass-through	199
Multi-drop Configuration	199
Off-line Active	199
<b>Recovery from Mechanical Errors</b>	<b>200</b>
<b>Programmer's Notes</b>	<b>200</b>
<b>APPENDIX A</b>	<b>201</b>
Code Page Definition Table	201
<b>APPENDIX B</b>	<b>203</b>
ASCII Code Table	203
<b>APPENDIX C: ORDERING SUPPLIES</b>	<b>204</b>
<b>INDEX</b>	<b>205</b>

## Table of Tables

Table 1 Possible Character Pitches.....	4
Table 2 Requested CPI and Resulting CPI .....	4
Table 3 Cell Size for Small, Medium and Large Fonts .....	5
Table 4 Standard Power Input Requirements.....	8
Table 5 Power Input Requirements with the 24-volt DC Power .....	8
Table 6: Paper Grades-Monochrome.....	9
Table 7 Cash Drawer Pin Assignment.....	12
Table 8 Parallel Port Pin-outs .....	13
Table 9 Serial Port Pin-outs.....	14
Table 10 Serial interface pin out .....	6
Table 11 Parallel interface pin out .....	6
Table 12 Error Blink Codes.....	12
Table 13 Character Pitch .....	42
Table 14 Inter-character Spacing .....	43
Table 15 Language Table ID's.....	46
Table 16 Code Page Definition Table .....	48
Table 17 Euro Character Substitution Matrix .....	49
Table 18 OCR MA-3.....	53
Table 19 Paper Sensor Commands.....	98
Table 20 Paper Sensor Commands.....	99
Table 21 Supported TM-T90 Commands .....	116
Table 22 Undocumented TM-T90 Commands .....	116
Table 23 Supported EPOS Commands.....	117
Table 24 Select Character Font Table .....	125
Table 25 International Character Sets.....	126
Table 26 Character Code Pages .....	128
Table 27 Character Code Table.....	129
Table 28 Print Modes .....	130
Table 29 Rotation Modes .....	131
Table 30 Paper Sensor Commands.....	134
Table 31 Paper Sensor Commands.....	135
Table 32 Print Density Selection.....	139
Table 33 Automatic Status Back (ASB) Values for <n> .....	140
Table 34 Automatic Status Back (ASB) First Byte (Printer Information) .....	141
Table 35 Automatic Status Back (ASB) Second Byte (Error Information) .....	141
Table 36 Automatic Status Back (ASB) Third Byte (Paper Sensor Information) .....	142
Table 37 Automatic Status Back (ASB) Fourth Byte (Paper Sensor Information) .....	142
Table 38 Paper Sensor Status (<n> = 1, 49) .....	142
Table 39 Drawer Kick-out Connector Status (<n> = 2, 50).....	143
Table 40 Values for the Status Function, <n>.....	143
Table 41 Printer Status (<n> = 1).....	143
Table 42 Off line Status (<n> = 2) .....	144
Table 43 Error Status (<n> = 3) .....	144
Table 44 Paper Roll Sensor Status (<n> = 4).....	144
Table 45 Peripheral Status (<n> = 0, 48).....	145
Table 46 Paper Status.....	145
Table 47 Bar Code System Based on <m> .....	151
Table 48 Font for Human Readable Interpretation (HRI) Characters.....	152
Table 49 Horizontal size of the bar code .....	152
Table 50 Printer ID.....	154
Table 51 Type ID (<n> = 2 or 50).....	154
Table 52 Peripheral Device Bit Definitions .....	156
Table 53 Macro Control Bit Definitions.....	159
Table 54 User-defined Bit-image Resolutions .....	163

Table 55 Parallel-port Timing.....	187
Table 56 Paper Ordering Information.....	204
Table 57 Cables Ordering Information.....	204

## Table of Figures

Figure 1:iTherm™ 280 Printer.....	3
Figure 2 Receipt Printing, Tear off Position.....	10
Figure 3 Cash Drawer Pin Definitions.....	11
Figure 4 Cash Drawer Selection .....	5
Figure 5 Power and Communications Ports.....	5
Figure 6 3-pin mini DIN plug .....	6
Figure 7 Page Mode entry Orientations.....	61
Figure 8 Example of Character Graphics.....	168
Figure 9 Example Commands for a Sample Receipt.....	169
Figure 10 Sample Receipt.....	170
Figure 11 Receipt with graphics .....	173
Figure 12 Typical POS System .....	182
Figure 13 Host to Printer Link .....	183
Figure 14 Printer Communications Buffer Flow .....	184
Figure 15 Parallel-port Data Timing .....	186
Figure 16 Parallel Port ACK Timing Options.....	187
Figure 17 Serial Port Flow Control Using DTR.....	190
Figure 18 XON/XOFF Serial Port Flow Control .....	191

## Table of Flow Charts

Flow Chart 1 Serial Buffer Operation .....	192
Flow Chart 2 Print Controller Using Data .....	193
Flow Chart 3 Inquire Flow .....	196

# General Description

## iTherm™ 280 Thermal Receipt Printer

### iTherm™ 280 Thermal Printer Models

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

### Standard Features

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

- Print Speed for text is 8 inches per second (200 mm/sec) (monochrome)
- 8.0 inches per second paper feed speed
- 3.15 inch (80 mm.) print zone
- 44/57 characters per line
- Built-in self-ranging External Power supply
- Clam-shell paper loading
- Single RJ11 cash drawer driver with status (Single RJ12)
- Parallel (25 or 36 pin), serial (9 or 25 pin) RS232C, and USB interface
- Configurable receiver buffer
- Self diagnostics
- Set up and configuration utility program
- CPI selections from 8 to 30 CPI<sup>1</sup>
- Paper Out sensor
- Multiple printer emulations: Ithaca M80/M80+, Ithaca M50/M151 Micro-line, Epson Extended, Epson TM-T88II/III, TM-T90, U200, U300, Axiohm A793/4/5
- Maximum 8K buffer (adjustable)
- 2 Mega Bytes Flash Memory
- 2 Mega Bytes RAM
- APA and Epson graphics
- Bar Codes: Code 39, Code 93, Interleaved 2 of 5, UPC-A, UPC-E, EAN8 and EAN13, Code 128, PDF417 stacked symbology
- 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

---

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

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

- portrait/landscape printing under Windows
- Page mode printing
- Cover Open sensor
- Electronic journal capability
- Internal counters for hours on, cuts, print lines, 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)

## **Optional Features**

The following options are available on some of the models:

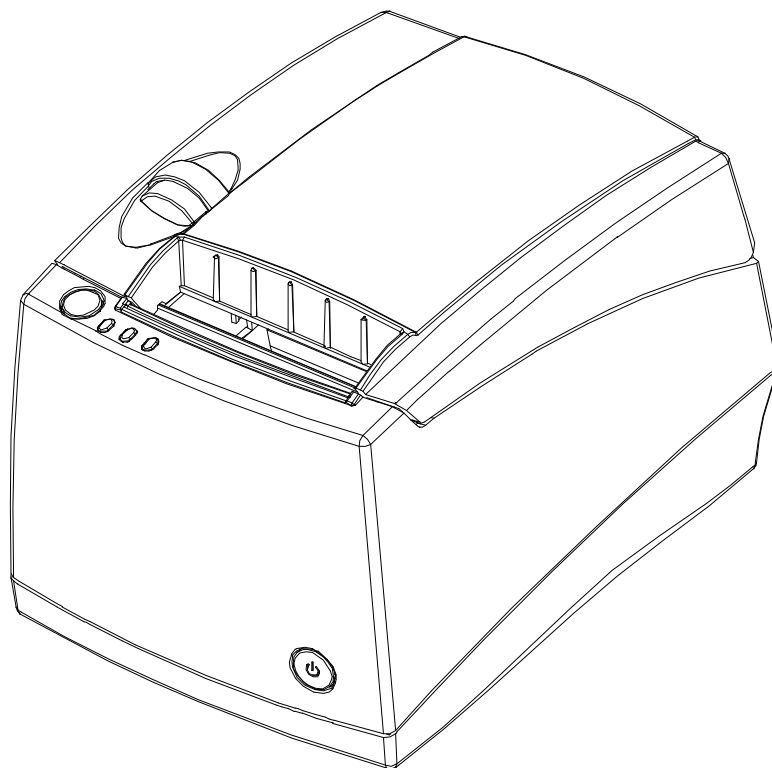
- Vertical Wall Mount Kit
- Adjustable paper low
- Custom interfaces and emulations
- DC powered version through Hosiden type connector

## Receipt Printer

The last line printed on the receipt is within 1.0 inch of the tear off or 0.70 inches from the cut off edge of the receipt. These dimensions are nominal values. Paper slackness and differences in paper type can result in differences from these nominal values. It is important for applications to allow for a margin of error when setting the paper cut position.

The receipt printing appears right side up with the total at the bottom as the receipt appears from the top of the printer and is presented to the operator.

The receipt printer handles single-ply thermal paper only.



