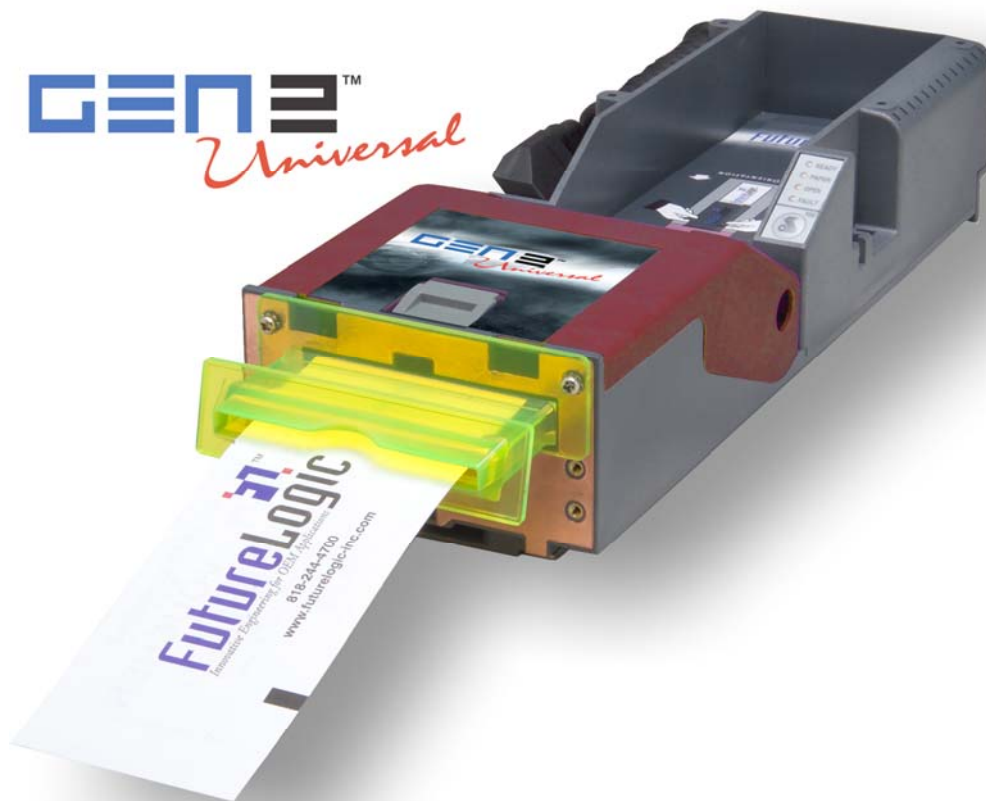


Developers Manual

GEN2 Universal™ Printer



PSA-66-ST2RU (RS232/USB)

While PSA-66-ST2 refers to all models of the printer, this manual is primarily for the RS232/USB interface of the GEN2 Universal printer.

Developers Manual

GEN2 Universal™ Printer (PSA-66-ST2RU (RS232/USB))

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07/21/2011

MNL-000033

REV.E



The printer described in this manual is in compliance with all applied CE standards.

Table of Contents

1	Manual Overview.....	2
	Introduction.....	2
	Intended Audience	2
	Applicability.....	2
	Conventions Used in this Document	3
2	Product Overview	4
	Introduction.....	4
	Warranty Information	4
	Problem Reporting	4
	Return Materials Authorization (RMA) Information.....	5
	Supporting Documentation/Software Tools.....	5
3	Printer Evaluation	6
	Introduction.....	6
	System Configuration	6
	Getting Started	6
4	Operator Interface	8
	Introduction.....	8
	Operator Indicators and Controls.....	8
	Bezel Operation.....	9
	Keypad Status Lights	9
	Loading Paper.....	9
	Feeding Paper	10
	Performing a Self Test	11
	Clearing a Paper Jam.....	11
	Cleaning the Print Head.....	12
	Removing the Printer	13
5	Ports and Cables	16
	Introduction.....	16
	Front Bezel Port	16
	PSA-66-ST2RU (GEN2 Universal Printer)	17
	USB/RS232 Interface Cable	17
	RS232 Evaluation Cable.....	19
	GDS Adaptor Cable	20
	Firmware Upload Port	21
	A Note about the Power Supply Connection	21
6	Packaging Considerations.....	22
	Introduction.....	22
	Mounting the Printer	22
	Presentation Chute	22
	Paper Tray	22
	Other Considerations.....	23

7	Fonts	24
	Introduction.....	24
	Fonts	24
8	Barcodes.....	25
	Introduction.....	25
	Barcode Families and Usage	25
	Code 128	26
	Subsets A, B, and C	26
	Characters below 20H	26
	Function Codes and Special Characters	26
9	Sensor, Bezel, and Buzzer Operation	27
	Sensor Introduction	27
	Printer Open Sensor.....	27
	Paper Out Sensor	27
	Paper Low Sensor.....	27
	Printer Platen Engaged Sensor	27
	Paper Taken Sensor	28
	Drawer Open Sensor	28
	Paper Jam Sensing.....	28
	Bezel Operation	29
10	Error Conditions and Recovery	30
	Error Condition Recovery for the Host Application	30
	Error Conditions	31
11	Communications.....	34
	Introduction.....	34
	Power-Up/Reset Timing	34
	Serial RS232 Interface	35
	Serial RS232 Handshaking	37
	Serial RS232 XON/XOFF Handshaking.....	37
	Serial RS232 RTS Hardware Handshaking	39
	RTS Hardware Handshaking with XON/XOFF	40
12	Windows Connectivity	41
	Introduction.....	41
	Simple Text Printer Setup	41
	System Printer Setup	41
	Windows Interface.....	41
	Label and Ticket Printer Setup.....	42
	Manually Develop Printer Command Strings	42
	Windows Printing and Printer API	42
13	Printer Language Features	43
	Journal Printing and Page Mode Printing	43
14	Line Printer Language	44
	Introduction.....	44
	Order of Commands.....	44
	Setting the Print Area and Margins	44
	Selecting Fonts and Characters Sets	47
	Command Summary.....	47
	Barcode Command.....	47
	Configuration Commands	47
	Line Spacing Commands.....	47

Font Selection Commands.....	48
Positioning Commands.....	48
Special Commands.....	48
System Specific Commands.....	49
Command Details	49
CR	49
DC2	50
DC4	50
ESC -	50
ESC !	51
ESC \$	52
ESC (^	52
ESC (C	53
ESC (c	53
ESC (t	54
ESC (U	54
ESC (V	55
ESC (v	55
ESC @	56
ESC [C	57
ESC [c	57
ESC [F	57
ESC [P	58
ESC [S or ♣ ENQ (05h)	58
ESC [^] ESC	61
ESC [b]	61
ESC \	62
ESC +	63
ESC 0	63
ESC 2	63
ESC 3	64
ESC 6	64
ESC 7	64
ESC B	65
ESC C	65
ESC C NUL	66
ESC c	66
ESC D	67
ESC E	67
ESC EM	68
ESC F	68
ESC g	68
ESC J	69
ESC l	69
ESC M	70
ESC N	70
ESC O	71
ESC P	71
ESC p	71
ESC Q	72
ESC S	72
ESC SP	73

ESC T	73
ESC t	73
ESC W	74
ESC w	74
ESC X	75
FF	75
HT	76
LF	76
SI	76
SO	77
VT	77
15 TCL Printer Language	78
Template Printing with TCL Language	78
TCL Coordinate System	78
Command Summary	79
Print Control Commands	79
Configuration Commands	80
Library Command	80
Polling Commands	80
System Control Commands	80
Command Details	80
^A	81
^b	82
^C	82
^c	83
^F	83
^f	84
^G	84
^h	85
^j	85
^L	86
^I|^ Inventory Poll	87
^O	89
^P	89
^R	91
^r	96
^S or ♣ (ENQ)	96
^s	99
^T	100
^tagv	102
^z	102
^z|\$| .....	103
^z|A| .....	104
^z|c| .....	104
^z|D| .....	105
^z|L| .....	105
^z|I| .....	105
^z|P| .....	106
^z|S| .....	106
^z|V| .....	107

16 Printer Resident Ticket Templates	108
Introduction.....	108
Ticket Package Tkt- <i>n.n</i>	108
Tkt- <i>n.n</i> Print Regions and Template Definitions	109
Ticket Template “0” – Cashout Ticket	111
Ticket Template “1” – Jackpot Ticket.....	112
Ticket Template “2” – Demo Ticket	112
Ticket Template “3” – Void Ticket	113
Ticket Template “4” – Jackpot Receipt.....	113
Ticket Template “5” – Voided Demo Ticket.....	114
Ticket Template “6” – Static Voiding Ticket.....	114
Ticket Template “7” – Cashout Receipt	115
Ticket Template “8” – Handpay Cashout Receipt	115
Ticket Template “9” – Generic Ticket	116
Ticket Template “A” – Generic Offset Ticket.....	116
Ticket Template “B” – Generic Voiding Ticket	116
Appendix A Technical Specifications	117
General Specifications	117
Electrical Characteristics	118
Absolute Maximum Ratings.....	119
Operating Conditions	119
Appendix B Paper Specifications.....	120
Appendix C Part Numbers – Printer/Spares	121
Appendix D Mechanical Dimensions	125
Appendix E Status Flags Bit Definitions	128
Index	131

List of Figures

Figure 3-1	Sample System Hookup	7
Figure 4-1	Operator Indicators and Controls	8
Figure 4-2	Load a Paper Stack	10
Figure 4-3	Feed Paper into Paper Loading Slot	10
Figure 4-4	Sample Configuration Ticket	11
Figure 4-5	Remove the Paper	11
Figure 4-6	Open the Lid	12
Figure 4-7	Clear the Paper Jam	12
Figure 4-8	Ground Screw and Copper Grounding Clips Location	13
Figure 4-9	Disconnect the Coiled Cable Connector	14
Figure 4-10	Slide the Printer Open	14
Figure 4-11	Remove the Paper	14
Figure 4-12	Push Release Bar	15
Figure 5-1	Front Bezel LED Control Port	16
Figure 5-2	USB/RS232 Interface Cable	17
Figure 5-3	USB/RS232 Interface Cable, Auxiliary Communications	18
Figure 5-4	RS232 Evaluation Cable	19
Figure 5-5	GDS Adaptor Cable	20
Figure 5-6	Firmware Upload Port	21
Figure 11-1	MRESET Signal Diagram	34
Figure 11-2	Power-Up/Reset Diagram	34
Figure 11-3	Serial Port Signals during Initialization (No Errors)	35
Figure 11-4	PC Logical Hookup	36
Figure 11-5	XON/XOFF Handshaking	38
Figure 11-6	RTS Handshaking	39
Figure 11-7	RTS Handshaking with XON/XOFF	40
Figure 13-1	Dual Printer Languages	43
Figure 14-1	Printable Area	45
Figure 14-2	Sample Page Setup for 4" Printer	46
Figure 15-1	TCL Printer Language Coordinate System	78
Figure 15-2	^I|^ Poll Command Reply	88
Figure 15-3	^I|^ Poll Command Reply for Factory Default	88
Figure 15-4	Different Types of Print Regions	91
Figure 15-5	Text Print Region with Several Lines	92
Figure 15-6	Print Region Orientation and (0,0) Origin Reference Points	93
Figure 15-7	Text Justified in a Print Region	93
Figure 15-8	Example Template	100
Figure 16-1	Ticket Template "0" – Cashout Ticket	111
Figure 16-2	Ticket Template "1" – Jackpot Ticket	112
Figure 16-3	Ticket Template "2" – Demo Ticket	112
Figure 16-4	Ticket Template "3" – Void Ticket	113
Figure 16-5	Ticket Template "4" – Jackpot Receipt	113
Figure 16-6	Ticket Template "5" – Voided Demo Ticket	114
Figure 16-7	Ticket Template "6" – Static Voiding Ticket	114
Figure 16-8	Ticket Template "7" – Cashout Receipt	115
Figure 16-9	Ticket Template "8" – Handpay Cashout Receipt	115

Figure B-1	Ticket Dimensional Specification.....	120
Figure D-1	PSA-66-ST2RU Printer	125
Figure D-2	PSA-66-ST2RU Printer with Green Bezel.....	125
Figure D-3	Mounting Rail	126
Figure D-4	Bezel Mounting Points	126
Figure D-5	Paper Tray Dimensions	127

List of Tables

Table 4-1	Bezel Display Status	9
Table 4-2	Keypad LEDs Status Reporting Printer Condition.....	9
Table 5-1	Front Bezel LED Control Port Pin-outs	16
Table 5-2	Base Port Cable Pin-outs	18
Table 5-3	RS232 Power/COMM Port Pin-outs.....	18
Table 5-4	USB Port (Series A) Pin-outs	18
Table 5-5	Bezel LED Control Port Pin-outs	18
Table 5-6	Evaluation Cable 14 pin Base Port Pin-outs	19
Table 5-7	Evaluation Cable DB9 RS232 Port Pin-outs	19
Table 5-8	Evaluation Cable Bezel Port Pin-outs	20
Table 5-9	GDS Adaptor Cable Connectors	20
Table 5-10	GDS Adaptor Cable Assembly	20
Table 7-1	Resident Fonts.....	24
Table 8-1	Resident Barcodes	25
Table 8-2	Barcode Dimensional Ranges.....	25
Table 8-3	Code 128 Subset Encoding	26
Table 8-4	3-Digit ASCII Value.....	26
Table 8-5	Code 128 Function Codes and Special Characters	26
Table 9-1	Bezel Display Status	29
Table 10-1	Error Conditions	31
Table 10-2	Printer Status during Error Condition.....	33
Table 11-1	Power-Up/Reset Timing Parameters.....	34
Table 11-2	Standard PC Hookup	36
Table 11-3	Serial Baud Rates, Parity, Data, and Stop Bits.....	36
Table 14-1	Print Area Commands.....	45
Table 14-2	Status Flags Bits Summary	60
Table 14-3	Status Flags Examples under Various Conditions	60
Table 15-1	TCL Printer Language Reserved Characters.....	79
Table 15-2	Paper Stock Types and <stock_type> Codes	86
Table 15-3	Legal Print Object I.D.'s	93
Table 15-4	Status Flags Bits Summary	98
Table 15-5	Status Flags Examples under Various Conditions	98
Table 15-6	^z Special System Control Codes	103
Table 15-7	User-Definable Flash Memorized Control Parameters.....	103
Table 16-1	Ticket Package TKT-1.0 Printer Resident Tickets.....	108

Introduction Notes

Important notes regarding this manual:

- These specifications are subject to change without notice and may not completely and correctly document the operation of this product.
- This document should not be regarded as a guide to designing a secure system for printing financial transactions. It is the responsibility of the host system to control the issuance of financial vouchers.



CAUTION!

ESD Sensitive Equipment!

Electronic boards and their components are sensitive to static electricity. Care must be taken during all handling operations and inspections of this product in order to ensure product integrity at all times.

Do not handle this product out of its protective enclosure while it is not used for operations purposes unless it is otherwise protected.

Discharge your clothing before touching the assembly. Discharge tools before use.

Whenever possible, unpack or pack this product only at EOS/ESD safe workstations. Where a safe workstation is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools.



Note: While PSA-66-ST2 refers to all models of the printer, this manual is primarily for the RS232/USB interface of the GEN2 Universal printer.

1 Manual Overview

Introduction

This manual is a comprehensive guide to the specifications and usage of the GEN2 Universal™ (PSA-66-ST2RU) printer. It contains detailed information on many areas of its operation.

It is often the case that the user initially wishes to perform only a cursory evaluation of the unit and to absorb greater details at a later time when in the full design stage. The list below will assist you in determining which sections should receive attention first. It is helpful to review the list to obtain a cursory understanding of the scope of this manual.

We hope that this manual is easy to read and informative. If you have any comments we would like to hear from you. Email us at info@futurelogic-inc.com.

Specific Content	Location
To review the paper specification for ordering more paper	see Appendix B
To print something as quickly as possible for evaluation	See Chapter 3
To use the standard set of prepared resident tickets	See Chapter 16
To understand paper loading and operator control	See Chapter 4
To review specifications on the unit	See Appendices
To study communications connectivity	See Chapters 5 and 11
To review packaging information	See Chapter 6
To recover from an error condition	See Chapter 10
To poll the printer for meaningful status and error codes	See ENQ (05h)
To see a primer on the printer language(s) supported	See Chapter 13
To learn more on barcode capability	See Chapter 8
To find out about resident fonts	See Chapter 7
To connect the printer to Windows®	See Chapter 12

Intended Audience




The intended audience for this document is developers.

Applicability

This manual covers the GEN2 Universal (PSA-66-ST2RU) printer.

Conventions Used in this Document

This document uses the following conventions:

Example	Description
	This is a note. A note includes information that emphasizes or supplements important points of the topic.
	This is a tip. A tip provides techniques and procedures to aid with a task.
	This is a Caution. A Caution emphasizes information that may cause damage to equipment and/or injury to a person.
Bold text	This document uses bold text to clearly identify a field, a command selection, and an option selection.
Button	This document uses button text to clearly identify a button to press. For example, Click the FEED button.

2 Product Overview

Introduction

Thank you for purchasing the GEN2 Universal™ printer. We hope our product delivers the quality and performance that you expect.

This Developers Manual describes the specifications and operations of the GEN2 Universal printer. The printer is specifically designed to serve as heavy duty direct thermal kiosk printers.

If you have any comments about this manual or our product, we would like to hear from you. Email us at info@futurelogic-inc.com.



Note: While PSA-66-ST2 refers to all models of the printer, this manual is primarily for the RS232/USB interface of the GEN2 Universal printer.

Each GEN2 Universal printer is an advanced thermal printer capable of creating high quality complex output with a minimum of development and effort on the part of the user. The printer supports both serial and parallel interfaces and extended temperature operation to allow it to operate in a wide range of environments.

Features of the GEN2 Universal printer include:

- The ITH® (Intelligent Ticket Handling) technology that prevents player interference with any part of ticket production or presentation
- May be mounted on an angle or horizontally
- Simple paper loading—no loose parts
- Variable paper capacity with different paper trays—300, 600, and 900 tickets
- Page mode printing with TCL printer language
- Line printer capability
- High quality laser-like san serif fonts in multiple sizes
- Windows connectivity
- 3.5" inch per second peak print speed
- Wide temperature range operation
- Standard and customized serial interfaces available—RS232 and USB

Additionally, a key feature of the GEN2 Universal printer is Universal Communications:

- USB 2.0 Full Speed (Future GSA Compliant™, IGT Compliant)
- RS232 Port (Backward Compatible)

Warranty Information

Each printer has a two-year warranty as per the manufacturer's written warranty.

Problem Reporting

For technical support, send an email to techsupport@futurelogic-inc.com.

Return Materials Authorization (RMA) Information

To request a RMA:

1. Send an email to RMA@futurelogic-inc.com.
2. Include the following in your written request:

- Subject: RMA Request
- Model: PSA-66-ST2RU
- The Quantity
- Detailed description of the issue

After your request is authorized, you will receive an authorization number to use in returning material to FutureLogic.

Supporting Documentation/Software Tools

Additional documentation and software tools for the printer are available from the FutureLogic ExchangeTM secured area of our web site (<http://www.futurelogicinc.com>). If you need access, please submit your request to webaccess@futurelogicinc.com.

3 Printer Evaluation

Introduction

This chapter provides details on evaluating the printer.

System Configuration

The printer interfaces to a host computer or game controller through a RS232 or USB port. It accepts character data and converts it to printed output as per the printer language chapters of this manual (see Chapters 14 and 15).

Getting Started

This section covers the steps necessary to configure the printer and prepare your system for communications so that you may be up and printing quickly.

To set-up your evaluation unit:

1. Identify and confirm the model of the printer as PSA-66-ST2RU.
2. Ready your power supply and power harness.

The unit is designed to operate from a single 24VDC power supply. The 24V supply net will experience numerous step loads that vary based on the demands of the thermal printer engine. If your power supply has difficulty adjusting to the rapid load changes and you are experiencing dynamic voltage dips much greater than about one volt, try adding a low ESR capacitor to the output terminals in the range of 2,220uF to 10,000uF. This helps buffer these rapid step load changes (see illustration in Chapter 5). If you still experience difficulty with your power supply, a number of economical power supply options exist that work well with the printer.

3. Connect the printer cable harness power connector to your power supply.



Note: While the printer is hot connectable, it is still a good maintenance procedure to turn off the power.

4. Tie into the host system. To create cabling for the system, refer to Chapter 5.

If you are working with the evaluation unit with the DB-9 terminated communications cable, the unit may be directly connected to a standard PC using a standard straight through pass cable (not a Null modem cable). Figure 3-1 illustrates a sample hook up.

5. Power-up and print a sample ticket.

Print a demo file to test your setup. Turn on power to the unit. Insert paper into the feed slot; the printer will automatically load its own paper. (For more on paper loading, refer to Chapter 4).

Once the status light on the keypad turns green, the unit is ready to print.

To test printing, try the following:

- Send the text file "TICKET0.TXT" (available in the Ticket packet available from FutureLogic, Inc.) to the port to which the printer is attached. Use a Windows "Generic Text Only" printer or a Windows utility which supports file dumping to the port (such as Hyper Terminal). You can also use the DOS "Copy" command (with the /b binary option).

Congratulations, you did it! If for any reason the system does not print, shut down power to the system and double-check all connections. If after double-checking the system you are still unable to print successfully, turn off the system power and contact Technical Support.

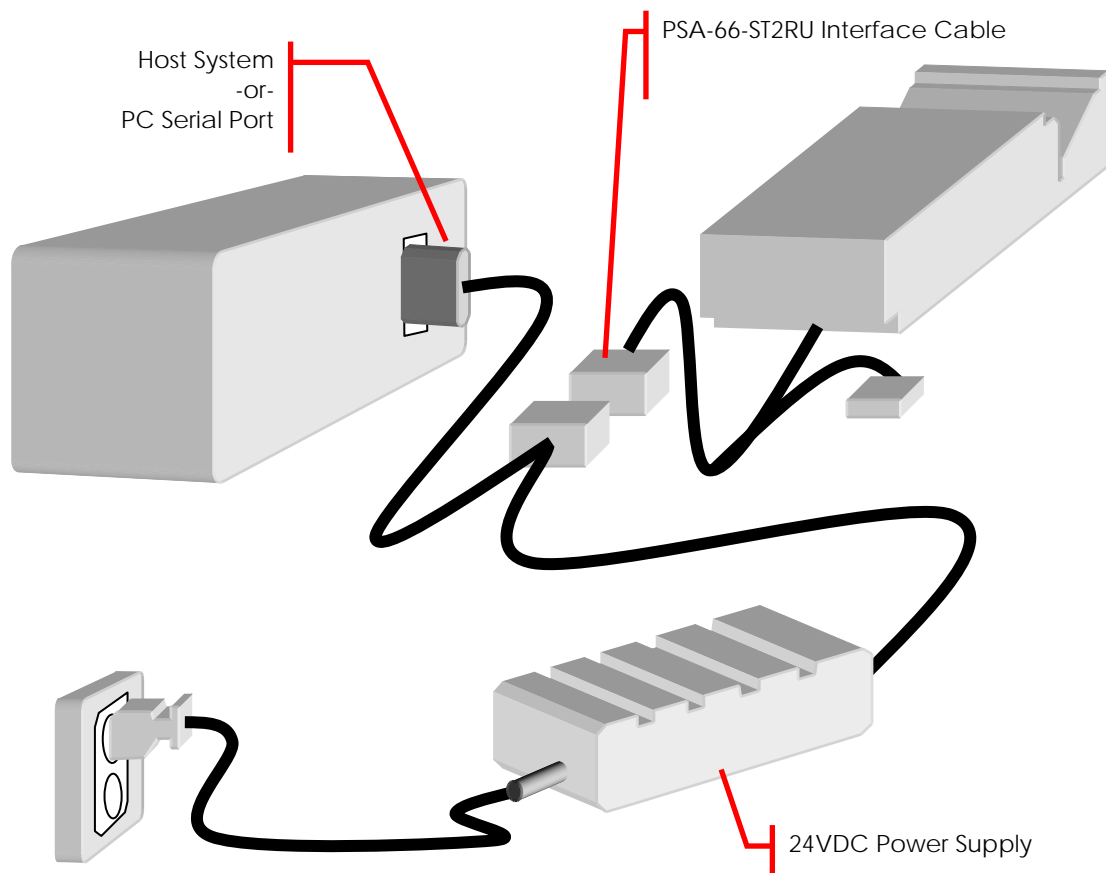


Figure 3-1 Sample System Hookup

4 Operator Interface

Introduction

This chapter covers various operations of the printer including loading paper and clearing a paper jam.

Operator Indicators and Controls

The printer is equipped with status indicators and a FEED button, which allow you to manage and interpret the operations of the printer.

The status indicators are:

- The front bezel light
- Keypad lights:
 - Ready – Green
 - Paper – Yellow
 - Open – Orange
 - Fault – Red

Figure 4-1 illustrates the location of these controls and indicators.

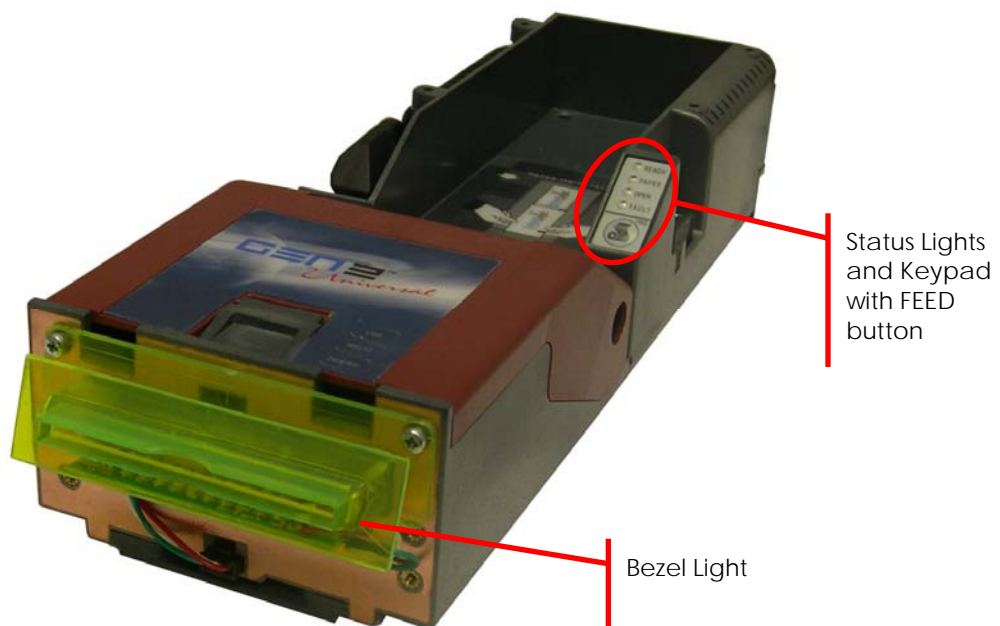


Figure 4-1 Operator Indicators and Controls

Bezel Operation

Use the front bezel display to determine the state of the printer while on the casino floor, at a distance, without disturbing the game. Table 4-1 lists the conditions indicated on the bezel display.