**Figure 1:**iTherm™ 280 Printer

## 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 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. It is recommended that this font be used for printing 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. It is recommended that this font be used for printing 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. It is recommended that this font be used for printing 10 to 14 CPI. This font is only available in the Ithaca Emulation and provides a bigger and darker character for better readability.

```

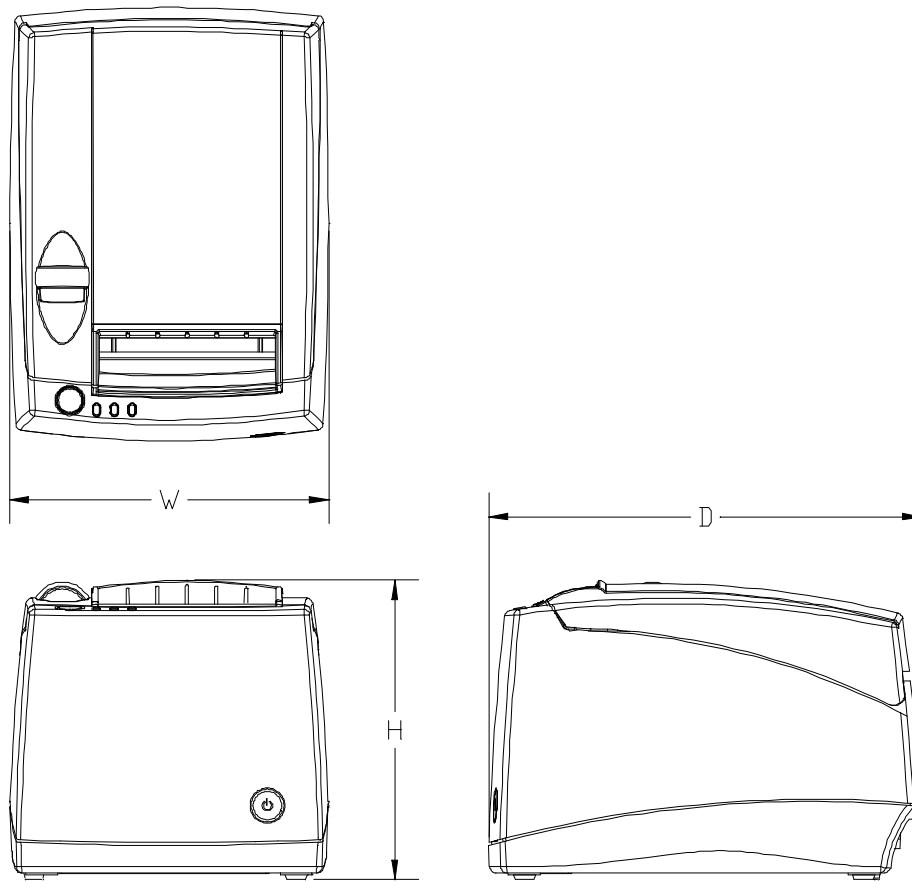
01      ....0000.....
02      ...000000.....
03      ...000000.....
04      ..000..000....
05      ..000..000....
06      ..000..000....
07      ..000..000....
08      ..000..000....
09      ..000..000....
10      ..000..000....
11      ..000..000....
12      .000....000..
13      .000....000..
14      .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

approx. 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 <sup>2</sup>	DC	0.125 A	2.0 A (Cash Drawer Fire) 3.5 A (Printing maximum for < 1 minute) 4.8 A Peak (< 167 msec.)

**Table 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 printers configuration to agree with the paper being used (58 or 80 mm width)

<sup>2</sup> For DC powered printers, the cash drawer is supplied directly from the DC input supply. The cash drawer requirements may effect 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

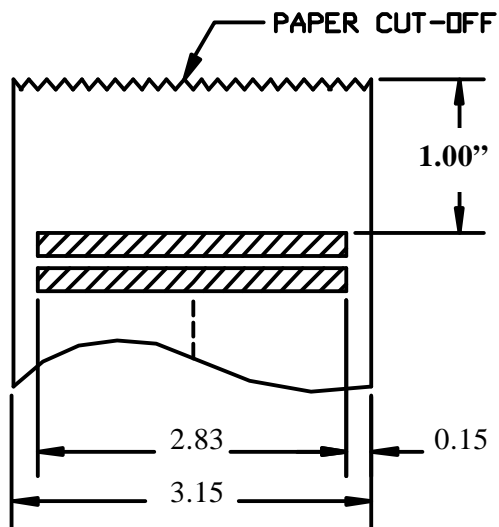
A receipt paper-low sensor is provided as an optional feature. An operator adjustable paper-low assembly will be provided to allow the printer to sense when the paper roll diameter is between .94 to 1.29 inches (approximate). It is adjustable to compensate for various paper core dimensions.

Paper Low Adjustment Settings	Approximate Paper Remaining (in feet)	Paper Roll Diameter
UPPER LIMIT: 2 turns (counter clockwise)	29'	1.29"
1 turns (counter clockwise)	23'	1.203"
FACTORY SETTING	18'	1.115"
1 turn ( <i>clockwise</i> )	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
- Receipt Printable Area

### RECEIPT PAPER ROLL



**Figure 2 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 Therm™ 280 Printers.

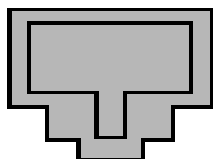
Cutter type	Rotary
Media width	3.13 +/- .02 inches (79.5 +/- .5 mm)
Media thickness range	0.0025 to 0.0035 inch
Cut to line of print	0.70 inch
Cutter life	1,000,000 cuts
Partial Cut tab:	.125 inches +/- .0625 inches (right edge of receipt)
Cut time:	less than 350 milliseconds

**Cash Drawer Drivers****Interface Description**

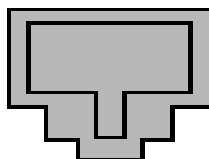
The iTherm™ 280 Printer supports a single cash drawer with status. The driver in the printer is capable of supplying 24 V DC at up to 1.5 amps for up to 250 milliseconds. The iTherm™ 280 Printer defines cash drawer closed as switch open. If the drawer is disconnected, it will be viewed by the printer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

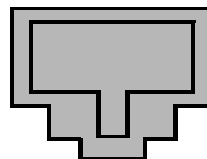
Drawer status    Open/close drawer status provided to printer

**Cash Drawer Pin Assignments***Ithaca*

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

*Epson*

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

*Star*

1	2	3	4	5	6
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 3 Cash Drawer Pin Definitions**

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

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

Table 7 Cash Drawer Pin Assignment

## 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.

## Interface Adapters

### Parallel Interface Adapters

There are two parallel interface adapters. One is a 25-pin, D-shell connector. The pin-out is such that the printer will interface to a standard IBM PC parallel printer interface with a one-to-one cable. The second adapter will provide a standard Centronics 36-pin connector.

#### Interface signals and pin definitions

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

**Table 8 Parallel Port Pin-outs**

#### Signal Levels

Voltage levels	0 V and +5 V (nominal)
Logic levels	
Logic one	
Driver	+2.4 V to +5 V
Receiver	+2.0 V to +5 V
Logic zero	
Driver	0 V to +0.4 V
Receiver	0 V to +0.8 V
Current requirements	
Logic one	Source 0.25 ma at +2.4 V
Logic zero	Sink 16 ma
Line termination	
Data and control	3.3K ohm to +5 V
Strobe	1.2K ohm to +5 V

## Serial Interface

### Serial Port Features

The serial port features are as follows

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

### Serial Port Pin-out

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 9 Serial Port Pin-outs**

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

### Signal levels

The serial interface meets EIA RS-232 Requirements.

-15 V to -3 V: mark = off = Logic 1

+3 V to +15 V: space = on = Logic 0

## USB Interface

### Standard USB Interface

The USB interface is a Version 1.1 Compliant interface. It is implemented through a Standard Series "B" Receptacle as defined in the USB Specification.

The printer is Self powered and does not draw power from the USB interface cable.

## 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 down 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.

# Customer Support

## Service Information

TransAct Technologies Incorporated has a full service organization to meet your printer service and repair requirements. If your printer needs service, please contact your service provider first. If any problems 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

## Warranty Information

TransAct's iTherm™ 280 Printers come with a standard 24-month warranty that commences upon shipment from factory, and covers parts and labor. An optional warranty, covering both parts and labor for an additional 12 months, may be purchased separately. Repairs are warranted for 90 days from the date of repair or for the balance of the original warranty period, whichever is greater.

## TransAct Product Support

Monday through Friday, 8 A.M. to 5 P.M. (excluding holidays). To obtain Technical Support, call TransAct's Ithaca Facility at (607) 257-8901, or (877) 7ITHACA. Have the following information at hand:

- The Model Number and Serial Number.
- A list of any other peripheral devices attached to the same port as the printer.
- The application software, operating system, and network you are using.
- A copy of your printer's Configuration Settings. See reverse side of this sheet for instructions on how to use Self-Test to printout your current settings.
- 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, a Returned Materials Authorization (RMA) number must be issued before returning the printer. Prepare the printer being returned for repair as follows:

- Remove and discard ink cartridges.
- Pack the printer to be returned in the original packing material. Packing items may be purchased from TransAct's Ithaca Facility.
- Return only the accessories that a Support Technician asks you to include.
- Write the RMA number clearly on the outside of the box.

## Shipping Printers

Never ship a printer by any means with a print cartridge installed. Be sure to save the packing materials in the event that you need to send the printer in for servicing. TransAct Technologies is not responsible for damaged return items that are not packaged in original shipping material.

## Where Can You Find More Information?

### Our Internet Support and Sales Services

Web address : [www.transact-tech.com](http://www.transact-tech.com)

TransAct Technologies Incorporated maintains an Internet web site with content devoted to supporting our products. Within the Support Services section you can find documentation for the iTherm™ 280 Printer, including a current copy of the Operator's Guide and Programmer's Guide.

## TransAct Product Support

After entering TransAct's web site, you will be brought to the "Welcome to TransAct" page. On this page you will find the Ithaca® Brand listed at the top right.

Click the Ithaca® logo; locate the category "Support Services" on the next page.

Click on the "iTherm™ 280" sub-section on the lower half of the Ithaca® page.

**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**

## Internet Support

TransAct Technologies Incorporated maintains an Internet web site. The address is <http://www.transact-tech.com>. The technical support page contains support information for our printers. The iTherm™ 280 Printer support pages offer the latest information. The pages include the current version of this manual; program examples; test procedures; programming instructions; and supported print drivers.

## Operator's Guide

The Operator's Guide is intended for anyone who wishes to learn more about how to use the iTherm™ 280. It contains specific information pertaining to installation and operation and also offers detailed explanations of the iTherm™ 280 operational controls including troubleshooting reference tables, indicator light blink tables, and connector pin-outs.

## Contacting TransAct's Ithaca Facility

Contact TransAct's Ithaca facility for information about the iTherm™ 280 Printer and how it works with your system. For information on International distribution, visit our web site at [www.transact-tech.com](http://www.transact-tech.com). Contact the TransAct's Sales and Technical Support Departments at the following address and telephone or fax numbers.

### Technical Support

Receive technical support, order documentation, request additional information, or send in a printer for service.

### Sales

Order supplies, receive more product information, or order product brochures.

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

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

# Setup Procedures

## Verifying the configuration

Before you install a 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 printer is configured correctly.

### Verify the communications interface card

There are three 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

It is easy to distinguish most of the interface cards besides 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 print out. If a serial interface card is installed, the print out will refer to the RS-232 Serial Interface. If the parallel interface card is installed, the print out 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 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. 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 card retaining screws.
5. Slide the interface card towards the back of the printer and remove it.

### 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 5 .

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 4 Cash Drawer Selection**

The Cash drawer connector may be connected to one of three internal connectors on the controller board. To gain access to 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**

4. slide the cash drawer socket out of the slot in the frame.
5. Unplug the socket harness from the main circuit board.
6. Plug the harness into the connector for the desired interface.
7. Reinstall the cash drawer socket into the frame.

**Re-Install the interface card**

6. 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.
7. Install the retaining screws.
8. Connect the communications interface card and any cash drawer cables.
9. Turn over the printer, and reconnect the power.

**Installing cables**

Figure 5 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.

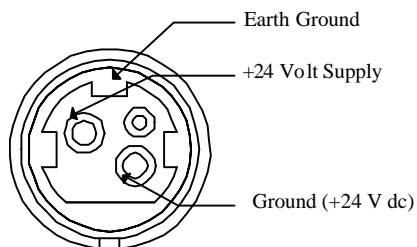


Figure 6 3-pin mini DIN plug

### 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. 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

Included in the box your printer shipped in is an example receipt 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 Instructions for WIN95, 98, Me

1. Insert the “**Windows 98, 98, Me printer driver**” floppy 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 (ie. 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. Although, 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 Instructions 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 “**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. Although, 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 Comm port setup dialog will be displayed.
3. After running Setup.exe there will be a OPOS setup utility in the OPOS program group/start menu and also in the control panel. Use this utility to setup 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 you 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.

## Operational Controls

### How to Operate the iTherm™ 280 Printer

The keypad contains two buttons and five (LED) indicator lights. Although not located on the keypad, the third button is the \* button. The \* is located on the front-face of the printer's cabinet.

In addition to power control and feeding paper, the two buttons can be used to perform functions like self-testing, clearing errors, and printer configuration. The two buttons are:

- |                 |  |
|-----------------|--|
| <b>* BUTTON</b> | This is the standby or power down button and is located on front face of the printer's cabinet |
| <b>FEED</b>     | 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 a OFF low power mode. The printer is not completely off but is in Standby<sup>3</sup>.

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

#### FEED Button

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

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

## Indicator Lights (LED)

### The three iTherm™ 280 indicator lights are:

- Power LED Indicates printer activity and non-recoverable errors
- Error LED Indicates problems and probability of recovery
- Paper LED Indicates paper status (paper low)

### Power Indicator (LED)

The power indicator lets the user know that the printer is ON. If the power indicator blinks in conjunction with the ERROR indicator, the printer is experiencing a non-recoverable error. See the fault indicators 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 fault indicators below. If the error is not operator recoverable, a power cycle may correct the problem. If a power cycle does not correct the fault, the printer must be serviced.

### Paper Indicator (LED)

The PAPER indicator signals the paper status. If the printer is equipped with a paper low option, the paper indicator will blink when the paper is low. The low sensor is adjustable, and the amount of paper remaining is dependent on the adjustment. If the paper indicator is lit with the error indicator, the printer is out of paper. The printer stops printing and waits for the paper to be changed.

## Fault Indicators

The error indicator is the primary fault indicator. It is always on or blinking if a fault has occurred.

### Three types of faults exist

<b>Fully-recoverable faults</b>	Paper out or cover open
<b>Semi-recoverable faults</b>	Head Jam
<b>Non-recoverable faults</b>	Component failure

**Fully-recoverable and Status**

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

**Semi-recoverable**

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

**Non-recoverable**

A non-recoverable error produces information loss.

If during normal operation, the **ERROR** indicator is lit and the **POWER** indicator is blinking, a minor error occurred. The **POWER** indicator shows the error by blinking a pattern. Pressing the \* button restarts the printer. Blink patterns are defined as follows.<sup>4</sup>

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

— — — — —

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

— — — — —

**3 Blink** (3 blinks pause)

— — — — —

And So on.

Error indications are:

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 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 and changes necessary.

<sup>4</sup> The blink rate is effected by the data received. The faster the data, the faster the printer blinks.

**Entering Self-Test, Configuration, and Hex Dump 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 Line Feed button.
3. While holding the Line Feed button, press and release the \* button.
4. When the red, error indicator light blinks, release the Line 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 that allows the printers configuration to be changed, and two that 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. Read the instructions. They are not the same as self-test. You may exit configuration mode at any time with out effecting the printers 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.

## 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.

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 is probably incorrect. Either the parity, baud rate, or bit length setting is wrong. If the printer prints incorrect characters (like Hex C1 instead of Hex 41 "A"), it is set for 8-bit data, and the host is set for 7-bit. In most cases, the print problem can be traced to the host and printer being configured differently.

## Factory Test

**Disregard the following options when cycling through the menu.** The following 2 Self-Test options do not need to be run in order to determine if the printer is running properly. These test options are only used for factory burn-in and testing.

TEST-Burn-in  
TEST-Rolling ASCII

## Level 0 Diagnostics

Level 0 diagnostics always and only run at power up. (Power being applied)

**Level 0 diagnostics perform the following tasks:**

Cold Power On

1. Basic System Integrity
2. Vector Integrity
3. RAM Test
4. Flash Boot Loader Integrity

5. Flash Firmware Integrity 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 that the printer firmware is correct. Tests 1-4 non-recoverable errors if they fail. The power must be removed from the printer, and the printer must be returned for service. If the boot loader is intact, but the main firmware is corrupted, the printer automatically enters boot loader mode. The firmware can then be reloaded into the printer.

### Boot Loader Mode

The boot loader cannot be entered during normal operation. Boot loader mode can only be entered in one of two ways.

1. When Level 0 Diagnostics finds that the firmware check CRC is bad.
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 failed, the printer will remain in boot load mode. If the load failed, you should reset the printer by removing the power and

# Changing the Configuration of the iTherm™ 280

## 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. Because the iTherm™ 280 utilizes just 2 keys, the printer's internal, self-configuration mode is complicated and slow. To provide a faster, easier way to configure or reconfigure the iTherm™ 280 printer, a remote CONFIG program is available. To obtain more information, or the latest version of the CONFIG program, call our Sales Department or Tech Support.

## Manual Configuration

TransAct does not recommend that Manual Configurations be made by anybody but a trained service technician who has successfully completed training on the iTherm™ 280. Please remember that these settings are only several of the complete list of configurable categories. If you continue to experience incompatibility issues after changing these settings to match your system, contact TransAct's Technical Support Department for assistance.

## 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 stuck key, release the Feed key and enter self test.
- 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 if any, the error logs. Save this print out 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, the print out that was printed at the beginning of the configuration process may be incorrect for the new emulation. When you change the emulation, 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. Because we only have two buttons, changing the configuration can be frustrating.

The following chart lists all the potential parameters and there 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	Is 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 is CTS and DSR used	None (Not used)	None (Not used)
Multidrop Mode	Is multidrop Active	Off, A, B, or C Address	Off
Busy-to-ACK	This is the relationship of Busy to ACK on the IEEE1284 interface	ACK while Busy ACK in Busy ACK after Busy	ACK in Busy
Select/Deselect	What command is 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	Slashed Un-Slashed	Defined by the language set.

	the language set.	Follow 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 from 10 to 24 characters per inch	15
Smoothing	Are scaled characters smoothed	Enabled, Disabled	Enabled
Paper Width	How wide is the paper installed.	80 or 58 mm paper and print zone from 608 to 256 dots	80 mm and 576 dots.
Bar Code Width	How wide is the 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.	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 GTECH Standard 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	60 to 120 Watts	80

	external supply is used, this adjustment will limit the printer to the power indicated.		
Page Length	This options sets the default form feed page length.	0 – 60 lines. 0 disables the	40
Cash Drawer CMD	The Micro line option has two potential CD 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
Ext. User Store	Is the 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.
Elect. Journal	This specifies the amount of external flash is available for the electronic journal or user data space.	1 to 31 64K blocks	2
Ext. 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 weather 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 tare 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

## Remote Configuration

Remote configuration is provided for all printers. It 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.

# Programming Controls

## 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.
<Name...>	This indicates an ASCII string. ASCII strings are terminated by some special character typically a NUL character.
<n>	Indicates a variable parameter. The variable parameter, <n>, can have a value from zero to 255. The meaning of <n> is described and defined in the description of the command.
<n <sub>1</sub> > <n <sub>2</sub> >	Indicates that there are two parameters, <n <sub>1</sub> > and <n <sub>2</sub> >, where both can have values from zero to 255.
<m <sub>1</sub> > <m <sub>2</sub> >	Is an Ithaca® Printer Control Language (IPCL) parameter consisting of two digits where <m <sub>1</sub> > and <m <sub>2</sub> > are ASCII characters from zero to nine. The parameter is combined to form a value from zero to 99. If <m <sub>3</sub> > is included, the parameter is combined to be from zero to 999. If two values are specified, there must be two bytes added to the IPCL code. That is, if the command specifies <m <sub>1</sub> > <m <sub>2</sub> > and the desired value is five, it must be specified as 05.
x	All other characters in control strings represent ASCII characters. For example, [ESC] 1 represents 1BH followed by 31H.

In many cases, applications require that control sequences be specified in hexadecimal or decimal codes. In most cases, commands are specified in ASCII, hexadecimal, and decimal. Appendix B ASCII Code Table, on page 203 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 an Ithaca® Series 50 Printer with IBM code sets will function with a iTherm™ 280printer.

## IPCL Codes

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

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

## EPOS Emulation

ESC/POS<sup>5</sup> is referred to here as EPOS. The iTherm™ 280printer supports two Epson emulations. One emulation is for the TM-T88, and the other is an enhanced TM-T90 emulation.

**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™ 280Printer 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 how the printer works including a description of the internal print buffer, communications link, and interaction between the host computer and printer.

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<sup>5</sup> ESC/POS is a registered trademark of the Seiko Epson Corporation.

## 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. Commands are grouped by function and may be difficult to find. To minimize the time it takes to find commands, code summary charts, arranged by code and function, are provided.

### PcOS Printer Control Codes

The following section defines the 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 into a new application.

The new feature in the iTherm™ 280 Printer is the ability to print color graphics. 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 By Function

Description	ASCII	Hex	IPCL equivalent code	Page
<b>Low Level paper Motion</b>				
Line feed	[LF]	0AH	&%LF	33
Carriage return	[CR]	0DH	&%CR	33
<b>Horizontal Motion</b>				
Back space	[BS]	08H	&%BS	34
Horizontal tab	[HT]	09H	&%HT	34
Set horizontal tab stops	[ESC] D <n <sub>1</sub> > <n <sub>2</sub> > ... <n <sub>i</sub> > <0>	1BH,44H	none	34
Set horizontal position	[ESC] n <n <sub>1</sub> > <n <sub>2</sub> >	1BH,6EH	&%HP<m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >	35
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}	35
Reset horizontal and vertical tab stops	[ESC] R	1BH,52H	&%HV	35
Set left/right print margins n <sub>1</sub> = Left margin, n <sub>2</sub> = Right margin	[ESC] X <n <sub>1</sub> ><n <sub>2</sub> >	1BH,58H	none	58
<b>Vertical Motion</b>				
Perform a fine line feed	[ESC] J <n>	1BH,4AH	&%FM <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >	36
Perform a fine line feed in reverse	[ESC] M <n>	1BH,4DH	&%FR <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >	40
Set 1/8-inch line spacing	[ESC] 0	1BH,30H	&%ST	36
Set 7/72-inch line spacing	[ESC] 1	1BH,31H	&%SG	37
Begin variable line spacing (Enable [ESC] A <n>)	[ESC] 2	1BH,32H	none	37
Set variable line spacing to n/216 inch	[ESC] 3 <n>	1BH,33H	&%SV <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >	36
Set variable line spacing to n/72 inch	[ESC] A <n>	1BH,41H	none	37
Feed <n> lines at current spacing	[ESC] d <n>	1BH,64H	&%FL <m <sub>1</sub> > <m <sub>2</sub> >	37
Feed <n> lines at current spacing in reverse	[ESC] e <n>	1BH,65H	&%FB <m <sub>1</sub> > <m <sub>2</sub> >	37
Set vertical tab stops	[ESC] B <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> >...<n <sub>i</sub> > 0	1BH,42H	none	39
Vertical tab	[VT]	0BH	&%VT	38
Form feed	[FF]	0CH	&%FF	39
Set top of form	[ESC] 4	1BH,34H	&%TF	39
Set form length in lines	[ESC] C <n>	1BH,43H	&%SL <m <sub>1</sub> > <m <sub>2</sub> >	39
Begin auto line feed n=0 End n=1	[ESC] 5 <n>	1BH,35H	&%CA {n=0} &%MA {n=1}	40
Set form length in inches	[ESC] C [NUL] <n>	1BH,43H	&%SI <m <sub>1</sub> > <m <sub>2</sub> >	40
Reverse line feed	[ESC] ]	1BH,5DH	&%LR	40
<b>Character Pitch</b>				
Begin 10 CPI character pitch	[DC2]	12H	&%F3	41
Begin 12 CPI character pitch	[ESC] :	1BH,3AH	&%F2	41
Begin 17 CPI character pitch	[SI]	0FH	&%F1	41
Set character pitch	[ESC] [ P <n>	1BH,5BH, 50H	&%F<n>	42
Set inter-character spacing	[ESC] V <n>	1BH,56H	none	43

Begin 24 CPI character pitch	[ESC][SI]	1BH,0FH	&%F4	41
<b>Character Font</b>				
Begin 12 x 12 draft print	[ESC] # <n>	1BH,23H, 00H	&%QT	44
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}	44
Begin rotated font (See command description).	[ESC] P <n>	1BH,50H	&%RI &%RF &%RN	45
Select character code page	[ESC] [ T <n <sub>1</sub> > <n <sub>2</sub> >	1BH,5BH, 54H	&%CP <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> > <m <sub>4</sub> >	46
Insert euro character	[ESC] [ C <n>	1BH,5BH, 43H	&%EU	49
Print control character	[ESC] ^ <n>	1BH,5EH	&%CC <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >	49
Redefine character set	[ESC] [ S ...	1BH,5BH, 53H...		50
Define user-defined characters	[ESC] = <y> <c <sub>1</sub> > <c <sub>2</sub> >...	1BH,3DH	none	51
Enable user-defined characters	[ESC] > <n>	1BH,3EH	none	52
Enable OCR characters	[ESC] y <11>	1BH,79H, 0BH	&%YX011	52
Disable OCR characters	[ESC] y <12>	1BH,79H, 0CH	&%YX012	52
Cancel user-defined characters	[ESC] \$	1BH,24H	none	52
<b>Character Attributes</b>				
Select color	[ESC] c <n>	1BH,63H	&%CL <m <sub>1</sub> >	54
Begin one-line double-wide print	[SO]	0EH	&%MW	54
Cancel one-line double-wide print	[DC4]	14H	&%MN	54
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}	55
Enable/disable overscore n=0 End n=1 Begin	[ESC] _ <n>	1BH,5FH	&%CO {n=0} &%MO {n=1}	54
Begin Underline mode n = 0 End n = 1 Begin	[ESC] - <n>	1BH,2DH	&%CU {n=0} &%MU {n=1}	56
Begin enhanced print	[ESC] G	1BH,47H	&%ME	56
End enhanced print	[ESC] H	1BH,48H	&%CE	56
Begin emphasized print	[ESC] E	1BH,45H	&%MM	56
End emphasized print	[ESC] F	1BH,46H	&%CM	56
Set print style (See command description.)	[ESC] [ @ ...	1BH,5BH, 40H...	&%DH &%SH	55
Select superscript	[ESC] S <0>	1BH,53H, 00H	&%SP	57
Select subscript	[ESC] S <1>	1BH,53H, 01H	&%SB	57
End superscript or subscript	[ESC] T	1BH,54H	&%SE	57
Begin italics	[ESC] % G	1BH,25H, 47H	&%MI	57
End italics	[ESC] % H	1BH,25H, 48H	&%CI	57
Begin/end rotated print	[ESC] r <n>	1BH,72H	&%RX	59
Set rotated print line length	[ESC] s <n>	1BH,73H	&%RL	60
<b>Page Mode</b>				
Select page mode	[ESC] t <n>	1BH,74H	&%PM <m <sub>1</sub> >	62
Set page mode page position	[ESC] o <n <sub>1</sub> > ...	1BH,6FH		63
Exit page mode	[FF]	0CH	&%FF	64

<b>APA Graphics</b>				
Print single-density graphics <n <sub>1</sub> >=0...255 <n <sub>2</sub> >=0...3 len=<n <sub>1</sub> > + 256 * <n <sub>2</sub> >	[ESC] K <n <sub>1</sub> > <n <sub>2</sub> >	1BH,4BH	none	65
Print half-speed double-density graphics	[ESC] L <n <sub>1</sub> > <n <sub>2</sub> >	1BH,4CH	none	65
Print full-speed double-density graphics	[ESC] Y <n <sub>1</sub> > <n <sub>2</sub> >	1BH,59H	none	65
Print quad-density graphics	[ESC] Z <n <sub>1</sub> > <n <sub>2</sub> >	1BH,5AH	none	66
Select bi-directional or unidirectional print n=0 Bi-directional n=1 Unidirectional	[ESC] U <n>	1BH,55H	&%GU {n=1} &%GB {n=0}	67
Print graphics in mode <m>  <n <sub>2</sub> >	[ESC] * <m> <n <sub>1</sub> > <n <sub>2</sub> >	1BH,2AH	none	66
Reassign graphic mode	[ESC] ? <m><n>	1BH,3FH	none	67
<b>Two Color Graphics</b>				
Process horizontal graphics data	[ESC] h <color> <length> <format> <data>	1BH,68H	none	68
Set horizontal graphic mode	[ESC] * <m> <0> <0>	1BH,2AH	none	69
<b>User Store (Graphic Save)</b>				
Begin named macro record	[ESC] [US] b <Name..> <0>	1BH,1FH, 62H	&%UB <Name..> <0>	72
Save macro data in user store	[ESC] [US] m <Name..> <0>	1BH,1FH, 6DH	&%UM <Name..> <0>	73
End named macro record	[ESC] [US] e <Name..> <0>	1BH,1FH, 65H	&%UG <Name..> <0>	72
Load item from user store	[ESC] [US] l <Name..> <0>	1BH,1FH, 6CH	&%UL <Name..> <0>	73
Save user-defined characters	[ESC] [US] c <Name..> <0>	1BH,1FH, 63H	&%UC <Name..> <0>	73
Run macro data from user store	[ESC] [US] r <Name..> <0>	1BH,1FH, 72H	&%UR <Name..> <0>	73
Flag item as a start-up macro	[ESC] [US] s <Name..> <0>	1BH,1FH, 6DH	&%US <Name..> <0>	73
Delete item from user store	[ESC] [US] d <Name..> <0>	1BH,1FH, 64H	&%UD <Name..> <0>	74
Flush information from user store	[ESC] [US] f ALL <0> or EXT <0>	1BH,1FH, 66H,00H	&%UF	74
Transfer user store to extended user store	[ESC] [US] t ALL <0>	1BH,1FH, 66H,00H	&%UF	74
Report on user store	[ESC] [US] q <Name..> <0>	1BH,1FH, 72H	&%UQ <Name..> <0>	74
Return a report on user store	[ESC] [US] ? <Name..> <0>	1BH,1FH, 72H	&%UQ <Name..> <0>	74
Process user macro	[ESC] g <0>	1BH,67H, 00H	&%GP	76
Start macro record	[ESC] g <1>	1BH,67H, 01H	&%GS	76
Stop macro record	[ESC] g <2>	1BH,67H, 02H	&%GE	76
Stop macro record and save	[ESC] g <3>	1BH, 67H, 03H	&%GW	76

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}	77
Set bar code height n=0 Restore defaults n=1 - 9 Number of passes (0.11 inch per pass)	[ESC] [EM] B <n>	1BH,19H, 42H	&%BH <m <sub>1</sub> ><m <sub>2</sub> >	79
Set bar code justification, HRI print mode, and print direction	[ESC] [EM] J <n>	1BH,19H, 4AH	&%BJ<m <sub>1</sub> ><m <sub>2</sub> >	79
Set bar code width	[ESC] [EM] W <n>	1BH,19H, 57H	&%BW<m>	
Electronic Journal				
Electronic journal initialize and set password	[ESC][GS]I <Password><0>	1BH 1DH 49H	%&EI	82
Electronic journal erase the electronic journal	[ESC][GS]E <Password><0>	1BH 1DH 45H	%&EC	82
Print the electronic journal	[ESC][GS]P< S <sub>i</sub> > <S <sub>h</sub> >< L <sub>i</sub> >< L <sub>h</sub> >	1BH 1DH 50H	%&EP	82
Report the electronic journal	[ESC][GS]R< S <sub>i</sub> > < S <sub>h</sub> >< L <sub>i</sub> >< L <sub>h</sub> >	1BH 1DH 52H	%&EQ	83
Electronic journal begin entry	[ESC]I <3>	1BH 6CH	%&EB	
Electronic journal suspend entry	[ESC]I <2>	1BH 6CH	%&ES	89
Electronic journal resume entry	[ESC]I <1>	1BH 6CH	%&ER	89
Electronic journal end entry	[ESC]I <0>	1BH 6CH	%&EE	89
Electronic journal mode begin (Journal station)	[ESC]{	1BH 7BH	None	88
Unicode				
Set Font ID	[ESC] + 1 <low byte> <high byte>	1BH 2BH 31H	none	
Set Font Descriptor	[ESC] + 2	1BH 2BH 32H	none	
Select Font	[ESC] + 3 <low byte> <high byte>	1BH 2BH 31H	none	
Set Character Code ID	[ESC] + 4 <low byte> <high byte>	1BH 2BH 34H	none	
Send Character Definition	[ESC] + 5 <low byte length> <high byte length>	1BH 2BH 35H	none	
Delete Current Selected Soft Font	[ESC] + 6	1BH 2BH 36H	none	
Delete All Soft Fonts	[ESC] + 7	1BH 2BH 37H	none	
Query Soft/RAM Font Information	[ESC] + Q	1BH 2BH 51H	none	
Copy Soft Font from RAM to User memory/flash memory.	[ESC] + U	1BH 2BH 55H	none	
Initiate Unicode UTF-16BE Encoding	[ESC] + H	1BH 2BH 48H	none	
Initiate Unicode UTF-16LE Encoding	[ESC] + L	1BH 2BH 4CH	none	
Initiate Unicode UTF-8 Encoding (MBCS)	[ESC] + M	1BH 2BH 4DH	none	
Initiate Normal 8-bit Character Encoding	[ESC] + A	1BH 2BH 41H	none	
Miscellaneous Commands				
Disable paper out sensor	[ESC] 8	1BH,38H	%&PF	96
Enable paper out sensor	[ESC] 9	1BH,39H	%&PO	96

Set left/right margins. n <sub>1</sub> = Left margin n <sub>2</sub> = Right margin	[ESC] X <n <sub>1</sub> ><n <sub>2</sub> >	1BH,58H	none	58
Clear print buffer	[CAN]	18H	&%RP	96
Query marker	[ESC] q <n>	1BH,71H	none	96
Open cash drawer n=1 Cash Drawer 1 n=2 Cash Drawer 2	[ESC] x <n>	1BH,78H	&%D1 {n=1} &%D2 {n=2}	97
Perform auto cut	[ESC] v	1BH,76H	&%FC	97
Audio alert	[BEL]	07H	&%BL	97
Configure audio alert	[ESC] [BEL] <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> >	1BH,07H	none	98
Print suppress and data pass through	[ESC] <n>	1BH,3CH	&%PT <n>	99
Initialize printer	[ESC] @	1BH,40H	none	97
Enable paper error mode operation	[ESC] p <n>	1BH,70H	&%PE <m <sub>1</sub> > <m <sub>2</sub> >	98
Enable dynamic response	[ESC] w <n>	1BH,77H	none	110
Begin multi-drop control	[SOH] <n>	01H	none	100
Inquire status (Refer to command descriptions.)	[ENQ] <n>	05H	none	103
Inquire cash drawer 1 status	[ENQ] <1>	05H 01H	none	103
<b>Extended Diagnostics</b>				
Set control feature commands	[ESC] y <n>	1BH,79H	&%Y0 - 9 or &%YX<m <sub>1</sub> > <m <sub>2</sub> ><m <sub>3</sub> > (for numbers >9)	100
Extended diagnostics	[ESC] ~ <n>	1BH,7EH	none	<b>Error! Bookm ark not define d.</b>

## Quick PcOS Reference Chart (Alphabetic)

Description	ASCII	Hex	IPCL equivalent code	Page
Begin multi-drop control	[SOH] <n>	01H	none	100
Inquire status (Refer to command descriptions.)	[ENQ] <n>	05H	none	103
Audio alert	[BEL]	07H	&%BL	97
Back space	[BS]	08H	&%BS	34
Horizontal tab	[HT]	09H	&%HT	34
Line feed	[LF]	0AH	&%LF	33
Vertical tab	[VT]	0BH	&%VT	38
Form feed	[FF]	0CH	&%FF	39
Exit page mode	[FF]	0CH	&%FF	64
Carriage return	[CR]	0DH	&%CR	33
Begin one-line double-wide print	[SO]	0EH	&%MW	54
Begin 17 CPI character pitch	[SI]	0FH	&%F1	41
Begin 10 CPI character pitch	[DC2]	12H	&%F3	41
Cancel one-line double-wide print	[DC4]	14H	&%MN	54
Clear print buffer	[CAN]	18H	&%RP	96
Configure audio alert	[ESC] [BEL] <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> >	1BH,07H	none	98
Begin 24 CPI character pitch	[ESC][SI]	1BH,0FH	&%F4	41
Set bar code height n=0 Restore defaults n=1 - 9 Number of passes (0.11 inch per pass)	[ESC] [EM] B <n>	1BH,19H, 42H	&%BH <m <sub>1</sub> ><m <sub>2</sub> >	79
Activate/Deactivate Auto Journal Feature	[ESC][GS]A<n>	1BH 1DH 41H	&%JO &%JF	90
Electronic journal erase the electronic journal	[ESC][GS]E <Password><0>	1BH 1DH 45H	&%EC	82
Electronic journal initialize and set password	[ESC][GS]I <Password><0>	1BH 1DH 49H	%&EI	82
Set bar code justification, HRI print mode, and print direction	[ESC] [EM] J <n>	1BH,19H, 4AH	&%BJ<m <sub>1</sub> ><m <sub>2</sub> >	79
Print the electronic journal	[ESC][GS]P< S <sub>1</sub> > <S <sub>h</sub> >< L <sub>1</sub> >< L <sub>h</sub> >	1BH 1DH 50H	&%EP	82
Report the electronic journal	[ESC][GS]R< S <sub>1</sub> > < S <sub>h</sub> >< L <sub>1</sub> >< L <sub>h</sub> >	1BH 1DH 52H	&%EQ	83
Return a report on user store	[ESC] [US] ? <Name..> <0>	1BH,1FH, 72H	&%UQ <Name..> <0>	74
Begin named macro record	[ESC] [US] b <Name..> <0>	1BH,1FH, 62H	&%UB <Name..> <0>	72
Save user-defined characters	[ESC] [US] c <Name..> <0>	1BH,1FH, 63H	&%UC <Name..> <0>	73
Delete item from user store	[ESC] [US] d <Name..> <0>	1BH,1FH, 64H	&%UD <Name..> <0>	74
End named macro record	[ESC] [US] e <Name..> <0>	1BH,1FH, 65H	&%UG <Name..> <0>	72
Flush information from user store	[ESC] [US] f ALL <0> or EXT <0>	1BH,1FH, 66H,00H	&%UF	74
Load item from user store	[ESC] [US] l <Name..> <0>	1BH,1FH, 6CH	&%UL <Name..> <0>	73
Save macro data in user store	[ESC] [US] m <Name..> <0>	1BH,1FH, 6DH	&%UM <Name..> <0>	73
Report on user store	[ESC] [US] q <Name..> <0>	1BH,1FH, 72H	&%UQ <Name..> <0>	74
Run macro data from user store	[ESC] [US] r <Name..> <0>	1BH,1FH, 72H	&%UR <Name..> <0>	73

Flag item as a start-up macro	[ESC] [US] s <Name...> <0>	1BH,1FH, 6DH	&%US <Name...> <0>	73
Transfer user store to extended user store	[ESC] [US] t ALL <0>	1BH,1FH, 66H,00H	&%UF	74
Begin 12 x 12 draft print	[ESC] # <0>	1BH,23H, 00H	&%QT	44
Cancel user-defined characters	[ESC] \$	1BH,24H	none	52
Begin italics	[ESC] % G	1BH,25H, 47H	&%MI	57
End italics	[ESC] % H	1BH,25H, 48H	&%CI	57
Set horizontal graphic mode	[ESC] * <m> <0> <0>	1BH,2AH	none	69
Print graphics in mode <m>	[ESC] * <m> <n <sub>1</sub> > <n <sub>2</sub> >	1BH,2AH	none	66
Begin Underline mode n = 0 End n = 1 Begin	[ESC] - <n>	1BH,2DH	&%CU {n=0} &%MU {n=1}	56
Set 1/8-inch line spacing	[ESC] 0	1BH,30H	&%ST	36
Set 7/72-inch line spacing	[ESC] 1	1BH,31H	&%SG	37
Begin variable line spacing (Enable [ESC] A <n>)	[ESC] 2	1BH,32H	none	37
Set variable line spacing to n/216 inch	[ESC] 3 <n>	1BH,33H	&%SV <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >	36
Set top of form	[ESC] 4	1BH,34H	&%TF	39
Begin auto line feed n=0 End n=1	[ESC] 5 <n>	1BH,35H	&%CA {n=0} &%MA {n=1}	40
Disable paper out sensor	[ESC] 8	1BH,38H	&%PF	96
Enable paper out sensor	[ESC] 9	1BH,39H	&%PO	96
Begin 12 CPI character pitch	[ESC] :	1BH,3AH	&%F2	41
Print suppress and data pass through	[ESC] < <n>	1BH,3CH	&%PT <n>	99
Define user-defined characters	[ESC] = <y> <c <sub>1</sub> > <c <sub>2</sub> >...	1BH,3DH	none	51
Enable user-defined characters	[ESC] > <n>	1BH,3EH	none	52
Reassign graphic mode	[ESC] ? <m><n>	1BH,3FH	none	67
Initialize printer	[ESC] @	1BH,40H	none	97
Set variable line spacing to n/72 inch	[ESC] A <n>	1BH,41H	none	37
Set vertical tab stops	[ESC] B <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> >...<n <sub>i</sub> > 0	1BH,42H	none	39
Set form length in lines	[ESC] C <n>	1BH,43H	&%SL <m <sub>1</sub> > <m <sub>2</sub> >	39
Set form length in inches	[ESC] C [NUL] <n>	1BH,43H	&%SI <m <sub>1</sub> > <m <sub>2</sub> >	40
Set horizontal tab stops	[ESC] D <n <sub>1</sub> > <n <sub>2</sub> > ... <n <sub>i</sub> > <0>	1BH,44H	none	34
Begin emphasized print	[ESC] E	1BH,45H	&%MM	56
End emphasized print	[ESC] F	1BH,46H	&%CM	56
Begin enhanced print	[ESC] G	1BH,47H	&%ME	56
End enhanced print	[ESC] H	1BH,48H	&%CE	56
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}	44
<b>Perform a fine line feed</b>	[ESC] J <n>	1BH,4AH	&%FM <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >	36

Print single-density graphics <n <sub>1</sub> >=0...255 <n <sub>2</sub> >=0...3 len=<n <sub>1</sub> > + 256 * <n <sub>2</sub> >	[ESC] K <n <sub>1</sub> > <n <sub>2</sub> >	1BH,4BH	none	65
Print half-speed double-density graphics	[ESC] L <n <sub>1</sub> > <n <sub>2</sub> >	1BH,4CH	none	65
<b>Perform a fine line feed in reverse</b>	[ESC] M <n>	1BH,4DH	&%FR <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >	40
Begin rotated font (See command description).	[ESC] P <n>	1BH,50H	&%RI &%RF &%RN	45
Reset horizontal and vertical tab stops	[ESC] R	1BH,52H	&%HV	35
Select superscript	[ESC] S <0>	1BH,53H, 00H	&%SP	57
Select subscript	[ESC] S <1>	1BH,53H, 01H	&%SB	57
End superscript or subscript	[ESC] T	1BH,54H	&%SE	57
Select bi-directional or unidirectional print n=0 Bi-directional n=1 Unidirectional	[ESC] U <n>	1BH,55H	&%GU {n=1} &%GB {n=0}	67
Set inter-character spacing	[ESC] V <n>	1BH,56H	none	43
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}	55
Set left/right print margins n <sub>1</sub> = Left margin, n <sub>2</sub> = Right margin	[ESC] X <n <sub>1</sub> ><n <sub>2</sub> >	1BH,58H	none	58
Print full-speed double-density graphics	[ESC] Y <n <sub>1</sub> > <n <sub>2</sub> >	1BH,59H	none	65
Print quad-density graphics	[ESC] Z <n <sub>1</sub> > <n <sub>2</sub> >	1BH,5AH	none	66
Set print style (See command description.)	[ESC] [ @ ...	1BH,5BH, 40H...	&%DH &%SH	55
Insert euro character	[ESC] [ C <n>	1BH,5BH, 43H	&%EU	49
Set character pitch	[ESC] [ P <n>	1BH,5BH, 50H	&%F<n>	42
Redefine character set	[ESC] [ S ...	1BH,5BH, 53H...		50
Select character code page	[ESC] [ T <n <sub>1</sub> > <n <sub>2</sub> >	1BH,5BH, 54H	&%CP <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> > <m <sub>4</sub> >	46
Reverse line feed	[ESC] ]	1BH,5DH	&%LR	40
Print control character	[ESC] ^ <n>	1BH,5EH	&%CC <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >	49
Enable/disable overscore n=0 End n=1 Begin	[ESC] _ <n>	1BH,5FH	&%CO {n=0} &%MO {n=1}	54
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}	35

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}	77
Select color	[ESC] c <n>	1BH,63H	&%CL <m <sub>1</sub> >	54
Feed <n> lines at current spacing	[ESC] d <n>	1BH,64H	&%FL <m <sub>1</sub> > <m <sub>2</sub> >	37
Feed <n> lines at current spacing in reverse	[ESC] e <n>	1BH,65H	&%FB <m <sub>1</sub> > <m <sub>2</sub> >	37
Process user macro	[ESC] g <0>	1BH,67H, 00H	&%GP	76
Start macro record	[ESC] g <1>	1BH,67H, 01H	&%GS	76
Stop macro record	[ESC] g <2>	1BH,67H, 02H	&%GE	76
Stop macro record and save	[ESC] g <3>	1BH, 67H, 03H	&%GW	76
Process horizontal graphics data	[ESC] h <color> <length> <format> <data>	1BH,68H	none	68
Activate Auto Journal	[ESC] i <n>	1BH,69H	&%VJ	90
Electronic journal begin entry	[ESC] l <3>	1BH 6CH	&%EB	
Electronic journal suspend entry	[ESC] l <2>	1BH 6CH	&%ES	89
Electronic journal resume entry	[ESC] l <1>	1BH 6CH	&%ER	89
Electronic journal end entry	[ESC] l <0>	1BH 6CH	&%EE	89
Set horizontal position	[ESC] n <n <sub>1</sub> > <n <sub>2</sub> >	1BH,6EH	&%HP<m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >	35
Set page mode page position	[ESC] o <n <sub>1</sub> > ...	1BH,6FH	&%PY<m <sub>1</sub> > <m <sub>2</sub> >	63
Enable paper error mode operation	[ESC] p <n>	1BH,70H	&%PE <m <sub>1</sub> > <m <sub>2</sub> >	98
Query marker	[ESC] q <n>	1BH,71H	none	96
Begin/end rotated print	[ESC] r <n>	1BH,72H	&%RX	59
Set rotated print line length	[ESC] s <n>	1BH,73H	&%RL	60
Select page mode	[ESC] t <n>	1BH,74H	&%PM <m <sub>1</sub> >	62
Perform auto cut	[ESC] v	1BH,76H	&%FC	97
Enable dynamic response	[ESC] w <n>	1BH,77H	none	110
Open cash drawer n=1 Cash Drawer 1 n=2 Cash Drawer 2	[ESC] x <n>	1BH,78H	&%D1 {n=1} &%D2 {n=2}	97
Set control feature commands	[ESC] y <n>	1BH,79H	&%Y0 - 9 or &%YX<m <sub>1</sub> > <m <sub>2</sub> ><m <sub>3</sub> > (for numbers >9)	100
Enable OCR characters	[ESC] y <11>	1BH,79H, 0BH	&%YX011	52
Disable OCR characters	[ESC] y <12>	1BH,79H, 0CH	&%YX012	52
Electronic journal mode begin (Journal station)	[ESC] {	1BH 7BH	None	88
Extended diagnostics	[ESC] ~ <n>	1BH,7EH	none	<b>Error! Bookm ark not define d.</b>

## Low Level Paper Motion Control

### Print/Paper Motion

---

<b>Function</b>	<b>Carriage return</b>
<b>ASCII</b>	[CR]
<b>Hexadecimal</b>	0DH
<b>Decimal</b>	<13>
<b>IPCL</b>	&%CR
<b>EPOS</b>	0DH
<b>Description</b>	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.

---

<b>Function</b>	<b>Line feed</b>
<b>ASCII</b>	[LF]
<b>Hexadecimal</b>	0AH
<b>Decimal</b>	<10>
<b>IPCL</b>	&%LF
<b>EPOS</b>	0AH
<b>Description</b>	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.

---

Function	Horizontal tab
ASCII	[HT]
Hexadecimal	09H
Decimal	<9>
IPCL	&%HT
EPOS	[HT]
Description	The [HT] command inserts spaces in the print buffer up to the next tab stop. The default tab locations are every eight spaces.

---

Function	Back space
ASCII	[BS]
Hexadecimal	08H
Decimal	<8>
IPCL	&%BS
EPOS	[BS]
Description	The [BS] command moves the print buffer one character width to the left. The pointer position cannot be moved to the left of the left margin. [BS] does not cause the buffer to be printed, the following data is OR'ed with the previous data.

---

Function	Set horizontal tab stops
ASCII	[ESC] D <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> > ... <n <sub>i</sub> > 0
Hexadecimal	1BH 44H <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> > ... <n <sub>i</sub> > 00H
Decimal	<27> <68> <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> > ... <n <sub>i</sub> > <0>
IPCL	none
EPOS	[ESC] D <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> > ... <n <sub>i</sub> > 0
Description	The [ESC] D <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> > ... <n <sub>i</sub> > 0 command sets tab stops at the character columns specified by <n>. The end of the settings is specified by a <0>. All previously set tabs will be cleared. The restore-default procedure other than to re-specify the tabs. Column sizes are in accordance with the current character pitch. Setting tabs that are beyond the station width is possible. A [CR] is inserted when the tab is used. Printing begins at the home position. The power up default is every eight spaces, i.e., 9, 17, 25, and so on.

---



## Vertical Motion Control

<b>Function</b>	<b>Perform a fine line feed</b>
<b>ASCII</b>	[ESC] J <n>
<b>Hexadecimal</b>	1BH 4AH <n>
<b>Decimal</b>	<27> <74> <n>
<b>IPCL</b>	&%FM <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >
<b>EPOS</b>	[ESC] J <n>
<b>Description</b>	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.
<b>Note 1</b>	In EPOS mode, the command performs feeds in n/144-inch increments.
<b>Note 2</b>	Immediately after APA graphics, the command is adjusted for the difference between 72 dpi graphics and 101 dpi print.
<b>Function</b>	<b>Set variable line spacing to n/216 inch</b>
<b>ASCII</b>	[ESC] 3 <n>
<b>Hexadecimal</b>	1BH 33H <n>
<b>Decimal</b>	<27> <51> <n>
<b>IPCL</b>	&%SV <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >
<b>EPOS</b>	[ESC] 3 <n>
<b>Description</b>	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.
<b>Note 1</b>	In EPOS mode, the command performs line feeds in n/144-inch increments.
<b>Function</b>	<b>Set line spacing to 1/8 inch</b>
<b>ASCII</b>	[ESC] 0
<b>Hexadecimal</b>	1BH 30H
<b>Decimal</b>	<27> <48>
<b>IPCL</b>	&%ST
<b>EPOS</b>	[ESC] 2
<b>Description</b>	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.
<b>Note 1</b>	In EPOS mode, the command sets 1/6-inch spacing or six lines per inch.

---

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

---

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

---

<b>Function</b>	<b>Enable [ESC] A &lt;n&gt; variable line spacing</b>
<b>ASCII</b>	[ESC] 2
<b>Hexadecimal</b>	1BH 32H
<b>Decimal</b>	<27> <50>
<b>IPCL</b>	none
<b>EPOS</b>	none
<b>Description</b>	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.

---

<b>Function</b>	<b>Feed &lt;n&gt; lines at the current spacing</b>
<b>ASCII</b>	[ESC] d <n>
<b>Hexadecimal</b>	1BH 64H <n>
<b>Decimal</b>	<27> <100> <n>
<b>IPCL</b>	&%FL <m1> <m2>
<b>EPOS</b>	[ESC] d
<b>Description</b>	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.
<b>Note 1</b>	The IPCL command prints from 00 to 99 lines. For example, if you wish to feed 12 lines, the IPCL command would be as follows: &%FL12.

---

<b>Function</b>	<b>Reverse feed &lt;n&gt; lines at the current spacing</b>
<b>ASCII</b>	[ESC] e <n>
<b>Hexadecimal</b>	1BH 65H <n>
<b>Decimal</b>	<27> <101> <n>
<b>IPCL</b>	&%FB <m1> <m2>
<b>EPOS</b>	[ESC] e
<b>Description</b>	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.
<b>Note 1</b>	The IPCL command prints from 00 to 99 lines. For example, if you wish to feed 12 lines, the IPCL command would be as follows: &%FL12.

---

---

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

---

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

---

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

---

<b>Function</b>	<b>Form Feed</b>
<b>ASCII</b>	[FF]
<b>Hexadecimal</b>	0CH
<b>Decimal</b>	<12>
<b>IPCL</b>	&%FF
<b>EPOS</b>	none
<b>Description</b>	The [FF] command performs a form feed to the top of the form.
<b>Note 1</b>	The form feed command can be disabled. Set the form length to zero.

---

<b>Function</b>	<b>Set top of form</b>
<b>ASCII</b>	[ESC] 4
<b>Hexadecimal</b>	1BH 34H
<b>Decimal</b>	<27> <52>
<b>IPCL</b>	&%TF
<b>EPOS</b>	[ESC] L
<b>Description</b>	The [ESC] 4 command sets the top of form to the current position.

---

<b>Function</b>	<b>Set form length in lines</b>
<b>ASCII</b>	[ESC] C <n>
<b>Hexadecimal</b>	1BH 43H <n>
<b>Decimal</b>	<27> <67> <n>
<b>IPCL</b>	&%SL <m <sub>1</sub> > <m <sub>2</sub> >
<b>EPOS</b>	[ESC] C <n>
<b>Description</b>	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.

---

<b>Function</b>	<b>Set form length in inches</b>
<b>ASCII</b>	[ESC] C [NUL] <n>
<b>Hexadecimal</b>	1BH 43H <0> <n>
<b>Decimal</b>	<27> <67> <0> <n>
<b>IPCL</b>	&%SI <m <sub>1</sub> > <m <sub>2</sub> >
<b>EPOS</b>	none
<b>Description</b>	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.
<b>Function</b>	<b>Begin auto line feed</b>
<b>ASCII</b>	[ESC] 5 <n>
<b>Hexadecimal</b>	1BH 35H <n>
<b>Decimal</b>	<27> <53> <n>
<b>IPCL</b>	&%MA (Begin)
<b>IPCL</b>	&%CA (End)
<b>EPOS</b>	none
<b>Description</b>	The [ESC] 5 <1> command sets auto line feed mode. [ESC] 5 <0> command ends auto line feed mode.
<b>Note 1</b>	The begin and end auto line feed command overrides the configuration setting.
<b>Function</b>	<b>Reverse line feed</b>
<b>ASCII</b>	[ESC] ]
<b>Hexadecimal</b>	1BH 5DH
<b>Decimal</b>	<27> <93>
<b>IPCL</b>	&%LR
<b>EPOS</b>	none
<b>Description</b>	The [ESC] ] command performs a reverse line feed at the current line spacing.
<b>Note 1</b>	The iTherm™ 280 Printer can tolerate no more than 1/2 inch of reverse feed.

## Character Pitch

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

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

---

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

---

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

---

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

<b>Function</b>	<b>Set character pitch</b>
<b>ASCII</b>	[ESC] [ P <n>
<b>Hexadecimal</b>	1BH 5BH 50H <n>
<b>Decimal</b>	<27> <91> <80> <n>
<b>IPCL</b>	&%F1, &%F2, &%F3, &%F4, &%F5, &%F6, &%F7
<b>EPOS</b>	[ESC] [SP] <n>
<b>Description</b>	The [ESC] [ P <n> command sets character per inch print pitch to <n>. The printer resolution limits the exact print pitch. The following table lists the exact pitch for various values on <n>.

<n>	Resulting Characters per Inch	IPCL
1	1.00	
2	2.01	
3	3.03	
4	4.06	
5	5.08	
6	6.15	
7	7.00	
8	8.12	&%F7
9	9.23	
10	10.15	&%F3
11	11.28	
12	12.69	&%F2
13	13.53	
14	14.50	
15	15.62	&%F6
16	16.92	
17	18.45	&%F1
18	18.45	
19	20.30	
20	20.30	&%F5
21	22.56	
22	22.56	
23	25.38	
24	25.38	&%F4
25	25.38	
26	29.00	
27	29.00	
28	29.00	
29	29.00	
30	33.83	

Table 13 Character Pitch

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

<b>Function</b>	<b>Set inter-character spacing</b>
<b>Mode</b>	Global
<b>ASCII</b>	[ESC] V <n>
<b>Hexadecimal</b>	1BH 56H <n>
<b>Decimal</b>	<27> <86> <n>
<b>IPCL</b>	none
<b>EPOS</b>	[ESC] [SP] <n>
<b>Description</b>	The [ESC] V <n> command sets inter-character spacing by adding white space between characters. The value of <n> sets the spacing in 216 of an inch. The printer can only set the spacing in 203 of an inch and converts 216 to the nearest 203 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.
<b>Note 1</b>	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.
<b>Note 2</b>	With the inter-character spacing command, the pitch cannot be set less than the font size. Therefore, it is not as effective as the pitch command, [ESC] [ P <n>. The following table lists the cpi equivalent for several values of <n>.

<n>	Small Draft (cpi)	Large Draft (cpi)	NLQ (cpi)
0			
1			
2			
3			
4			
5			

Table 14 Inter-character Spacing

## Character Font

---

<b>Function</b>	<b>Begin 12 x 12 draft print mode</b>
<b>ASCII</b>	[ESC] # <0>
<b>Hexadecimal</b>	1BH 23H 00H
<b>Decimal</b>	<27> <35> <0>
<b>IPCL</b>	&%QT
<b>EPOS</b>	[ESC] ! <n>
<b>Description</b>	The [ESC] # <0> command begins 12 x 12 draft print mode. Draft print is provided to maintain compatibility with other Ithaca® products.

---

<b>Function</b>	<b>Set print quality mode</b>
<b>ASCII</b>	[ESC] I <n>
<b>Hexadecimal</b>	1BH 49H <n>
<b>Decimal</b>	<27> <73> <n>
<b>IPCL</b>	&%QT 10 x 24 Small &%QU 13 x 24 Medium &%QL 15 x 24 Large &%QS 15 x 24 Large
<b>EPOS</b>	[ESC] x <n> and/or [ESC] ! <n>
<b>Description</b>	The [ESC] I <n> command begins draft, large draft or near letter quality print mode.
<b>Where n</b>	0 = 10 x 24 Small 1 = 13 x 24 Medium 2 = 15 x 24 Large 3 = 15 x 24 Large 4 - 7 repeats 0 - 3

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

---

<b>Function</b>	<b>Begin rotated font and/or Right to left entry</b>
<b>ASCII</b>	[ESC] P <n>
<b>Hexadecimal</b>	1BH 50H <n>
<b>Decimal</b>	<27> <80> <n>
<b>IPCL</b>	&%RI {n=2} &%RF {n=1} &%RN {n=0}
<b>EPOS</b>	[ESC] V <n>
<b>Description</b>	The [ESC] P <n> command sets the print font to a rotated 90° or 270° font.
<b>Where n</b>	n = 0    Normal n = 1    Rotate 90° n = 2    Rotate 270°

### 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. It became a problem for the application to match the characters displayed and printed. To solve the problem, a second method of selecting a character set was developed - code pages. The printer and display use the same code page. The application displays and prints the same characters. IBM and EPOS defined new commands to select code pages and left the old commands in effect.

The 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.<sup>6</sup>

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.

Function	Select international character set
ASCII	[ESC] ! <n>
Hexadecimal	1BH 21H <n>
Decimal	<27> <33> <n>
IPCL	&%CS <n>
EPOS	[ESC] R <n>
Description	The [ESC] ! <n> command selects international character set <n>. In standard mode, the value of <n> is as follows.

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

Table 15 Language Table ID's

Function	Select character code page <sup>7</sup>
----------	---

<sup>6</sup> Epson provides limited code page support through ID to code page translation. Only six translations are defined.

<b>ASCII</b>	[ESC] [ T <n <sub>h</sub> > <n <sub>i</sub> >
<b>Hexadecimal</b>	1BH 5BH 54H <n <sub>h</sub> > <n <sub>i</sub> >
<b>Decimal</b>	<27> <91> <84> <n <sub>h</sub> > <n <sub>i</sub> >
<b>IPCL</b>	&%CP <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> > <m <sub>4</sub> >
<b>EPOS</b>	[ESC] t <n>
<b>Description</b>	The [ESC] [ T <n <sub>h</sub> > <n <sub>i</sub> > command selects character code page <n <sub>h</sub> > <n <sub>i</sub> >. The iTherm™ 280 Printer supports many code pages. The following code pages are supported.

Code Page	Country Code/Language Set	Decimal <n <sub>h</sub> > <n <sub>i</sub> >	Hex <n <sub>h</sub> > <n <sub>i</sub> >
64	USA (Slashed 0)	0,64	0H,040H
65	USA (Unslashed 0)	0,65	0H,041H
66	British	0,66	0H,042H
67	German	0,67	0H,043H
68	French	0,68	0H,044H
69	Swedish I	0,69	0H,045H
70	Danish	0,70	0H,046H
71	Norwegian	0,71	0H,047H
72	Dutch	0,72	0H,048H
73	Italian	0,73	0H,049H
74	French Canadian	0,74	0H,04AH
75	Spanish	0,75	0H,04BH
76	Swedish II	0,76	0H,04CH
77	Swedish III	0,77	0H,04DH
78	Swedish IV	0,78	0H,04EH
79	Turkish	0,79	0H,04FH
80	Swiss I	0,80	0H,050H
81	Swiss II	0,81	0H,051H
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

<sup>7</sup> There is an Arabic Character set available on special order with some emulation restrictions.

Code Page	Country Code/Language Set	Decimal <n <sub>h</sub> > <n <sub>i</sub> >	Hex <n <sub>h</sub> > <n <sub>i</sub> >
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 1** The code page field is a 16-bit field that is equivalent to the code page number. For example, 1 \* 256 + 181 = 437. For the IPCL command, the page is specified in ASCII as a 4-byte field.

<b>Function</b>	<b>Print control character</b>
<b>ASCII</b>	[ESC] ^ <n>
<b>Hexadecimal</b>	1BH 5EH <n>
<b>Decimal</b>	<27> <94> <n>
<b>IPCL</b>	&%CC <m1> <m2> <m3>
<b>EPOS</b>	[ESC] ^ <n>
<b>Description</b>	The [ESC] ^ <n> command allows characters from zero to 31 codes to be printed. During normal operation, characters from zero to 31 are control characters. The command turns off control code translation for the following character. <n> can be from zero to 255.

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

<b>Function</b>	<b>Redefine character set</b>
<b>ASCII</b>	[ESC] [ S <L <sub>L</sub> > <L <sub>H</sub> > <B <sub>C</sub> > <T <sub>1L</sub> ><T <sub>1H</sub> > <T <sub>2L</sub> ><T <sub>2H</sub> > <T <sub>3L</sub> ><T <sub>3H</sub> > ... <T <sub>nL</sub> ><T <sub>nH</sub> >
<b>Hexadecimal</b>	1BH 5BH 53H ...
<b>Decimal</b>	<27> <91> <83> ...
<b>IPCL</b>	none
<b>Description</b>	<p>The [ESC] [ S &lt;L<sub>L</sub>&gt; &lt;L<sub>H</sub>&gt; &lt;B<sub>C</sub>&gt; &lt;T<sub>1L</sub>&gt;&lt;T<sub>1H</sub>&gt; &lt;T<sub>2L</sub>&gt;&lt;T<sub>2H</sub>&gt; &lt;T<sub>3L</sub>&gt;&lt;T<sub>3H</sub>&gt; ... &lt;T<sub>nL</sub>&gt;&lt;T<sub>nH</sub>&gt; command allows an application to replace or redefine the active character set mapping in the printer. Where &lt;L<sub>L</sub>&gt; &lt;L<sub>H</sub>&gt; defines the total length of the following data: &lt;L<sub>L</sub>&gt; + 256 * &lt;L<sub>H</sub>&gt; = 1 + 2 * is the total number of characters to be replaced; &lt;B<sub>C</sub>&gt; is the first character in the active map to be replaced; and &lt;T<sub>1H</sub>&gt; &lt;T<sub>1L</sub>&gt;<sup>8</sup> is the internal address of the replacement character image. The mapping of a print pattern to each character address is referred to a code page or character set. At any given time, the printer character set is comprised of 256 characters. Each character is addressed by an 8-bit value generally referred to as a character code. For example, if you want to print an 'A', it would be addressed by sending a &lt;65&gt; 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:</p>