Table 4-1 Bezel Display Status

Bezel Display	Status
Solid On	Printer Idle and Ready
Slow Blink	Paper Low or Printer Error
Fast Blink	Ticket Printing and/or Ticket in Chute
Off	Printer power off


See Chapter 5 for information on the current ratings of the bezel ports.

Keypad Status Lights

The keypad status LEDs report the status of the printer whenever power is present. Table 4-2 lists each condition of the keypad LEDs.

Table 4-2 Keypad LEDs Status Reporting Printer Condition

Condition	Ready	Paper	Open	Fault
Unit is Powered Off				
Unit Ready	blink			
Unit Flushed				
Paper Out				
Head Up or Ticket Module Open				
Temperature Error				
Voltage Error				
Print Head Error				
Missing Black Index Mark				
Paper is Jammed				blink

 = LED ON

See Chapter 10 for more information on printer errors.

Loading Paper

The automatic paper loading feature of this system simplifies the paper loading process to essentially two steps: putting the paper stack into the Paper Tray and feeding the paper into the Paper Loading Slot of the printer. These functions revolve around loading paper into the printer. Once paper is loaded, it is generally not required that the operator perform any other operations for the printer to correctly function.

To load paper:

1. Pull open the Printer Drawer until the Paper Tray is completely accessible.
2. Place the paper stack in the printer as indicated by the band around the stack and the label on the bottom of the Paper Tray.



Tip: To prevent a new paper stack from sticking together, fan out the paper after you take off the band.



Figure 4-2 Load a Paper Stack

3. Feed the paper into the Paper Loading Slot and release it once the motor engages and the printer takes hold of the paper.

The printer pulls through a form or two, leaving it registered at the top of a form.



Figure 4-3 Feed Paper into Paper Loading Slot

4. Remove any excess ticket from the printer.

Feeding Paper

To feed paper into the printer:

- Press the **FEED** button.

Each long press (~1 second) of the **FEED** button results in paper advancing to the top of the next form. The top of form for indexed paper is determined by the black mark on the back of the paper and the `<idx_to_tof>` field of the `^L` command (see page 86 for details).

Performing a Self Test

To run a self test:

- Press the **FEED** button during power-up or reset.

This self test prints a configuration ticket if the test passes successfully. The test ticket (illustrated in Figure 4-4) contains important information on how the printer is configured.

Model number	Model:	PSA-66 USB REV A	Resident ticket template package version
	Firmware:	GUU0010432 2006-05-17	
System communications setup	COMMUNICATION Interface:	USB 2.0 Full Speed	Firmware version
Print control parameters	PRINT CONTROL		
	Darkness Control:	+0.0	
	Black Bar Index:	Enabled	
	Print On Demand:	Disabled	
	Auto Sleep Timer:	Off	
Amount of memory	SYSTEM RESOURCES		
	FLASH -Used:	000000	
	-Free:	065536	
	LIBRARY INVENTORY		
	Templates:	0,1,2,3,4,5,6,7,8,9,A,B,z,x	Listing of stored Templates and fonts available in TCL page mode
	Fonts:	1,2,3,4,5,7,8,9	

Figure 4-4 Sample Configuration Ticket

Clearing a Paper Jam

The printer is designed to operate reliably with a minimum of paper jamming. If you need to clear a paper jam, follow the instructions below. After you clear a paper jam, perform these steps in reverse to load paper.

When clearing a paper jam:

- Ensure that all paper paths from the entry point at the back of the paper well, through the printer, cutter, and the ticket module chute are clear of paper or obstructions.
- Use the Lid Release Lever located on the top of the printer.
- Do not allow a screwdriver or other probing object to come in contact with the printer. This can cause permanent damage.

To clear a paper jam:

- Remove the paper from the printer.



Figure 4-5 Remove the Paper

2. Open the lid by pressing the Lid Release Lever.
The spring-loaded lid opens, exposing the paper path.

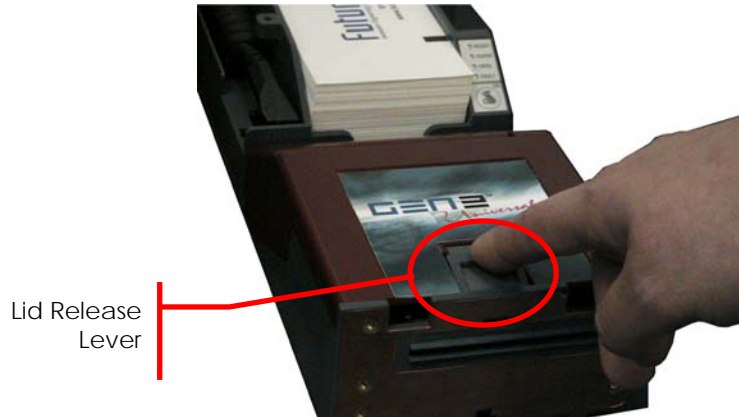


Figure 4-6 Open the Lid

3. Remove the jammed ticket.
4. If necessary, access the paper path through the print mechanism by opening the Main Release Lever.

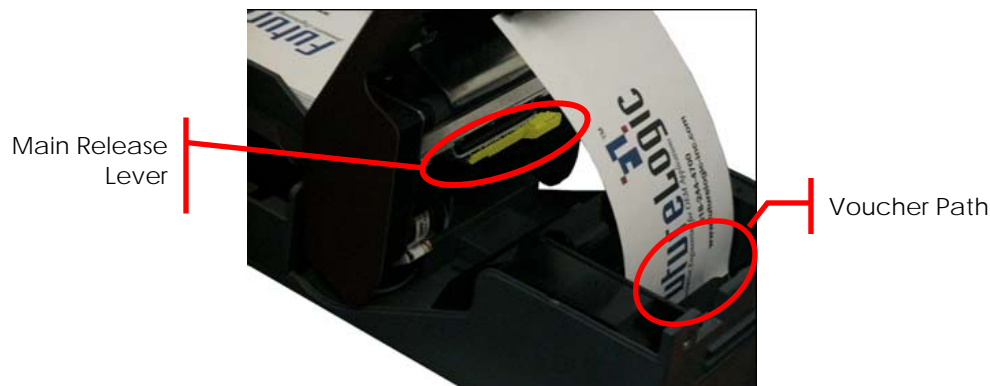


Figure 4-7 Clear the Paper Jam

5. Once you clear the jam, reverse these steps to return the printer to a ready state.
6. Load the paper.

Cleaning the Print Head

See MNL-000054, Printer Cleaning Guide for details.

Removing the Printer

You can remove the printer from its stationary module using the steps below. To re-install the printer, repeat the steps in reverse order.



Note: While the printer is hot-connectable, it is still a good maintenance procedure to turn off the power.



CAUTION!

ESD Sensitive Equipment!

Electronic boards and their components are sensitive to static electricity. Care must be taken during all handling operations and inspections of this product in order to ensure product integrity at all times.

Do not handle this product out of its protective enclosure while it is not used for operations purposes unless it is otherwise protected.

Discharge your clothing before touching the assembly. Discharge tools before use.

Whenever possible, unpack or pack this product only at EOS/ESD safe workstations. Where a safe workstation is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools.



Important Information!

Do not remove the ground screw in the rail as it will release the internal nut!

After removing the printer, do not slide the printer on a tabletop or other surface. Doing so will cause damage to the copper grounding clips on the bottom of the printer.

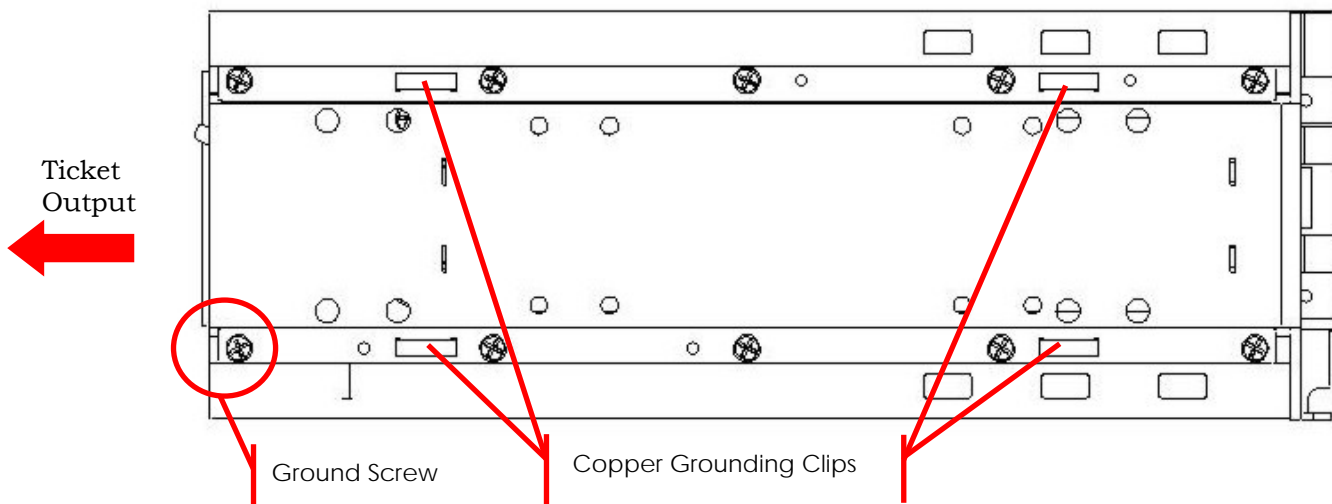


Figure 4-8

Ground Screw and Copper Grounding Clips Location

To remove the printer:

1. Disconnect the power.
2. Disconnect the Coiled Cable Connector.



CAUTION! The cable is under tension.



Figure 4-9 Disconnect the Coiled Cable Connector

3. Slide the printer open until it stops in the stationary module.

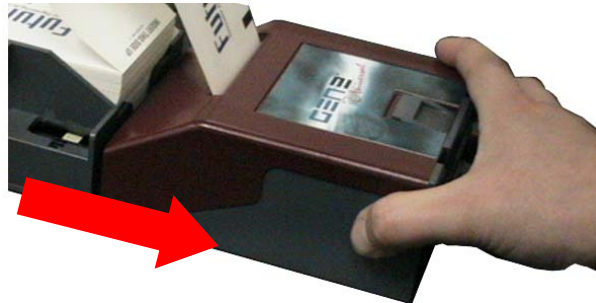


Figure 4-10 Slide the Printer Open

4. Remove the paper from the printer.



Figure 4-11 Remove the Paper

5. Push the Release Bar (located under the bottom of the printer) to remove.
While holding in the Release Bar, gently pull the printer towards you.

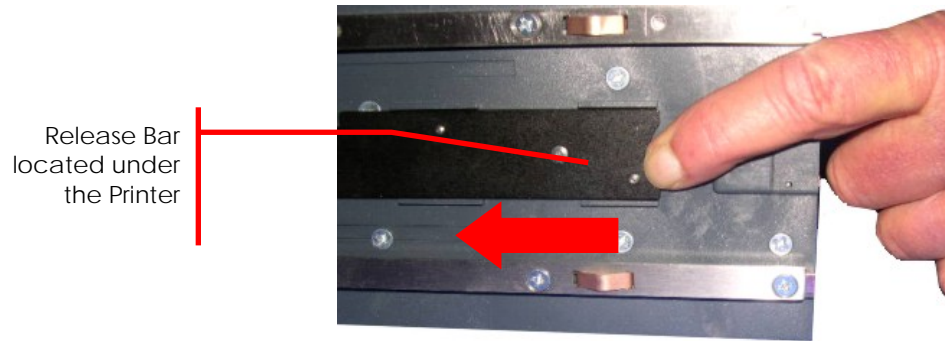


Figure 4-12 Push Release Bar



Important Information!

After removing the printer, do not slide the printer on a tabletop or other surface. Doing so will cause damage to the copper grounding clips on the bottom of the printer.

5 Ports and Cables

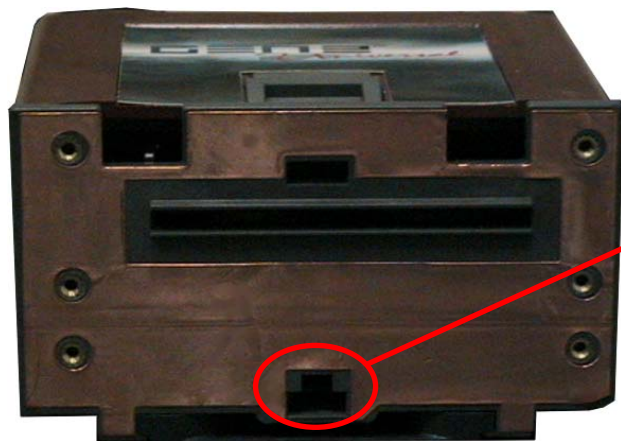
Introduction

This chapter describes the interface connectors and port pin-outs for the printer. For complete electrical specifications on these ports, refer to Appendix A for the power connector and Chapter 10 for the serial communication ports.

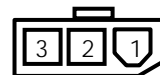


Note: While PSA-66-ST2 refers to all models of the printer, this manual is primarily for the RS232/USB interface of the GEN2 Universal printer.

Front Bezel Port



Bezel LED Control Port



Connector: Molex Micro-Fit 43640-0301
Mate: Molex Micro-Fit 43645-0300

Figure 5-1 Front Bezel LED Control Port

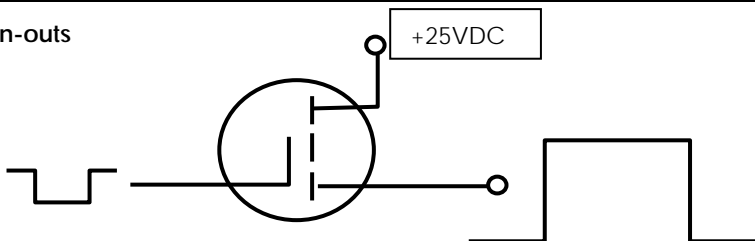
Table 5-1 lists information on the LED bezel port on the printer. This is an open drain modulated high side drive 25VDC port capable of driving up to a maximum 1.5A.



Note: The 24VDC current ratings of the printer in Appendix A do not include any current supplied by this port to a light bezel.

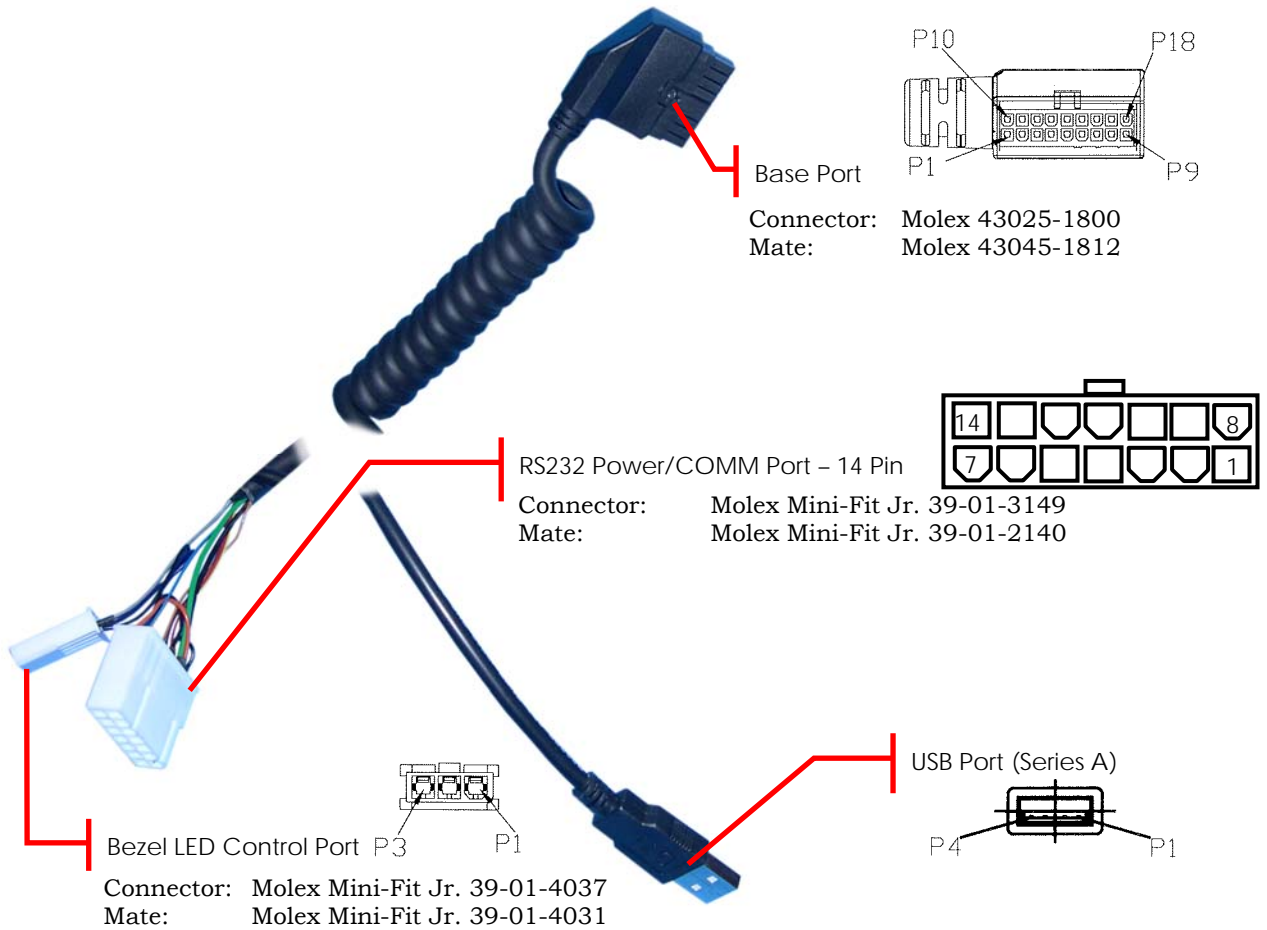
Table 5-1 Front Bezel LED Control Port Pin-outs

Pin	Function
1	Switched 25VDC, 100mA Min
2	BGND
3	Frame (Chassis) Ground



PSA-66-ST2RU (GEN2 Universal Printer)

USB/RS232 Interface Cable



USB/RS232 14 Pin Cable P/N 150-00176-100

Figure 5-2 USB/RS232 Interface Cable

Table 5-2 Base Port Cable Pin-outs

Pin	Function
1	RAW BGND
2	D-
3	+13V
4	SWITCHED 24V
5	DTR 232
6	MRESET
7	D+
8	RAW 24V
9	RTS 232
10	RX2/SCL
11	TX2/SDA
12	RX1/232
13	TX1 232
14	TX1 NET
15	RX1 NET
16	OPTO GND
17	DGND
18	+9 – 14V

Table 5-3 RS232 Power/COMM Port Pin-outs

Pin	Function
1	MRESET
2	Netplex TXD
3	+12 VDC (RS232 optional)
4	Netplex RXD
5	GND
6	+24 VDC
7	GND
8	+24 VDC
9	Modulated +24VDC
10	GND
11	RS232 RXD
12	RS232 TXD
13	DTR
14	RTS

Table 5-4 USB Port (Series A) Pin-outs

Pin	Function
1	USB BUS SUPPLY
2	D-
3	D+
4	GND

Table 5-5 Bezel LED Control Port Pin-outs

Pin	Function
1	SWITCHED 24V
2	NO CONNECT
3	GND



Note: For Bezel LED Port on cable, no Intermittent or in rush current exceeding 1.5A is allowed.

As a special order, the GEN2 Universal RS232 Interface Cable also is available with an auxiliary communication port. Please contact FutureLogic for details.

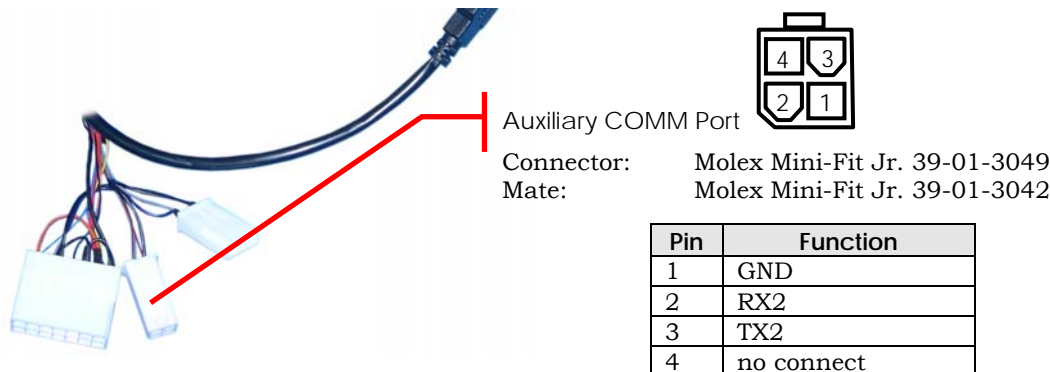


Figure 5-3 USB/RS232 Interface Cable, Auxiliary Communications

RS232 Evaluation Cable

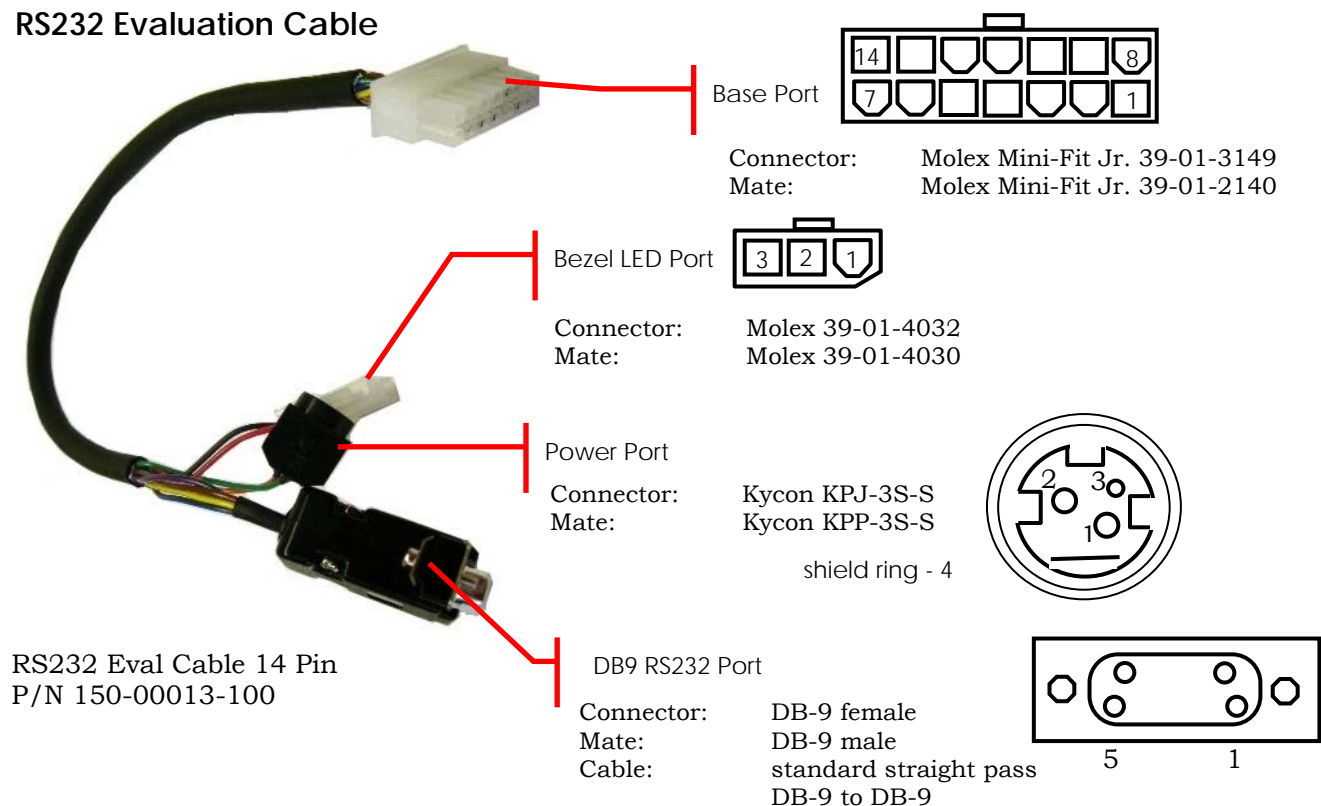


Figure 5-4 RS232 Evaluation Cable

The following table lists the pin out of the 14 pin base port. The Modulated +24VDC pin has the same function as the bezel port pin.

Table 5-6 Evaluation Cable 14 pin Base Port Pin-outs

PIN	FUNCTION	I/O*
1	MRESET	I
2	Netplex TXD	I
3	+12 VDC (RS232 optional)	I
4	Netplex RXD	O
5	GND	-
6	+24 VDC	-
7	GND	-
8	+24 VDC	-
9	Modulated +24VDC	O
10	GND	-
11	RS232 RXD	I
12	RS232 TXD	O
13	DTR	O
14	RTS	O

*I/O viewed from the printer

Table 5-7 Evaluation Cable DB9 RS232 Port Pin-outs

Pin	Function	I/O*
1	No connect	-
2	TX	O
3	RX	I
4	DSR	I
5	GND	-
6	DTR	O
7	CTS	I
8	RTS	O
9	No connect	-

*I/O viewed from the printer

Table 5-8 Evaluation Cable Bezel Port Pin-outs

Pin	Function
1	Modulated +24VDC
2	No connect
3	GND



Note: For Bezel LED Port on cable, no Intermittent or in rush current exceeding 1.5A is allowed.

GDS Adaptor Cable

The GDS adaptor cable changes the RS232 14 pin down to a 1 x 4 Molex mini fit to match the GDS power connector standard.