```
[ESC] [ S <3> <0> <35> <90> <1>
```

```

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

```

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

**Note 1**

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

<sup>8</sup> The internal character map is provided in the *Master Character Set Definitions Guide*, PN 100-9785.

Function	Define user-defined characters	Not valid in page mode
ASCII	[ESC] = <y> <c <sub>1</sub> > <c <sub>2</sub> > [<x <sub>1</sub> > <d <sub>1</sub> > ... d(y x x <sub>1</sub> )] ... [<x <sub>k</sub> > <d <sub>1</sub> > ... d (y x x <sub>k</sub> )]	
Hexadecimal	1BH 3DH <y> ...	
Decimal	<27> <51> <y> ...	
Range	y = 2 or 3 32 ≤ c <sub>1</sub> ≤ c <sub>2</sub> ≤ 126 0 ≤ x ≤ 12 (12 x 12 font) 0 ≤ x ≤ 14 (12 x 14 font) 0 ≤ x ≤ 16 (24 x 16 font) 0 ≤ d <sub>1</sub> ... d (y x x) ≤ 255	
IPCL	none	
Description	<p>The [ESC] = &lt;y&gt; &lt;c<sub>1</sub>&gt; &lt;c<sub>2</sub>&gt; [&lt;x<sub>1</sub>&gt; &lt;d<sub>1</sub>&gt; ... d(y x x<sub>1</sub>)] ... [&lt;x<sub>k</sub>&gt; &lt;d<sub>1</sub>&gt; ... d (y x x<sub>k</sub>)] command defines user-defined characters from character code &lt;c<sub>1</sub>&gt; to &lt;c<sub>2</sub>&gt;. &lt;y&gt; and &lt;x&gt; are the configurations of a user-defined character. &lt;y&gt; specifies the number of bytes in the vertical direction. &lt;x&gt; specifies the number of bytes in the horizontal direction. Character code ranges from zero to 255 (FFH) can be defined by &lt;c<sub>1</sub>&gt; and &lt;c<sub>2</sub>&gt;. Up to 32 user-defined characters can be defined. Data (&lt;d&gt;) 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.</p> <p>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 &lt;y&gt; = 2, the 12 x 12 draft font or the 12 x 14 large draft font can be defined. If &lt;y&gt; = 3, only the 16 x 24 NLQ font can be defined. If &lt;y&gt; = 2 and the NLQ font is active, the large draft user-defined font will be loaded. If &lt;y&gt; = 3 and a draft font is active, the NLQ user-defined font will be loaded.</p>	

<b>Function</b>	<b>Cancel user-defined characters</b>
<b>ASCII</b>	[ESC] \$
<b>Hexadecimal</b>	1BH 24H
<b>Decimal</b>	<27> <36>
<b>IPCL</b>	none
<b>Description</b>	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.

---

<b>Function</b>	<b>Enable user-defined characters</b>
<b>ASCII</b>	[ESC] > <n>
<b>Hexadecimal</b>	1BH 3EH <n>
<b>Decimal</b>	<27> <62> <n>
<b>Range</b>	<0>, <1>, 0, or 1 1 Enables the characters 0 Disables the characters
<b>IPCL</b>	none
<b>Description</b>	The [ESC] > <n> command enables or disables the user-defined characters. The internal character set is printed.

---

<b>Function</b>	<b>Enable OCR characters</b>
<b>ASCII</b>	[ESC] y <11>
<b>Hexadecimal</b>	1BH 79H 0BH
<b>Decimal</b>	<27> <121> <11>
<b>IPCL</b>	&%YX011
<b>EPOS</b>	[ESC] y <11>
<b>Description</b>	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.
<b>Note 1</b>	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.
<b>Note 2</b>	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.

---

<b>Function</b>	<b>Disable OCR characters</b>
<b>ASCII</b>	[ESC] y <12>
<b>Hexadecimal</b>	1BH 79H 0CH
<b>Decimal</b>	<27> <121> <12>
<b>IPCL</b>	&%YX012
<b>EPOS</b>	[ESC] y <12>
<b>Description</b>	The [ESC] y <12> command returns the 30 OCR characters to the previously selected character set. It does not restore the print mode.
<b>Note</b>	Any character definitions defined by the redefine character set command are also replaced by the [ESC] y <12> command.

## OCR Characters

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

Table 18 OCR MA-3

## Character Attribute Commands

<b>Function</b>	<b>Select color</b>
<b>ASCII</b>	[ESC] c <n>
<b>Hexadecimal</b>	1BH 63H <n>
<b>Decimal</b>	<27> <99> <n>
<b>IPCL</b>	&%CL <m <sub>1</sub> >
<b>EPOS</b>	none
<b>Description</b>	The [ESC] c <n> command selects the print color and should match the color of the pen installed.
<b>Where &lt;n&gt;</b>	0 = Black 1 = Red 2 = Green 3 = Blue

---

<b>Function</b>	<b>Begin one-line double-wide print</b>
<b>ASCII</b>	[SO]
<b>Hexadecimal</b>	0EH
<b>Decimal</b>	<14>
<b>IPCL</b>	&%MW
<b>EPOS</b>	none
<b>Description</b>	The [SO] command causes subsequent characters to be printed at twice the currently selected character width. For example, 10 cpi becomes 5 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.

---

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

---

<b>Function</b>	<b>Enable/Disable overscore</b>
<b>ASCII</b>	[ESC] _ <n>
<b>Hexadecimal</b>	1BH 5FH 01H
<b>Decimal</b>	<27> <95> <n>
<b>IPCL</b>	&%MO (Begin)
<b>IPCL</b>	&%CO (End)
<b>EPOS</b>	[ESC] ! <n>
<b>Description</b>	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.
<b>Note 1</b>	In EPOS mode, [ESC] ! <n> performs a similar function; however, near letter quality (NLQ) is not available.

<b>Function</b>	<b>Multi-line double-wide and double-high mode</b>		
<b>ASCII</b>	[ESC] W <n>		
<b>Hexadecimal</b>	1BH 57H <n>		
<b>Decimal</b>	<27> <87> <n>		
<b>IPCL</b>	&%FD {n = 1} &%FS {n = 0} &%FHA {n = 3}		
	(Note: Single-wide, double-high mode is not available in IPCL mode.)		
<b>EPOS</b>	[ESC] ! <n>		
<b>Description</b>	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.		
<b>Note 1</b>	The [ESC] W <n> command does not affect line spacing.		
<b>Note 2</b>	In EPOS mode, [ESC] ! <n> performs a similar function; however, near letter quality (NLQ) is not available.		
<b>Function</b>	<b>Set print style: double-wide, double-high, italic control</b>		
<b>ASCII</b>	[ESC] [ @ [EOT] [NUL] <k> [NUL] <n> <m>		
<b>Hexadecimal</b>	1BH 5BH 40H 04H 00H <k> 00H <n> <m>		
<b>Decimal</b>	<27> <91> <64> <04> <0> <K> <0> <n> <m>		
<b>IPCL</b>	&%DH Double-high, double-wide, and double-space &%SH Single-high, single-wide, and single-space Also, see [ESC] W above.		
<b>Description</b>	The [ESC] [ @ [EOT] [NUL] <k> [NUL] <n> <m> command sets double-wide, double-high, and italic print mode.		
<b>Where k bits</b>	<b>k</b>	<b>76543210</b>	
		----xxxx	Italic control
	0	----0000	No change
	1	----0001	Italics On
	2	----0010	Italics Off
<b>Where n bits</b>	<b>n</b>	<b>76543210</b>	
		----0nnn	Height multiplier (Maximum 4)
	0	----0000	No change
		xxxx----	Line spacing
	0	0000----	No change
<b>Where m bits</b>	<b>m</b>	<b>76543210</b>	
		----0nnn	Width multiplier (Maximum 4)
	0	----0000	No change
<b>Note 1</b>	The maximum height and width multiplier is four.		

---

<b>Function</b>	<b>Begin underline</b>
<b>ASCII</b>	[ESC] - <n>
<b>Hexadecimal</b>	1BH 2DH 01H
<b>Decimal</b>	<27> <45> <n>
<b>IPCL</b>	&%MU (Begin)
<b>IPCL</b>	&%CU (End)
<b>EPOS</b>	[ESC] ! <n>
<b>Description</b>	The [ESC] - <1> command begins underline print mode. All subsequent text, leading spaces, and trailing spaces are underlined. [ESC] - <0> ends the mode.
<b>Note 1</b>	In EPOS mode, [ESC] ! <n> performs a similar function; however, near letter quality (NLQ) is not available.

---

<b>Function</b>	<b>Begin enhanced print</b>
<b>ASCII</b>	[ESC] G
<b>Hexadecimal</b>	1BH 47H
<b>Decimal</b>	<27> <71>
<b>IPCL</b>	&%ME
<b>EPOS</b>	[ESC] G <1>
<b>Description</b>	All subsequent text is printed in enhanced print mode (two passes with a vertical offset). Enhanced printing provides a deeper resolution of each character.

---

<b>Function</b>	<b>End enhanced print mode</b>
<b>ASCII</b>	[ESC] H
<b>Hexadecimal</b>	1BH 48H
<b>Decimal</b>	<27> <72>
<b>IPCL</b>	&%CE
<b>EPOS</b>	[ESC] G <0>
<b>Description</b>	The [ESC] H command cancels enhanced print mode and returns to the currently selected font.

---

<b>Function</b>	<b>Begin emphasized print mode</b>
<b>ASCII</b>	[ESC] E
<b>Hexadecimal</b>	1BH 45H
<b>Decimal</b>	<27> <69>
<b>IPCL</b>	&%MM
<b>EPOS</b>	[ESC] E <1>
<b>Description</b>	The [ESC] E command begins emphasized print mode (one pass with horizontal offset). Emphasized print is bolder than normal print.

---

<b>Function</b>	<b>End emphasized print mode</b>
<b>ASCII</b>	[ESC] F
<b>Hexadecimal</b>	1BH 46H
<b>Decimal</b>	<27> <70>
<b>IPCL</b>	&%CM
<b>EPOS</b>	[ESC] E <0>
<b>Description</b>	The [ESC] F command cancels emphasized print mode.

---

---

<b>Function</b>	<b>Select superscript</b>
<b>ASCII</b>	[ESC] S <0>
<b>Hexadecimal</b>	1BH 53H 00H
<b>Decimal</b>	<27> <83> <0>
<b>IPCL</b>	&%SP
<b>EPOS</b>	none
<b>Description</b>	The [ESC] S <0> command selects superscript. The following characters are printed half size on the upper side of the print line.
<b>Note 1</b>	Superscript is not available in all print modes.

---

<b>Function</b>	<b>Select subscript</b>
<b>ASCII</b>	[ESC] S <1>
<b>Hexadecimal</b>	1BH 53H 01H
<b>Decimal</b>	<27> <83> <1>
<b>IPCL</b>	&%SB
<b>EPOS</b>	none
<b>Description</b>	The [ESC] S <1> command selects subscript. The following characters are printed half size on the bottom side of the print line.
<b>Note 1</b>	Subscript is not available in all print modes.

---

<b>Function</b>	<b>End superscript or subscript</b>
<b>ASCII</b>	[ESC] T
<b>Hexadecimal</b>	1BH 54H
<b>Decimal</b>	<27> <84>
<b>IPCL</b>	&%SE
<b>EPOS</b>	none
<b>Description</b>	The [ESC] T command ends superscript or subscript.

---

<b>Function</b>	<b>Begin italics</b>
<b>ASCII</b>	[ESC] % G
<b>Hexadecimal</b>	1BH 25H 47H
<b>Decimal</b>	<27> <37> <71>
<b>IPCL</b>	&%MI
<b>EPOS</b>	[ESC] 4
<b>Description</b>	The [ESC] % G command begins italic print mode.
<b>Note 1</b>	Italics are not available in all print modes.

---

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

## Print Zone Control

---

Function	Set left/right print margins
ASCII	[ESC] X <n <sub>1</sub> > <n <sub>2</sub> >
Hexadecimal	1BH 58H <n <sub>1</sub> > <n <sub>2</sub> >
Decimal	<27> <88> <n <sub>1</sub> > <n <sub>2</sub> >
IPCL	none
EPOS	[ESC] I, [ESC] Q
Description	The [ESC] X <n <sub>1</sub> > <n <sub>2</sub> > command sets left and right print margins in characters from the home position. Where n <sub>1</sub> = left margin and n <sub>2</sub> = right margin, the absolute position depends on the current print pitch. If the left and right margins are set to the right of the current horizontal position, the new margins become valid in the same line. If the left margin is set to the left of the current horizontal position, and the right margin is 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.

## 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.

Line spacing is controlled by inserting [LF] (1/8 inch) or [ESC] J <n> (n/216 inch) commands in the rotated data.

Note: The rotated 90 and 270 commands are supported for compatibility with previous PcOS printers. It is recommended the page mode be used to format rotated print.

Function	Begin rotated print
ASCII	[ESC] r <n>
Hexadecimal	1BH 72H <n>
Decimal	<27> <114> <n>
IPCL	&%RX
EPOS	[ESC] T <3>
Description	The [ESC] r <n> command starts rotated print mode where n defines the mode as shown below. In Page Mode, this command operate with 0 and 180° only.

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 iTherm printer supports a full, buffered page mode. When in page mode, this command will operate with 0 and 180° only.

**Rotated Print Summary**

Function	Begin 90° rotated print	Not available in Page Mode
ASCII	[ESC] r <1>	
Hexadecimal	1BH 72H 01H	
Decimal	<27> <114> <1>	
IPCL	&%R1	
Function	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	
Function	Begin 270° rotated print	Not available in Page Mode
ASCII	[ESC] r <3>	
Hexadecimal	1BH 72H 03H	
Decimal	<27> <114> <3>	
IPCL	&%R3	
Function	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>	
Function	End rotated print	
ASCII	[ESC] r <0>	
Hexadecimal	1BH 72H 00H	
Decimal	<27> <114> <0>	
IPCL	&%R0	
EPOS	[ESC] { <0>	
Description	The [ESC] r <0> command prints the contents of the rotated print buffer (when in 90° or 270° rotated mode) and returns to normal print orientation. In 180° rotated mode, the printer returns to normal mode. Characters in the print buffer that have not been printed are not printed.	

**Rotated Print Length Format**

Function	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 <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> >	
EPOS	none	
Description	The [ESC] s <n> command sets the print line length used in autoformat rotated print mode. The maximum number of characters per line is 128. The power on default line length is 80 characters. To determine the number of available print lines, divide 1760 by the number of characters per line and round down to the nearest whole number. There must be a minimum of 80 characters per line, which allows up to 22 lines of print. A value less than 80 does not allow additional print lines. Values greater than 80 reduce the number of lines.	

## 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.

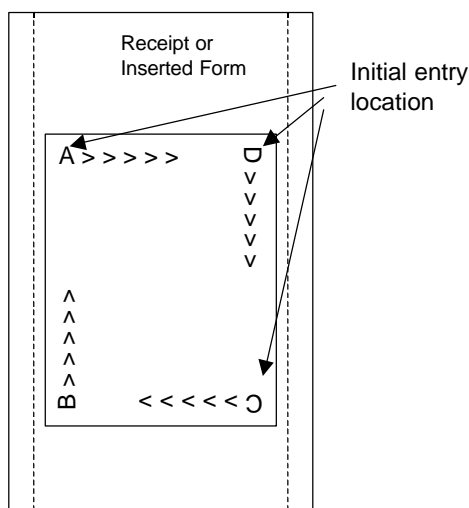


Figure 7 Page Mode entry Orientations

### 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 proceeded 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>

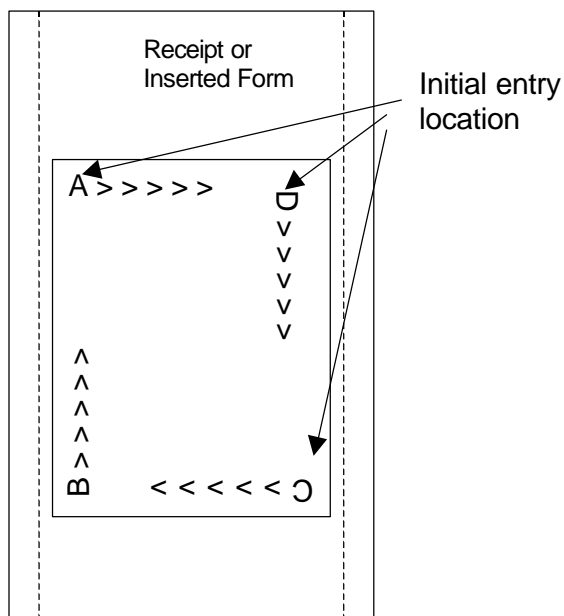
**IPCL**            &%PM<x<sub>1</sub>>

**EPOS**           [ESC] L

**Description**    This command activates page mode and sets the orientation.

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

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



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

**Note:**            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<sub>L</sub>><X<sub>H</sub>><Y<sub>L</sub>><Y<sub>H</sub>><F>  
**Hexadecimal** 1BH 6FH <X<sub>L</sub>><X<sub>H</sub>><Y<sub>L</sub>><Y<sub>H</sub>><F>  
**Decimal** <27><111><X<sub>L</sub>><X<sub>H</sub>> <Y<sub>L</sub>><Y<sub>H</sub>><F>  
**EPOS** [ESC] W

**Description** 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.

The X and Y positions are in dots.

$Y = Y_h * 256 + Y_l$  dots from the top

$X = X_h * 256 + X_l$  dots from the left

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.

**Note:** You can also use the [ESC]J, [ESC]M, [ESC]d and [ESC]e commands to position the print on the page.

---

<b>Function</b>	<b>Exit Page Mode</b>
<b>ASCII</b>	[FF]
<b>Hexadecimal</b>	0CH
<b>Decimal</b>	<12>
<b>IPCL</b>	&%FF
<b>EPOS</b>	[FF]
<b>Description</b>	This command exits page mode definition and starts the print process. If the printer is not in page mode this command is treated as a normal form feed command.
<b>Note:</b>	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.

## iTherm™ 280 Graphics

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.

The iTherm™ 280 Printer always prints in one of the native resolutions of 101 x 101, 203 x 101, 101 x 203, or 203 x 203 dpi. To provide compatibility with the standard IBM APA resolutions, the printer internally modifies the graphics to print as expected. The printer converts the vertical resolution by altering the [ESC] J command (which is typically used for vertical spacing) and adjusting it so that horizontal passes touch as expected. The requested horizontal resolution is converted by data scaling. Because the vertical dpi of the printer is always greater, the resulting APA graphics printed on the iTherm™ 280 Printer are slightly smaller than the same graphic printed on an impact printer. All of this is done transparently to the application; however, loss of resolution may result in some modes. If desired the [ESC] \* <m> command can be used to select the native resolution.

**Note 1** If the iTherm™ 280 Printer is used with programs that convert text to graphics, the printer is slower than if the printer is sent ASCII text. The iTherm™ 280 Printer is supported by a Windows print driver that allows applications to select supported fonts.

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

### Standard APA Graphics

<b>Function</b>	<b>Print single-density graphics (60h x 72v dpi)</b>
<b>ASCII</b>	[ESC] K <n <sub>1</sub> > <n <sub>2</sub> >
<b>Hexadecimal</b>	1BH 4BH <n <sub>1</sub> > <n <sub>2</sub> >
<b>Decimal</b>	<27> <75> <n <sub>1</sub> > <n <sub>2</sub> >
<b>IPCL</b>	none
<b>Description</b>	The [ESC] K <n <sub>1</sub> > <n <sub>2</sub> > command prints <n <sub>1</sub> > + 256 * <n <sub>2</sub> > bytes of single-density graphics (60 dpi).
<b>Function</b>	<b>Print half-speed double-density graphics (120h x 72v dpi)</b>
<b>ASCII</b>	[ESC] L <n <sub>1</sub> > <n <sub>2</sub> >
<b>Hexadecimal</b>	1BH 4CH <n <sub>1</sub> > <n <sub>2</sub> >
<b>Decimal</b>	<27> <76> <n <sub>1</sub> > <n <sub>2</sub> >
<b>IPCL</b>	none
<b>Description</b>	The [ESC] L <n <sub>1</sub> > <n <sub>2</sub> > command prints <n <sub>1</sub> > + 256 * <n <sub>2</sub> > bytes of double-density graphics (120 dpi) at half speed allowing full and half dots to be printed.
<b>Function</b>	<b>Print full-speed double-density graphics (120h x 72v dpi)</b>
<b>ASCII</b>	[ESC] Y <n <sub>1</sub> > <n <sub>2</sub> >
<b>Hexadecimal</b>	1BH 59H <n <sub>1</sub> > <n <sub>2</sub> >
<b>Decimal</b>	<27> <89> <n <sub>1</sub> > <n <sub>2</sub> >
<b>IPCL</b>	none
<b>Description</b>	The [ESC] Y <n <sub>1</sub> > <n <sub>2</sub> > command prints <n <sub>1</sub> > + 256 * <n <sub>2</sub> > bytes of double-density graphics (120 dpi) at full speed with no consecutive dots. (The mode is generally used to print 120h by 144v dpi resolutions in two passes)

---

<b>Function</b>	<b>Print quad-density graphics (240h x 72v dpi)</b>
<b>ASCII</b>	[ESC] Z <n <sub>1</sub> > <n <sub>2</sub> >
<b>Hexadecimal</b>	1BH 5AH <n <sub>1</sub> > <n <sub>2</sub> >
<b>Decimal</b>	<27> <90> <n <sub>1</sub> > <n <sub>2</sub> >
<b>IPCL</b>	none
<b>Description</b>	The [ESC] Z <n <sub>1</sub> > <n <sub>2</sub> > command prints <n <sub>1</sub> > + 256 * <n <sub>2</sub> > bytes of quad-density graphics (240 dpi) at half speed with no consecutive dots. (The mode is generally used to print 240h by 144v dpi resolutions in two passes)

### Extended APA Graphics

---

Function	Print graphics in mode <m> (60h/ 120h/ 240h x 72v dpi)			
ASCII	[ESC] * <m> <n <sub>1</sub> > <n <sub>2</sub> >			
Hexadecimal	1BH 2AH <m> <n <sub>1</sub> > <n <sub>2</sub> >			
Decimal	<27> <42> <m> <n <sub>1</sub> > <n <sub>2</sub> >			
IPCL	none			
Description	The [ESC] * <m> <n <sub>1</sub> > <n <sub>2</sub> > command selects one of three graphic modes as specified by <m>.			
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	101 x 101 dpi		1 horizontal 1 vertical pass
	11	203 x 101 dpi		2 horizontal 1 vertical pass
	12	101 x 203 dpi		1 horizontal 2 vertical passes
	13	203 x 203 dpi		2 horizontal 2 vertical passes
	15,16	Not supported		

---

<b>Function</b>	<b>Reassign graphic mode</b>				
<b>ASCII</b>	[ESC] ? <m> <n>				
<b>Hexadecimal</b>	1BH 3FH <m> <n>				
<b>Decimal</b>	<27> <63> <m> <n>				
<b>IPCL</b>	none				
<b>Description</b>	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:				
<b>Where &lt;m&gt;</b>	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	101 x 101 dpi		Native 1/4 density	
	11	203 x 101 dpi		Native 1/2 density	
	12	101 x 203 dpi		Native 1/2 density	
	13	203 x 203 dpi		Native density	
<b>Note 1</b>	Modes 11 through 13 are designed to support horizontal graphics and not intended for APA graphics.				

---

<b>Function</b>	<b>Select unidirectional print</b>				
<b>ASCII</b>	[ESC] U <1>				
<b>Hexadecimal</b>	1BH 55H 01H				
<b>Decimal</b>	<27> <85> <1>				
<b>IPCL</b>	&%GU				
<b>EPOS</b>	ESC] U <1>				
<b>Description</b>	The [ESC] U <1> command prints all data in unidirectional print mode to improve line to line registration for graphical data.				
<b>Note 1</b>	Unidirectional print should be canceled before normal text is printed. Print time is slowed if it is not canceled.				

---

<b>Function</b>	<b>Select bi-directional print</b>				
<b>ASCII</b>	[ESC] U <0>				
<b>Hexadecimal</b>	1BH 55H 00H				
<b>Decimal</b>	<27> <85> <0>				
<b>IPCL</b>	&%GB				
<b>EPOS</b>	[ESC] U <0>				
<b>Description</b>	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 3 color plans. Typically, a red plane or scan line is sent, then green and blue. The sequence of lines defines one row of dots that is printed on the paper.

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

Function	Process horizontal graphics data
ASCII	[ESC] h <color> <length> <format> <data>
Hexadecimal	1BH 68H
Decimal	<27> <104>
IPCL	None
EPOS	None
Description	<p>The [ESC] h &lt;color&gt; &lt;length&gt; &lt;format&gt; &lt;data&gt; command processes horizontal graphic data. Where &lt;color&gt; is a byte that specifies the color of the data being sent.</p> <p>&lt;color&gt; =           0 Use Previously Selected Color  1 Red  2 Green  4 Blue</p>
<b>Note 1</b>	Red, green, and blue pixels set to one at the same location result in white dot. While red, green, and blue pixels set to zero form a black dot. For black print, 1 represents a black dot, while a 0 represents a white dot.
<b>Note 2</b>	<p>More than one color may be set at a time. Setting the color to six would set green and blue simultaneously. Where &lt;length&gt; is a byte specifying the length of the data including the format byte.</p> <p>&lt;length&gt; =           0 to 254 (255 is reserved for future use.)</p> <p>Where &lt;format&gt; is a byte specifying the format of the graphics data.</p> <p>&lt;format&gt; =           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</p>

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

<b>Function</b>	<b>Set horizontal graphic mode</b>		
<b>ASCII</b>	[ESC] * <m> <0> <0>		
<b>Hexadecimal</b>	1BH 2AH <m> <0> <0>		
<b>Decimal</b>	<27> <42> <m> <0> <0>		
<b>IPCL</b>	none		
<b>Description</b>	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.		
<b>Where &lt;m&gt;</b>	0,2,3,4,5,6,7	Standard Graphic Modes (See above.)	
	8,9	Not supported	
	10	101 x 101 dpi	1 horizontal, 1 vertical pass
	11	203 x 101 dpi	2 horizontal, 1 vertical pass
	12	101 x 203 dpi	1 horizontal, 2 vertical passes
	13	203 x 203 dpi	2 horizontal, 2 vertical passes
	14,15,16	Not supported	
<b>Note 1</b>	Only modes 10 thorough 13 should be selected for horizontal graphics.		
<b>Example</b>	<b>Command</b>	<b>Comment</b>	
	ESC * <10> <0> <0>	Set resolution to 100 x 101 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>

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.

In difference compression, data is represented in byte pairs. In compression, the first byte is an index into the byte stream, as it would exist if sent in an uncompressed format. The second byte is the data that is different in the new scan line data. Think of compression mode as, "The scan line is the same as the previous except for the byte at a specific position." ESC h <1> <5> <254> <03H> <d5H> <0bH> <51H> Where <03H> <d5H> means use the previously transmitted scan line data but change byte 3 to a d5H and change byte 11 (0bH) to a 51H.

### Same-As-Previous Compression

In same-as-previous compression, the command does not contain any graphics data. The command specifies that the printer is to use the previous scan line data for the current scan line. ESC h <1> <1> <255>.

### User Store (Graphic Save)

The iTherm™ 280 Printer maintains a 16K (16384 bytes) section of flash memory and up to 192K of extended flash memory to save user information. The information can be either macros or user-defined characters. These groups of data are indexed by name and may be called up at any time after they are stored. See the sections on Macros and User-defined Characters for definitions of these functions.

To allow the host application to maintain these groups of data, a series of user store maintenance commands are available. As referenced earlier in this manual, the user can define a limited number of custom characters and define a macro. These character/macro definitions can also be saved in user store. However, only one character definition and one macro can be active at any time. One macro and one user-defined character definition can be flagged to load and run at startup. If a flag is set, the printer will automatically process the macro and/or load the user-defined character set at initialization.

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

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

### Defining Macros

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

<b>Function</b>	<b>Begin named macro record</b>
<b>ASCII</b>	[ESC] [US] b <Name..> <0> Then send the data to be recorded. The printer does not process the data. The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 75.
<b>Function</b>	<b>End name macro record</b>
<b>ASCII</b>	[ESC] [US] e <Name..> <0> The second way to define macros is to use [ESC] g commands to define the macro and then the save macro data command to save the data. The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 75.
<b>Function</b>	<b>Start macro record</b>
<b>ASCII</b>	[ESC] g <1>Then send the data to be recorded. (The data is processed and printed).
<b>Function</b>	<b>Stop macro record</b>
<b>ASCII</b>	[ESC] g <2>Then save the macro.
<b>Function</b>	<b>Save macro data</b>
<b>ASCII</b>	[ESC] [US] m <Name..><0> Saving User-defined Characters. To save user-defined characters, first define the character set.

<b>Function</b>	<b>Define user-defined characters</b>
<b>ASCII</b>	<p>[ESC] = &lt;y&gt; &lt;c<sub>1</sub>&gt; &lt;c<sub>2</sub>&gt; [x<sub>1</sub> d<sub>1</sub> ... d(y x x<sub>1</sub>)] ... [x<sub>k</sub> d<sub>1</sub> ... d(y x x<sub>k</sub>)]</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>
<b>Function</b>	<b>Save user-defined characters</b>
<b>ASCII</b>	<p>[ESC] [US] c &lt;Name..&gt; &lt;0&gt;</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 &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&lt;n&gt; on page 75.</p>
<b>Function</b>	<b>Load item from user store</b>
<b>ASCII</b>	<p>[ESC] [US] l &lt;Name..&gt; &lt;0&gt;</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 &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&lt;n&gt; on page 75.</p>
<b>Function</b>	<b>Flag as a start-up macro</b>
<b>ASCII</b>	<p>[ESC] [US] s &lt;Name..&gt; &lt;0&gt;</p> <p>The [ESC] [US] s &lt;Name..&gt; &lt;0&gt; 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 &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&lt;n&gt; on page 75.</p>
<b>Function</b>	<b>Remove item from user store</b>
<b>ASCII</b>	<p>[ESC] [US] e &lt;Name..&gt; &lt;0&gt;</p> <p>The [ESC] [US] e &lt;Name..&gt; &lt;0&gt; command removes an item from user store and frees up its space. The terminating &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&lt;n&gt; on page 75.</p>
<b>Function</b>	<b>Flush information from user store</b>
<b>ASCII</b>	[ESC] [US] f ALL <0>    Base User Store
<b>or</b>	[ESC] [US] f EXT <0>    Extended User Store.
<b>Description</b>	<p>The [ESC] [US] f ALL &lt;0&gt; command clears all of the information to the user store and frees the data space. The [ESC] [US] f EXT &lt;0&gt; command clears all of the information in the extended the user store.</p> <p>The terminating &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&lt;n&gt; on page 75.</p>

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<b>Function</b>	<b>Report on user store</b>
<b>ASCII</b>	ESC] [US] q <0>
<b>Description</b>	The [ESC] [US] q <0> prints or returns information about the contents of and available space in user store.
<b>Note 1</b>	<p>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.</p> <p>The terminating &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&lt;n&gt; on page 75.</p>

## User-Store Commands

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<b>Function</b>	<b>Begin named macro record</b>
<b>ASCII</b>	[ESC] [US] b <Name..> <0>
<b>Hexadecimal</b>	1BH 1FH 62H
<b>Decimal</b>	<27> <31> <98>
<b>IPCL</b>	&%UB <Name..> <0>
<b>EPOS</b>	none
<b>Description</b>	<p>The [ESC] [US] b &lt;Name..&gt; &lt;0&gt; command erases the current macro, initializes the macro buffer structure, and redirects the following data to the macro buffer. It uses the &lt;Name..&gt; 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.</p> <p>The terminating &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&lt;n&gt; on page 75.</p>

---

<b>Function</b>	<b>End named macro record</b>
<b>ASCII</b>	[ESC] [US] e <Name..> <0>
<b>Hexadecimal</b>	1BH 1FH 65H
<b>Decimal</b>	<27> <31> <101>
<b>IPCL</b>	&%UG <Name..> <0>
<b>EPOS</b>	none
<b>Description</b>	<p>The [ESC] [US] e &lt;Name..&gt; &lt;0&gt; command ends the macro record operation and saves the macro to flash. It uses the &lt;Name..&gt; field to verify the command end and must match the "Begin named macro record" command. If the name already exists in the flash user store or the macro memory is exceeded, the command is valid, and the &lt;Name..&gt; field prints. If there is not enough room in the flash user store for the macro, the save is not performed, but the macro buffer is valid.</p> <p>The terminating &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&lt;n&gt; on page 75.</p>

---

<b>Function</b>	<b>Save macro data in user store</b>
<b>ASCII</b>	[ESC] [US] m <Name..> <0>
<b>Hexadecimal</b>	1BH 1FH 6DH
<b>Decimal</b>	<27> <31> <109>
<b>IPCL</b>	&%UM <Name..> <0>
<b>EPOS</b>	[GS] -...<Name..> <0> is from one to 15 characters and must be null terminated.
<b>Description</b>	<p>The [ESC] [US] m &lt;Name..&gt; &lt;0&gt; command saves the current macro buffer structure into the flash user-store area. It uses the &lt;Name..&gt; field as a reference name. If the name already exists in the flash user store, the command does not store the data.</p> <p>The terminating &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&lt;n&gt; on page 75.</p>

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<b>Function</b>	<b>Save user-defined characters</b>
<b>ASCII</b>	[ESC] [US] c <Name..> <0>
<b>Hexadecimal</b>	1BH 1FH 63H
<b>Decimal</b>	<27> <31> <99>
<b>IPCL</b>	&%UC <Name..><0>
<b>EPOS</b>	[GS] 6<Name..> <0> is from one to 15 characters and must be null terminated.
<b>Description</b>	<p>The [ESC] [US] c &lt;Name..&gt; &lt;0&gt; command saves the current user-defined character structure in the flash user-save storage area. It uses the&lt;Name..&gt; field as a reference. If the name already exists in the flash user store, the command will not store the data.</p> <p>The terminating &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&lt;n&gt; on page 75.</p>

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<b>Function</b>	<b>Load item from user store</b>
<b>ASCII</b>	[ESC] [US] l <Name..> <0>
<b>Hexadecimal</b>	1BH 1FH 6CH
<b>Decimal</b>	<27> <31> <108>
<b>IPCL</b>	&%UL <Name..> <0>
<b>EPOS</b>	[GS] 0<Name..> <0> is from one to 15 characters and must be null terminated.
<b>Description</b>	<p>The [ESC] [US] l &lt;Name..&gt; &lt;0&gt; 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 &lt;0&gt; inserts the macro buffer into the data stream. If the named item does not exist, the command does nothing.</p> <p>The terminating &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&gt;n&gt; on page 75.</p>

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<b>Function</b>	<b>Run macro data from user store</b>
<b>ASCII</b>	[ESC] [US] r <Name..> <0>
<b>Hexadecimal</b>	1BH 1FH 72H
<b>Decimal</b>	<27> <31> <114>
<b>IPCL</b>	&%UR <Name..> <0>
<b>EPOS</b>	[GS] 0<Name..> <0> is from one to 15 characters and must be null terminated.
<b>Description</b>	<p>The [ESC] [US] r &lt;Name..&gt; &lt;0&gt; 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.</p> <p>The terminating &lt;0&gt; may be replaced with an &amp; or redefined. See [ESC] [EM]T&lt;n&gt; or &amp;%UT&lt;n&gt; on page 75.</p>

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<b>Function</b>	<b>Flag item as a start-up macro</b>
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<b>ASCII</b>	[ESC] [US] s <Name..> <0>
<b>Hexadecimal</b>	1BH 1FH 73H
<b>Decimal</b>	<27> <31> <115>
<b>IPCL</b>	&%US <Name..> <0>
<b>EPOS</b>	[GS] 0<Name..> <0> is from one to 15 characters and must be null terminated.
<b>Description</b>	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.
<b>Note</b>	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 75

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<b>Function</b>	<b>Delete item from user store</b>
<b>ASCII</b>	[ESC] [US] d <Name..> <0>
<b>Hexadecimal</b>	1BH 1FH 64H
<b>Decimal</b>	<27> <31> <100>
<b>IPCL</b>	&%UD <Name..> <0>
<b>EPOS</b>	[GS] 1 <Name..> <0> is from one to 15 characters and must be null terminated.
<b>Description</b>	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 75.

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<b>Function</b>	<b>Transfer all items from user store to extended user store.</b>
<b>ASCII</b>	[ESC] [US] t <0>
<b>Hexadecimal</b>	1BH 1FH 74H
<b>Decimal</b>	<27> <31> <116>
<b>IPCL</b>	&%UX <0>
<b>EPOS</b>	None
<b>Description</b>	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 75.

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<b>Function</b>	<b>Flush information from user store or extended user store</b>
<b>ASCII</b>	[ESC] [US] f ALL <0>      User Store.
<b>Or</b>	[ESC] [US] f EXT <0>      Extended User Store.
<b>Hexadecimal</b>	1BH 1FH 66H 00H
<b>Decimal</b>	<27> <31> <102> <0>
<b>IPCL</b>	&%UF
<b>EPOS</b>	[GS] 5
<b>Description</b>	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 75.

---

<b>Function</b>	<b>Report on user store</b>
<b>ASCII</b>	[ESC] [US] q <0>      Print a user store report
<b>Or</b>	[ESC] [US] ? <0>      Return a formatted user store report
<b>Hexadecimal</b>	1BH 1FH 71H
<b>Decimal</b>	<27> <31> <113>
<b>IPCL</b>	&%UQ <Name..> <0>

**EPOS** [GS] 3

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

**Note 1** The report is also printed as part of the configuration report. The terminating <0> may be replaced with an & or redefined. See [ESC] [EM]T<n> or &%UT<n> on page 75.

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**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 is designed to store 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 the user store, it is expanded into the macro buffer, and replaces whatever is currently there.

### Programming Considerations

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

The buffer is initially about 16K<sup>9</sup> bytes long. All commands<sup>10</sup> and print data are placed in the buffer and must be included in the size limits. The printer does not indicate when the buffer is full. The application must make sure that the buffer is not overfilled. The printer simply stops saving information when it is full. As the buffer fills, the input data is printed normally. The effect of the macro start command is to clear the buffer and to start to save the input data. The macro stop command stops saving data and initializes internal pointers for the next print. To store the data in the nonvolatile flash, it must be named and saved by one of the user store save commands.

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

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<sup>9</sup> The actual buffer is smaller because of the overhead.

<sup>10</sup> IPCL commands are converted by the printer into an equivalent [ESC] code and then placed in the save buffer. The equivalent [ESC] code should be used to calculate the size of the save buffer data.

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.

### Legacy Macro Commands

The iTherm™ 280 Printer maintains a number of legacy PcOS macro commands. It is intended that these commands not be used for new applications as the new commands allow multiple macros to be saved.

<b>Function</b>	<b>Process user macro</b>
<b>ASCII</b>	[ESC] g <0>
<b>Hexadecimal</b>	1BH 67H 00H
<b>Decimal</b>	<27> <103> <0>
<b>IPCL</b>	&%GP
<b>EPOS</b>	[ESC] g <0>
<b>Description</b>	The [ESC] g <0> command prints the user store data buffer.
<b>Function</b>	<b>Start macro record</b>
<b>ASCII</b>	[ESC] g <1>
<b>Hexadecimal</b>	1BH 67H 01H
<b>Decimal</b>	<27> <103> <1>
<b>IPCL</b>	&%GS
<b>EPOS</b>	[ESC] g <1>
<b>Description</b>	The [ESC] g <1> command clears the user store data buffer and begins recording data. The next 2,000 bytes (including characters and commands) are recorded.
<b>Function</b>	<b>Stop macro record</b>
<b>ASCII</b>	[ESC] g <2>
<b>Hexadecimal</b>	1BH 67H 02H
<b>Decimal</b>	<27> <103> <2>
<b>IPCL</b>	&%GE
<b>EPOS</b>	[ESC] g <2>
<b>Description</b>	The [ESC] g <2> command stops recording user store data information. The buffer is not saved into the nonvolatile memory.
<b>Function</b>	<b>Stop macro record and save</b>
<b>ASCII</b>	[ESC] g <3>
<b>Hexadecimal</b>	1BH 67H 03H
<b>Decimal</b>	<27> <103> <3>
<b>IPCL</b>	&%GW
<b>EPOS</b>	[ESC] g <3>
<b>Description</b>	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"
<b>Note 1</b>	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 <sub>1</sub> > <m <sub>2</sub> > Code 128 (allows a two character length, preceding the information) &%UP ... [CR] UPC A &%UE ... [CR] UPC E &%EA .. [CR] EAN-13 &%E8 ... [CR] EAN-8 &%93 .. [CR] Code 93 &%CB .. [CR] Codabar																											
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 =	<table><tr><td>0</td><td>Interleaved 2 of 5</td><td>Numeric (0-9) only; must be even number of digits</td></tr><tr><td>1</td><td>Code 39</td><td>26 uppercase letters (A-Z); 10 digits (0-9)</td></tr><tr><td>2</td><td>Code 128</td><td>Three sets of 106 different characters</td></tr><tr><td>3</td><td>UPC A</td><td>Numeric (0-9) only; 11 digits</td></tr><tr><td>4</td><td>EAN-13</td><td>Numeric (0-9) only; 12 digits</td></tr><tr><td>5</td><td>UPC E</td><td>Numeric (0-9) only; 11 digits</td></tr><tr><td>6</td><td>EAN-8</td><td>Numeric (0-9) only; 7 digits</td></tr><tr><td>7</td><td>Code 93</td><td>26 letters; 10 digits (0-9); and 7 special characters</td></tr><tr><td>8</td><td>Codabar</td><td>10 digits (0-9); 4 start/stop characters, A, B, C, and D; and 6 special characters.</td></tr></table>	0	Interleaved 2 of 5	Numeric (0-9) only; must be even number of digits	1	Code 39	26 uppercase letters (A-Z); 10 digits (0-9)	2	Code 128	Three sets of 106 different characters	3	UPC A	Numeric (0-9) only; 11 digits	4	EAN-13	Numeric (0-9) only; 12 digits	5	UPC E	Numeric (0-9) only; 11 digits	6	EAN-8	Numeric (0-9) only; 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.
0	Interleaved 2 of 5	Numeric (0-9) only; must be even number of digits																										
1	Code 39	26 uppercase letters (A-Z); 10 digits (0-9)																										
2	Code 128	Three sets of 106 different characters																										
3	UPC A	Numeric (0-9) only; 11 digits																										
4	EAN-13	Numeric (0-9) only; 12 digits																										
5	UPC E	Numeric (0-9) only; 11 digits																										
6	EAN-8	Numeric (0-9) only; 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.																										

**NOTE:** You may print barcodes in page mode. If you rotate them 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. Due to space limitations, only eight characters can be printed. If illegal characters pass to the printer, they are converted to legal codes. (For example, a → A.)

**Code 128**

Code 128 is an alphanumeric bar code. It is a high-density, variable-length, continuous code, 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> can specify the Code set as follows:

Code Set A	<135>
Code Set B	<136>
Code Set C	<137>

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.

To have the printer selected code set:       [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 from Code A.

Code 128 Note: The 'A' space is defined as a <0>, which makes programming difficult and causes control character conflicts for the printer. To solve the problem, the 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.

**UPC A**

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

**UPC E**

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

**EAN-13**

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

**EAN-8**

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

**Code 93**

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

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<b>Function</b>	<b>Set bar code height</b>
<b>ASCII</b>	[ESC] [EM] B <n>
<b>Hexadecimal</b>	1BH 19H 42H <n>
<b>Decimal</b>	<27> <25> <66> <n>
<b>IPCL</b>	&%BH <m>
<b>EPOS</b>	[GS] h <n>
<b>Description</b>	The [ESC] [EM] B <n> command sets the bar code height where <n>*24 is the number dots. the default is n = 4 and results in a barcode that is about 0.47 inches high.

Function	Set bar code width
ASCII	[ESC] [EM] W <n>
Hexadecimal	1BH 19H 57H <n>
Decimal	<27> <25> <87> <n>
IPCL	&%BW <m>
EPOS	[GS] w <n>
Description	The [ESC] [EM] w <n> command sets the minimum bar width. The value may be between 1 and 8. The default is 3.

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