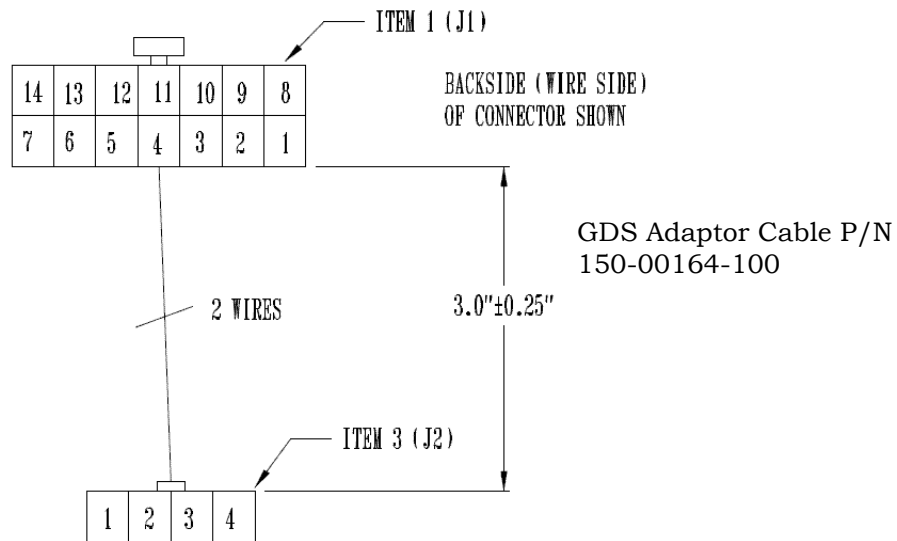


Figure 5-5 GDS Adaptor Cable

Table 5-9 GDS Adaptor Cable Connectors

From Connector	To Connector	Color	Length
J1-5	J2-3 *	Black	3.0" ±0.25"
J1-6	J2-4	Red	3.0" ±0.25"

* Use Grounding Terminal (Item 5) for J2-3.

Table 5-10 GDS Adaptor Cable Assembly

Item #	Qty	FL. Part #	Description	OEM	OEM Part #
1	1	170-00267-100	Conn, 14 Ckt, 2x7, 4.20MM Pitch	Molex	39-01-2145
2	2	170-00172-100	Term, Crimp, Female, 18-24AWG, 4.20MM Pitch	Molex	39-00-0038
3	1	170-00269-100	Conn, 4 Ckt, 1x4, 4.20MM. Pitch, Free Hanging	Molex	39-01-4046
4	1	170-00149-100	Term, Crimp, Male, 18-24AWG	Molex	39-00-0040
5	1	170-00152-100	Term, Crimp, Male, 18-24AWG, Grounding Pin	Molex	30490-2002
6	.28	513-00061-100	Wire Stranded, 20 AWG, Red, 1 Ft.	Belden	9982-2
7	.28	513-00062-100	Wire Stranded, 20 AWG, Black, 1 Ft.	Belden	9982-10

Firmware Upload Port

The Firmware Upload Port upgrades the printer firmware while the printer is installed and powered in the game. The printer uploads through its Firmware Upload Port just as it would through its communications connector at the rear of the printer.

To use this port, slide the printer out until the upload port (shown in the following figure) is visible. Then plug an appropriate upgrade cable into the printer. This connection may be made while the power is on.

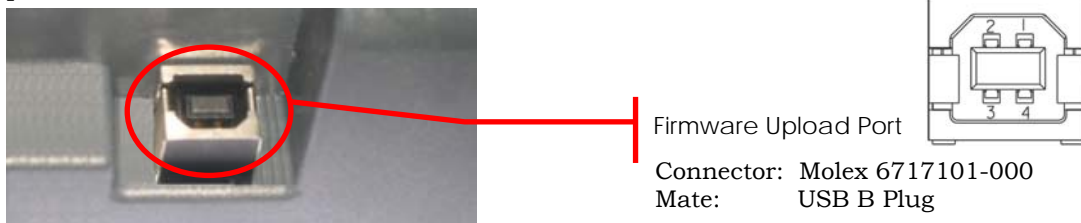


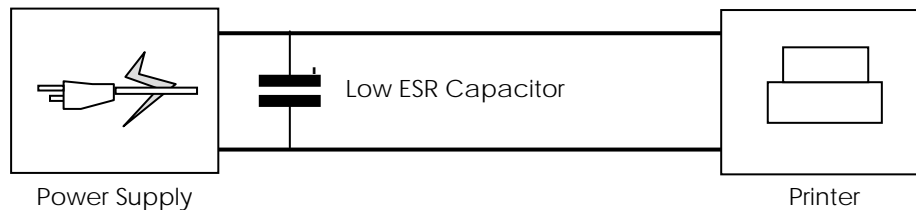
Figure 5-6 Firmware Upload Port

A Note about the Power Supply Connection

Thermal printers by their nature require numerous step load changes during the printing operation. In the case of the PSA-66-ST2RU, peak current on the 24V supply is consumed every time there is a high density of dots in the horizontal axis. Peak current surges can result in sag on the 24V net if the power supply or cable harnessing is inadequate. Voltage sag can adversely affect print quality or in extreme conditions cause the printer to enter a voltage error condition (for more information on error conditions, see Chapter 9).

Consider these tips when configuring a power supply net for 24 volts:

- Try to use a power supply designed for quick response to quick step load changes in current (response < 250us when step from 300mA to peak given in Appendix A is encountered). Power supplies specifically designed for thermal fax machines make excellent cost effect choices.
- Keep the wire connection between the power supply and the printer as short as necessary. Try to use a minimum of 18 AWG wire for this connection.
- If you are experiencing difficulties with your power supply, try connecting a good quality low ESR dumping capacitor at the output terminals of your power supply as shown here. A capacitor in the range of 2,200uF to 6,800uF is usually sufficient. This fix should be considered temporary in nature and is not necessary recommended for production purposes.



Note: The PSA-66-ST2RU achieves its frame ground through its chassis frame. It is important that the printer has a good frame connection. There is a 1MΩ connection between frame ground and digital ground internal to the printer.

6 Packaging Considerations

Introduction

The printer is designed to be packaged within a finished kiosk or large instrument with a minimum of difficulty. The chassis was designed so the entire printer would reside within the kiosk cavity with the exception of the presentation chute.

There are essentially three points of interface that should be made available to the field operator: the Paper Well, the Control Keypad, and the Lid Release Lever. For the location of these items, refer to Chapter 4.

Mounting the Printer

There are a number of mounting holes on the bottom of the printer chassis that provide mechanical pickup points to facilitate the mounting process. There are a set of four press nut M4 screw holes and four M4 clearance bolt through holes that reside on the base plate. The M4 bolt-through holes are ready for a mounting stud to pass through, with a nut to be added from inside the printer.

To access the pass-through holes, remove the printer from the stationary module (see page 12). Appendix D contains the mechanical specifications to locate these holes and provides their dimensions.

The printer may be mounted either horizontally or at an angle within the kiosk. As mounting angle increases, the printer may not stay locked open without assistance.



Note: The PSA-66-ST2RU achieves its frame ground (very important) through its chassis. Be sure the stationary module makes a good connection to the frame ground of the host machine.

Presentation Chute

To complete packaging the printer within a kiosk, add an output chute to the front of the printer.

There are six M3 mounting holes on the front of the printer to use for mounting the output chute. The chute should be designed to prevent back pressure on the ticket during printing. For more information on bezels available for the printer, please contact your sales representative or FutureLogic.

Paper Tray

The printer can be configured with one of three paper trays, each with a different paper holding capacity. There are 300, 600, and 900 ticket trays available. Be sure to check that the mounting angle does not interfere with the flow of the fanfold paper during operation.

Other Considerations

Although the electronic components of the printer generally have been sealed within the chassis, the following factors should be considered when deciding on the packaging of the printer within the end system:

- The printer is not water tight.
- The printer is not dust tight. If the printer is being used in a dirty environment, fine particulate abrasive matter can also be a problem for the thermal print mechanism. If necessary, use a dust shield or other arrangement to reduce debris falling into the printer mechanism area.
- The openings around the thermal print mechanism should never be probed with screwdrivers, pens or other long thin instruments. This is especially true of the print head. A screwdriver can cause permanent damage to the printer if it comes into contact with the print head. Refer to page 11 for information on how to clear a paper jam.
- Fluids or other matter that accumulate on the Paper Taken and Paper Low sensors can affect the performance of these optical devices.
- To protect the printer against static discharge by the operator, be sure that the stationary module makes good physical connection to frame ground.



CAUTION!

ESD Sensitive Equipment!

Electronic boards and their components are sensitive to static electricity. Care must be taken during all handling operations and inspections of this product in order to ensure product integrity at all times.

Do not handle this product out of its protective enclosure while it is not used for operations purposes unless it is otherwise protected.

Discharge your clothing before touching the assembly. Discharge tools before use.

Whenever possible, unpack or pack this product only at EOS/ESD safe workstations. Where a safe workstation is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools.

7 Fonts

Introduction

This chapter identifies the fonts that are supported by the printer.

Fonts

The printer supports the eight resident fonts listed in Table 7-1. The printer supports an extensive line printing language. Operating in this mode, the printer has its own internal automatic font selection scheme based on the current pitch and point selections. The printer makes the best selection available from its resident fonts to match the current pitch and point settings of the printer.

The fonts of Table 7-1 are also available for manual selection using the special control code ESC [F command (covered on page 57). If using the printer under Microsoft Windows with the Epson or FutureLogic, Inc. printer drivers, the printer automatically handles the font selection (see Chapter 12 for details).

When printing, characters can be specified as either fixed pitch or proportionally spaced by software command. Proportionally spaced characters are usually superior in appearance for presentation. Fixed pitch characters are typically used for journal, ticket, or report printing where tabular columns are required.

Table 7-1 Resident Fonts

Name	I.D. ¹	Point ²	Pitch ³ (Cpi)	Character Set	Notes
NOTARY BOLD	1	29.4	2.5	Standard English ASCII Capital characters only	Bold Sans Serif font
NOTARY BOLD	2	25.9	3.3	Standard English ASCII 96 characters	Bold Sans Serif font
NOTARY BOLD	3	13.8	5.5	Standard English ASCII 96 characters	Bold Sans Serif font
NOTARY BOLD	4	21.3	4.0	Standard English ASCII 96 characters	Bold Sans Serif font
NOTARY BOLD	5	10.6	7.3	Standard English ASCII 96 characters	Bold Sans Serif font
NOTARY BOLD	7	8.5	20.5	PC437	Bold Sans Serif font
NOTARY BOLD	8	9.2	10.1	Standard English ASCII 96 characters	Bold Sans Serif font
NOTARY BOLD	9	12.4	5.6	Standard English ASCII 96 characters	Bold Sans Serif font

Table Notes:

¹ For TCL page mode capable printers, this is the <obj_id> field character.

² Average columns. When printing proportionally, characters per inch may be greater.

³ cpi = characters per inch.

8 Barcodes

Introduction

This chapter contains information on barcodes.



Note: It is important to have a cursory understanding of the TCL language before attempting to print barcodes. Refer to Chapter 15 for more on printer-based barcode generation.

Barcode Families and Usage

The printer supports generation of a number of industry standard barcodes. The barcodes available are identified in Table 8-1 and can be printed using the TCL page mode language.

Please note the following key points when generating a barcode:

- Send the controller the actual barcode characters in the data field of the command. The printer will automatically generate the check digit and framing characters (if appropriate), then print the symbol.

Sending illegal data for a barcode will result in a software error. Table 8-1 provides some guidance for the types of data supported by the various barcodes, but remember that the AIM and manufacturers specifications are the final word in barcodes.

Table 8-1 Resident Barcodes

Barcode ¹	I.D. ²	Characters Data	Barcode ¹	I.D. ²	Characters Data
UPCA	a	fixed at 11 digits	Code 2 of 5	l	variable, digits
UPCA +2	b	fixed at 13 digits	Coda Bar	m	variable, limited alpha-numeric
UPCA +5	c	fixed at 16 digits	Code 128 A	n	variable, control codes, upper case ASCII set
UPCE	d	fixed at 6 digits	Code 128 B	o	variable, Upper and lower case ASCII set
UPCE +2	e	fixed at 8 digits	Code 128 C	p	variable, even number of digits 00-99
UPCE +5	f	fixed at 11 digits	MSI	q	variable, digits
EAN 13	g	fixed at 13 digits	Code 128 A,B,C	r	variable, ASCII set, control codes and even number of digits 00-99
EAN 8	h	fixed at 8 digits	PDF-417	s	
Code 39	k	variable, alpha-numeric			

Table Notes:

¹ Controller will automatically generate framing and check digit characters as appropriate.

² Code used in the <obj_id> field to select the barcode for printing.

Table 8-2 Barcode Dimensional Ranges

Bar Types	Dim (Mils)	Dim (Mm)
Fixed with bars	0.495 – 2.75	0.125 – 0.750
Narrow bars	0.495 – 2.75	0.125 – 0.750
Wide bars	0.900 – 11.88	0.250 – 3.00

Barcodes in TCL page mode may be printed in either picket fence or ladder orientation (90° rotated).

Code 128

Subsets A, B, and C

The Code 128 barcode comprises of three code subsets that are optimized for printing various character and digit data. All three subsets are available through four options selections: user-fixed subset selection A, B, or C (available via I.D.s “n” through “p”), and Code 128 auto switching (I.D. “r”), which automatically selects between subsets A, B, and C to create an optimum symbol.

Table 8-3 lists the type of data that each Code 128 subset is designed to encode.

Table 8-3 Code 128 Subset Encoding

Family	Data
A	Control characters (0-1FH) and lower case characters
B	Upper case characters
C	Two digit quantities such as “99” or “17”, etc.

Refer to a specification on Code 128 characters if using the specific subset I.D. selections “n”, “o”, or “p”.

Characters below 20H

Since the TCL language was designed to use only simple ASCII characters ranging from 20H to 7FH, special accommodations are made to print the characters allowed by Code 128 subset B or the auto subset selection command (which have a value less than 20H).

The convention for printing characters 0H to 1FH follows the TCL page mode tilde escape sequence whereby the 3-digit ASCII value is preceded by the tilde (~) character. This is demonstrated using the following examples of the following table:

Table 8-4 3-Digit ASCII Value

Hex Code	TCL Replacement	Hex Code	TCL Replacement
00H	~000	....	...
01H	~001	1DH	~029
02H	~002	1EH	~030
03H	~003	1FH	~031

Function Codes and Special Characters

Code 128 supports the printing of function codes and special characters that can be embedded inside the barcode. Table 8-5 lists these codes and the TCL tilde (~) sequence.

Table 8-5 Code 128 Function Codes and Special Characters

Code	TCL Sequence	Code	TCL Sequence
FUNC1	~200	SHIFT	~204
FUNC2	~201	CODE A	~205
FUNC3	~202	CODE B	~206
FUNC4	~203	CODE C	~207

9 Sensor, Bezel, and Buzzer Operation

Sensor Introduction

There are six primary sensors on the printer:

- Printer Open
- Paper Taken (Paper in Chute)
- Printer Platen Engaged
- Paper Out
- Paper Low
- Printer Drawer Open

These sensors provide information to the host system as to the status of the printer at all times. The sensor information is available by use of three software poll commands:

- The ENQ (05h) character. See page 58.
- The “ESC [S e” command. See ESC [S on page 58.
- The “^Se” command. See ^S on page 96.

The polling method for the parallel interface is given in Chapter 11.

For more information on error messages, see Chapter 10.

Printer Open Sensor

The Printer Open sensor is located in the front of the printer. It detects when the printer clamshell is open. A Printer Open condition is corrected by firmly closing the clamshell. The Printer Open state is tracked in *status_flags1* BIT 3.

Paper Out Sensor

The Paper Out sensor is located within the thermal printer engine. It terminates the print operation when paper has run out, and checks for black mark registration. The printer ceases printing and feeding operations once a Paper Out condition is detected. A Paper Out condition is corrected by loading more paper to the printer. The paper out status bit is located in *status_flags1* BIT 2.

Paper Low Sensor

The Paper Low sensor is located in the paper well. It determines when the paper stack has approximately 2 tickets. A Paper Low condition automatically resets once a stack with a greater height is loaded. Paper low sensing occurs when the system is idle and takes a few seconds to detect the new paper level.

Printer Platen Engaged Sensor

The Platen Engaged sensor is located in the print head. It detects when the printer platen is in use. The Platen Engaged state is tracked through *status_flags1* BIT3.

Paper Taken Sensor

The Paper Taken (or Paper in Chute) sensor is located in the presentation chute. It determines when the previously printed ticket was taken.

The printer provides two modes for use of the information returned by the Paper Taken sensor:

- **Continuous Print Mode.** (default) This mode removes the printer from making any decisions based on the sensor and leaves interpretation of its state up to the host.
It is the responsibility of the host to interpret the state of the Paper Taken sensor. The related flag bit will reflect the status of the presentation chute; 1 if paper is present or 0 when the chute is clear. The flag bit will operate regardless of whether the cutter operated after a paper advance (print or feed). The printer will continue to print and feed regardless of whether the previously printed ticket was taken by the customer. (See ^O on page 87.)
- **Auto Demand Mode.** This mode allows the printer to operate intelligently based on the state of the sensor and its own current state. In this mode, the printer will enter a suspend condition if paper has been printed, but is still present in the chute. The printer will interpret this sequence as the case where a ticket was printed, but it has not yet been taken. New print jobs will be suspended until the paper chute is again seen as clear.

The key purpose of Auto Demand mode is to pace the printer's production of tickets to the rate at which the customer is taking them to prevent an eventual jam if the presentation chute becomes loaded with a number of uncollected tickets. Auto Demand mode will still process feed commands and feed requests from the keypad. (See ^O on page 87.)

Drawer Open Sensor

The Drawer Open sensor is located in the paper well. It detects when the printer is open. The Draw Open state is tracked through *status_flags5* BIT2.

Paper Jam Sensing

The printer supports detection of a Paper Jam condition using the Paper Present sensor. If the chute starts in a clear condition (no paper present in the chute) while a print or feed function begins and paper present is not detected after ~2" of paper has advanced, the Paper Jam bit (*status_flags4* BIT 1) is set. The operation of the printer after the jam is detected will depend on the jam detect mode: Default Detect or Suspend mode.

- **Default Detect Mode.** This mode is the power-up default for the printer. When the printer detects a jam in this mode, the jam flag bit sets, but the printer will continue to operate normally. This bit will remain set until a ^C|j|^ command is received (to reset the bit and the condition). In the Default Detect mode, it is the host system's responsibility to make use of this flag. (See page 82.)
- **Suspend Mode.** This mode is used to configure the printer to self detect and manage a Paper Jam condition. In this mode, a jam condition results in setting the Paper Jam bit. Further printing or feeding will be terminated and the printer will suspend future print and feed operation until the Platen Release Lever is raised (indicating that the operator is attempting to fix the jam). Suspend mode is selected using the ^z|S| command (see page 106).

Bezel Operation

The printer is equipped with an optional buzzer and two identical LED bezel ports to provide easy to interpret external feedback to the player and operator as to the status of the printer. The LED boards, which are available discretely or in Bezel kits, are designed to direct connect to the bezel ports on the printer. Table 9-1 lists the signaling performed by these devices.

Table 9-1 Bezel Display Status

Bezel Display	Status
Solid On	Printer Idle and Ready
Slow Blink	Paper Low or Printer Error
Fast Blink	Ticket Printing and/or Ticket in chute
Off	Printer power off

See Chapter 5 for information on the current ratings of the bezel ports.

10 Error Conditions and Recovery

Error Condition Recovery for the Host Application



Note: If you are running the printer under DOS, Windows, or another operating system that supports its own error checking and recovery, it is not necessary for the application to perform these functions. You can skip this chapter. However, if you are responsible for the complete management of the printer function, it is important to tailor the behavior of the host application to support successful recovery from an error condition of the printer. This creates a robust printing system.

The following steps will ensure trouble-free operation and recovery from unexpected interruptions of the printing process.

1. As a host, check for errors and status on a regular basis. For an RS232 printer, use the status poll command ENQ (05h). See page 96 for the RS232 status poll commands and the response to these commands.

The status response message has two special sticky bits: SF5_TOF and SF5_BCODE. These bits reflect the status of a printing ticket which allows the host to determine the progress of the printer at all times. These bits can be useful in lost ticket detection.

2. If there is a catastrophic error, immediately terminate sending print or job data to the printer. A catastrophic error is any one or more of the following (for more details on these flags, see Chapter 10 and Chapter 15):

- **SF1_PLATTEN.** The yellow print head lever is raised to release the paper.
- **SF1_PAPER.** The printer is out of paper.
- **SF1_HEAD.** A hardware error with the printer head has been detected.
- **SF1_VOLT.** An illegal condition with the +24VDC has been detected (too high or low).
- **SF2_TEMP.** The print head is over or under legal operational temperature range.
- **SF3_PS.** The printer failed to find the top of next form mark for ticket registration.

All commands and print data sent to the printer once it enters an error condition are discarded. The printer will only respond to an ENQ (05h) poll. You can determine the nature of the error from the detailed status information that is returned in response to a poll or by studying the error status line conditions in Table 10-2.

3. Wait to send new data and commands to the printer until the error condition is corrected. The operator or the printer can correct all error conditions except for hardware errors.

Hardware errors are rare and occasionally may be by cycling the printer's power. Failure to clear the error by power cycle means that the printer probably requires service. A hardware errors is the following:

- **SF1_HEAD.** A hardware error with the printer head has been detected.

In addition, these errors may be the result of a printer hardware error:

- **SF1_VOLT.** An illegal condition with the +24VDC has been detected (too high or low).
- **SF2_TEMP.** The print head is over or under legal operational temperature range.

4. After the error condition is cleared and none of the flags of item #2 are set, the recovery procedure varies depending on the printer activity interrupted by the error.
 - If the printer was at idle, it is not necessary to take any additional steps.
 - If the printer was feeding paper, the host may want to assume that the actual position on the paper is unknown (although the printer will attempt to register to top of form upon recovery) and send a command to align the paper to top of form.
 - If a TCL ticket was being printed, such that the SF1_BUSY flag was set but the SF5_BCODE sticky bit was not yet set, this indicates that the ticket had not completed printing. The host may want to re-send the ticket.
 - If line-by-line text was being printed, assume that the last few lines have been lost. It is recommended that the host re-send an appropriate portion of the interrupted message.
5. If an error condition is not cleared after a long period of time, issue a hardware reset through the MRESET line (if available).

Error Conditions

Although there are a variety of error conditions that can occur, most printer errors are a result of the printer running out of paper or the operator raising the head release lever. This section lists the possible errors that can occur and how to remedy the condition.

Table 10-1 Error Conditions


Error	Description	Remedy	Status Flag Tracking This Condition
Paper Out	Results when the printer does not detect paper present. The printer scans for a paper out condition only when a print or feed is being performed.	Load more paper into the printer. If the printer is set to use black mark indexed paper, the new paper must also have indexes or an error will occur. The printer will resume operation once paper has been successfully loaded.	SF1_PAPER
Head Up	Results from raising the Side Release Lever.	Lower the lever.	SF1_PLATTEN
Print Head	Results when the printer senses an internal error due to connectivity or interfacing problem with the thermal print head. This can be a result of a cable problem between the main controller board and the printer engine.	The printer will remain in this error state until the power is cycled or the printer is reset. If the problem persists, the printer will require service.	SF1_HEAD
Voltage	Results if the printer detects a head supply voltage (VDD) outside of range. Note that on an AC powered system a transient voltage dip can be interpreted as a voltage error, it is important that the power supply output remain relatively flat during printing. Transient voltage changes are the norm with a battery powered system. If you are using a battery designated controller, these transients will be ignored.	The printer will automatically resume operation after the VDD-applied head voltage falls within range.	SF1_VOLT

Error	Description	Remedy	Status Flag Tracking This Condition
Temperature	Results when operating the printer outside of its allowable temperature range. The temperature is measured at the thermal print head. If performing heavy duty cycle printing, the head temperature may exceed the ambient temperature by a significant amount. At high ambient temperatures, this could result in the printer ceasing operation even if the ambient temperature is in range. At low temperatures, the printer could continue to operate even though the ambient is below the cut off level.	The printer will automatically resume operation after the head temperature falls within range.	SF2_TEMP
Buffer Overflow	Results from a mismatch in handshaking between the host and the controller with a serial interface.	The printer will remain in this error state until the power is cycled or the printer is reset. If this condition is observed, double-check the handshaking selection of the system. If the handshaking is OK, the problem most likely resides in the communication cable.	SF2_BUFF
Missing Black Index Mark	Results if the selected paper type is indexed paper and while feeding paper or printing, a black mark is not seen within approximately 10" of paper. This error alerts the user to the presence of the wrong kind of paper in the printer or paper inserted in the wrong direction (so the black mark index is rotated 180°).	The condition is cleared by raising the head release lever (presumably to change the paper).	SF3_PS
Paper Jam	Results if the printer is equipped with a Paper Present sensor (PSA-66-ST2RU), the printer detects a jam, and the printer is in Paper Jam suspend mode (see Chapter 9).	When a jam is detected under these conditions, the printer enters a Paper Jam state and ceases printing/feeding operations until the Platen Release Lever is raised (indicating the operator is attempting to fix the jam).	SF4_P_JAM
Software	Results while using the printer in the TCL page language mode when incorrect data is sent to the printer. These errors alert the user during the development stage to the incorrectness of a command or commands in their data streams.	These status sticky bits can be cleared by the ^C| command. This condition will not prevent the printer from operating normally. To locate the exact nature of the problem, try developing data streams with a serial interface and polling the printer for its status.	SF2_BUFF SF2_JOBMEM SF3_CMD SF3_LIBSAVE

Table 10-2 lists these errors and the state of the host and user interface during the error condition.

Table 10-2 Printer Status during Error Condition

Condition	Ready	Paper	Open	Fault
Unit is Powered Off				
Unit Ready	blink			
Unit Flushed				
Paper Out				
Head Up or Ticket Module Open				
Temperature Error				
Voltage Error				
Print Head Error				
Missing Black Index Mark				
Paper is Jammed				blink

 = LED ON

11 Communications

Introduction

The design intention of the printer was to make connectivity to the printer as simple as possible.

Power-Up/Reset Timing

Table 11-1, Figure 11-1, Figure 11-2 and Figure 11-3 illustrate the printer handshaking behavior during power-up and initialization.