Function	Set bar code justification, human readable interpretation (HRI) character print mode, and print direction			
ASCII	[ESC] [EM] J <n>			
Hexadecimal	1BH 19H 4AH <n>			
Decimal	<27> <25> <74> <n>			
IPCL	&%BJ <m <sub>1</sub> > <m <sub>2</sub> >			
EPOS	none			
	The power on default is center justified with HRI characters not printed.			
Description	The [ESC] [EM] J <n> command selects the operation of the bar code justification, HRI characters, and print direction.			
Where n bits	n	IPCL	76543210	
			-----xx	Justified
	0	00	-----00	Left
	1	01	-----01	Center
	2	02	-----10	Right
			--xx-----	HRI characters
	0	00	--00-----	Not printed
	16	16	--01-----	Printed above the bar code
	32	32	--10-----	Printed below the bar code
	48	48	--11-----	Printed above and below the bar code
			-x-----	Vertical print mode. (Page mode may work better)
	0	00	-0-----	Bar code printed in horizontal direction (default)
	64	64	-100-----	Bar code printed in vertical direction

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

**Note 2** HRI is not available in vertical print mode. You may print normal barcodes in page mode and you will get HRI and significantly longer barcodes.

## Electronic Journal

The iTherm™ 280 has the capability to store electronic journal<sup>11</sup> data in flash memory. There are two ways entries can be made into the electronic journal. The first is by selecting the journal station. The second is by requesting that print data be placed into the electronic journal.

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

### Configuring the Electronic Journal

The iTherm™ 280 has about<sup>12</sup> 1024K bytes of flash that can be assigned to the electronic journal or to extended user store. The 1024K is segmented in 64K segments which may be assigned to either to electronic journal or extended user store. That is you can assign 2 segments or 128K to the electronic journal and the remaining segments will be assigned to extended user store.

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

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

**CAUTION:** The printer does not stop if the electronic journal runs out of memory. If the printer were to stop there would be no way for the host to print and clear the journal. The host system should monitor the Journal with the [ENQ]<25> command. This command will return the electronic journal status and report how much memory is remaining (See page 84). 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.

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.

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<sup>11</sup> 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.

<sup>12</sup> The amount of free flash depends on the version of code installed and the amount of flash used for enhanced language support.

### 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

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<b>Function</b>	<b>Initialize and Set Password</b>
<b>ASCII</b>	[ESC][GS]I<Password><0>
<b>Hexadecimal</b>	1BH 1DH 49H <Password><0x00>
<b>Decimal</b>	<27> <29><73> <Password><0>
<b>IPCL</b>	&%EI<Password>&
<b>EPOS</b>	
<b>Description</b>	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.
<b>Note:</b>	The electronic journal can not be deleted without this password.

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<b>Function</b>	<b>Erase the Electronic Journal</b>
<b>ASCII</b>	[ESC][GS]E<Password><0>
<b>Hexadecimal</b>	1BH 1DH 45H <Password><0x00>
<b>Decimal</b>	<27> <29><50> <Password><0>
<b>IPCL</b>	&%EC<Password>&
<b>EPOS</b>	
<b>Description</b>	This command erases all of the electronic journal. The password was set using the [ESC][GS]I command.
<b>Note:</b>	The electronic journal can not be deleted without the correct password.

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

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

<b>Function</b>	<b>Set the Electronic Journal Record Header</b>
<b>ASCII</b>	[ESC][GS]F<String %d><0>
<b>Hexadecimal</b>	1BH 1DH 46H
<b>Decimal</b>	<27> <29><70>
<b>IPCL</b>	None
<b>EPOS</b>	
<b>Description</b>	This command allows the record separator that is printed between records to be changed. The default format is:  \r\nRecord %d\r\n
<b>Where:</b>	\r represents CR, \n represents LF, %d represents the position of the record number.
<b>Note:</b>	The %d must be present.
<b>Note:</b>	This follows standard "C" programming conventions. Most standard "C" formatting print parameters may be used.
<b>Note:</b>	The Record header may be totally disabled by a configuration option.

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

**Function      Query the Electronic Journal****ASCII**      [ENQ]<25>**Hexadecimal**      05H 19H**Decimal**      <05> <25>**IPCL**      None**EPOS****Description**      This is a real time status request that returns the current state of the electronic journal.**Return Format:** [NAK]<25><42><n<sub>H</sub>><n<sub>L</sub>>[NAK] EJ is not active. It is either off, not initialized or full. If  $n_H * 256 + n_L$  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<sub>H</sub>><n<sub>L</sub>>[ACK] the EJ is active and available and  $n_H * 256 + n_L$  is the available space in K (1024) bytes.**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 a 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]I and E commands.

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

**Entering and using Journal Print Mode**

Journal print mode can be used to initialize, print the 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	<p>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.</p> <p>The following commands are ignored:</p> <p>[ESC][BEL] [ESC][EM] [ESC]! [ESC]4 [ESC]8 [ESC]9 [ESC]? [ESC]C [ESC]v</p> <p>The following commands cause the journal to stop and will be processed again after the journal information is saved.</p> <p>[ESC][FS] [ESC][FF] [ESC][GS] [ESC][US] [ESC]" [ESC]\$ [ESC]* [ESC]@ [ESC]= [ESC]&gt; [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]~</p> <p>The following commands are processed and not placed in the journal:</p> <p>[ESC]q [ESC]w [ESC]x [BEL]</p> <p>All other commands are placed in the journal and will be processed when the journal is printed.</p> <p>The [EOT] (4 or 4H) and CAN (24 or 14H) will cause the journal to stop and will not be processed again.</p> <p>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.</p>

**Carbon Copy Journal Mode**

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

---

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

---

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

---

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

---

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

### Auto Journal

The iTherm™ 280 can simulate an impact printer's ability to duplicate a validation operation on impact receipt paper. The printer will store the validation information and repeat it on the receipt after the validation form is removed.

This feature can be configured in three ways:

- 1) Disabled  
The [ESC]i<n> command is ignored.
- 2) Enabled and activated by command.  
The [ESC]i<n> command will be active and will start and stop the saving of data in validation mode.
- 3) Auto activated when in validation mode.  
The Auto journal is always active and whenever the printer is in validation mode, the data will be saved and reprinted.

The [ESC][GS]A command may be used to enable (or disable) the auto journal in a printer that is not configured for the feature. This command needs only be sent once.

If the printer is configured to have this feature enabled, (not AUTO enabled) the [ESC]i command must be used to turn the feature on when information is to be saved. If the feature is in AUTO mode, the [ESC]i command is not needed, however, it will function to turn the saving of data on and off.

**NOTE:** Most user macro operations are not compatible with AUTO Journal and will deactivate it and clear the buffer. It is not possible to have auto journal active and use a stored graphic on the validation. The Auto Journal operation will be stopped and cleared.

Function	Activate/Deactivate Auto Journal Feature
ASCII	[ESC][GS]A<n>
Hexadecimal	1BH 1DH 41H<n>
Decimal	<27> <29><65><n>
IPCL	&%JO = Journal on &%JF = Journal off (Auto mode only)
Description	This command activates or deactivates the Auto Journal feature. It does not turn the feature on. It is intended as a safe guard to prevent auto journal activation unless activated. .
Where	n = 0 deactivates the Auto Journal feature n = 1 activates the Auto Journal in command mode. n = 3 activates the auto Journal in auto mode.  The auto journal repeats any validation data on the receipt after the validation form is removed from the printer. This feature can be used to simulate the ability of impact printers to generate a record of validation operations on impact paper on the receipt station.
NOTE:	This command should not be issued when in validation mode.
NOTE:	This feature may be activated by default by setting Auto Journal in the configuration menu to Enabled.

Function	Activate/Deactivate Auto Journal
ASCII	[ESC]i<n>
Hexadecimal	1BH 69H
Decimal	<27> <105>
IPCL	&%VJ (Activate only)
Description	This command activates the storing of information that is to be printed on the receipt when the validation slip is removed..
Where:	n = 1 Activates the saving of data. n = 0 stops saving data.

When activated, validation data is saved in the printer and then printed on the receipt when the validation slip is removed.

The auto journal repeats any validation data on the receipt after the validation form is removed from the printer. This feature can be used to simulate the ability of impact printers to generate a record of validation operations on impact paper on the receipt station.

**NOTE:**

The Journal buffer is limited to 2000 bytes. This includes commands and printable information.

Commands that provide status such as [ESC]q and non-print activity like open Cash drawer commands will not be saved in the Auto journal buffer. However, commands that control print fonts and other print functions will be included. It is up to the programmer to assure that the printer is in an appropriate mode to print the receipt when the slip is complete.

This command must be issued when in validation mode with a form present.

This feature may be activated by default by setting Auto Journal in the configuration menu to AUTO. (This is not settable in the manual configuration mode. It is intended to be a factory configurable feature.)

## 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.

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 <sup>st</sup> Byte	2nd Byte	3rd Byte
00000000xxxxxx	0xxxxxx		
0000yyyyxxxxxx	110yyyy	10xxxxxx	
Zzzzyyyyyxxxxxx	1110zzzz	10yyyyyy	10xxxxxx

---

<b>Function</b>	<b>Set Font ID</b>
<b>ASCII</b>	[ESC] + 1 <low byte> <high byte>
<b>Hexadecimal</b>	1BH 2BH 31H
<b>Decimal</b>	<27> <43> <49>
<b>Description</b>	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.

---

<b>Function</b>	<b>Set Font Descriptor</b>
<b>ASCII</b>	[ESC] + 2
<b>Hexadecimal</b>	1BH 2BH 32H
<b>Decimal</b>	<27> <43> <50>
<b>Description</b>	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 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.

---

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

---

<b>Function</b>	<b>Set Character Code ID</b>
<b>ASCII</b>	[ESC] + 4 <low byte> <high byte>
<b>Hexadecimal</b>	1BH 2BH 34H
<b>Decimal</b>	<27> <43> <52>
<b>Description</b>	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.

---

<b>Function</b>	<b>Send Character Definition</b>
<b>ASCII</b>	[ESC] + 5 <low byte length> <high byte length>
<b>Hexadecimal</b>	1BH 2BH 35H
<b>Decimal</b>	<27> <43> <53>
<b>Description</b>	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.

---

<b>Function</b>	<b>Delete Current Selected Soft Font</b>
<b>ASCII</b>	[ESC] + 6
<b>Hexadecimal</b>	1BH 2BH 36H
<b>Decimal</b>	<27> <43> <54>
<b>Description</b>	The [ESC] + 6 command deletes the current selected font from RAM. It will not delete a font from flash memory for from ROM

---

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

---

---

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

---

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

---

<b>Function</b>	<b>Initiate Unicode UTF-16BE Encoding</b>
<b>ASCII</b>	[ESC] + H
<b>Hexadecimal</b>	1BH 2BH 48H
<b>Decimal</b>	<27> <43> <72>
<b>Description</b>	The [ESC] + H command will put the printer into UTF-16BE character encoding mode of operation. If you wish to access characters above 255, You must select a Unicode encoding such as UTF-16BE.

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.

---

<b>Function</b>	<b>Initiate Unicode UTF-16LE Encoding</b>
<b>ASCII</b>	[ESC] + L
<b>Hexadecimal</b>	1BH 2BH 4CH
<b>Decimal</b>	<27> <43> <76>
<b>Description</b>	The [ESC] + L command will put the printer into UTF-16LE character encoding mode of operation. If you wish to access characters above 255, You must select a Unicode encoding such as UTF-16LE.

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.

---

<b>Function</b>	<b>Initiate Unicode UTF-8 Encoding (MBCS)</b>
<b>ASCII</b>	[ESC] + M
<b>Hexadecimal</b>	1BH 2BH 4DH
<b>Decimal</b>	<27> <43> <77>
<b>Description</b>	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 <sup>st</sup> Byte	2nd Byte	3rd Byte
00000000xxxxxx	0xxxxxx		
00000yyyyyxxxxxx	110yyyyy	10xxxxxx	
zzzzzyyyyyxxxxxx	1110zzzz	10yyyyyy	10xxxxxx

---

<b>Function</b>	<b>Initiate Normal 8-bit Character Encoding</b>
<b>ASCII</b>	[ESC] + A
<b>Hexadecimal</b>	1BH 2BH 41H
<b>Decimal</b>	<27> <43> <65>
<b>Description</b>	The [ESC] + A command will put the printer into normal character encoding mode of operation. One byte = one character.

## Miscellaneous Commands

### General Control

<b>Function</b>	<b>Disable Paper Out Sensor</b>
<b>ASCII</b>	[ESC] 8
<b>Hexadecimal</b>	1BH 38H
<b>Decimal</b>	<27> <56>
<b>IPCL</b>	&%PF
<b>EPOS</b>	none
<b>Description</b>	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.
<b>Function</b>	<b>Enable Paper Out Sensor</b>
<b>ASCII</b>	[ESC] 9
<b>Hexadecimal</b>	1BH 39H
<b>Decimal</b>	<27> <57>
<b>IPCL</b>	&%PO
<b>EPOS</b>	none
<b>Description</b>	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.
<b>Function</b>	<b>Clear Print Buffer</b>
<b>ASCII</b>	[CAN]
<b>Hexadecimal</b>	18H
<b>Decimal</b>	<24>
<b>IPCL</b>	&%RP
<b>EPOS</b>	[CAN]
<b>Description</b>	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.
<b>Function</b>	<b>Query Marker</b>
<b>ASCII</b>	[ESC] q <n>
<b>Hexadecimal</b>	1BH 71H <n>
<b>Decimal</b>	<27> <113> <n>
<b>IPCL</b>	none
<b>EPOS</b>	none
<b>Description</b>	The [ESC] q <n> command returns a status to the host when it is processed.
<b>Response</b>	[SOH] <n>
	The [ESC] q <n> command may be placed in the print data. When it is 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.
<b>Note 1</b>	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.

<b>Function</b>	<b>Open Cash Drawer</b>
<b>ASCII</b>	[ESC] x <n>
<b>Hexadecimal</b>	1BH 78H <n>
<b>Decimal</b>	<27> <120> <n>
<b>IPCL</b>	&%D1 (Cash Drawer 1) &%D2 (Cash Drawer 2)
<b>EPOS</b>	[ESC] p
<b>Description</b>	The [ESC] x <n> command charges the cash drawer, <n>, for 150 ms.
<b>Where &lt;n&gt; =</b>	<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.
<b>Note 1</b>	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.
<b>Note 2</b>	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.

---

<b>Function</b>	<b>Perform Auto Cut</b>
<b>ASCII</b>	[ESC] v
<b>Hexadecimal</b>	1BH 76H <n>
<b>Decimal</b>	<27><118>
<b>IPCL</b>	&%FC &%PC
<b>EPOS</b>	[ESC] i or [ESC] m
<b>Description</b>	The [ESC] v command operated the auto cutter.
<b>Note 1</b>	The auto cutter is optional. If the auto cutter is not installed this command will be ignored.

---

<b>Function</b>	<b>Initialize the Printer</b>
<b>ASCII</b>	[ESC] @
<b>Hexadecimal</b>	1BH 40H
<b>Decimal</b>	<27> <64>
<b>Description</b>	The [ESC] @ command initializes the printer. All settings, including character font and line spacing, are canceled.

---

<b>Function</b>	<b>Audio Alert</b>
<b>ASCII</b>	[BEL]
<b>Hexadecimal</b>	07H
<b>Decimal</b>	<7>
<b>IPCL</b>	&%BL
<b>EPOS</b>	[BEL]
<b>Function</b>	When enabled, the [BEL] command starts the audio alert sequence.
<b>Description</b>	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.

<b>Function</b>	<b>Configure Audio Alert</b>
<b>ASCII</b>	[ESC] [BEL] <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> >
<b>Hexadecimal</b>	1BH 07H <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> >
<b>Decimal</b>	<27> <7> <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> >
<b>IPCL</b>	None
<b>EPOS</b>	None
<b>Description</b>	The [ESC] [BEL] <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> > command alters the way the audio alert sounds.  The default is a single sound lasting the period of time defined by the audio alert setting. The [ESC] [BEL] <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> > command allows the sound to be altered.
<b>Where</b>	<n <sub>1</sub> > is the number of alert cycles <n <sub>2</sub> > is the on time of the alert cycle in 10 mS intervals <n <sub>3</sub> > is the off time of the alert cycle in 10 mS intervals

<b>Function</b>	<b>Enable/disable paper feed</b>
<b>ASCII</b>	[ESC] p 5 <n>
<b>Hexadecimal</b>	1BH 70H 35H <n>
<b>Decimal</b>	<27> <112> <53> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	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.
<b>Where &lt;n&gt;</b>	Bit 0 = 1 the FEED Button is disabled Bit 0 = 0 the Button is enabled.

<b>Function</b>	<b>Select Paper Sensor(s) to Stop Printing</b>
<b>ASCII</b>	[ESC] p 4 <n>
<b>Hexadecimal</b>	1BH 70H 34H <n>
<b>Decimal</b>	<27> <112> <52> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	The [ESC] p 4 <n> command selects the sensors that tell the printer to stop printing. The default setting occurs only when the paper out sensor stops printing. When the paper roll low sensor is enabled and the sensor detects a low 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 low sensor is disabled and a paper low condition is detected during printing, the paper out (error) LED comes on, but the printer continues to print.
<b>Note:</b>	The iTherm™ 280 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 low sensor disabled
	On	01H,02H,03H	<1>,<2>,<3> >	Paper roll low sensor enabled
7	-	00H	<0>	Undefined

Table 19 Paper Sensor Commands

<b>Function</b>	<b>Select Paper Sensor(s) to Output Paper-End Signals</b>
<b>ASCII</b>	[ESC] p 3 <n>
<b>Hexadecimal</b>	1BH 70H 33H <n>
<b>Decimal</b>	<27> <112> <51> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	The [ESC] p 3 <n> command selects the paper sensor that outputs a paper out signal to the parallel interface when a paper out 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 out, the paper out signal is output. The command is only available with a parallel interface. The paper out 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 low sensor disabled
	On	01H	<1>	Paper roll low sensor enabled
1	Off	00H	<0>	Paper roll low sensor disabled
	On	02H	<2>	Paper roll low 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

<b>Function</b>	<b>Enable print suppress and data pass through</b>
<b>ASCII</b>	[ESC] < <n>
<b>Hexadecimal</b>	1BH 3CH <n>
<b>Decimal</b>	<27> <60> <n>
<b>IPCL</b>	&%PT <n>
<b>EPOS</b>	[ESC] = <n>
<b>Description</b>	The [ESC] < <n> command provides print suppress and data pass through features.
<b>Where</b>	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.
<b>Note 1</b>	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.
<b>Note 2</b>	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.
<b>Note 3</b>	When Ithaca® Series 50 Printer compatibility is being used, these commands do not function. Series 50 Printer pass through must be used.
<b>Note 4</b>	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.

---

<b>Function</b>	<b>Begin Multi-Drop Control</b>
<b>ASCII</b>	[SOH] <n>
<b>Hexadecimal</b>	01H <n>
<b>Decimal</b>	<1> <n>
<b>IPCL</b>	none
<b>Where &lt;n&gt;</b>	is the printer address. Addresses of A, B, or C are configurable.
<b>Description</b>	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.

---

<b>Function</b>	<b>Set Control Feature Commands</b>
<b>ASCII</b>	[ESC] y <n>
<b>Hexadecimal</b>	1BH 79H <n>
<b>Decimal</b>	<27> <121> <n>
<b>IPCL</b>	&% Y0-9 or &% YX <m <sub>1</sub> > <m <sub>2</sub> > <m <sub>3</sub> > (for numbers greater than nine)
<b>EPOS</b>	[ESC] y <n>
<b>Where &lt;n&gt; =</b>	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
<b>Description</b>	<p>The [ESC] y &lt;n&gt; command enables and disables command set features.</p> <p>It is possible that the IPCL commands will interfere with print data. If this occurs, the IPCL can be disabled with an [ESC] y &lt;4&gt; command.</p>
<b>Note 1</b>	Once IPCL commands are disabled, the Enable IPLC command will not be a valid IPCL code.
<b>Note 2</b>	[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.
<b>Note 3</b>	[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.

### Documented Extended Configuration and 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 refer to the iTherm™ 280 extended control discussion on page **Error! Bookmark not defined.**

Function	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 STANDBY/OFF mode. When the command is issued, the printer performs print cartridge maintenance and enters STANDBY/OFF. Unlike pushing the \* Button, remote power mode leaves the communications active. All commands except the exit power down command are ignored.

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

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

**IEEE 1284 Mode Inquire**

In parallel, IEEE 1284 mode, status information can be returned to the host 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.

**Dynamic Response Mode**

Dynamic status, [ESC] w <n>, can be used to allow the host to sense status changes without sending repeated inquire commands. The dynamic response operation varies depending on the configuration of the printer. If the printer is configured for serial, USB, or IEEE 1284 operation, more than one status can be sensed because the printer responds to status changes as if an inquire were issued. The response to dynamic status is the same as an inquire command. That is, if cash drawer status is to be sensed, the ACK/NAK is the same as for inquire commands.

**Inquire Commands**

Function	Inquire Printer Status	
ASCII	[ENQ] <n>	
Hexadecimal	05H <n>	
Decimal	<5> <n>	
IPCL	none	
EPOS	[GS] r or [DLE] [ENQ] or [DLE] [EOT]	
Description	The [ENQ] <n> command inquires about the printer's status and returns a result.	
Note 1	When the printer is off line, inquires may not be accepted	
Function	Inquire Cash Drawer 1 status	
ASCII	[ENQ] <1>	
Hexadecimal	05H 01H	
Decimal	<5> <1>	
Function	Cash Drawer 1 Status	
Response	ACK <1> (06H 01H)	Cash Drawer 1 is closed.
	NAK <1> (15H 01H)	Cash Drawer 1 is open.
	Cash drawer status is defined as open circuit being drawer closed.	
Function	Inquire Receipt Paper Low Status	
ASCII	[ENQ] <3>	
Hexadecimal	05H 03H	
Decimal	<5> <3>	
Function	Receipt paper low	
Response	ACK <3> (06H 03H)	Receipt paper is present.
	NAK <3> (15H 03H)	Receipt paper is low.

---

<b>Function</b>	<b>Inquire Receipt Paper Out Status</b>	
<b>ASCII</b>	[ENQ] <4>	
<b>Hexadecimal</b>	05H 04H	
<b>Decimal</b>	<5> <4>	
<b>Function</b>	Receipt paper exhausted	
<b>Response</b>	ACK <4> (06H 04H)	Receipt paper is present
	NAK <4> (15H 04H)	Receipt paper is exhausted

---

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

---

<b>Function</b>	<b>Is the buffer empty? Clear the IEEE 1284 buffer.</b>	
<b>ASCII</b>	[ENQ] <9>buffer, Clearing	
<b>Hexadecimal</b>	05H 09H	
<b>Decimal</b>	<5> <9>	
<b>Function</b>	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.	
<b>Response</b>	ACK <9> (06H 09H)	The buffer is empty.
	NAK <9> (15H 09H)	The buffer is not empty.

---

<b>Function</b>	<b>Request Printer Reset</b>
<b>ASCII</b>	[ENQ] <10>
<b>Hexadecimal</b>	05H 0AH
<b>Decimal</b>	<5> <10>
<b>Function</b>	Reset printer
<b>Response</b>	Serial                      Parallel ACK <10> (06H 0AH)      No response The command was accepted. NAK <10> (15H 0AH) The command was rejected.
<b>Description</b>	<p>The ENQ &lt;10&gt;, EPOS DLE ENQ &lt;n&gt; 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.</p> <p>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] &lt;10&gt; 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.</p>
<b>Note 1</b>	If reset inhibit is set in the configuration menu, the command is ignored.
<b>Function</b>	<b>Inquire Power Cycle Status</b>
<b>ASCII</b>	[ENQ] <11>
<b>Hexadecimal</b>	05H 0BH
<b>Decimal</b>	<5> <11>
<b>Function</b>	Has the printer been power cycled since the last request?
<b>Response</b>	ACK <11> (06H 0BH) Printer has been power cycled since the last [ENQ] <11>  NAK <5> (15H 0BH) Printer has not power cycled since the last [ENQ] <11>
<b>Description</b>	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.

---

<b>Function</b>	<b>Inquire Mechanical Error Status</b>	
<b>ASCII</b>	[ENQ] <14>	
<b>Hexadecimal</b>	05H 0EH	
<b>Decimal</b>	<5> <14>	
<b>Function</b>	Error status	
<b>Response</b>	ACK <14> (06H 0EH)	No Mechanical Errors
	NAK <14> (15H 0EH)	Mechanical Error Has Occurred (Use [ENQ]<22> to identify the error)
<b>Note:</b>	For this status request to function, the "Buffer Full Only" off line option should be selected.	

---

<b>Function</b>	<b>Inquire Printer State</b>	
<b>ASCII</b>	[ENQ] <15>	
<b>Hexadecimal</b>	05H 11H	
<b>Decimal</b>	<5> <15>	
<b>Function</b>	The [ENQ] <15> command returns the current printer state	
<b>Note</b>	[ENQ] <17> also returns the current printer state, but it should not be used as it conflicts with XON/XOFF flow control.	
<b>Response</b>	[ACK] <15> <n> <r <sub>1</sub> > <r <sub>2</sub> >...	

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

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

**<r<sub>1</sub>>:**        bit 0 = 1 always  
                  bit 1 = Cover is closed.  
                  bit 2 = Receipt paper is out.  
                  bit 3 = 0  
                  bit 4 = Printer is waiting in an error mode.  
                          Use [ENQ]<22> to identify the specific error and [ENQ]<10> to recover

**<r<sub>2</sub>>:**        bit 5 = 0  
                  bit 6 = 1 always  
                  bit 7 = 0 always

**<r<sub>2</sub>>:**        bit 0 - 5 = 0 always  
                  bit 6 = 1 always  
                  bit 7 = 0 always

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

---

<b>Function</b>	<b>Inquire all Printer Status</b>
<b>ASCII</b>	[ENQ] <20>
<b>Hexadecimal</b>	05H 14H
<b>Decimal</b>	<5> <20>
<b>Function</b>	The [ENQ] <20> command returns all status flags
<b>Response</b>	[ACK] <20> <n> <r <sub>1</sub> > <r <sub>2</sub> >...
<b>Where</b>	<20> is the echo of command ID.
<n>	is the number of return bytes + 40 (28H) (to prevent confusion with XON/XOFF)
<r <sub>1</sub> >:	bit 0 = Cash Drawer 1 is open. bit 1 = Cash Drawer 2 is open bit 2 = Receipt paper is out. bit 3 = Slip detected bit 4 = Receipt paper error occurred. (low or out) bit 5 = Slip loaded bit 6 = 1 always bit 7 = 0 always
<r <sub>2</sub> >:	bit 0 = 1 always bit 1 = Cover is closed. bit 2 = Buffer is empty. bit 3 = Printer has been power cycled, Reading this does not affect the state of the power-cycled flag. (Use [ENQ] <11> to reset the power cycled bit.) bit 4 = Printer is waiting in an error mode. Use [ENQ] <22> to identify the specific error and [ENQ] <10> to recover bit 5 = 0 bit 6 = 1 always bit 7 = 0 always
<r <sub>3</sub> >:	bit 0 = Receipt station selected bit 1 = Top validation station selected bit 2 = Undefined bit 3 = Waiting for form bit 4 = Undefined bit 5 = Printer is blocking print (Cover is open or out of paper.) bit 6 = 1 always bit 7 = 0 always
<r <sub>4</sub> >:	bit 0 = Printer supports receipts. bit 1 = Printer supports inserted forms. bit 2 = Printer supports multiple colors bit 3 = Printer supports cutter. bit 4 = Printer supports partial cuts. bit 5 = 0 bit 6 = 1 always bit 7 = 0 always
<r <sub>5</sub> >:	Percentage of ink remaining on cartridge 1 (0-100) + 40 (28H)
<r <sub>6</sub> >:	Percentage of ink remaining on cartridge 2 (0-100) + 40 (28H)
<r <sub>7</sub> >:	Current multi-head alignment (0-16, 8 = 0 offset)

---

<b>Function</b>	<b>Inquire Printer ID</b>
<b>ASCII</b>	[ENQ] <21>
<b>Hexadecimal</b>	05H 15H
<b>Decimal</b>	<5> <21>
<b>Function</b>	The [ENQ] <21> command returns the printer IEEE 1284 ID string.
<b>Response</b>	[ACK] <21> <n> {ID string}
<b>Where</b>	<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:PJ1500CL,IPCL;  
 CLS:PRINTER;  
 MDL:1500 PcOS;  
 DES:Ithaca-Peripherals iTherm™ 280;  
 REV:PE1500-01.80  
 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

---

<b>Function</b>	<b>Inquire Error Status</b>
<b>ASCII</b>	[ENQ] <22>
<b>Hexadecimal</b>	05H 17H
<b>Decimal</b>	<5> <22>
<b>Function</b>	The [ENQ] <22> command reports on the error status.
<b>Response</b>	[ACK] <22> <n> <r>
<b>Where</b>	<22> is the echo of the command ID.
<n>	is the number of return bytes + 40 (28H) (to prevent confusion with XON/XOFF).
<r <sub>1</sub> >:	bit 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.
<b>Note 1:</b>	If bit 7 is set, a serious error has occurred. The printer is not able to recover from type of an error without operator intervention. If bit 7 is set without bit 5 (Auto-cutter fault) the print carriage has faulted. This 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.
<b>Note 2:</b>	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.
<b>Note 3:</b>	For this status request to function during a serious error, the "Buffer Full Only" off line option should be selected.

---

<b>Function</b>	<b>Inquire User Store Status</b>
<b>ASCII</b>	[ENQ] <23>
<b>Hexadecimal</b>	05H 17H
<b>Decimal</b>	<5> <23>
<b>Function</b>	The [ENQ] <23> command reports on the user store status.
<b>Response</b>	[ACK] <23> <Report> <0>
<b>Where</b>	<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>
<b>Type</b>	The type field describes the type of information. M = macro C = character definition

---

**Function**      **Inquire Color Status****ASCII**      [ENQ] <24>**Hexadecimal**      05H 18H**Decimal**      <5> <24>**Function**      The [ENQ] <24> command reports Color Cartridge status.**Response**      [ACK] <24> <Length+40><n<sub>123

**Where <24>**      Is the echo of command

<n<sub>1</sub>>      Secondary Pen Color 0 = Not installed, 1 = Red, 2 = Green, 4 = Blue

<n<sub>2</sub>>      Primary Pen Color 1 = Red, 2 = Green, 4 = Blue 16 = Black

<n<sub>3</sub>>      Pen Status

bit 0 = Not defined

bit 1 = Not defined

bit 2 = Secondary Cartridge not installed

bit 3 = Primary Cartridge not installed

bit 4 = Secondary Cartridge low on ink.

bit 5 = Primary Cartridge low on ink.

bit 6 = 1 always

bit 7 = 0 always

---

**Function**      **Query the Electronic Journal**

**ASCII**      [ENQ]<25>

**Hexadecimal**      05H 19H

**Decimal**      <05> <25>

**IPCL**      None

**EPOS**

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

**Return Format:** [NAK]<25><42><n<sub>H</sub>><n<sub>L</sub>>

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

**Or**      [ACK]<25><42><n<sub>H</sub>><n<sub>L</sub>>

[ACK] the electronic journal is active and available and n<sub>H</sub>\*256 + n<sub>L</sub> is the available space in K (1024) bytes.

---

**Function**      **Enable Dynamic Response**

**ASCII**      [ESC] w <n>

**Hexadecimal**      1BH 77H <n>

**Decimal**      <27> <119> <n>

**IPCL**      none

**EPOS**      [GS] a <n>

**Where n**      Defines the features that cause dynamic responses

<b>Where Bit</b>	0	Cash Drawer 0	ACK/NAK <1>
	1	Cash Drawer 1	ACK/NAK <2>
	2	Paper low status	ACK/NAK <3>
	3	Paper out status	ACK/NAK <4>
	4	Electronic Journal (Low/Out)	ACK/NAK<25><low><high>
	5	Validation Form present	ACK/NAK <7>
	6	Mechanical Error Status	ACK/NAK <14>
	7	Cover status	ACK/NAK <8>

Page 110

Rev A

May-03</sub>

<b>Description</b>	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.
<b>Note</b>	For mechanical error status to function, the "Buffer Full Only" off line option should be selected.
<b>Note</b>	The electronic journal status follows the format of the [ENQ]<25> response and reports the amount of electronic journal memory remaining.

## Ithaca® Series 50 Compatibility Commands<sup>13</sup>

To allow the iTherm™ 280 Printer to replace the Ithaca® Series 50 Printer without affecting the Series 50 application, the most popular Series 50 emulation modes are provided. The Series 50 modes should only be used if you are replacing a Series 50 Printer and cannot modify the application to use the standard iTherm™ 280 commands.

A number of items are different with the iTherm™ 280 emulation, including the processing of IPCL commands. The Series 50 IPCL processor did not deal with command parameters by translating ASCII digits into binary field. When a iTherm™ 280 Printer is in Series 50 mode, it behaves as the Series 50 Printer does.

The primary changes to the standard iTherm™ 280 emulation are the removal of commands not present on the Series 50 Printer and the addition of the following commands which are only present on the Series 50 Printer. Refer to the Series 50 Programmer's Guide for documentation and additional commands.

There are three basic Model 50 printers. M50, M50PLUS, and M50 Microline. The behavior of iTherm™ 280 will vary based on the M50 Mode setting. If you are replacing an M50 PLUS, set the mode to M50PLUS. The Microline emulation is documented in iTherm™ 280 Microline emulation programmers guide (part number 12-03220).

<b>Function</b>	<b>Set Extended Series 50 Cash Drawer Command</b>
<b>ASCII</b>	[BS]
<b>Hexadecimal</b>	08H
<b>Decimal</b>	<8>
<b>Description</b>	The [BS] command opens Cash Drawer 2
<b>Function</b>	<b>Set Extended Series 50 Cash Drawer Command</b>
<b>ASCII</b>	[BEL]
<b>Hexadecimal</b>	07H
<b>Decimal</b>	<7>
<b>Description</b>	The [BEL] command opens Cash Drawer 1
<b>Function</b>	<b>Set Extended Series 50 Cash Drawer Command</b>
<b>ASCII</b>	[ESC] +
<b>Hexadecimal</b>	1BH 2BH
<b>Decimal</b>	<27> <43>
<b>Description</b>	The [ESC] + command opens Cash Drawer 1
<b>Function</b>	<b>Set Extended Series 50 Pass Through</b>
<b>ASCII</b>	[ESC] # or [ESC] d or [ESC] [RS] and [ESC] ”
<b>Hexadecimal</b>	1BH 23H or 1BH 64H or 1BH 1EH and 1BH 22H
<b>Decimal</b>	<27> <35> or <27> <100> or <27> <30> and <27> <34>
<b>Description</b>	[ESC] # or [ESC] d turn on pass through, and [ESC] [RS] or [ESC] ” turn off pass through. These commands require that the pass through function be enabled in the configuration menu.
<b>Note:</b>	[ESC]# for pass through is only active if the M50 Mode is selected. It is defined as print quality in M50PLUS mode.

In addition to these commands, there are a number of configuration options that will modify the printers characteristics to more closely match the specific model 50 printer you are replacing. If you are finding that the printer is not performing as expected, carefully review the configuration options .

<sup>13</sup> Some versions of the iTherm™ 280 printer do not support the Series 50 emulation.

## ESC/POS™ Codes (EPOS)

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. TransAct Technologies, Inc. makes 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 a 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.

## 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	122
CR	0DH	Print and carriage return	122
ESC d	1BH,64H	Print and feed <n> lines	122
ESC J	1BH,4AH	Print and feed paper <n> vertical units	122
Line Spacing Commands			
Command		Name	Page
ESC 2	1BH,32H	Select default line spacing, 1/6 lpi	124
ESC 3	1BH,33H	Set line spacing	124
Character Commands			
Command		Name	Page
ESC SP	1BH,20H	Set right-side character spacing	124
ESC !	1BH,21H	Select print mode(s)	130
ESC %	1BH,25H	Select/cancel user-defined character sets	124
ESC &	1BH,26H	Define user-defined characters	125
ESC -	1BH,2DH	Turn underline mode on/off	130
ESC ?	1BH,3FH	Cancel user-defined characters	125
ESC E	1BH,45H	Turn emphasized mode on/off	130
ESC G	1BH,47H	Turn double-strike mode on/off	131
ESC M	1BH,4DH	Select character font	125
ESC R	1BH,52H	Select an international character set	125
ESC V	1BH,56H	Turn on/off 90° rotation mode	131
ESC t	1BH,74H	Select character code table	129
ESC {	1BH,7BH	Turn upside-down printing mode on/off	131
GS !	1DH,21H	Select character size	132
GS B	1DH,42H	Turn white/black reverse printing mode on/off	129
Panel Button Commands			
Command		Name	Page
ESC c 5	1BH,63H, 35H	Enable/disable panel buttons	133
Paper Sensor Commands			
Command		Name	Page
ESC c 4	1BH,63H, 34H	Select paper sensor(s) to stop printing	134
ESC c 3	1BH,63H, 33H	Select paper sensor(s) to output paper out signals	135

## Supported TM-T88 Commands

Print Position Commands			
Command		Name	Page
HT	09H	Set horizontal tab positions	137
ESC \$	1BH,24H	Set absolute print position	136
ESC D	1BH,44H	Set horizontal tab positions	138
ESC \	1BH,5CH	Set relative print position	136
ESC a	1BH,61H	Select justification	136
GS L	1DH,4CH	Set left margin	138
GS T	1DH,54H	Set print position to the beginning of the line	136
GS W	1DH,57H	Set printing area width	138
Bit-image Command			
Command		Name	Page
ESC *	1BH,2AH	Select bit-image mode	139
GS v 0	1DH,76H,30H	Print raster bit image	139
Status Commands			
Command		Name	Page
DLE EOT	10H,04H	Real-time status transmission	143
DLE ENQ	10H,05H	Real-time status request to printer	143
GS a	1DH,61H	Enable/disable Automatic Status Back (ASB)	140
GS r	1DH,72H	Transmit status	142
Bar Code Commands			
Command		Name	Page
GS H	1DH,48H	Select printing position of HRI characters	152
GS f	1DH,66H	Select font HRI characters	152
GS h	1DH,68H	Set bar code height	152
GS k	1DH,6BH	Print bar code	150
GS w	1DH,77H	Set bar code width	150
Mechanism Control Commands			
Command		Name	Page
GS V	1DH,56H	Select cut mode and cut paper	153

## Supported TM-T88 Commands

Miscellaneous Commands			
Command		Name	Page
DLE DC4 <1>	10H,14H,01H	Generate pulse in real-time	155
DLE DC4 <2>	10H,14H,02H	Execute power-off sequence	155
DLE DC4 <8>	10H,14H,08H	Clear buffers	155
ESC =	1BH,3DH	Select peripheral device status	156
ESC @	1BH,40H	Initialize printer	154
ESC p	1BH,70H	Generate pulse	155
GS ( A	1DH,28H,41H	Enter Test Mode	157
GS I	1DH,49H	Transmit printer ID	154
GS P	1DH,50H	Set horizontal and vertical motion units	154
GS b	1DH,62H	Turns smoothing mode on/off	132
GS c	1DH,63H	Print counter	157
GS g 0	1DH,67H,30H	Initialize maintenance counter	157
GS g 2	1DH,67H,32H	Transmit maintenance counter value	157
Macro Function Commands			
Command		Name	Page
GS :	1DH,3AH	Start/end macro definition	159
GS ^ r t m	1DH,5EH	Execute macro	159
Page Mode Commands			
Command		Name	Page
FF	0CH	Print and return to standard mode	39
CAN	18H	Cancel print data in page mode	147
ESC FF	1BH,0CH	Print data in page mode	150
ESC L	1BH,4CH	Select Page mode	147
ESC S	1BH,53H	Switches from page mode to standard mode	148
ESC T	1BH,54H	Select print direction in page mode	148
ESC W	1BH,57H	Set printing area in page mode	147
GS \$	1DH,24H	Set absolute vertical print position in page mode	150
GS \	1DH,5CH	Set relative vertical print position in page mode	150
User-defined Memory Commands			
Command		Name	Page
GS *	1DH,2AH	Define single user-defined bit-image	162
GS /	1DH,2FH	Print single user-defined bit-image	163

Table 21 Supported TM-T90 Commands

## Undocumented TM-T88 Commands

Command	Name	
ESC I	Auto Cut	153
ESC m	Auto Cut	153
ESC u	Transmit Peripheral Device Status	144
ESC v	Transmit Paper status	145

Table 22 Undocumented TM-T90 Commands

## Supported TM-T90 Commands

Print and Feed Commands			
Command		Name	Page
LF	0AH	Print and line feed	122
CR	0DH	Print and carriage return	122
ESC d	1BH,64H	Print and feed <n> lines	122
ESC e	1BH,65H	Print and reverse feed <n> lines	122
ESC J	1BH,4AH	Print and feed paper <n> vertical units	122
ESC K	1BH,4BH	Print and reverse feed [<n> x (1/144)] inches	123
ESC j	1BH,6AH	Print and reverse feed	123
Line Spacing Command			
Command		Name	Page
ESC 2	1BH,32H	Select default line spacing, 1/6 lpi	124
ESC 3	1BH,33H	Set line spacing	124
Character Commands			
Command		Name	Page
ESC SP	1BH,20H	Set right-side character spacing	124
ESC !	1BH,21H	Select print mode(s)	130
ESC %	1BH,25H	Select/cancel user-defined character sets	124
ESC &	1BH,26H	Define user-defined characters	125
ESC -	1BH,2DH	Turn underline mode on/off	130
ESC 4	1BH,34H	Set italics mode	132
ESC 5	1BH,35H	Reset italics mode	132
ESC ?	1BH,3FH	Cancel user-defined characters	125
ESC E	1BH,45H	Turn emphasized mode on/off	130
ESC G	1BH,47H	Turn on/off double-strike mode	131
ESC M	1BH,4DH	Select character font	125
ESC R	1BH,52H	Select an international character set	125
ESC V	1BH,56H	Turn on/off 90° rotation mode	131
ESC [ T	1BH,5BH, 54H	Select character code table	127
ESC ^	1BH,5EH	Print control character	129
ESC r	1BH,72H	Select color	129
ESC t	1BH,74H	Select character code table	129
ESC {	1BH,7BH	Turn on/off upside-down printing mode	131
GS !	1DH,21H	Set character size	132
GS #	1DH,23H	Insert euro character	129
GS B	1DH,42H	Turn white/black reverse printing mode on/off	129
Panel Button Commands			
Command		Name	Page
ESC c 5	1BH,63H, 35H	Enable/disable panel buttons	133

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.	134
ESC c 3	1BH,63H, 33H	Select paper sensor(s) to output paper out signals.	135
ESC c 1	1BH, 63H, 31H	Select paper types for command settings	147
ESC c 0	1BH, 63H, 30H	Select paper types for printing	146
Print Position Commands			
Command		Name	Page
BS	08H	Set back space	137
HT	09H	Set horizontal tab positions	137
ESC \$	1BH,24H	Set absolute print position	136
ESC <	1BH,3CH	Return home	139
ESC D	1BH,44H	Set horizontal tab positions	138
ESC Q	1BH,51H	Set right margin in characters	139
ESC U	1BH,55H	Turn on/off unidirectional printing mode	138
ESC \	1BH,5CH	Set relative print position	136
ESC a	1BH,61H	Select justification	136
ESC l	1BH,6CH	Set left right margin in characters	139
GS L	1DH,4CH	Set left margin	138
GS T	1DH,54H	Set print position to the beginning of the line	136
GS W	1DH,57H	Set printing area width	138
Bit-image Commands			
Command		Name	Page
ESC *	1BH,2AH	Select bit-image mode	139
GS v 0	1DH,76H,30H	Print raster bit image	139
Status Commands			
Command		Name	Page
DLE EOT	10H,04H	Transmit real-time status	143
DLE ENQ	10H,05H	Real-time status request to printer	143
ESC u	1BH, 75H	Transmit peripheral status	144
ESC v	1BH, 76H	Transmit paper status	145
GS a	1DH,61H	Enable/disable automatic status back (ASB)	140
GS r	1DH,72H	Transmit status	142

## Supported TM-T90 Commands

Bar Code Commands			
Command		Name	Page
GS H	1DH,48H	Select printing position of HRI characters	152
GS f	1DH,66H	Select font HRI characters	152
GS h	1DH,68H	Set bar code height	152
GS k	1DH,6BH	Print bar code	150
GS w	1DH,77H	Set bar code width	150
Mechanism Control Commands			
Command		Name	Page
GS V	1DH,56H	Select cut mode and cut paper	153
ESC I	1BH,69H	Set partial knife cut	153
ESC m	1BH,69H	Set partial knife cut	125
BEL	07H	Sound buzzer	153
ESC BEL	1BH,07H	Sound buzzer	153
Miscellaneous Commands			
Command		Name	Page
DLE DC4 <1>	10H,14H,01H	Generate pulse in real-time	155
DLE DC4 <2>	10H,14H,02H	Execute power-off sequence	155
DLE DC4 <8>	10H,14H,08H	Clear buffers	155
ESC =	1BH,3DH	Select peripheral device status	156
ESC @	1BH,40H	Initialize printer	154
ESC p	1BH,70H	Generate pulse	155
GS ( A	1DH, 28H,41H	Enter test mode	157
GS I	1DH,49H	Transmit printer ID	154
GS P	1DH,50H	Set horizontal and vertical motion units	154
GS b	1DH,62H	Turns smoothing mode on/off	132
GS c	1DH,63H	Print counter	157
GS g 0	1DH,67H,30H	Initialize maintenance counter	157
GS g 2	1DH,67H,32H	Transmit maintenance counter value	157
Macro Function Commands			
Command		Name	Page
GS :	1DH,3AH	Start/end macro definition	159
GS ^ r t m	1DH,5EH	Execute macro	159
GS _	1DH,5FH	Delete start-up macro definition	160
Page Mode Commands			
Command		Name	Page
FF	0CH	Print and return to standard mode	39
CAN	18H	Cancel print data in page mode	96
ESC FF	1BH,0CH	Print data in page mode	150
ESC L	1BH,4CH	Select Page mode	147
ESC S	1BH,53H	Switches from page mode to standard mode	148
ESC T	1BH,54H	Select print direction in page mode	148
ESC W	1BH,57H	Set printing area in page mode	147
GS \$	1DH,24H	Set absolute vertical print position in page mode	150
GS \	1DH,5CH	Set relative vertical print position in page mode	150

## Supported TM-T90 Commands

User-defined Memory Commands			
Command		Name	Page
GS - <Name> ...	1DH,2DH, <Name> ...	Define user-defined bit image	160
GS 0 <Name> ... <m>	1DH,30H, <Name> ...	Print user-defined bit image	161
GS 1 <Name> ...	1DH,31H, <Name> ...	Erase single entry from nonvolatile memory	161
GS *	1DH,2AH	Define single user-defined bit-image	162
GS /	1DH,2FH	Print single user-defined bit-image	163
GS 3	1DH,33H	Query nonvolatile memory pool information	163
GS 5	1DH,35H	Erase all entries from nonvolatile memory	161
GS 6	1DH,36H	Save user-defined character set	163
GS 7	1DH,37H	Select user-defined character set	163

## Extended Electronic Journal Commands

Electronic Journal Commands			
Command		Name	Page
[ESC][GS]I <Password><0>	1BH 1DH 49H	Electronic journal initialize and set password	82
[ESC][GS]E <Password><0>	1BH 1DH 45H	Electronic journal erase the electronic journal	82
[ESC][GS]P< S <sub>l</sub> > <S <sub>h</sub> >< L <sub>l</sub> >< L <sub>h</sub> >	1BH 1DH 50H	Print the electronic journal	82
[ESC][GS]R< S <sub>l</sub> > < S <sub>h</sub> >< L <sub>l</sub> >< L <sub>h</sub> >	1BH 1DH 52H	Report the electronic journal	83

## TM-T88 / TM-T90 and ESCPOS 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

<b>Function</b>	<b>Print and Line Feed</b>
<b>ASCII</b>	[LF]
<b>Hexadecimal</b>	0AH
<b>Decimal</b>	<10>
<b>Description</b>	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.
<b>Function</b>	<b>Print and Carriage Return</b>
<b>ASCII</b>	[CR]
<b>Hexadecimal</b>	0DH
<b>Decimal</b>	<13>
<b>Description</b>	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.
<b>Function</b>	<b>Print and Feed &lt;n&gt; Lines</b>
<b>ASCII</b>	[ESC] d <n>
<b>Hexadecimal</b>	1BH 64H <n>
<b>Decimal</b>	<27> <100> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	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.
<b>Function</b>	<b>Print and Reverse Feed&lt;n&gt; Lines</b>
<b>ASCII</b>	[ESC] e <n>
<b>Hexadecimal</b>	1BH 65H <n>
<b>Decimal</b>	<27> <101> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	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.
<b>Function</b>	<b>Print and Feed Paper</b>
<b>ASCII</b>	[ESC] J <n>
<b>Hexadecimal</b>	1BH 4AH <n>
<b>Decimal</b>	<27> <74> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	The [ESC] J <n> command prints the data in the print buffer and feeds the paper [n x (1/144)] inches, which means that the printer can feed the paper in half-dot units. The command is used to temporarily feed a specific length without changing the line spacing set by other commands.

---

<b>Function</b>	<b>Print and Reverse Feed &lt;n&gt; Lines</b>
<b>ASCII</b>	[ESC] K <n>
<b>Hexadecimal</b>	1BH 4BH <n>
<b>Decimal</b>	<27> <75> <n>
<b>Range</b>	$0 \leq n \leq 48$
<b>Description</b>	The [ESC] K <n> command prints the data in the print buffer and feeds the paper [<n> x (1/144)] inches in the reverse direction. Consequently, the printer can feed the paper in half-dot units in the reverse direction. The command is used to temporarily feed a specific length without changing the line spacing set by other commands.

---

<b>Function</b>	<b>Print and Reverse Feed</b>
<b>ASCII</b>	[ESC] j
<b>Hexadecimal</b>	1BH 6AH
<b>Decimal</b>	<27> <106>
<b>Range</b>	$0 \leq n \leq 48$
<b>Description</b>	The [ESC] j command prints the data in the print buffer and feeds the paper one line in reverse.

## Line Spacing Commands

<b>Function</b>	<b>Select Default Line Spacing</b>
<b>ASCII</b>	[ESC] 2
<b>Hexadecimal</b>	1BH 32H
<b>Decimal</b>	<27> <50>
<b>Description</b>	The [ESC] 2 command sets the line spacing to 1/6 inch, which is equivalent to 12 dots.

---

<b>Function</b>	<b>Set Line Spacing</b>
<b>ASCII</b>	[ESC] 3 <n>
<b>Hexadecimal</b>	1BH 33H <n>
<b>Decimal</b>	<27> <51> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	The [ESC] 3 <n> command sets the line spacing to [<n> x (1/144)] inches. The default setting of the paper feed amount is 1/6 inch (<n> = 24). The line spacing can be set in half-dot units.

## Character Commands

<b>Function</b>	<b>Set Right-Side Character Spacing</b>
<b>ASCII</b>	[ESC] SP <n>
<b>Hexadecimal</b>	1BH 20H <n>
<b>Decimal</b>	<27> <32> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	The [ESC] SP <n> sets the right-side character spacing in [<n> x (1/160)] inches. It is used to change the spacing between characters. The default right-side character spacing is set to zero. (<n> = 0). Right-side character spacing can be set in half-dot units.

---

<b>Function</b>	<b>Select/Cancel User-Defined Character Set</b>
<b>ASCII</b>	[ESC] % <n>
<b>Hexadecimal</b>	1BH 25H <n>
<b>Decimal</b>	<27> <37> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	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.

<b>Function</b>	<b>Define User-Defined Characters</b>
<b>ASCII</b>	[ESC] & <y> <c1> <c2> [x1 d1 ... d(y x x1)] ... [xk d1 ... d(y x xk)]
<b>Hexadecimal</b>	1BH 26H y c1 c2 [x1 d1 ... d(y x x1)] ... [xk d1 ... d(y x xk)]
<b>Decimal</b>	<27> <38> y c1 c2 [x1 d1 ... d(y x x1)] ... [xk d1 ... d(y x xk)]
<b>Range</b>	y = 2 $32 \leq c_1 \leq c_2 \leq 126$ $0 \leq x \leq 12$ (9 x 9 font) $0 \leq x \leq 9$ (7 x 9 font) $0 \leq d_1 \dots d(y \ x \ x) \leq 255$
<b>Description</b>	The [ESC] & <y> <c1> <c2> [x1 d1 ... d(y x x1)] ... [xk d1 ... d(y x xk)] command defines user-defined characters from character code <c1> to <c2>. <y> and <x> are the configurations of user-defined characters. <y> specifies the number of bytes in the vertical direction. <x> specifies the number of bytes in the horizontal direction. Character codes ranging from ASCII code 20H (32) to 7EH (126) can be defined by <c1> and <c2>. Up to 19 user-defined characters can be defined. Data (<d>) specifies a bit printed to one and not printed to zero. At the default, user-defined characters are not defined, and the internal character set is printed. Once the user-defined characters have been defined, they are available until [ESC] @ or [ESC] ? is executed; the user-defined characters are redefined; the power is turned off; or the printer is reset.

<b>Function</b>	<b>Cancel User-Defined Characters</b>
<b>ASCII</b>	[ESC] ? <n>
<b>Hexadecimal</b>	1BH 3FH <n>
<b>Decimal</b>	<27> <63> <n>
<b>Range</b>	$32 \leq n \leq 126$
<b>Description</b>	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.

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

<b>Function</b>	<b>Select an International Character Set</b>
<b>ASCII</b>	ESC R <n>
<b>Hexadecimal</b>	1BH 52H <n>
<b>Decimal</b>	<27> <82> <n>
<b>Range</b>	$0 \leq n \leq 74$
<b>Default</b>	<n> = 0
<b>Description</b>	The ESC R <n> command selects an international character set, <n>, from the following table.

## International Character Sets

Country	Epson ID	Country	Epson ID
ASCII	0	Greek 437	38
French	1	Greek 928	39
German	2	Greek 437 CYPRUS	41
British	3	ECMA-94	42
Danish I	4	Canada French	43
Swedish I	5	Cyrillic I-855	44
Italian	6	Cyrillic II-866	45
Spanish I	7	East Europe Latin II-852	46
Japanese	8	Greek 869	47
Norwegian	9	Windows East Europe	49
Danish II	10	Windows Greek	50
Spanish II	11	Latin 5 (Windows Turkey)	51
Latin American	12	Windows Cyrillic	52
French Canadian	13	Hungarian CWI	54
Dutch	14	Kamenicky (MJK)	55
Swedish II	15	ISO Latin 4 (8859/4)	56
Swedish III	16	Turkey_857	57
Swedish IV	17	Roman-8	58
Turkish	18	Hebrew NC (862)	60
Swiss I	19	Hebrew OC	61
Swiss II	20	Windows Hebrew	62
Cyrillic II-866	21	KBL- Lithuanian	63
Polska Mazovia	22	Ukrainian	66
ISO Latin 2	23	ISO Latin 6 (8859/10)	67
Serbo Croatian I	24	Windows Baltic	68
Serbo Croatian 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<sub>h</sub>> <n<sub>l</sub>>**Hexadecimal**      1BH 5BH 54H <n<sub>h</sub>> <n<sub>l</sub>>**Decimal**      <27> <91> <84> <n<sub>h</sub>> <n<sub>l</sub>>**Default**      <n<sub>h</sub>> = 1<n<sub>l</sub>> =      181 (Code Page 437)**Description**      The ESC [ T <n<sub>h</sub>> <n<sub>l</sub>> command selects a code page, <n>, from the character code table.

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

Table 26 Character Code Pages

<b>Function</b>	<b>Print Control Character</b>
<b>ASCII</b>	[ESC] ^ <n>
<b>Hexadecimal</b>	1BH 5EH <n>
<b>Decimal</b>	<27> <94> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	The [ESC] ^ <n> command allows characters from zero to 31 codes to be printed. During normal operation, characters from zero to 31 are control characters. Control code translation is turned off for the following character.

<b>Function</b>	<b>Insert Euro Character</b>
<b>ASCII</b>	GS # <n>
<b>Hexadecimal</b>	1DH 23H <n>
<b>Decimal</b>	<29> <35> <n>
<b>Description</b>	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.

<b>Function</b>	<b>Turn Color Mode ON/OFF</b>
<b>ASCII</b>	[ESC] r <n>
<b>Hexadecimal</b>	1BH 72H <n>
<b>Decimal</b>	<27> <114> <n>
<b>Range</b>	<n> = 0, 1, 48, 49
<b>Description</b>	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.

<b>Function</b>	<b>Select Character Code Table</b>
<b>ASCII</b>	[ESC] t <n>
<b>Hexadecimal</b>	1BH 74H <n>
<b>Decimal</b>	<27> <116> <n>
<b>Range</b>	0 ≤ n ≤ 5; <n> = 254, 255
<b>Description</b>	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

<b>Function</b>	<b>Select Print Mode(s)</b>
<b>ASCII</b>	[ESC] ! <n>
<b>Hexadecimal</b>	1BH 21H <n>
<b>Decimal</b>	<27> <33> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	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

<b>Function</b>	<b>Turn ON/OFF Underline Mode</b>
<b>ASCII</b>	[ESC] - <n>
<b>Hexadecimal</b>	1BH 2DH <n>
<b>Decimal</b>	<27> <45> <n>
<b>Range</b>	<n> = 0, 1, 48, 49
<b>Description</b>	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.

<b>Function</b>	<b>Turn ON/OFF Emphasized Mode</b>
<b>ASCII</b>	[ESC] E <n>
<b>Hexadecimal</b>	1BH 45H <n>
<b>Decimal</b>	<27> <69> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	The [ESC] E <n> command turns on or off emphasized mode. When the least significant bit (LSB) of <n> = 1, emphasized mode is turned on; when it is 0, emphasized mode is turned off. The default setting is <n> = 0. Emphasized and double-strike printing appear the same.

<b>Function</b>	<b>Turn ON/OFF Double-Strike Mode</b>
<b>ASCII</b>	[ESC] G <n>
<b>Hexadecimal</b>	1BH 47H <n>
<b>Decimal</b>	<27> <71> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	The [ESC] G <n> command turns on or off double-strike mode. When the least significant bit (LSB) of <n> = 1, double-strike mode is turned on; when it is 0, double-strike mode is turned off. The default setting is <n> = 0. Double-strike and emphasized printing appear the same.

<b>Function</b>	<b>Turn ON/OFF Upside-Down Print Mode</b>
<b>ASCII</b>	[ESC] { <n>
<b>Hexadecimal</b>	1BH 7BH <n>
<b>Decimal</b>	<27> <123> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	The [ESC] { <n> turns on or off upside-down printing mode. When the least significant bit of <n> = 1, upside-down printing mode is turned on; when it is 0, upside-down printing mode is turned off. The default setting is <n> = 0. When upside-down mode is turned on, the printer prints 180° rotated characters from right to left. The line printing order is not reversed, so the order of the data transmitted is important. The command is enabled only when input at the beginning of a line.

<b>Function</b>	<b>Turn ON/OFF 90° Rotation Mode</b>
<b>ASCII</b>	ESC V <n>
<b>Hexadecimal</b>	1BH 56H <n>
<b>Decimal</b>	<27> <86> <n>
<b>Range</b>	<n> = 0, 1, 2, 48, 49, 50
<b>Description</b>	The ESC V <n> command turns on/off 90° clockwise rotation mode. The command is only enabled in standard mode. In page mode, an internal flag is activated, and the command is enabled when the printer returns to standard mode.

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

Table 29 Rotation Modes

---

<b>Function</b>	<b>Set Character Size</b>	
<b>ASCII</b>	GS ! <n>	
<b>Hexadecimal</b>	1DH 21H <n>	
<b>Decimal</b>	<29> <33> <n>	
<b>Description</b>	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.	
<b>Where &lt;n&gt;</b>	xxxx0000	Vertical scale 1
	xxxx0001	Vertical scale 2
	0000xxxx	Horizontal scale 1
	0001xxxx	Horizontal scale 2

---

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

---

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

---

<b>Function</b>	<b>Turns smoothing on/off</b>
<b>ASCII</b>	[GS] b <n>
<b>Hexadecimal</b>	1DH 62H <n>
<b>Decimal</b>	<29> <98> <n>
<b>Description</b>	The [GS] b <n> command Turns smoothing mode on or off.
<ul style="list-style-type: none"> <li>• When the LSB of <i>n</i> is 0, smoothing mode is turned off.</li> <li>• When the LSB of <i>n</i> is 1, smoothing mode is turned on.</li> </ul>	

## Panel Button Commands

---

<b>Function</b>	<b>Enable/Disable Paper Feed</b>
<b>ASCII</b>	[ESC] c 5 <n>
<b>Hexadecimal</b>	1BH 63H 35H <n>
<b>Decimal</b>	<27> <99> <53> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	The [ESC] c 5 <n> command enables or disables the <b>FEED</b> Button. When the least significant bit (LSB) of <n> = one, the <b>FEED</b> Button is disabled; when it is zero, the button is enabled. To prevent problems caused by accidentally pressing the <b>FEED</b> Button, use the command to disable it. The <b>FEED</b> 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.
<b>Where &lt;n&gt;</b>	Bit 0 = 1 the <b>FEED</b> 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 ≤ n ≤ 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 ≤ n ≤ 255
Description	<b>ESC c 3 n</b> 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<sub>l</sub>> <n<sub>h</sub>>

**Decimal** <29> <84> <n<sub>l</sub>> <n<sub>h</sub>>

**Range** 0 ≤ n ≤ 1  
48 ≤ n ≤ 49

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

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

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

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

---

**Function** Set Absolute Print Position

**ASCII** [ESC] \$ <n<sub>l</sub>> <n<sub>h</sub>>

**Hexadecimal** 1BH 24H <n<sub>l</sub>> <n<sub>h</sub>>

**Decimal** <27> <36> <n<sub>l</sub>> <n<sub>h</sub>>

**Range** 0 ≤ n<sub>l</sub> ≤ 255  
0 ≤ n<sub>h</sub> ≤ 255

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

---

**Function** Set Relative Print Position

**ASCII** [ESC] \ <n<sub>l</sub>> <n<sub>h</sub>>

**Hexadecimal** 1BH 5CH <n<sub>l</sub>> <n<sub>h</sub>>

**Decimal** <27> <92> <n<sub>l</sub>> <n<sub>h</sub>>

**Range** 0 ≤ n<sub>l</sub> ≤ 255  
0 ≤ n<sub>h</sub> ≤ 255

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

---

**Function** Select Justification

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

**Hexadecimal** 1BH 61H <n>

**Decimal** <27> <97> <n>

**Range** 0 ≤ n ≤ 2  
48 ≤ n ≤ 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.

---

<b>Function</b>	<b>Set Back Space</b>
<b>ASCII</b>	[BS]
<b>Hexadecimal</b>	08H
<b>Decimal</b>	<8>
<b>Description</b>	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.

---

<b>Function</b>	<b>Set Horizontal Tab</b>
<b>ASCII</b>	[HT]
<b>Hexadecimal</b>	9H
<b>Decimal</b>	<10>
<b>Description</b>	The [HT] command moves the print position to the next horizontal tab position. The command is used to align character columns. The command is ignored unless another horizontal tab position has been set.

<b>Function</b>	<b>Set Horizontal Tab Positions</b>
<b>ASCII</b>	[ESC] D <n <sub>1</sub> > ... <n <sub>k</sub> > NUL
<b>Hexadecimal</b>	1BH 44H <n <sub>1</sub> > ... <n <sub>k</sub> > 00
<b>Decimal</b>	<27> <68> <n <sub>1</sub> > ... <n <sub>k</sub> > <0>
<b>Range</b>	1 ≤ n ≤ 255 0 ≤ k ≤ 32
<b>Description</b>	The [ESC] D <n <sub>1</sub> > ... <n <sub>k</sub> > NUL command sets the horizontal tab positions. <n> specifies the column number for setting a horizontal tab position. The command deletes any previously set, horizontal tab positions. Up to 32 tab positions can be set. The default tab positions are at intervals of eight characters for 7 x 9 font.
<b>Function</b>	<b>Set Left Margin</b>
<b>ASCII</b>	GS L <n <sub>l</sub> > <n <sub>h</sub> >
<b>Hexadecimal</b>	1DH 4CH <n <sub>l</sub> > <n <sub>h</sub> >
<b>Decimal</b>	<29> <76> <n <sub>l</sub> > <n <sub>h</sub> >
<b>Range</b>	0 ≤ n <sub>l</sub> ≤ 255 0 ≤ n <sub>h</sub> ≤ 255
<b>Description</b>	The GS L <n <sub>l</sub> > <n <sub>h</sub> > command sets the left margin using n <sub>l</sub> and n <sub>h</sub> . The left margin is set to [(n <sub>l</sub> + n <sub>h</sub> × 256) × horizontal motion unit)] from the beginning of the line. In standard mode, the command is enabled only when input at the beginning of a line. In page mode, an internal flag is activated, and the command is enabled when the printer returns to standard mode.
<b>Function</b>	<b>Set Printing Area Width</b>
<b>ASCII</b>	GS W <n <sub>l</sub> > <n <sub>h</sub> >
<b>Hexadecimal</b>	1DH 57H <n <sub>l</sub> > <n <sub>h</sub> >
<b>Decimal</b>	<29> <87> <n <sub>l</sub> > <n <sub>h</sub> >
<b>Range</b>	0 ≤ n <sub>l</sub> ≤ 255 0 ≤ n <sub>h</sub> ≤ 255
<b>Description</b>	The printing area width is set to [(n <sub>l</sub> + n <sub>h</sub> × 256) × horizontal motion unit)] from the left margin. In standard mode, the command is enabled only when input at the beginning of a line. In page mode, an internal flag is activated, and the command is enabled when the printer returns to standard mode.
<b>Function</b>	<b>Turn ON/OFF Uni-Directional Printing Mode</b>
<b>ASCII</b>	[ESC] U <n>
<b>Hexadecimal</b>	1BH 55H <n>
<b>Decimal</b>	<27> <85> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	The [ESC] U <n> command turns on/off unidirectional printing mode. When the least significant bit (LSB) of <n> = 1, unidirectional printing is turned on. When LSB = 0, unidirectional printing is turned off, and i-directional printing is turned on. Unidirectional printing can be turned on when printing double-high characters to ensure that the top and bottom of the characters are aligned. <n> = 0 is the default setting.
<b>Function</b>	<b>Set Left Margin</b>
<b>ASCII</b>	[ESC] l <n>
<b>Hexadecimal</b>	1BH 6CH <n>
<b>Decimal</b>	<27> <108> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	The [ESC] l <n> command sets the left margin using <n>. The left margin is set to <n> characters from the beginning of the line.

<b>Function</b>	<b>Set Right Margin</b>
<b>ASCII</b>	[ESC] Q <n>
<b>Hexadecimal</b>	1BH 51H <n>
<b>Decimal</b>	<29> <81> <n>
<b>Range</b>	$0 \leq n \leq 255$
<b>Description</b>	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.

<b>Function</b>	<b>Return Home</b>
<b>ASCII</b>	[ESC] <
<b>Hexadecimal</b>	1BH 3CH
<b>Decimal</b>	<27> <60>
<b>Description</b>	The [ESC] < command moves the print head to the home position.

## Bit-Image Commands

<b>Function</b>	<b>Select Bit-Image Mode</b>
<b>ASCII</b>	[ESC] * <m> <nl> <nh> <dl> ... <dk>
<b>Hexadecimal</b>	1BH 2AH <m> <nl> <nh> <dl> ... <dk>
<b>Decimal</b>	<27> <42> <m> <nl> <nh> <dl> ... <dk>
<b>Range</b>	<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
<b>Description</b>	[ESC] * <m> <nl> <nh> <dl> ... <dk> 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

<b>Function</b>	<b>Enable/Disable Automatic Status Back (ASB)</b>
<b>ASCII</b>	[GS] a <n>
<b>Hexadecimal</b>	1DH 61H <n>
<b>Decimal</b>	<29> <97> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	<p>The [GS] a &lt;n&gt; 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 &lt;n&gt; = 0, ASB is disabled.</p> <p>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 &lt;n&gt; as follows:</p>

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>**

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 <b>FEED</b> Button
	On	40H	<64>	Paper is being fed by the <b>FEED</b> 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 <sup>14</sup>
	On	20H	<32>	Unrecoverable error occurred
6	Off	00H	<0>	No temporary abnormality of the print head temperature (high temperature)
	On	40H	<64>	Temporary abnormality of the print head temperature (high temperature) occurred
7	Off	00H	<0>	Not used; fixed to Off

Table 35 Automatic Status Back (ASB) Second Byte (Error Information)

<sup>14</sup> The iTherm™ 280 can not recover from mechanical errors without flushing the input buffer. All print data will be lost if a mechanical error occurs.

Bit	Off/On	Hex	Decimal	Status for Automatic Status Back (ASB)
0	Off	00H	<0>	Journal memory adequate
	On	01H	<1>	Journal memory low (Less than 8K)
1	Off	00H	<0>	Paper low sensor: paper adequate
	On	02H	<2>	Paper low sensor: paper low
2	Off	00H	<0>	Journal memory adequate
	On	04H	<4>	Journal memory exhausted.
3	Off	00H	<0>	Paper out sensor: paper present
	On	08H	<8>	Paper out sensor: paper not present
4	Off	00H	<0>	Not used; fixed to Off
5,6	-	-	-	Undefined
7	Off	00H	<0>	Not used; fixed to Off

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

Bit	Off/On	Hex	Decimal	Status
0	Off	00H	<0>	Journal Memory adequate
	On	01H	<1>	Journal Memory low (Less than 8K)
1	Off	00H	<0>	Paper low sensor: paper adequate
	On	02H	<2>	Paper low sensor: paper low
2	Off	00H	<0>	Journal Memory adequate
	On	04H	<4>	Journal Memory exhausted.
3	Off	00H	<0>	Paper out sensor: paper present
	On	08H	<8>	Paper out sensor: paper not present
4	Off	00H	<0>	Not used; fixed to Off
5,6	-	-	-	Undefined
7	Off	00H	<0>	Not used; fixed to Off

Table 38 Paper Sensor Status (&lt;n&gt; = 1, 49)

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

Table 39 Drawer Kick-out Connector Status (&lt;n&gt; = 2, 50)

Function	Transmit Real-Time Status
ASCII	[DLE] [EOT] <n>
Hexadecimal	10H 04H <n>
Decimal	<16> <4> <n>
Range	1 ≤ n ≤ 4
Description	The [DLE] EOT <n> command transmits the specified status in real time. The command is executed if the printer is off line, the print buffer is full, or an error occurs. If the printer goes off line due to a paper-end condition, bit 5 of the printer status (waiting for on-line recovery) is on from the time the paper roll is inserted to the time the printer goes on-line. See the [GS] z 0 command for details of the on-line recovery wait time. The paper roll 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, &lt;n&gt;

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

Table 41 Printer Status (&lt;n&gt; = 1)

Bit	Off/On	Hexl	Decimal	Status
0	Off	00H	<0>	Not used; fixed to off
1	On	02H	<2>	Not used; fixed to on
2	-	-	-	Undefined
3	Off	00H	<0>	Paper is not being fed by the <b>FEED</b> Button
	On	08H	<8>	Paper is being fed by the <b>FEED</b> 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 (&lt;n&gt; = 2)

Bit	Off/On	Hex	Decimal	Status
0	Off	00H	<0>	Not used; fixed to off
1	On	02H	<2>	Not used; fixed to on
2	Off	00H	<0>	No mechanical error
	On	04H	<4>	Mechanical error occurred
3	Off	00H	<0>	No auto-cutter error
	On	08H	<8>	Auto-cutter error occurred
4	On	10H	<16>	Not used; fixed to on
5	Off	00H	<0>	Unrecoverable error occurred <sup>15</sup>
	On	20H	<32>	Recoverable error occurred
6	Off	00H	<0>	Not used; fixed to off
7	Off	00H	<0>	Not used; fixed to off

Table 43 Error Status (&lt;n&gt; = 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 (&lt;n&gt; = 4)

Function	Transmit Peripheral Status
ASCII	[ESC] u <n>
Hexadecimal	1BH 75H <n>
Decimal	<27> <117> <n>
Range	n = 0

<sup>15</sup> The iTherm™ 280 does not allow buffer recovery on unrecoverable errors. Following the recovery process will not restore the data buffers.

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

Bit	Off/On	Hex	Decimal	Status
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 (&lt;n&gt; = 0, 48)

**Function** Transmit Paper Sensor Status

**ASCII** [ESC] v

**Hexadecimal** 1BH 76H

**Decimal** <27> <118>

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

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

Table 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	<p><b>ESC c 0 n</b> 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 <b>ESC 2</b>, <b>ESC 3</b>, <b>GSL</b>, and <b>GS W</b>. 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 <math>n = 1</math>. The paper type(s) are selected for printing by using <math>n</math> as follows:</p>

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 does 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 82.

In EPOS mode, the electronic journal and the paper roll may be both selected. As there is limited space in the electronic journal, the amount of data sent the journal should be limited.

NOTE: In EPOS emulation the iTherm™ 280 printer will recognize the Epson Slip Select command and enter Validation mode.

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

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

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

**Function** Select Paper Type for Command Settings**ASCII** [ESC] f <t<sub>1</sub>><t<sub>2</sub>>**Hexadecimal** 1BH 66H <t<sub>1</sub>><t<sub>2</sub>>**Decimal** <27> <116> <t<sub>1</sub>><t<sub>2</sub>>

**Range** 0 ≤ t<sub>1</sub> ≤ 15  
0 ≤ t<sub>2</sub> ≤ 64

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

## Page Mode

**Function** Cancel Print Data in Page Mode**ASCII** [CAN]**Hexadecimal** 18H**Decimal** <24>

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

**Function** Select Page Mode**ASCII** [ESC] L**Hexadecimal** 1BH 4CH**Decimal** <27> <76>

**Description** ESC L Switches from standard mode to page mode and starts the page mode definition.

**Function** Set Printing Area in Page Mode**ASCII** [ESC] W xL xH yL yH dxL dxH dyL dyH

**Hexadecimal** 1BH 57H xL xH yL yH dxL dxH dyL dyH  
**Decimal** <27> <87> xL xH yL yH dxL dxH dyL dyH  
**Range**  $0 \leq (xL + xH \times 256) \leq 65535$  ( $0 \leq xL \leq 255$ ,  $0 \leq xH \leq 255$ )  
 $0 \leq (yL + yH \times 256) \leq 65535$  ( $0 \leq yL \leq 255$ ,  $0 \leq yH \leq 255$ )  
 $1 \leq (dxL + dxH \times 256) \leq 65535$  ( $0 \leq dxL \leq 255$ ,  $0 \leq dxH \leq 255$ )  
 $1 \leq (dyL + dyH \times 256) \leq 65535$  ( $0 \leq dyL \leq 255$ ,  $0 \leq dyH \leq 255$ )

**Description** ESC W sets the position and the size of the printing area.

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

---

**Function** Select Standard Mode

**ASCII** [ESC] S

**Hexadecimal** 1BH 53H

**Decimal** <27> <83>

**Description** ESC S Switches from page mode to standard mode with out printing the page. All page definition is lost.

---

**Function** Select Page Mode Entry Direction

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

**Hexadecimal** 1BH 54H <n>

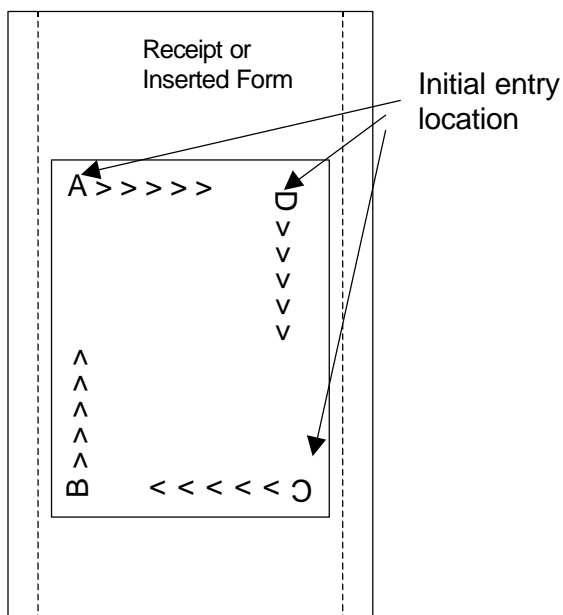
**Decimal** <27> <84>

**Description** ESC T Select print direction in page mode

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

**Where**

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



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<b>Function</b>	<b>Print and return to standard mode (in page mode)</b>
<b>ASCII</b>	[FF]
<b>Hexadecimal</b>	0CH
<b>Decimal</b>	<12>
<b>Description</b>	[FF] In page mode, prints the data in the print buffer collectively and returns to standard mode.

<b>Function</b>	<b>Print data in page mode</b>		
<b>ASCII</b>	[ESC][FF]		
<b>Hexadecimal</b>	1BH,0CH		
<b>Decimal</b>	<27><12>		
<b>Description</b>	[ESC][FF] Prints the page as it is currently defined and reenters page mode without deleting the page definition.		
<b>Function</b>	<b>Set Absolute Vertical Print Position in Page Mode</b>		
<b>ASCII</b>	[GS]\$		
<b>Hexadecimal</b>	1DH,24H		
<b>Decimal</b>	<29><36>		
<b>Description</b>	GS \$ sets the absolute vertical print starting position to $[nL + nH \times 256]$ (vertical or horizontal motion units)] in page mode. x		
<b>Function</b>	<b>Set Relative Vertical Print Position in page mode</b>		
<b>ASCII</b>	[GS] \ <n <sub>i</sub> > <n <sub>h</sub> >		
<b>Hexadecimal</b>	1BH 5CH <n <sub>i</sub> > <n <sub>h</sub> >		
<b>Decimal</b>	<27> <92> <n <sub>i</sub> > <n <sub>h</sub> >		
<b>Range</b>	0 ≤ n <sub>i</sub> ≤ 255 0 ≤ n <sub>h</sub> ≤ 255		
<b>Description</b>	The [GS] \ <n <sub>i</sub> > <n <sub>h</sub> > command sets the print starting position based on the current position and the distance from the current position to $[(n_i + n_h \times 256) \times \text{vertical or horizontal unit}]$ .		

## Bar Code Commands

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

Mode	<m>	Bar Code System	Number of Characters	Remarks
1	0	UPC A	11 ≤ k ≤ 12	48 ≤ d ≤ 57
1	1	UPC E	11 ≤ k ≤ 12	48 ≤ d ≤ 57
1	2	JAN-13 (EAN-13)	12 ≤ k ≤ 13	48 ≤ d ≤ 57
1	3	JAN-8 (EAN-8)	7 ≤ k ≤ 8	48 ≤ d ≤ 57
1	4	Code 39	1 ≤ k	48 ≤ d ≤ 57, 65 ≤ d ≤ 90 d = 32, 36, 37, 43, 45, 46, 47
1	5	ITF	1 ≤ k (even number)	48 ≤ d ≤ 57
1	6	Codabar	1 ≤ k	48 ≤ d ≤ 57, 65 ≤ d ≤ 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 &lt;m&gt;

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

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

**[Description for 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.

(See next page.)

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 ≤ n ≤ 255
Default	0.90 inch high
Description	The GS h <n> command sets the height of the bar code. The bar code height is set to n/180 inch.

Function	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 48 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 ≤ n ≤ 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 49 Horizontal size of the bar code

## Mechanism Control Commands

<b>Function</b>	<b>Select cut mode and cut paper</b>
<b>ASCII</b>	[GS] V <m> <n>
<b>Hexadecimal</b>	1DH 56H <m> <n>
<b>Decimal</b>	<29> <86> <m> <n>
<b>Description</b>	When <m> = 1 or 49, <n> is not used and a partial cut is performed. When <m> = 66, [GS] V <m> <n> executes a partial cut (one point left uncut) after paper is fed [cutting position (<n> x approximately 1/144 inch)]. When using the command, there is a gap between the auto-cutter position and the print position. The [GS] V <m> <n> command is only effective when input at the beginning of a line. The [GS] V <m> <n> command executes paper feeding to the manual cutting position.
<b>Function</b>	<b>Partial knife cut</b>
<b>ASCII</b>	[ESC] i
<b>Hexadecimal</b>	1BH 69H
<b>Decimal</b>	<27> <105>
<b>Description</b>	The [ESC] i command performs a partial knife cut.
<b>Function</b>	<b>Perform a partial knife cut</b>
<b>ASCII</b>	[ESC] m
<b>Hexadecimal</b>	1BH 6DH
<b>Decimal</b>	<27> <109>
<b>Description</b>	The [ESC] m command performs a partial knife cut.
<b>Function</b>	<b>Sound buzzer</b>
<b>ASCII</b>	[BEL]
<b>Hexadecimal</b>	07H
<b>Decimal</b>	<07>
<b>Description</b>	The [BEL] command sounds the internal buzzer, if equipped.
<b>Function</b>	<b>Sound buzzer</b>
<b>ASCII</b>	[ESC] BEL
<b>Hexadecimal</b>	1BH 07H
<b>Decimal</b>	<27> <07>
<b>Description</b>	The [ESC] BEL command sounds the internal buzzer, if equipped.

## Miscellaneous Commands

<b>Function</b>	<b>Set Horizontal and Vertical Motion Units</b>
<b>ASCII</b>	[GS] P x y
<b>Hexadecimal</b>	1DH 50H x y
<b>Decimal</b>	<29> <80> x y
<b>Range</b>	0 ≤ x ≤ 255
<b>Default</b>	x = 180, y = 360
<b>Description</b>	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.

<b>Function</b>	<b>Initialize the Printer</b>
<b>ASCII</b>	[ESC] @
<b>Hexadecimal</b>	1BH 40H
<b>Decimal</b>	<27> <64>
<b>Description</b>	The [ESC] @ command initializes the printer. All settings, including character font and line spacing, are canceled.

<b>Function</b>	<b>Transmit Printer ID</b>
<b>ASCII</b>	[GS] I <n>
<b>Hexadecimal</b>	1DH 49H <n>
<b>Decimal</b>	<29> <73> <n>
<b>Range</b>	1 ≤ n ≤ 3 49 ≤ n ≤ 51
<b>Description</b>	The [GS] I <n> command transmits the printer ID specified by <n> below. Each printer ID consists of one byte of data.

<n>	Printer ID	Hex ID
1,49	Printer model ID	0DH
2,50	Type ID	20H or 32D <sup>16</sup>
3,51	ROM version ID	2H or 2D.

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

<sup>16</sup> The Epson Type ID and ROM version are based on the Epson TM-88 documentation and a sample printer. This value can be reconfigured to any 8 bit value.

<b>Function</b>	<b>Generate Pulse</b>
<b>ASCII</b>	[ESC] p <m> <t <sub>1</sub> > <t <sub>2</sub> >
<b>Hexadecimal</b>	1BH 70H <m> <t <sub>1</sub> > <t <sub>2</sub> >
<b>Decimal</b>	<27> <112> <m> <t <sub>1</sub> > <t <sub>2</sub> >
<b>Range</b>	<m> = 0, 1, 48, 49 0 ≤ t <sub>1</sub> ≤ 255 0 ≤ t <sub>2</sub> ≤ 255
<b>Description</b>	The [ESC] p <m> <t <sub>1</sub> > <t <sub>2</sub> > command sends a pulse (on time = <t <sub>1</sub> > x 2 msec) to the specified connector pin. When <m> = 1 or 48, the pulse is sent to drawer-kick-out connector pin 2. When <m> = 0 or 49, the pulse is sent to drawer-kick-out connector pin 5.

<b>Function</b>	<b>Generate Pulse in real time</b>
<b>ASCII</b>	[DLE] [DC4] <1> <m> <t>
<b>Hexadecimal</b>	10H 14H <1> <m> <t>
<b>Decimal</b>	<16> <20> <1> <m> <t>
<b>Range</b>	0 ≤ m ≤ 8 0 ≤ t ≤ 8
<b>Description</b>	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

<b>Function</b>	<b>Execute power-off sequence</b>
<b>ASCII</b>	[DLE] [DC4] <2> <a> <b>
<b>Hexadecimal</b>	10H 14H <2> <a> <b>
<b>Decimal</b>	<16> <20> <2> <a> <b>
<b>Range</b>	a = 1 b = 8
<b>Description</b>	The [DLE] [DC4] <2> <a> <b> command executes the printer power-off sequence as follows:

Stores the values of the maintenance counter.

Transmits the following power-off status (Header + Status + NUL)

Power off status	Hex	Decimal	Amount of data
Header	3BH	59	1 byte
Status	30H	48	1 byte
NUL	00H	0	1 byte

Executes the printer power off

<b>Function</b>	<b>Clear buffer(s)</b>
<b>ASCII</b>	[DLE] [DC4] <8> d1...d7
<b>Hexadecimal</b>	10H 14H <8> d1...d7
<b>Decimal</b>	<16> <20> <8> d1...d7
<b>Range</b>	d1=1, d2=3, d3=20, d4=1, d5=6, d6=2, d7=8
<b>Description</b>	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 52 Peripheral Device Bit Definitions**

**Note 1**            The Epson Customer display is not supported by the iTherm 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

<b>Function</b>	<b>Enter Test Mode</b>
<b>ASCII</b>	[GS] ( A <2> <0> <n> <m>
<b>Hexadecimal</b>	1DH 28H 41H <2> <0> <n> <m>
<b>Decimal</b>	<29> <40> <65> <2> <0> <n> <m>
<b>Description</b>	This command places the printer into test mode based on the parameters <n> and <m>.
<b>Where &lt;n&gt;</b>	may be 0, 1, 2, 48, 49, or 50. It is intended to select the print station. The iTherm™ 280 will accept any of these values
<b>Where &lt;m&gt;</b>	1 or 49 Selects Hex Dump mode. You must press the * Button to exit this mode 2 or 50 Selects Printer configuration print out. 3 or 51 Selects Rolling ASCII test pattern. You must press * Button to exit this mode.

<b>Function</b>	<b>Print counter</b>
<b>ASCII</b>	[GS] c:
<b>Hexadecimal</b>	1DH 63H
<b>Decimal</b>	<29> <99>
<b>Description</b>	<b>Sets the serial counter value in the print buffer and increments or decrements the counter value.</b>
<ul style="list-style-type: none"> <li>After setting the current counter value in the print buffer as print data (a character string), the printer counts up or down based on the count mode set</li> </ul>	

<b>Function</b>	<b>Initialize maintenance counter</b>
<b>ASCII</b>	[GS] g 0 m nl nh:
<b>Hexadecimal</b>	1DH 67H 30H
<b>Decimal</b>	<29> <103> <48>
<b>Description</b>	<b>Initializes the resettable maintenance counter to 0.</b>
<ul style="list-style-type: none"> <li>nl, nh specifies the maintenance counter number as (nl + nh x 256)</li> </ul>	

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

<b>Function</b>	<b>Transmit maintenance counter</b>
<b>ASCII</b>	[GS] g 2 m nl nh:
<b>Hexadecimal</b>	1DH 67H 32H
<b>Decimal</b>	<29> <103> <50>
<b>Description</b>	<b>Transmits the value of the specified maintenance counter.</b>
<ul style="list-style-type: none"> <li>nl, nh specifies the maintenance counter number as (nl + nh x 256)</li> </ul>	

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	cumulative
14	20	Printer operation time	
14	20	Number of line feeds: roll paper	
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:

	Hexadecimal	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	<p>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 <math>t \times 100</math> 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 <b>FEED</b> 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.</p>

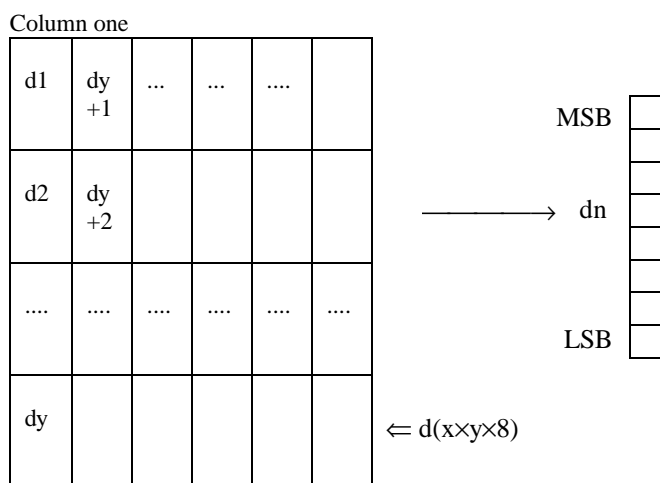
Bit	Off/On	Hexl	Decimal	Function
0	Off	00	0	Macro executes r times continuously with the interval specified by t
	On	01	1	<b>FEED</b> Button controlled operation with time interval t
1-4	-	-	-	Undefined
5	On	20	32	Value given by r is ignored and macro is run infinitely
6	On	40	64	Save start-up macro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

Table 53 Macro Control Bit Definitions

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

## User-defined Images and Graphics Commands

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