Table 11-1 Power-Up/Reset Timing Parameters

Symbol	Description	Min.	Typ.	Max.	Units
t _{RESET}	MRESET pulse width (RS232 and Universal interface only). Refer to Figure 11-1.	30			ms
t _{RDY}	Configuration completion time from \RESET or 24V power applied Refer to Figure 11-2.			2000	ms

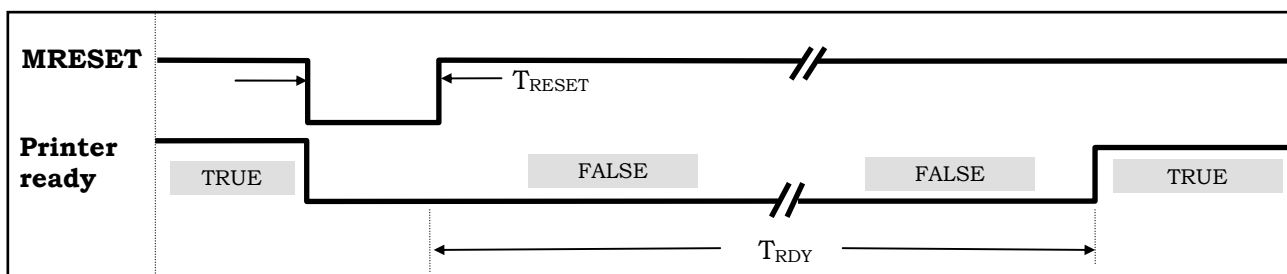


Figure 11-1 MRESET Signal Diagram

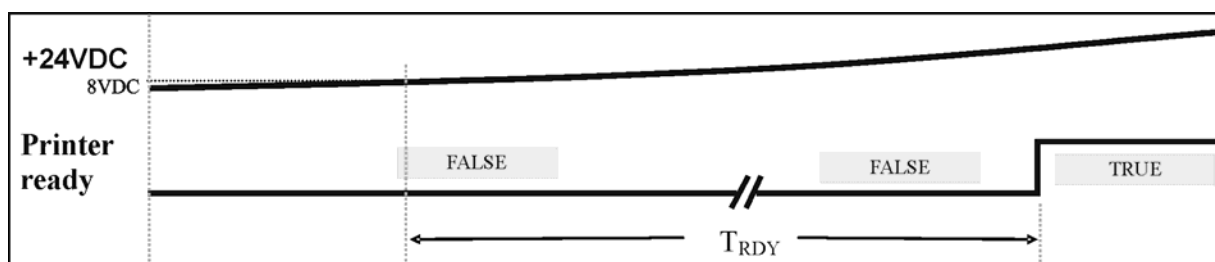
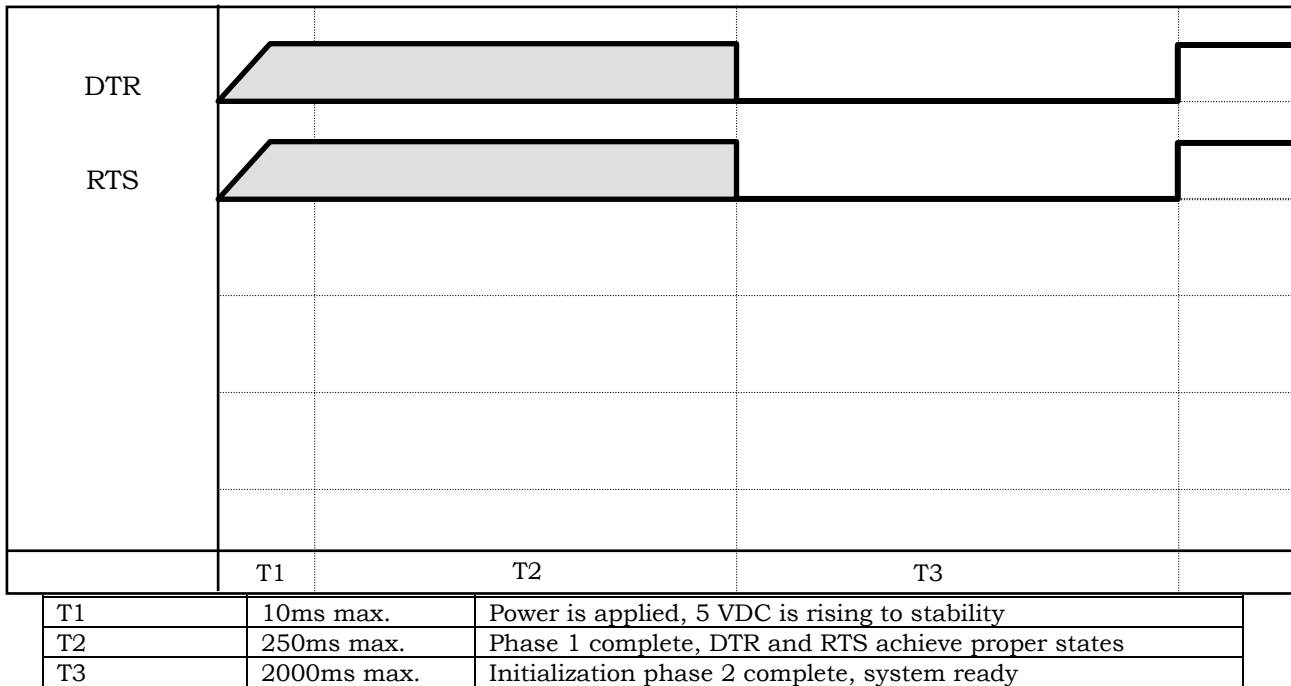


Figure 11-2 Power-Up/Reset Diagram



Note: Gray area indicates that the state of the signal is unknown.

Figure 11-3 Serial Port Signals during Initialization (No Errors)

Serial RS232 Interface



Note: This section does not apply if the printer uses a Netplex or USB interface.

The serial interface on the printer supports different protocols to allow it to adapt to various communication environments. Protocols are available via the software commands covered in Chapter 14 (for line printer language) and Chapter 15 (for TCL printer language).

Communications for the serial channel are asynchronous full-duplex serial, LSB first, meeting RS232 standards both for voltage and timing. The printer serial port connects to a standard PC-compatible serial port with a straight through DB-9 cable, similar to the type used to connect a modem.

Table 11-2 and Figure 11-4 describe the signal layout. To follow the table, trace the signal across horizontally to the signal given in the PC signal column and connect the two signals. Only the RXD, TXD, and GND signals given in the table are necessary for proper communications.

Table 11-2 allows this port to be directly connected to a PC or a standard UART for proprietary host systems. The printer will accept standard TTL levels on its inputs, but its outputs will still follow the RS232 standards, which can damage TTL and CMOS level devices.

Table 11-2 Standard PC Hookup

Printer Signal	I/O*	PC Signal	I/O*	PC DB-9 Pin #
TXD	O	RXD	O	2
RXD	I	TXD	O	3
GND	-	GND	-	5
DTR ²	O	DSR	I	6
RTS ³	O	CTS	I	8

* As viewed from the source

Notes:

1. The interface ignores these lines.
2. The DTR line is TRUE (high level) when the printer is online and ready.
3. The RTS line is TRUE (high level) when the printer is ready to accept print data, FALSE (low level) when the printer is XOFF due to buffer full or an error condition.

This swapping of all signals occurs in the printer hardware. A standard serial cable may be used if connecting to a PC.

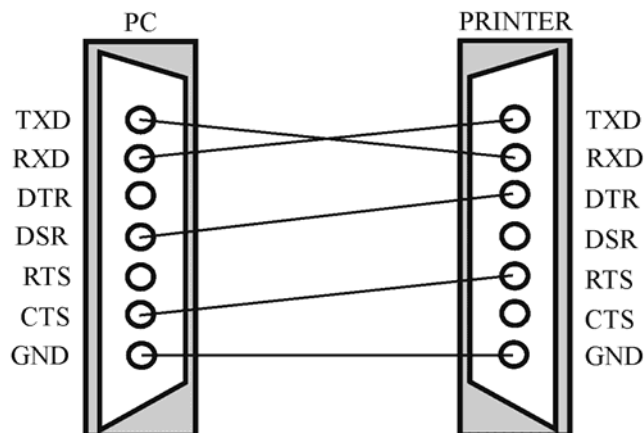


Figure 11-4 PC Logical Hookup

Table 11-3 lists the various protocols available for the serial interface. Any combination of baud rate and protocol is supported.

Table 11-3 Serial Baud Rates, Parity, Data, and Stop Bits

Baud Rates	Protocols
1200	N,8,1: No parity, 8 data bits, 1 stop bit
2400	7,E,1: Even parity, 7 data bits, 1 stop bit. Not recommended.
4800	
9600	
19.2K	
38.4K	

Serial RS232 Handshaking



Note: This section does not apply if the printer uses a USB interface.

The printer system supports three handshaking methodologies for data traffic flow from the host to printer to allow the printer to interface to different host environments. The handshaking choices for host to printer data flow are:

- RTS Hardware Handshake with XON/XOFF
- RTS Hardware Handshake Only
- XON/XOFF only

The printer does not support flow control for data traffic from the printer to the host.

In all handshake modes, the busy state sets when the printer's buffer is within 20% of being full. This allows the host some cushion on its response to the printer's XOFF state (busy is hereafter referred to as the XOFF state, ready being referred to as the XON state). The printer will resume with an XON state when buffer levels have dropped to within 20% of empty.

The host should not attempt to take advantage of the cushion in the buffer as this can lead to Buffer Overflow conditions, which in turn can result in unpredictable behavior. As a rule, the host should terminate sending data as soon as possible after the printer enters an XOFF condition.

Since the printer never sends any unsolicited transmissions and therefore always expects the host to be XON, the host system should ensure that its input buffer is prepared to receive the amount of data in a printer response before it issues the poll style command to the printer. The remaining sections describe the various handshaking modes.

Serial RS232 XON/XOFF Handshaking



Note: This section does not apply if the printer uses a USB interface.

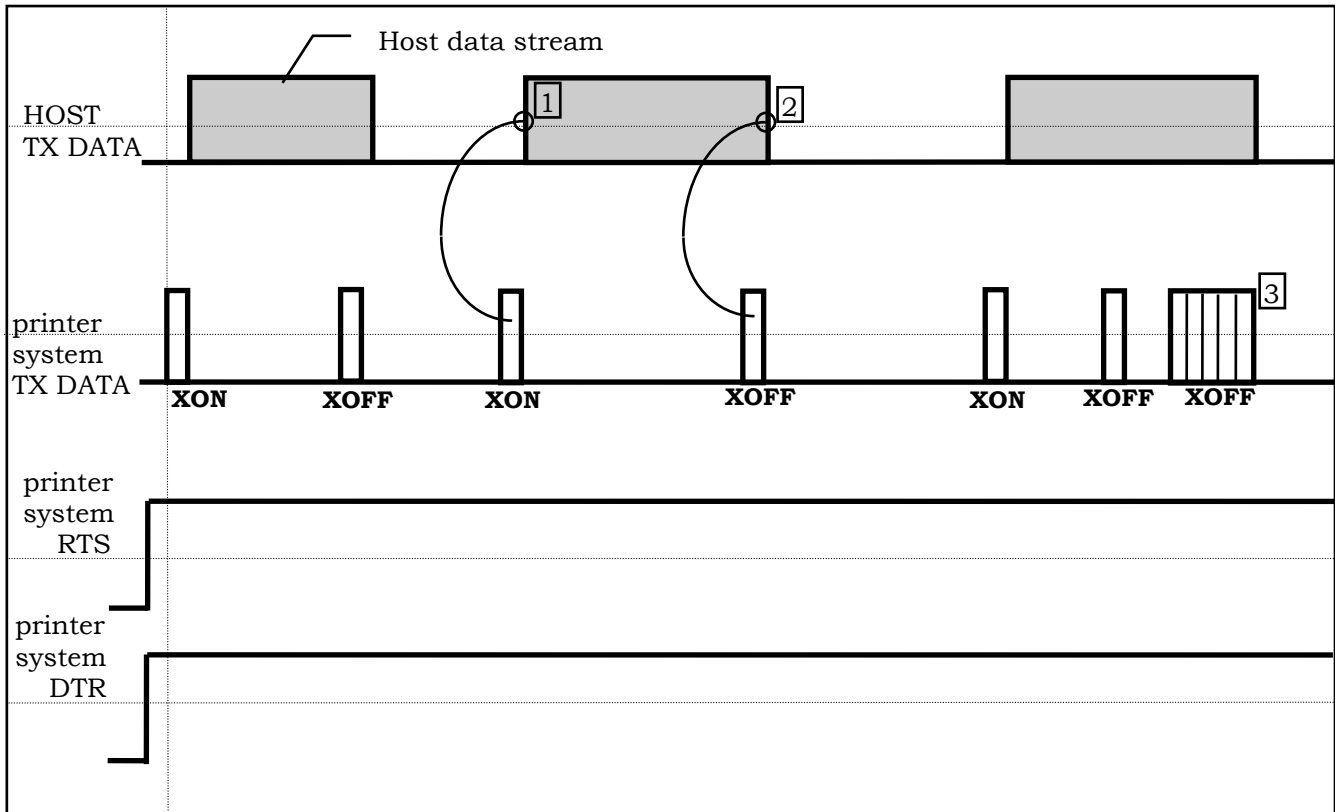
XON/XOFF handshaking allows the serial interface to be comprised of three wires, RX, TX, and GND. In this mode, the printer will issue the XON character (11H) when it is ready to receive data. The printer will only issue a single XON character. Data may be sent to the printer until it issues an XOFF character (13H).

When the input data buffer is roughly 80% full, the printer will issue a single XOFF character. If the printer is in an XOFF condition and additional characters are received after the first XOFF, the printer will assume that the host has missed its XOFF and will enter robust XOFF mode. The printer sends an XOFF character after each character it receives until the host stops sending data or its communication buffer overflows.

Once in an XOFF condition, the printer will allow its buffer levels to decrease to its low water mark and issue an XON character to request that the host resume sending data. Since communication with the printer is full duplex, the host must filter all incoming communications looking for an XOFF character (which may be embedded within a stream of regular data). Data sent from the printer to the host only occurs when a poll character ENQ (05h) or a ^S inquiry command is issued.