```
PRINT #1, CHR$(29),CHR$(45),
PRINT #1, "MY IMAGE",CHR$(0);
PRINT #1, CHR$(1),CHR$(1);
PRINT #1, CHR$(255),CHR$(255),CHR$(255),CHR$(255);
PRINT #1, CHR$(255),CHR$(255),CHR$(255),CHR$(255)
```

```
REM Enter the GS command
REM Define the image name
REM Image size (8 x 8 bits)
REM Send 8 bytes of image
REM data
```

**Function**      **Print User-Defined Bit Image****ASCII**          GS 0 <Name..> <0><m>**Hexadecimal**    1DH 30H <Name..> 0H<m>**Decimal**        <29> <48> <Name..> <0><m>**Range**          <Name..> = a 15-byte maximum length name to identify the image.

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

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

Where <m> selects a mode from the table below.

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

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

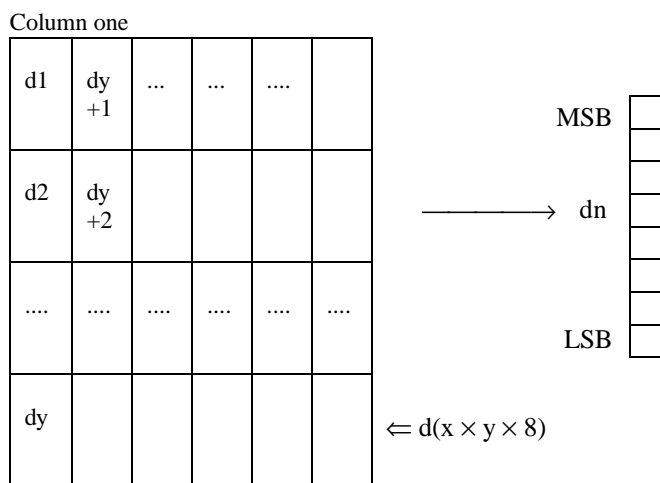
**Description**    GS 1 deletes a single entry (bit-image or character set) from storage in the nonvolatile memory pool.

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

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

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

<b>Function</b>	<b>Define Single User-Defined Bit-Image</b>
<b>ASCII</b>	GS * x y d <sub>1</sub> ... d(x x y x 8)
<b>Hexadecimal</b>	1DH 2AH x y d <sub>1</sub> ... d(x x y x 8)
<b>Decimal</b>	<29> <42> x y d <sub>1</sub> ... d(x x y x 8)
<b>Range</b>	1 ≤ x ≤ 255 1 ≤ y ≤ 48 0 ≤ d ≤ 255
<b>Description</b>	The GS * x y d <sub>1</sub> ... 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.



---

<b>Function</b>	<b>Print single user-defined bit-image</b>
<b>ASCII</b>	GS / <m>
<b>Hexadecimal</b>	1DH 2FH <m>
<b>Decimal</b>	<29> <47> <m>
<b>Description</b>	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 54 User-defined Bit-image Resolutions**


---

<b>Function</b>	<b>Save User-Defined Character Set</b>
<b>ASCII</b>	GS 6 <Name..> <0>
<b>Hexadecimal</b>	1DH 36H <Name..> 0H
<b>Decimal</b>	<29> <54> <Name..> <0>
<b>Range</b>	<Name> = a 15-byte maximum alphanumeric name to identify the image.
<b>Description</b>	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.

---

<b>Function</b>	<b>Select User-Defined Character Set</b>
<b>ASCII</b>	GS 7 <Name..> <0>
<b>Hexadecimal</b>	1DH 37H <Name..> 0H
<b>Decimal</b>	<29> <55> <Name..> <0>
<b>Range</b>	<Name..> = a 15-byte maximum alphanumeric name to identify the image.
<b>Description</b>	GS 7 <Name..> <0> selects a previously saved user-defined character set. If the character set does not exist, the command is ignored.

---

<b>Function</b>	<b>Query Nonvolatile Memory Pool Information</b>
<b>ASCII</b>	GS 3
<b>Hexadecimal</b>	1DH 33H
<b>Decimal</b>	<29> <51>
<b>Description</b>	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 **Error!**  
**Bookmark not defined..**

### Panel Button Commands

<b>Function</b>	<b>Enable/Disable Paper Feed</b>
<b>ASCII</b>	[ESC] p 5 <n>
<b>Hexadecimal</b>	1BH 70H 35H <n>
<b>Decimal</b>	<27> <112> <53> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	The [ESC] c 5 <n> command enables or disables the <b>FEED</b> Button.
<b>Where &lt;n&gt;</b>	Bit 0 = 1 the <b>FEED</b> Button is disabled Bit 0 = 0 the button is enabled.

### Paper Out/Low Sensor Commands

<b>Function</b>	<b>Paper Low Sensor</b>
<b>ASCII</b>	[ESC] p 4 <n>
<b>Hexadecimal</b>	1BH 70H 34H <n>
<b>Decimal</b>	<27> <112> <52> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	The [ESC] c 4 <n> command determines if the printer stops printing when paper low is detected.
<b>Where &lt;n&gt;</b>	0 Printer continues to print with paper low. 1 Printer stops printing when paper low is detected.

<b>Function</b>	<b>Paper Error Signal Control</b>
<b>ASCII</b>	[ESC] p 3 <n>
<b>Hexadecimal</b>	1BH 70H 33H <n>
<b>Decimal</b>	<27> <112> <51> <n>
<b>Range</b>	0 ≤ n ≤ 255
<b>Description</b>	The [ESC] c 3 <n> command controls how the paper error pin on the parallel interface operates.
<b>Where &lt;n&gt;</b>	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 0 = 1 Paper out will set the paper error pin. If Bit 0 = 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™ 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 emulations.

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: All of these commands follow the ESC ~ or ESC y 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	12	Base Flash Erases
1	Red Dots	13	Ext Flash Erases
2	Pink Dots	14	Auto Cutter Cycles
3	Cover Opens	15	Init Requests
4	Paper Outs	16	Error Vectors
5	Line Feeds	17	Auto Cutter Faults
6	Characters Printed	18	Power On Time (Min.)
7	Cash Drawer1	19	System Active Time (Min.)
8	Cash Drawer2	20	Over Temperature
9	Standby Cycles	21	Cutter Re-Home
10	Power Up Resets		
11	Watchdog Resets		

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.

---

<b>Function</b>	<b>Print Current Configuration and Totals</b>
<b>ASCII</b>	[ESC] y <9> or [ESC] ~ <9>
<b>Hexadecimal</b>	1BH 79H 09H
<b>Decimal</b>	<27> <121> <9>
<b>Description</b>	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.
<b>Note:</b>	This command must be preceded with an ESC y <8>.

---

<b>Function</b>	<b>Print Current Totals</b>
<b>ASCII</b>	[ESC] y <15>
<b>Hexadecimal</b>	1BH 79H 0FH
<b>Decimal</b>	<27> <121> <15>
<b>Description</b>	This command forces the printer to print the current totals log.
<b>Note:</b>	This command must be preceded with an ESC y <8>.

---

<b>Function</b>	<b>Print Current Print Setup Values</b>
<b>ASCII</b>	[ESC] y <20> or [ESC] ~ <20>
<b>Hexadecimal</b>	1BH 79H 14H
<b>Decimal</b>	<27> <121> <20>
<b>Description</b>	This command forces the printer to print the current setup values.
<b>Note:</b>	This command must be preceded with an ESC y <8>.

---

<b>Function:</b>	<b>Set Electronic Journal Print Configuration Control</b>
<b>ASCII:</b>	[ESC] ~ j <n>
<b>Hex:</b>	1BH 7EH 6AH
<b>Decimal:</b>	<27><126><105>
<b>Description:</b>	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.

<b>Note:</b>	Both parameters must be set at the same time by this command.
<b>Note:</b>	The Record separation configuration may be set in manual configuration mode. This command will reset the configuration to the value specified here.
<b>Note:</b>	This command performs a configuration update, and should not be done on a regular basis.
<b>Note:</b>	This command must be preceded with an ESC y <8> to enable it.

## POSjet® 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 8 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.

```

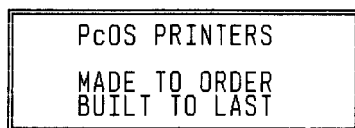
[ESC]:
[ESC]3<27>
[ESC]a<1>
<201>
<205><205><205><205><205><205><205><205>
<205><205><205><205><205><205><205><205>
<205><205><205><205>
<187>[CR][LF]
<186>    PcOS PRINTERS    <186>[CR][LF]
<186>    <186>[CR][LF]
<186>    MADE TO ORDER    <186>[CR][LF]
<186>    BUILT TO LAST    <186>[CR][LF]
<200>
<205><205><205><205><205><205><205><205>
<205><205><205><205><205><205><205><205>
<205><205><205><205>
<188>[CR][LF]
[ESC]a<0>
[ESC]0
[ESC][P<15>
[CR][LF]

ST# 2000  OP# 00067  TE# 021 0035[CR][LF]
KLEENEX FAM D04 QTY 1    1. 68 J[CR][LF]
RITZ        D01 QTY 1    2. 50 D[CR][LF]
CHIPS       D01 QTY 1    1. 50 D[CR][LF]
STORAGE BAG D04 QTY 1    1. 50 J[CR][LF]
          SUB TOTAL    7. 18[CR][LF]
          SALES TAX 1   . 50[CR][LF]
          -----[CR][LF]
          TOTAL        7. 68[CR][LF]
          CASH TEND    20. 00[CR][LF]
          CHANGE DUE   12. 23[CR][LF]

[CR][LF]
[ESC]a<1>
THANK YOU FOR SHOPPING WITH US[CR][LF]
[ESC]a<0>
[CR][LF]
{DATE: 0}          {TIME: 0}[CR][LF]
[ESC]d<10>

```

Figure 9 Example Commands for a Sample Receipt



ST# 2000 OP# 00067 TE# 021 0035  
KLEENEX FAM D04 QTY 1 1.68 J  
RITZ D01 QTY 1 2.50 D  
CHIPS D01 QTY 1 1.50 D  
STORAGE BAG D04 QTY 1 1.50 J  
SUB TOTAL 7.18  
SALES TAX 1 .50  
-----  
TOTAL 7.68  
CASH TEND 20.00  
CHANGE DUE 12.23

THANK YOU FOR SHOPPING WITH US

4/9/2003 12:57

Figure 10 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 forth 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 premixed colors. Typically one of the colors is black and 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 cartridges are used to generate the image. Because the program that generates the graphic image data should not need to be aware of the cartridges installed in the printer, three color plains are sent to the printer. The printer is aware of what colors the cartridges are that will generate the image. The printer will converts the full color image information into a two color image.

If the iTherm™ 280 printer is configured with a black cartridge 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 colored cartridges, the printer attempts to mix the colors to generate black. (Note that in text mode the cartridges are not mixed.) This requires that there be two basic modes of color graphic generation.

If the iTherm™ 280 printer is configured with a black cartridge it must be in the left print cartridge position. In this mode, the printer will not mix colors and the resulting image will be composed of black dots or highlight color dots.

If the iTherm™ 280 printer is configured with two color cartridges, the printer will mix the two installed inks on the paper. In this case, the left cartridge is assigned to the primary color and the right cartridge to 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 (left) cartridge. 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 cartridge (Left) is assigned as the default color and the Secondary cartridge (Right) is assigned as the alternate highlight color. In most cases the darkest color should be placed in the primary cartridge (Left) position.

The Ithaca® Windows print driver provides the translation from Windows color to the three color plains. When a graphic is created for the iTherm™ 280 Printer, the colors used must take into account that colors other than the pen color will print black. The Ithaca® Windows driver helps adjust the color content and generates the desired print from a full color image. (*Ithaca® Windows print driver patent pending.*)

**Procedure for color horizontal graphics:**

There are many ways to generate graphics for the iTherm™ 280 printer. The easiest is to use the PJColor program. (See the next section.) The other way is to use the Ithaca windows driver and capture the output to a file.

To generate an image using the windows print driver:

1. Generate the graphic image in the program of your choice. Use colors consistent with the two colors installed in the printer.
2. Make sure the paper size you pick fits the printer (3 inches wide with 0.25-inch margins).
3. The iTherm™ 280 print driver should be installed (even if the printer is not connected).
4. Set up the print driver to print the graphic to a file using whatever resolution is required.
5. Print the graphic image to a file.
6. Later, when you want to print the graphic, simply copy the file to the printer with your application.
7. You may also copy the graphic to the graphic save buffer and then request the printer to retrieve and print it without re-sending the graphic data.

Optionally, process the color image with the Ithaca® color image processor<sup>17</sup> in the PJColor program. The program can print the image or generate a printable file.



Figure 11 Receipt with graphics

As with all graphics, the data path to the printer must be eight bits. Seven-bit protocols do not work.

<sup>17</sup> Ithaca® Color Image Processor is patent pending

## iTherm™ 280 Universal Color Graphics

The iTherm™ 280 Printer firmware supports the ability to print two color graphics in all emulations. This support is an enhancement to the all the other printer emulations.

The intent of Universal Color Graphic support is to allow the iTherm™ 280 color graphics capability to be used in existing applications that do not support color graphics.

There are several ways to add color graphics to an existing application. The easiest for you will depend on how much control you have over your application. At a minimum, you should be able to change the name printed on the top of a receipt. With the PJColor<sup>18</sup> program you can store a named graphic into the printer and print it by changing the text name to match the stored graphic. For example, if your receipt has a name like "Joe's Market", you can save a graphic in the printer named "Joes" and then change the "Joe's Market" to "&%URJoes&". When the iTherm™ 280 finds "&%URJoes&", 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.

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.

### Store Graphics in the printer:

---

<sup>18</sup> The PJColor program has been enhanced to provide several ways to create color Logos and Coupons and make them available to the iTherm™ 280 printer.

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 the 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: 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 “**Generate a file to store graphics into a printer**” section 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

<b>Function</b>	<b>Begin named universal graphic record</b>
	&%UB <Name..>&
<b>Description</b>	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 d is ignored. The command must be followed by the "End name universal graphic record" command with the same name. If the data definition is terminated without saving any data.
<b>Function</b>	
<b>IPCL</b>	&%UG <Name..>&
	The &%UG <Name..>& command ends the universal graphic record operation and saves the and must match the "Begin named universal graphic record" command. If the name already exists in the flash user field prints.
<b>Function</b>	<b>Run universal graphic dat</b>
<b>IPCL</b>	&%UR <Name..>&
	The &%UR <Name..>& command loads the referenced universal graphic into the universal item does not exist or is not a universal graphic, the
<b>Function</b>	<b>Flag item as a start-</b>
<b>IPCL</b>	&%US <Name..>&
	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
<b>Function</b>	<b>Delete item from user store</b>
	&%UD <Name..>&
<b>Description</b>	does not exist, the iTherm™ 280 ignores the command.
<b>Function</b>	<b>Flush information from user store</b>
<b>IPCL</b>	
<b>Description</b>	The &%UFALL& command clears all entries in user store and frees the data space. It must have the name, "ALL" (in uppercase) attached.

---

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

---

<b>Function</b>	<b>Redefine User Store Termination Character</b>
<b>IPCL</b>	&%UT<n>
<b>Description</b>	This command allows the terminator used to signal the end of the name field in User Store commands to be modified. The value of <n> is used for the terminator. The value of n may be from 0 to 255.
<b>Example</b>	If &%UT% were sent to the printer the User Store command to run universal graphic "Demo" would be &%URDemo%.

---

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

---

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

---

## -Cut Logo Feature

inter has a feature (in some models<sup>19</sup>)  
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-

feature should be used to define and load the graphic. The Coupon is named "Coupon", and the Logo is named

-Cut Logo operation.

Configuration options are as follows:

Cut Command Logo:

Cut-	Perform Feed to cut, then cut, and then print the Logo.
Coupon-	Print the Coupon, Feed to Cut, and Cut.
Logo-	Print the Logo, Feed to Cut, and Cut.
Cut-	Perform Feed to cut, the
Coupon Cut-	Print the Coupon, Feed to cut, Cut, ad then print the Logo.
Logo- -Coupon	Print the Logo, Feed to cut, Cut, ad then print the Coupon.
-Logo Coupon	e Coupon.
-Coupon Logo	
Logo Coupon-	Print the Logo, then the Coupon, feed to cut and Cut.
Coupon- -Cut	Print the Coupon, then the Logo, feed to cut and Cut.
	Perform the Norm

---

<sup>19</sup> The PE1206 version of the firmware contains this feature. It includes the Coupon- -Logo feature, however, -izen or Star Emulation.

# Unicode

## History

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 'ç' 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.

guages. 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 system can 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 DBC

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 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 image of the character. A 32-dot character image uses 128 bytes of memory.  $128 \times 50,000 = 6,400,000$

## Ithaca'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 (e.g., Times, Helvetica, 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

available upon request. You must agree to use this utility with fonts that you have the right to download to a printer.

do not have the right to use the font as a downloaded printer font.

## Communications

### Protocol and Print Buffers

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

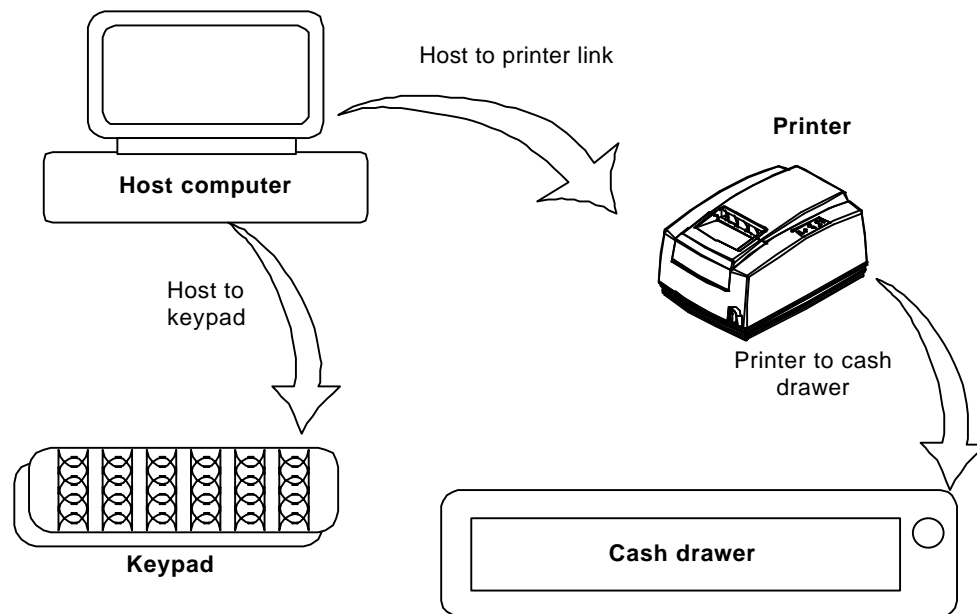


Figure 12 Typical POS System

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.

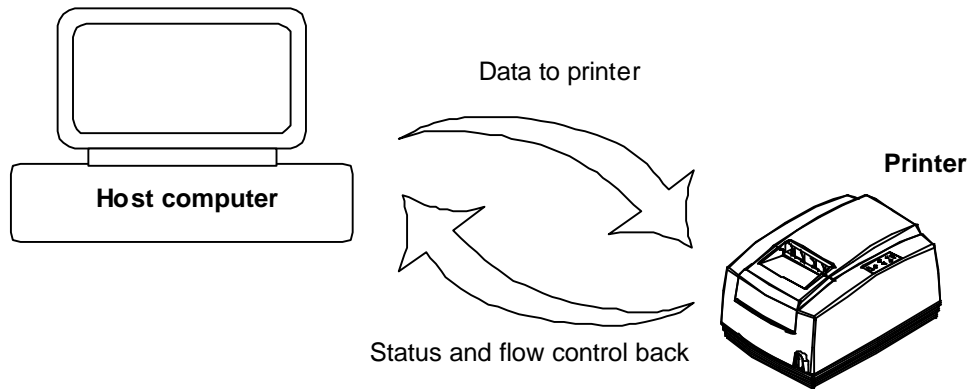


Figure 13 Host to Printer Link

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.

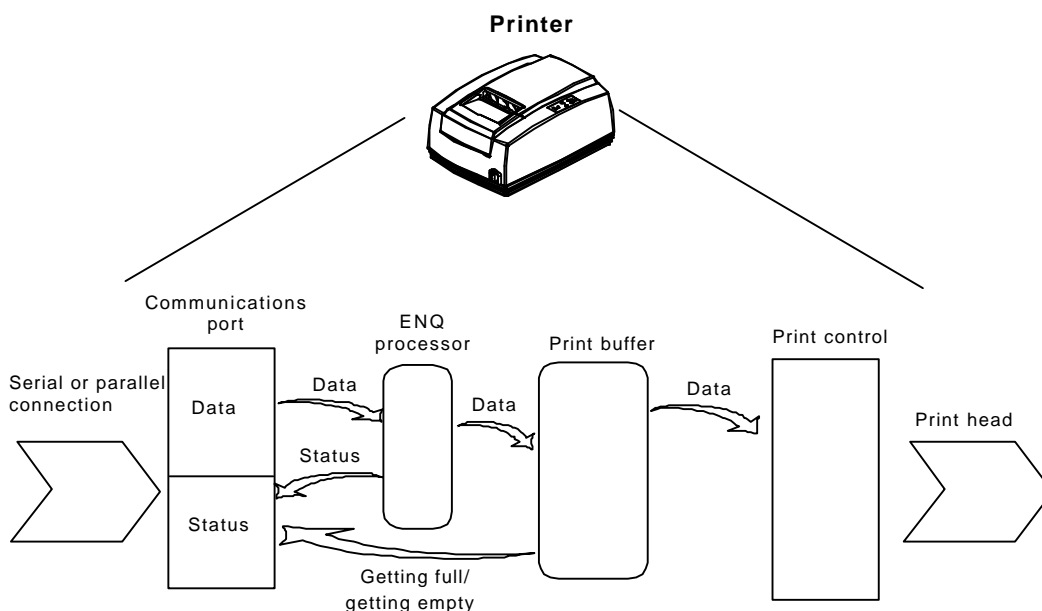


Figure 14 Printer Communications Buffer Flow

The communication port is either serial or parallel and is controlled by a software communication driver. The driver receives data and returns requested status. As information is received from the host, data is taken from the communication port hardware by the driver, preprocessed to look for status inquire commands, and placed in the buffer. When the buffer input function finds that the buffer is getting full, it notifies the communication driver to implement flow control. Flow control attempts to stop further information from being sent from the host.

The print control software takes information from the buffer, as it needs it and can use it. When the buffer output function finds that the buffer is getting low, it notifies the communication driver that the information flow can be resumed (if it was stopped) and allows more information to be placed in the buffer.

The iTherm™ 280 Printer has a configurable input buffer. The printer can be configured to allow from 40 to 8196 bytes of input buffer. Consequently, up to 8196 characters (or control codes) can be sent to the printer before they are interpreted and printed. In effect, the host computer can get 8196 characters ahead of the printer. In all cases, the buffer resumes communications when it is half empty. For example, if the buffer is configured to be 2048, the printer will signal stop when 2048 bytes are in the buffer; resume will be signaled when 1024 bytes remain. Inquire commands are preprocessed, which means they are found in the input data stream and acted upon as they are received. The status returned is valid as of the time the command is received. This is termed real-time status even though inquire commands are preprocessed and still placed in the buffer. Real-time status assures that data is not lost when the inquire sequence is part of another command. However, the buffer may also be filled by inquire commands if the printer is waiting for some activity.

## USB

USB stands for Universal Serial Bus. It was originally conceived in the early 90's and officially recognized by Compaq, Intel, Microsoft and NEC. The development of USB has been slow, however, with the release of Windows 95 SR2 development accelerated. Windows 2000 now fully supports USB as do Windows 98 SE, and Windows Me. A technical discussion of USB is beyond the scope of this document. If you would like more information about USB, visit the USB web site at [www.usb.org](http://www.usb.org).

### USB Support

POS printers are different from typical Windows printers in several ways. Microsoft has recognized these differences and has been working with the USB Device Working Group to generate a set of standards that would abstract all point-of-sale devices at the application level. At this time a workable standard for POS is years away. So while Microsoft is interested in POS in the long term, Microsoft's immediate goal is to enable POS USB devices a way that is compatible with existing service objects.

In order to support USB POS devices under the existing software architecture, Microsoft is providing the POS USB 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 POS USB 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 interface card that is used with the iTherm™ 280 is designed with the Cypress Anchor Chips EZ-USB chip. The Anchor Chips EZ-USB is a compact integrated circuit that provides a highly integrated solution for implementing a USB peripheral device.

#### **Two key EZ-USB features that are important to the end user are:**

1. The EZ-USB family provides a "soft" (RAM-based) solution that allows unlimited configuration and upgrades.
2. The EZ-USB family delivers full USB throughput. Designs that use EZ-USB are not limited by number of endpoints, buffer sizes or transfer speeds.

Because the USB interface card is RAM based it must have firmware loaded into it every time it is turned on. The iTherm™ 280 interface card can be configured with firmware in an EEPROM on the interface card or down loaded from the windows USB driver. Transact will support firmware on the interface card upon request but supports the driver down load by default. (The driver down load takes less than a second!). We are doing this to allow easy USB updates and to assure compatibility between the host driver and the firmware on the USB Interface card.

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 and USB. A USB compatible Beta version is available from customer support or from our web site.

## 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.

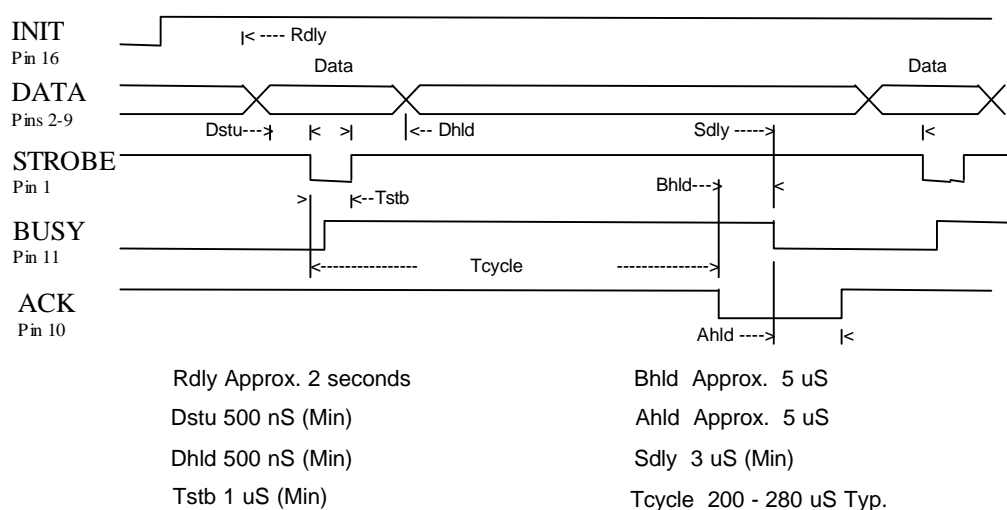


Figure 15 Parallel-port Data Timing

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.

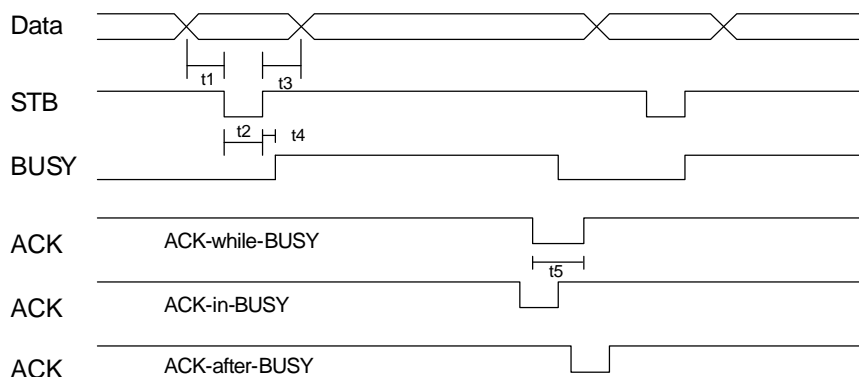


Figure 16 Parallel Port ACK Timing Options

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 55 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, 345 East 47th Street, New York, NY 10017, USA.

### 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:PJ1000CL,IPCL;  
 CLS:PRINTER;MDL M280 PcOS;  
 DES:TransAct iTherm 280;  
 REV:x.xx;OPTS;\$9xyz

**PnP ID:** LPTENUM\TransAct.M280\_PcECB3

**Device:** Ithaca® iTherm 280

**Device** Class: Printer

**The OPTS field is always:** OPTS;\$2XYZ

Where X is a model definition, X and Y are bit fields that designate the options attached to the printer.

Y		X	
Bit 0	Print zone	Bit 0	0
Bit 1	Undefined	Bit 1	Knife module attached
Bit 2	Undefined	Bit 2	0
Bit 3	0	Bit 3	0
Bits 4-5	1	Bits 4-5	1
Bits 6-7	0	Bits 6-7	0

## Serial Port

### Serial Port Protocol

The serial port supports two flow control standards, XON/XOFF and Ready/Busy (sometimes called Data Terminal Ready (DTR) or hardware handshake).

When Ready/Busy flow control is selected, the printer can be configured to use DTR, Request to Send (RTS), or both for flow control. If only DTR is selected for flow control, RTS will indicate the cover is open or the printer has faulted. The following discussion assumes the DTR is being used for flow control.

The Ready/Busy protocol generally uses the DTR signal to indicate to the host computer that the printer is not ready to accept data. The host should stop sending data to the printer as soon as possible. Because the host may not notice the DTR signal until it has transmitted several bytes of data to the printer, the printer continues to except up to 255<sup>20</sup> bytes of data after it indicates that it is not ready. Figure 17 Serial Port Flow Control Using DTR illustrates how the Ready/Busy protocol works, and Figure 18 XON/XOFF Serial Port Flow Control illustrates how the XON/XOFF protocol works.

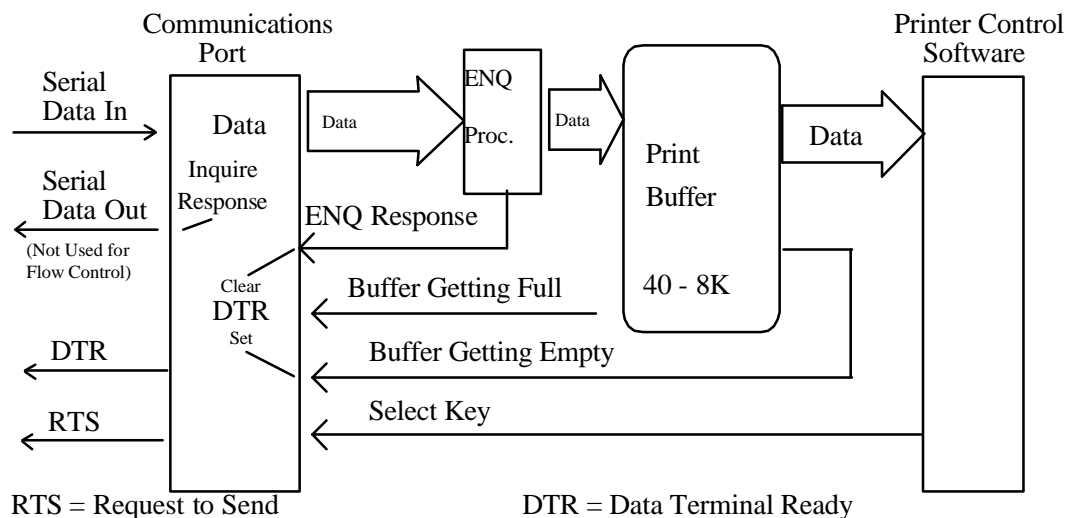
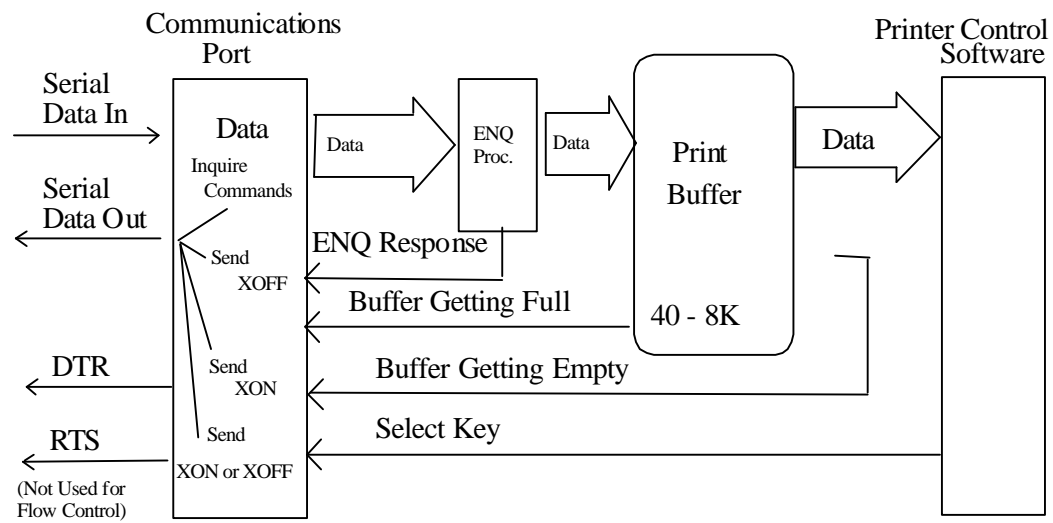


Figure 17 Serial Port Flow Control Using DTR

<sup>20</sup> The buffer always signals it is full before it overflows. The size of the reserve depends on the buffer size selected. It is always at least 255 bytes.



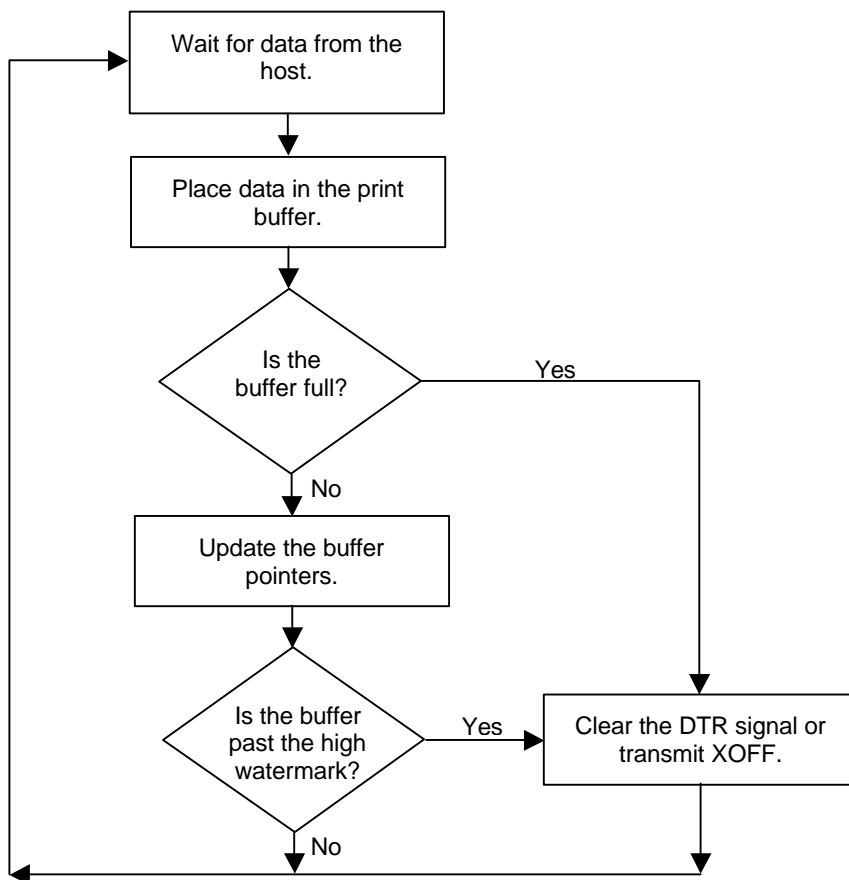
RTS = Request to Send

DTR = Data Terminal Ready

Figure 18 XON/XOFF Serial Port Flow Control

## Print Buffer Flow

Flow Chart 1 illustrates how the communications driver acquires data from the serial port and places it in the buffer using Ready/Busy or XON/XOFF flow control.



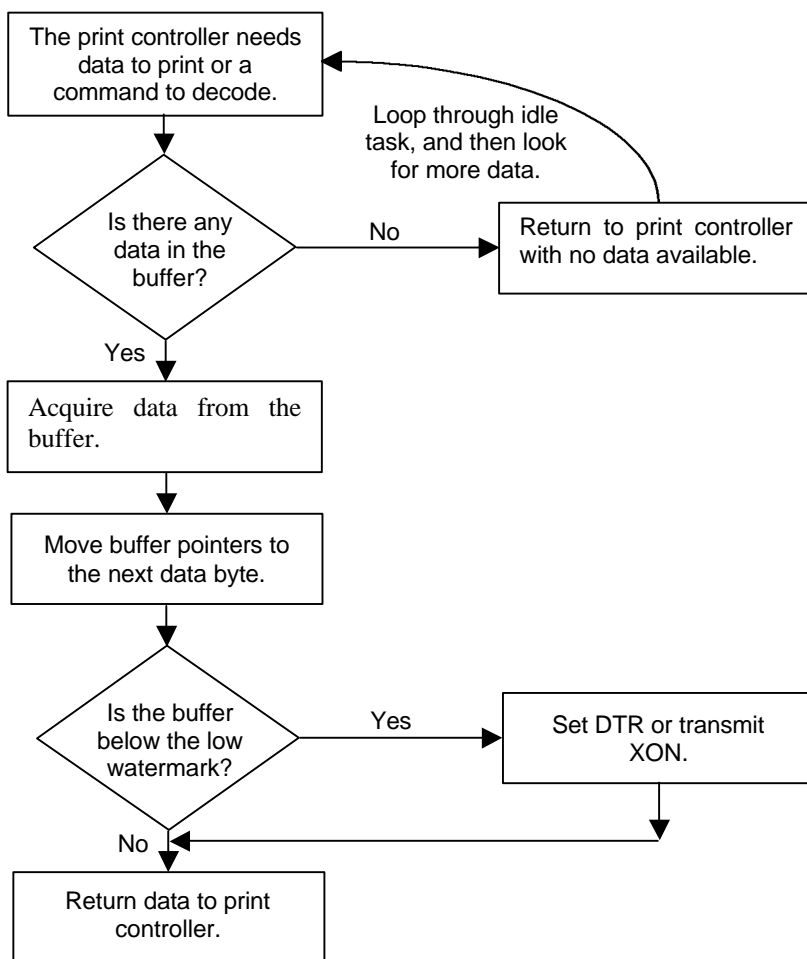
Flow Chart 1 Serial Buffer Operation

At the top of

Flow Chart 1, the driver is waiting for data. When data is received from the host, the printer checks to see if it is an inquire command. If the data is an inquire, it is responded to and placed in the buffer. If not, the data is placed in the buffer without response. The buffer is then checked to see if it is full before the internal pointer is incremented. If it is not full, the pointer is incremented in preparation for the next data byte. The buffer is checked by looking to see if it has passed a high watermark. If the buffer has, the communication driver is notified, and it resets DTR to indicate to the host that no more data should be sent.

Flow Chart 2 illustrates how the print control software takes data from the buffer and controls flow. At the top of the chart, the print control software asks for data. If there is no data in the buffer, a “no data flag” is returned. The print software must then wait for data. If there is data in the buffer, it is read, and the pointers are updated. The buffer is then checked to see how much information is left. If the buffer is below a low watermark (about 100 bytes left), the communication driver is notified, and DTR is reasserted.

When XON/XOFF flow control is used, the flow is similar to DTR flow except that DTR is not used and XON/XOFF control characters are transmitted back to the host on the serial link. The XON/XOFF advantage is that only three wires are required to interconnect to a printer. The disadvantage is that a serial-port receiver driver must be written for the host.



Flow Chart 2 Print Controller Using Data

When the printer is on, the print controller looks for data. If there is data, it processes it. Flow control is done when the data is taken from the buffer and the amount of data in the buffer is less than a prescribed amount. The low watermark is set based on the expected environment. The 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.

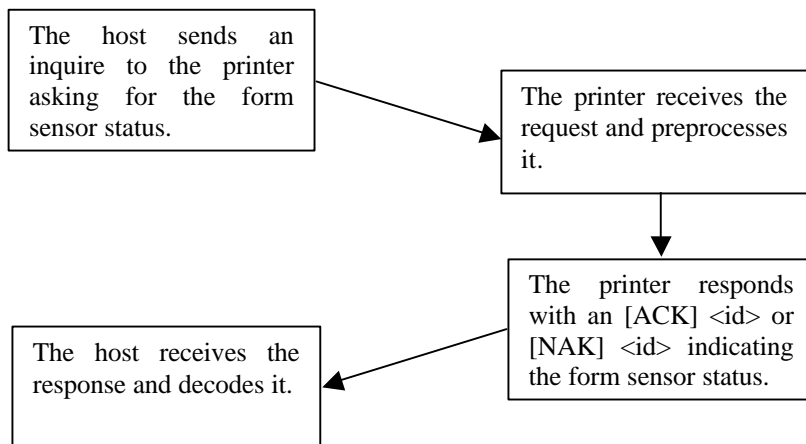
028H	Start of ASCII response	
	0,1	PnP Rev
	'IPR0210'	Unique ID (IPR plus revision level)
	\PRINTER	Printer
	\M280 PcOS	Model
	\SC:	19200,N,8,1
	Serial Configuration:	Baud, Parity, Bits, Stop Bits
	xxH	Check-sum
	029H	End PnP

**Note 1** 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

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 effect 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.

Function	Remote Power Control
ASCII	[ESC] y <n>
Hexadecimal	1BH 79H <n>
Decimal	<27> <121> <n>
IPCL	&%YX17 or &%YX18
EPOS	[ESC] y <n>
Where n	17 Requests the printer to enter remote 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 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. That is 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 Language Set	Code/ <n <sub>1</sub> ><n <sub>2</sub> >	Decimal <n <sub>1</sub> ><n <sub>2</sub> >	Hex <n <sub>1</sub> ><n <sub>2</sub> >	ASCII <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> >	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 Language Set	Code/ Code/	Decimal <n <sub>1</sub> ><n <sub>2</sub> >	Hex <n <sub>1</sub> ><n <sub>2</sub> >	ASCII <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> >	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
00	0	NULL
01	1	SOH
02	2	STX
03	3	ETX
04	4	EOT
05	5	ENQ
06	6	ACK
07	7	BEL
08	8	BS
09	9	HT
0A	10	LF
0B	11	VT
0C	12	FF
0D	13	CR
0E	14	SO
0F	15	SI
10	16	DLE
11	17	DC1
12	18	DC2
13	19	DC3
14	20	DC4
15	21	NAK
16	22	SYN
17	23	ETB
18	24	CAN
19	25	EM
1A	26	SUB
1B	27	ESC
1C	28	FS
1D	29	GS
1E	30	RS
1F	31	US

Hex	Decimal	ASCII
20	32	(SP)
21	33	!
22	34	"
23	35	#
24	36	\$
25	37	%
26	38	&
27	39	'
28	40	(
29	41	)
2A	42	*
2B	43	+
2C	44	,
2D	45	-
2E	46	.
2F	47	/
30	48	0
31	49	1
32	50	2
33	51	3
34	52	4
35	53	5
36	54	6
37	55	7
38	56	8
39	57	9
3A	58	:
3B	59	;
3C	60	<
3D	61	=
3E	62	>
3F	63	?

Hex	Decimal	ASCII
40	64	@
41	65	A
42	66	B
43	67	C
44	68	D
45	69	E
46	70	F
47	71	G
48	72	H
49	73	I
4A	74	J
4B	75	K
4C	76	L
4D	77	M
4E	78	N
4F	79	O
50	80	P
51	81	Q
52	82	R
53	83	S
54	84	T
55	85	U
56	86	V
57	87	W
58	88	X
59	89	Y
5A	90	Z
5B	91	[
5C	92	\
5D	93	]
5E	94	^
5F	95	_

Hex	Decimal	ASCII
60	96	`
61	97	a
62	98	b
63	99	c
64	100	d
65	101	e
66	102	f
67	103	g
68	104	h
69	105	i
6A	106	j
6B	107	k
6C	108	l
6D	109	m
6E	110	n
6F	111	o
70	112	p
71	113	q
72	114	r
73	115	s
74	116	t
75	117	u
76	118	v
77	119	w
78	120	x
79	121	y
7A	122	z
7B	123	{
7C	124	
7D	125	}
7E	126	~
7F	127	(sp)

## Appendix C: Ordering Supplies

iTherm™ 280 supplies can be ordered easily direct from the TransAct website ([www.transact-tech.com](http://www.transact-tech.com)) or our telephone number within the US toll free: (877) 7ithaca. (other inquires: (607) 257-8901). When calling by phone, please ask for the Sales Department.

Receipt Paper	Type	Dimensions	Stock Number
Black Monochrome Thermal	One-Ply, 24 rolls per box	3.125" wide x 4" diameter	100-04410
Red Color Thermal	One-Ply, 24 rolls per box Red/Black	3.125" wide x 4" diameter	100-04400
Blue Color Thermal	One-Ply, 24 rolls per box Blue/Black	3.125" wide x 4" diameter	100-04401
Green Color Thermal	One-Ply, 24 rolls per box Green/Black	3.125" wide x 4" diameter	100-04402

Table 56 Paper Ordering Information

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

Table 57 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.....	97
[BEL] Sound buzzer.....	153
[BS] Insert back space.....	34
[BS] Set back space.....	137
[CAN] Clear print buffer.....	96
[CR] Print and carriage return.....	122
[CR] Set carriage return.....	33
[DC2] Begin 10 cpi.....	41
[DC4] End one-line double-wide print.....	54
[DLE] [DC4] <1> <m> <t> Generate pulse in real time.....	155
[DLE] [DC4] <2> <a> <b> Executes the printer power-off sequence.....	155
[DLE] [DC4] <8> d1...d7 Clear Buffer(s).....	155
[DLE] ENQ <n> Real-time request to printer.....	156
[DLE] EOT <n> Transmit real-time status.....	143
[ENQ] <1> Inquire Cash Drawer 1 status.....	103
[ENQ] <10> Request printer reset.....	105
[ENQ] <11> Request printer power cycle status.....	105
[ENQ] <14> Inquire mechanical error status.....	106
[ENQ] <15> Inquire printer state.....	106
[ENQ] <20> Inquire all printer status.....	107
[ENQ] <21> Inquire printer ID.....	108
[ENQ] <22> Inquire Error Status.....	109
[ENQ] <23> Inquire user-store status.....	109, 110
[ENQ] <3> Inquire receipt paper low status.....	103
[ENQ] <4> Inquire receipt paper out status.....	104
[ENQ] <8> Inquire cover open status.....	104
[ENQ] <9> Inquire buffer status.....	104
[ENQ] <n> Inquire printer status.....	103
[ESC] - <1> Begin underline.....	54, 56
[ESC] - <n> Turn on/off underline mode.....	130
[ESC] \ <n1> <n1> Set relative print position.....	136
[ESC] ! <n> Select international character set.....	46, 92, 93, 94, 95
[ESC] ! <n> Select print mode(s).....	130
[ESC] # <0> Begin 12 x 12 draft print.....	44
[ESC] \$ <n1> <n1> Set absolute print position.....	136
[ESC] \$ <n1> <n1> Set print position to beginning.....	136
[ESC] \$ Cancel user-defined characters.....	52
[ESC] % <n> Select/cancel user-defined character set ..	124
[ESC] % G Begin italics.....	57
[ESC] % H End italics.....	57
[ESC] & <y> <c1> <c2> ... Define user-defined characters.....	125
[ESC] * <m> <0> <0> Set horizontal graphics mode.....	69
[ESC] * <m> <n1> <n2> Print graphics in mode <m>.....	66
[ESC] * <m> <n1> <n2> ... <dk> Select bit-image mode.....	139
[ESC] ? <m> <n> Reassign graphic mode.....	67
[ESC] ? <n> Cancel user-defined characters.....	125
[ESC] @ Initialize the printer.....	97, 154
[ESC] [ @ ... Double-wide, double-high italics.....	55
[ESC] [ C <n> Insert Euro character.....	49
[ESC] [ P <n> Set character pitch.....	42

[ESC] [ S... Redefine character set.....	50
[ESC] [ T <n1> <n1> Select character code page.....	47
[ESC] [BEL] <n1> <n2> <n3> Audio alert control.....	98
[ESC] [EM] B <n> Set bar code height.....	79, 80
[ESC] [EM] J <n> Set bar code justification and HRI modes.....	80
[ESC] [GS] A <n> Activate Auto Journal Feature.....	90
[ESC] [SI] Begin 24 cpi.....	41
[ESC] [US] l <Name..> <0> Load item process.....	71
[ESC] [US] b <Name..> <0> Begin named macro record.....	70, 72
[ESC] [US] c <Name..> <0> Save user-defined characters.....	71, 73
[ESC] [US] d <Name..> <0> Delete item from user store.....	74
[ESC] [US] e <Name..> <0> End name macro record.....	72
[ESC] [US] e <Name..> <0> Remove item from user store.....	71
[ESC] [US] e <Name..> <0> Stop name macro record.....	70
[ESC] [US] f ALL <0> Flush user store.....	71, 74
[ESC] [US] l <Name> <0> Load macro/character.....	73
[ESC] [US] m <Name..> <0> Save macro data.....	73
[ESC] [US] m <Name..> Save macro data.....	70
[ESC] [US] q <Name..> <0> Query user store.....	74
[ESC] [US] r <Name> <0> Run macro data.....	73
[ESC] [US] s <Name..> <0> Flag as a start-up macro.....	71
[ESC] [US] s <Name..> <0> Flag start-up macro.....	74
[ESC] ] Reverse line feed.....	40
[ESC] ^ <n> Print control character.....	49, 129
[ESC] { <n> Turn on/off upside-down print mode.....	131
[ESC] { Electronic Journal Begin.....	88
[ESC] < <n> Enable data pass through.....	99
[ESC] < <n> Enable print suppress.....	99
[ESC] < Return home.....	139
[ESC] <n> <n1> <n2> Set horizontal position.....	35
[ESC] = <n> Select peripheral device status.....	156
[ESC] = <y> <c1> <c2> ... Define user-defined characters.....	51
[ESC] = y c1 c2... Define user-defined characters.....	71
[ESC] > <n> Enable user-defined characters.....	52
[ESC] 0 Set line spacing to 27/216 inch.....	36
[ESC] 1 <n> Set left margin.....	138
[ESC] 1 Set line spacing to 7/72 inch.....	37
[ESC] 2 Enable variable line spacing.....	37
[ESC] 2 Select default line spacing.....	124
[ESC] 3 <n> Set line spacing.....	124
[ESC] 3 <n> Set line spacing to n/216 inch.....	36
[ESC] 4 Begin italics.....	132
[ESC] 4 Set top of form.....	39
[ESC] 5 <01> Begin auto line feed.....	40
[ESC] 5 End italics.....	132
[ESC] 8 Disable paper out sensor.....	96
[ESC] 9 Enable paper out sensor.....	96
[ESC] a <n> Select justification.....	136
[ESC] a <n> Set justification.....	35
[ESC] A <n> Set variable line spacing to n/72 inch.....	37
[ESC] b <n> ... Print bar code.....	77
[ESC] B <n1> <n2> ... <n1> 0 Set vertical tab stops.....	39
[ESC] Begin 12 cpi.....	41

[ESC] BEL Sound buzzer .....	153	[ESC] S <0> Select superscript .....	57
[ESC] C [NUL] <n> Set form length in inches .....	40	[ESC] S <1> Select subscript .....	57
[ESC] c <n> Select color .....	54	[ESC] s <n> Set rotated print line length .....	60
[ESC] C <n> Set form length in lines .....	39	[ESC] SP <n> Set right-side character spacing .....	124
[ESC] c 3 <n> Select paper sensor(s) to output paper-end signals .....	135, 164	[ESC] t <n> Select character code table .....	129
[ESC] c 4 <n> Select paper sensor(s) to stop printing... ..	134, 164	[ESC] T End superscript or subscript .....	57
[ESC] c 5 <n> Enable/disable paper feed .....	133, 164	[ESC] U <0> Begin bidirectional print .....	67
[ESC] d <n> Feed <n> lines at current spacing .....	37	[ESC] U <1> Begin unidirectional print .....	67
[ESC] d <n> Print and feed <n> lines .....	122	[ESC] U <n> Turn on/off unidirectional printing mode ..	138
[ESC] D <n <sub>1</sub> > <n <sub>2</sub> > <n <sub>3</sub> > ... <n <sub>k</sub> > 0 Set horizontal tab stops .....	34	[ESC] V <n> Set intercharacter spacing .....	43
[ESC] D <n <sub>1</sub> > ... <n <sub>k</sub> > NUL Set horizontal tab positions .....	138	[ESC] V <n> Turn on/off 90° rotation mode .....	131
[ESC] e <n> Print and reverse feed <n> lines .....	122	[ESC] W <n> Double-wide, double-high mode .....	55
[ESC] E <n> Turn on/off emphasized mode .....	130	[ESC] w <n> Enable dynamic response .....	110
[ESC] E Begin emphasized print .....	56	[ESC] x <n> Open cash drawer .....	97
[ESC] F End emphasized print .....	56	[ESC] X <n <sub>1</sub> > <n <sub>2</sub> > Set left/right print margin .....	58
[ESC] f Select receipt station .....	62, 63, 64	[ESC] y <11> OCR character enable .....	52
[ESC] g <0> Process user macro .....	76	[ESC] y <12> OCR character disable .....	52
[ESC] g <1> Start macro record .....	70, 76	[ESC] y <n> Set feature control .....	100
[ESC] g <2> Stop macro record .....	70, 76	[ESC] Y <n <sub>1</sub> > <n <sub>2</sub> > Print full-speed double-density graphics .....	65
[ESC] g <3> Stop macro record and save .....	76	[ESC] Z <n <sub>1</sub> > <n <sub>2</sub> > Print quad-density graphics .....	66
[ESC] G <n> Turn on/off double-strike mode .....	131	[FF] Set form feed .....	39
[ESC] G Begin enhanced print .....	56	[GS] \ <n <sub>1</sub> > <n <sub>n</sub> > Set relative vertical print position in page mode .....	150
[ESC] h <color> <length> <format> <data> Process color graphics .....	68	[GS] a <n> Enable/disable Automatic Status Back .....	140
[ESC] h <color> <length> <format> <data> Process horizontal graphics .....	68	[GS] b <n> Turns smoothing on/off .....	132
[ESC] H End enhanced print .....	56	[GS] c Print counter .....	157
[ESC] i Activate Auto Journal .....	90	[GS] g 0 Initialize maintenance counter .....	157
[ESC] I <n> Set print quality mode .....	44	[GS] g 2 Transmits maintenance counter .....	157
[ESC] i Partial knife cut .....	153	[GS] I <n> Transmit printer ID .....	154
[ESC] J <n> Fine line feed .....	36	[GS] P x y Set horizontal and vertical motion units .....	154
[ESC] J <n> Fine linefeed .....	82, 83, 84, 110	[GS] r <n> Transmit status .....	142
[ESC] J <n> Print and feed paper .....	122	[GS] Start/end macro definition .....	159
[ESC] j Print and reverse feed .....	123	[GS] V <m> <n> Select cut mode and cut paper .....	153
[ESC] K <n> Print and reverse feed <n> lines .....	123	[HT] Set horizontal tab .....	34, 137
[ESC] K <n <sub>1</sub> > <n <sub>2</sub> > Print single-density graphics .....	65	[LF] Print and line feed .....	122
[ESC] L <n <sub>1</sub> > <n <sub>2</sub> > Print half-speed double-density graphics .....	65	[LF] Set line feed .....	33
[ESC] l Electronic Journal Carbon Copy .....	89	[SI] Begin 17 cpi .....	41
[ESC] M <n> Select character font table .....	125	[SO] Begin one-line double-wide print .....	54
[ESC] m Perform a partial knife cut .....	153	[SOH] <n> Begin multi-drop control .....	100
[ESC] p <m> <t <sub>1</sub> > <t <sub>2</sub> > Generate pulse .....	155	[VT] Set vertical tab .....	38
[ESC] P <n> Begin rotated font .....	45		
[ESC] p 3 <n> Select paper sensor(s) to output paper-end signals .....	99		
[ESC] p 4 <n> Select paper sensor(s) to stop printing .....	98		
[ESC] p 5 <n> Enable/disable paper feed .....	98		
[ESC] q <n> Query marker .....	96		
[ESC] Q <n> Set right margin .....	139		
[ESC] r <0> End rotated print .....	60		
[ESC] r <1> Rotate 90° .....	60		
[ESC] r <3> Rotate 270° .....	60		
[ESC] r <5> Rotate 90° with line formatting .....	60		
[ESC] r <7> Rotate 270° with line formatting .....	60		
[ESC] r <n> Rotate 90°, 180°, or 270° .....	59		
[ESC] R <n> Select an international character set .....	125		
[ESC] r <n> Turn color mode on/off .....	129		
[ESC] R Reset horizontal and vertical tab stops .....	35, 39		

---

**I**

10 CPI Character Pitch, Beginning .....	41
12 CPI Character Pitch, Beginning .....	41
12 x 12 Draft Print Mode, Beginning .....	44
17 CPI Character Pitch, Beginning .....	41

---

**2**

24 CPI Character Pitch, Beginning .....	41
---	----

---

**A**

APA Graphics, Printing .....	66
Appendix A	
Ordering Supplies .....	204

Application Development .....	22
Audio Alert, Configuring .....	98
Auido alert .....	97
Auto cut, Performing .....	97
Auto Line Feed, Beginning .....	40
Automatic Status back, Enable/Disable .....	140

---

## B

Back Space .....	34
<b>Bar Code Commands</b> .....	150
Bar Code, Print .....	77
Bar Code, Set height .....	79, 80
Bar Code, Set Justification, Print Direction .....	80
Bar Codes .....	77
Begin Italics .....	57
Bidirectional Printing, Beginning .....	67
Bit Image Mode, Selecting .....	139
<b>Bit-Image Command</b> .....	139
Boot Loader Mode .....	15
<b>Buffer</b> .....	187

---

## C

Carriage Return .....	33
Cash Drawer 1 Status, Inquire .....	103
Cash drawer, Opening .....	97
Change User Store Terminator .....	75
Changing Interface Cards .....	4
Character attributes .....	54
Character Code Page, Setting .....	47
Character Code table, Selecting .....	127
Character Code Table, Selecting .....	129
<b>Character Commands</b> .....	124
Character Pitch, Setting .....	42
Character Set, Redefining .....	50
Character Spacing, Setting .....	124
Clear Buffer(s) .....	155
<b>Code Page Definitions</b> .....	201
<b>Color Graphics</b> .....	172
Color Mode, Turning on/off .....	129
Commands, User-store .....	72
<b>Communication</b>	
<b>Features</b> .....	199
<b>Parallel Port</b> .....	185
<b>Serial Port</b> .....	190
<b>Communications</b> .....	182
Configuration	
manual .....	16
<b>Remote</b> .....	20
Configuration Control, Extending .....	101
Configuration Mode	
Overview .....	16
Connecting Communication Cables .....	6
Connecting Power .....	5
contacting TransAct's Ithaca Facility .....	3
Control Character, Printing .....	49
<b>Control Codes</b>	
<b>Overview</b> .....	21

<b>Control Codes and Commands</b> .....	23
Control Feature, Setting .....	100
Cover Open Status, Inquire .....	104
Cut Mode/Cut paper, Selecting .....	153

---

## D

Data pass-through .....	199
<b>Display Pass Through</b> .....	197
Display pass-through .....	199
Double Density Graphics, Full-Speed Printing .....	65
Double Density Graphics, Half-Speed Printing .....	65
Double Strike Mode, On/Off .....	131
Dynamic Response, Enable .....	110

---

## E

Emphasized Mode, On/Off .....	130
Emphasized Print Mode, Beginning .....	56
Emphasized Print Mode, Ending .....	56
End Italics .....	57
Enhanced Print Mode, Ending .....	56
Enhanced print, Beginning .....	56
Entering Configuration Mode .....	16
Entering Self-Test Mode .....	13
<b>EPOS</b>	
<b>Codes</b> .....	113
<b>command summary</b> .....	117
EPOS 90° Rotation Mode, On/Off .....	131
EPOS Absolute Print Position, Setting .....	136
EPOS Back Space, Setting .....	137
EPOS Bar Code Height, Setting .....	152
EPOS Bar Code, Printing .....	150
EPOS Character Size, Setting .....	132
EPOS Control Character, Printing .....	129
EPOS Emulation .....	22
EPOS Euro Character, Insert .....	129
EPOS Execute Macro .....	159
EPOS HRI Characters, Selecting Font .....	152
EPOS Italics, Beginning .....	132
EPOS Italics, Ending .....	132
EPOS Knife Cut-Partial .....	153
EPOS Knife Cut-Partial, Performing .....	153
EPOS Macro Definition, Start/End .....	159
EPOS margin-eft, Setting .....	138
EPOS Margin-left, Setting .....	138
EPOS Margin-Right, Setting .....	139
EPOS Motion Units, Setting .....	154
EPOS Nonvolatile Memory, Erasing All Entries .....	161
EPOS Nonvolatile Memory, Erasing Single Entry .....	161
<b>EPOS Page Mode Commands</b> .....	147
EPOS Paper Error Signal Control .....	164
EPOS Printing Area Width, Setting .....	138
EPOS Query Nonvolatile Memory Pool Information .....	163
EPOS Relative Print Position, Setting .....	136
EPOS Relative Vertical Print Position in page mode, Setting .....	150
EPOS Set Print to beginning of print line .....	136
EPOS Sound Buzzer .....	153

EPOS Startup Macro Definition, Deleting .....	160
EPOS Unidirectional Printing Mode, On/Off .....	138
EPOS User Defined Bit Image, Define .....	162
EPOS User Defined Bit Image, Defining .....	160
<b>EPOS User Defined Bit Image, Printing</b> .....	161, 163
EPOS User Defined Character Set, Saving .....	163
EPOS User Defined Character Set, Selecting .....	163
EPOS, Print and Reverse Feed .....	123
Error Status, Inquire .....	109
ESC [ T <n <sub>i</sub> > <n <sub>i</sub> > Select character code table .....	127
Euro Character, Inserting .....	49
Executes power-off sequence .....	155
Extended APA Graphics .....	66
Extended Diagnostics	
Hex-Dump .....	14
Extended Functionality .....	14

---

## F

Firmware Configuration .....	7
Flow control	
Data Terminal Ready (DTR) .....	190
Ready/Busy .....	190
XON/XOFF .....	190
Form Feed .....	39
Form Length, Setting Inches .....	40
Form Length, Setting Lines .....	39
Forming characters .....	5

---

## G

<b>General Printer Description</b> .....	1
<b>General Specifications</b> .....	3
Generate Pulse .....	155
Generate Pulse in real time .....	155
Graphic	
Mode .....	65
Graphic Data, Processing .....	68
Graphic Mode, Reassigning .....	67
Graphic mode, Set Horizontal .....	69
Graphic save .....	70
Graphics	
<b>all-points-addressable (APA)</b> .....	171
<b>Character</b> .....	168
color .....	68
horizontal .....	68
<b>Horizontal</b> .....	171
<b>printing</b> .....	168
GS - <Name..> <0> x y d <sub>1</sub> ...d(x x y x 8) Define user-	
defined bit image .....	160
GS ! <n> Set character size .....	132
GS # <n> Insert Euro character .....	129
GS * x y d <sub>1</sub> ... d(x x y x 8) Define single user-defined bit-	
image .....	162
GS / <m> Print single user-defined bit-image .....	163
GS ^ r t m Execute macro .....	159
GS _ Delete start-up macro definition .....	160
GS 0 <Name..> <0> Print user-defined bit image .....	161

GS 1 <Name..> <0> Erase single entry from nonvolatile	
memory .....	161
GS 3 Query nonvolatile memory pool information .....	163
GS 5 Erase all entries from nonvolatile memory pool ...	161
GS 6 <Name..> <0> Save user-defined character set .....	163
GS 7 <Name..> <0> Select user-defined character set ...	163
GS f <n> Select font for HRI characters .....	152
GS h <n> Set bar code height .....	152
GS k <m> <d <sub>i</sub> > ... <d <sub>k</sub> > NUL Print bar code .....	150
GS L <n <sub>i</sub> > <n <sub>h</sub> > Set left margin .....	138
GS w <n> Set bar code width .....	152
GS W <n <sub>i</sub> > <n <sub>h</sub> > Set printing area width .....	138

---

## H

Home, Returning .....	139
<b>Horizontal Motion Control</b> .....	34
Horizontal Position, Setting .....	35
<b>Horizontal Tab</b> .....	34
Horizontal Tab Positions, Setting .....	138
Horizontal tab Stops, Setting .....	34
Horizontal Tab, Setting .....	137

---

## I

IEEE 1284 buffer, Clearing .....	104
<b>Indicator Lights</b> .....	11
<b>Indicators</b>	
<b>Fault</b> .....	11
Information Disclaimer .....	iii
Initialize maintenance counter .....	157
Initialize the Printer .....	97, 154
Ink Cartridges	
Ordering .....	204
<b>Inquire Commands</b> .....	103
Installing Cables .....	5
<b>Installing New Interface Cards</b> .....	5
Installing OPOS Printer Drivers .....	9
<b>Installing Paper</b> .....	7
Installing Printer Drivers .....	8
Installing USB Printer Drivers .....	9
Intercharacter Spacing, Setting .....	43
International Character Set, Selecting .....	46, 92, 93, 94, 95, 125
<b>International Character Sets</b> .....	126
Internet Support .....	2
IPCL Codes .....	22
Ithaca Specific iTherm™ 280 Commands .....	164

---

## J

Justification, Selecting .....	136
Justification, Setting .....	35

---

## L

LED indicator	
---------------	--

error.....	11
paper.....	11
power .....	11
<b>Level 0 diagnostics</b> .....	14
Line feed.....	33
<b>Line Feed Button</b> .....	10
Line Feed, Performing .....	36
Line Feed, Reverse .....	40
<b>Line Spacing Commands</b> .....	124
Line Spacing, Enabling.....	37
Line Spacing, Feeding Lines .....	37
Line Spacing, Select Default .....	124
Line Spacing, Set at 2 ½, 1 ¼ inch and 7/72 inch.....	37
Line Spacing, Set-1/8 inch .....	36
Line Spacing, Set-n/216 inch .....	36
Line Spacing, Setting.....	124
Line Spacing-Variable, Setting.....	37

---

## M

Mechanical Error Status, Inquire .....	106
Macro Data, Run from user Store .....	73
Macro Data, Saving .....	70
Macro Data, Saving in user Store .....	73
Macro Record, Beginning .....	70
Macro Record, Ending .....	72
Macro Record, Ending name.....	70
Macro Record, Start.....	76
Macro Record, Starting.....	70, 72
Macro Record, Stop.....	76
Macro Record, Stop and Save .....	76
Macro Record, Stopping .....	70
Macro, Flag on Startup .....	74
<b>Macro-Function Commands</b> .....	159
<b>Mechanism Control Commands</b> .....	153
Microline Emulation.....	22
<b>Miscellaneous Commands</b> .....	154
Multidrop configuration.....	199
Multi-Drop Control, Beginning .....	100
Multiline Mode .....	55

---

## O

OCR character	
disable .....	52
enable .....	52
OCR Character, Disable.....	52
OCR Characters, Enabling .....	52
OFF Button .....	10
Off-line active .....	199
One Line/Double Wide Print, Beginning .....	54
One Line/Double Wide Print, Canceling.....	54
Operator Panel Controls.....	10
Output Paper end Signals, Selecting Paper Sensors .....	99, 135

---

## P

Panel Button Commands.....	133
----------------------------	-----

paper Feed, Enable, Disable .....	98, 133
Paper Feed, Enable/Disable.....	164
Paper Low Sensor.....	164
Paper Motion.....	33
Paper Out Sensor, disable .....	96
Paper Out Sensor, enabling .....	96
Paper Out Status, Inquire .....	104
Paper Sensor Commands .....	134
Paper Sensors, Selecting to Stop Printing .....	98, 134
Parallel Interface Connector.....	6
Parallel port timing.....	185
<b>PcOS Control Codes</b> .....	23
PcOS Quick Reference Chart .....	24
Peripheral Device Status, Selecting .....	156
Plug and Play	
parallel.....	189
Serial .....	194
<b>POSjet™ 1000 Printer</b> .....	1
Power Control, Remote.....	101, 197
Power Cycle Status, Inquire .....	105
Power-cycle recovery .....	199
<b>Print</b>	
<b>rotation</b> .....	59
Print and Carriage Return .....	122
Print and Feed Lines .....	122
Print and Feed Paper.....	122
Print and Line Feed .....	122
Print and Reverse Feed Lines .....	122, 123
Print Buffer Flow .....	192
Print Buffer Size.....	194
Print buffer, control .....	96
<b>Print buffers</b> .....	182
Print counter.....	157
Print Current Configuration .....	167
Print Current totals .....	167
Print margins, setting .....	58
Print Modes, Selecting.....	130
Print Position Commands.....	136
Print Quality Mode, Setting .....	44
Print Style, Setting.....	55
Print Suppress/Data Pass Through, Enabling .....	99
Printer Care .....	10
Printer ID, Inquire .....	108
Printer Reset, Requesting.....	105
Printer State, Inquire.....	106
Printer Status.....	102
Printer Status, Inquire .....	103, 107
Process User Macro .....	76
<b>Programmer's Notes</b> .....	200
Programming Considerations .....	75
<b>Programming Controls</b> .....	21

---

## Q

Quad Density Graphics, Printing .....	66
Query marker .....	96

---

**R**

Read and return Totals.....	165
Real Time Status, Transmitting.....	143
real-time Request to Printer.....	156
Recovery from Mechanical Errors.....	200
Regulatory Compliance.....	iii
<b>Remote Power Control</b> .....	101, 197
<b>Remote Reset</b> .....	197
<b>Removing Old Interface Cards</b> .....	4, 5
Rotated Font, Beginning.....	45
Rotated Print, 270°.....	60
Rotated Print, 270° with Line Formatting.....	60
Rotated Print, 90°.....	60
Rotated Print, 90° with Line Formatting.....	60
Rotated Print, Beginning.....	59
Rotated Print, Ending.....	60
Rotated Print, Line Length.....	60

---

**S**

Select Character Font Table.....	125
Select Color.....	54
Select Subscript.....	57
Select Superscript.....	57
Self-Test	
Using.....	12
Serial Device Identification.....	195
Serial Interface Connector.....	6
Serial port	
flow control.....	190
Serial Port	
Inquire.....	196
Series 50 Cash Drawer, Set Extended.....	112
Series 50 Pass through, Set Extended.....	112
<b>Service Information</b> .....	1
<b>Setup Procedures</b> .....	4
Single Density Graphics, Printing.....	65
Standard APA Graphics.....	65
Standard Emulation.....	22
Start up Macro, Flagging.....	71
<b>Status Commands</b> .....	140
Status Inquire.....	102
Status, Inquire Receipt Paper Low.....	103
Superscript and Subscript.....	57
Supplies	
Ink Cartridges.....	204
Ordering Cables.....	204
Ordering Paper.....	204

---

**T**

Tab Stops, Resetting.....	35, 39
Testing the Printer.....	12
<b>TM T90 and EPOS Command Descriptions</b> .....	122
<b>TM-90</b>	
<b>Command Summary</b> .....	114
Top of Form, Setting.....	39
TransAct Technologies	
contacting.....	3
<b>TransAct Technologies, Ithaca facility</b> .....	3
Transmit Printer ID.....	154
Transmit Status.....	142
Transmits maintenance counter.....	157
Turns smoothing on/off.....	132

---

**U**

Underline Mode, On/Off.....	130
Underline, Beginning.....	54, 56
Unidirectional Printing, Beginning.....	67
Upside down Print Mode, On/Off.....	131
USB Interface Connector.....	6
User Defined Character Set, Selecting.....	124
User Defined Character, Saving.....	71, 73
User Defined Characters, Canceling.....	52, 125
User Defined Characters, Defining.....	51, 71, 125
User Defined Characters, Enabling.....	52
<b>User macros</b> .....	75
User store.....	70
User Store Status, Inquire.....	109, 110
User Store, Delete item.....	74
User Store, Flush Information.....	71, 74
User Store, Load item.....	73
User Store, Loading item.....	71
User Store, Removing Item.....	71
User Store, Report.....	74
User Store, Reporting.....	72
<b>User-Defined Memory Commands</b> .....	160
Using Configuration Mode.....	17
Using DSR.....	194

---

**V**

<b>Verify Cash Drawer Interface</b> .....	4
Verticle Tab.....	38
Verticle Tab Stops, Setting.....	39

---

**W**

warranty.....	1
---------------	---