The printer does not support handshaking control for data flow from the printer to the host. The host input buffer must always be prepared for the full data package from the printer before it issues a poll style command.

Figure 11-5 illustrates XON/XOFF handshaking from the printer to the host.



Event 1: XON informs host its OK to continue sending data.

Event 2: XOFF informs host to hold sending data.

Event 3: Unit goes robust XOFF if 34 additional characters are received after XOFF.

Notes:

1. Minimum hardware line set required by this handshaking: TXD, RXD, and GND.
2. Immediately after power-up, the printer will send an XOFF while it is configuring itself. This is followed by an XON when it is ready to receive data.
3. XOFF will be sent in hard error conditions that prevent the printer from printing. The printer will respond to an ENQ (05h) poll (an XOFF condition) so the host may query the printer as to the nature of its error condition.

Figure 11-5 XON/XOFF Handshaking

Serial RS232 RTS Hardware Handshaking

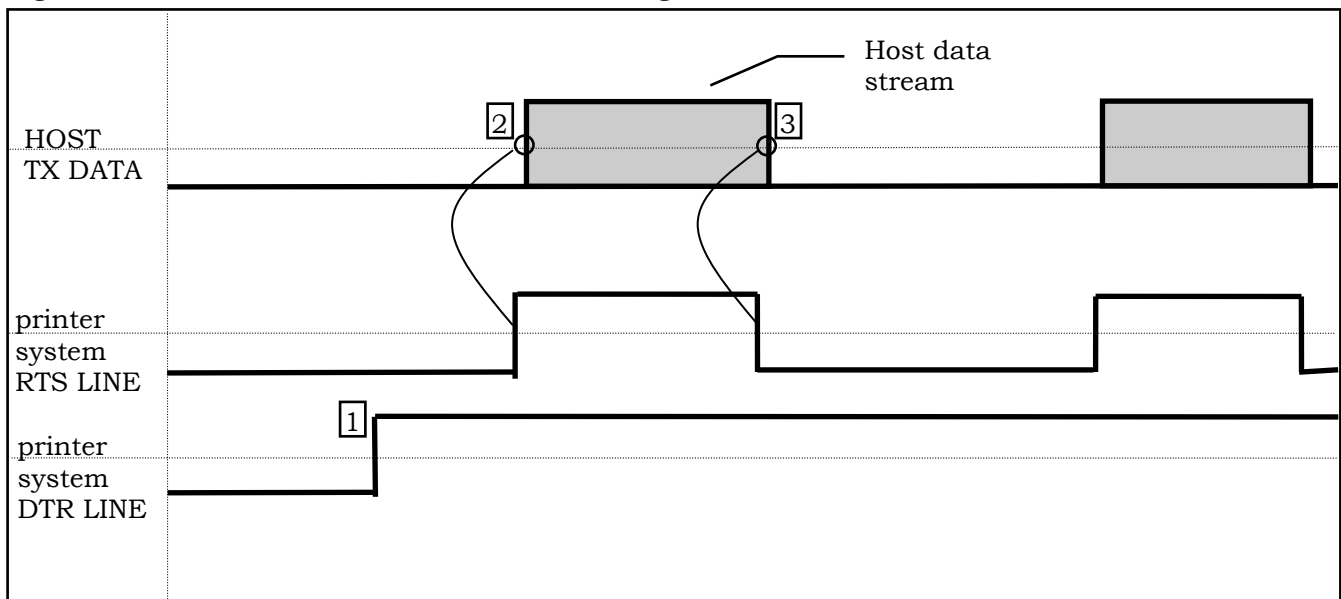


Note: This section does not apply if the printer uses a USB interface.

Data flow control from the host to the printer may also be accomplished through the hardware handshake lines, namely DTR and RTS. These signals are used in PC serial ports for handshaking with utilities such as DOS COPY or a redirection of print data to a COMM port.

In this mode, the printer asserts its DTR line to indicate the printer is powered on and online. The RTS line of the printer (used for flow control) will be asserted when the printer is ready to receive data. In this manner, the RTS line acts as an XON/XOFF flow control scheme. The printer assumes that the host is always ready to receive data in response to a host poll style command.

Figure 11-6 illustrates RTS hardware handshaking.



Event 1: DTR high informs host that printer is online and ready.

Event 2: RTS high informs host it is OK to send data.

Event 3: RTS negative voltage asks host to hold sending further data (will occur when input buffer is full or an error condition).

Notes:

1. Minimum hardware line set required by this handshaking: TXD, RXD, RTS, and GND.
2. Immediately after power-up, the printer will not assert DTR and RTS while configuring itself, after which both signals will be asserted until an error condition results or a buffer full condition exists.
3. RTS will not assert in error conditions that prevent printing. Send the ENQ (05h) poll to query the printer as to the nature of its error condition.

Figure 11-6 RTS Handshaking

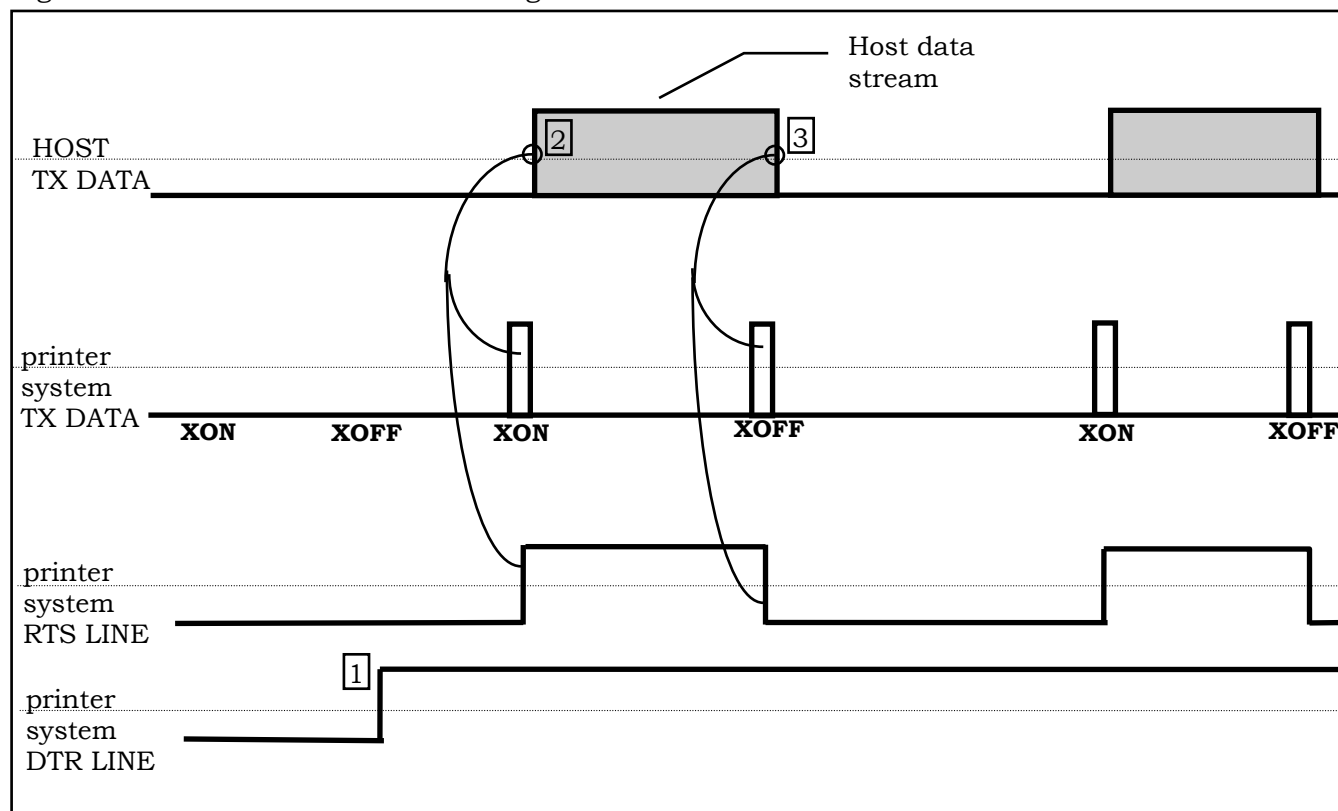
RTS Hardware Handshaking with XON/XOFF



Note: This section does not apply if the printer uses a USB interface.

This handshaking mode is a combination of RTS hardware handshaking and XON/XOFF software handshaking. If using this mode, the host may conduct either type of handshaking successfully.

Figure 11-7 illustrates this handshaking mode.



Event 1: DTR high informs host that printer is online and ready.

Event 2: RTS high and XON inform the host it is OK to send data.

Event 3: RTS negative and XOFF ask the host to hold sending further data.

Notes:

1. Minimum hardware line set required by this handshaking: TXD, RXD, RTS, and GND.
2. Immediately after power-up, the printer will not assert DTR and RTS, and will send an XOFF while configuring itself, after which both signals will be asserted until an error condition results or a buffer full condition exists.
3. RTS will not assert and the printer will send an XOFF when an error condition which prevents printing results. Send the ENQ (05h) poll to query the printer as to the nature of its error condition.

Figure 11-7 RTS Handshaking with XON/XOFF

12 Windows Connectivity

Introduction



Note: You can skip this chapter if the printer uses a Netplex interface. Do not attempt to use a Netplex interface printer as a Windows system printer.

The printer is designed to connect to a Windows environment in four ways depending on how you intend to use the printer. These modes:

- Use an ordinary ledger style printer.
- Use a system printer to print the client screen for applications such as Word, Excel, Notepad, etc.
- Use a self contained printing environment to produce labels and tickets.
- Develop printer command strings.



Tip: If you want to develop a custom Windows application that uses the printer as a system printer, refer to page 42.

Simple Text Printer Setup

To use ordinary ledger style printing (text only) set up the printer as a “Generic Text Only” printer on the appropriate port. Note that using this standard Windows driver will allow text only printing because the driver inherently filters out binary data).

Make sure the page width setup in various applications from which you are printing matches the width of the paper loaded into the printer. For example, for a 112mm printer, verify the page width does not exceed 4.2”. Some trial and error with the page width setting will yield the correct value.

System Printer Setup

To configure the printer as a Windows system printer primarily for printing images (text and graphics) that appear in the application client screen, use the Epson LQ570+ driver to allow faithful reproduction of the client area.

This method will produce WYSIWYG output at the expense of print speed since Windows will send much of the data as a raster graphic. Use the parallel interface in this mode to maximize the system performance due to the much higher data support rate.

Windows Interface

You can interface the printer to Windows using the following information.

1. Make sure the printer is in line printer mode.
2. For optimum system performance, use the parallel interface. If a serial interface is required, skip to the next step. For a parallel interface, select the LPT port to which the printer is connected. It may be necessary to change the computer BIOS setup to select Compatibility Mode instead of ECP or EPP modes (not supported by the printer).
3. For a serial interface, FutureLogic, Inc. recommends using the highest possible baud rate supported by the printer to achieve faster printing (also results in the better print quality). Set the printer’s handshaking to RTS hardware with XON/XOFF and the Windows handshaking on the port XON/XOFF.

4. The printer driver to use is EPSON LQ570+ ESC/P2. This driver is available standard with Windows. There are often two versions of this driver available; do not select the driver version that indicates "Scaleable Font".
5. Under "Properties" for the printer, select 180 dpi x 180 dpi resolution. The printer does not support the 360 dpi resolution, which may be the default. (This option may only be available for Windows NT).
6. It is recommended that you skip printing the test page. The test page for this driver expects an 8" paper width; therefore the test page will print garbage.
7. In the Windows application you are using, make sure the page size matches the paper size of the thermal printer. For example, if you are using a 112mm mechanism, set a page width no wider than 4.2".
8. Print the document to the printer/port you just created.
9. DOS utilities that send data to the parallel port often do not function properly in the Windows '95 DOS shell. An example of a Windows utility that dumps binary data to the parallel port is "PRINTFILE".

If you use the Windows driver to print, the output should be WYSIWYG. For ordinary text output using the resident fonts of the printer, the output will maintain a relatively close logical match to the data in Windows. It may be necessary to experiment with the page size settings in your application to obtain the optimum output.
10. If you use a number of different fonts on the page and you are attempting to use the printer's resident fonts, you may notice repeated backward and forward motions of the printer. This is caused by the raster positioning commands that Windows often sends. These motions will usually cause reduced print quality. To avoid this, do not use the version of the driver that indicates "Scaleable Font".
11. Print results with some packages may vary under Windows NT usually due to setting of the paper size. If you experience problems, try using an 8" paper width and a left margin as follows: 112mm – 4", 80mm – 5", 60mm – 6". This may correct any problems. A small amount of experimenting will usually lead to positive results.

Label and Ticket Printer Setup

This setup takes advantage of the page printing mode capability of the printer and its resident fonts. This method generally yields the fastest printing by taking advantage of these resident printer objects.

Chapter 15 contains more information on the TCL printer language.

Manually Develop Printer Command Strings

The fourth method for running the printer under Windows is to create text strings and commands for the printer in its command language, either as a line printer (see Chapter 14) or as a page mode printer (see Chapter 15) using a text editor, then send these strings to the printer port.

To send data files to the printer port, use a Windows utility that handles binary files. An example of such a utility that copies binary files to a parallel port is PRINTFILE.

Windows Printing and Printer API

At the time of writing this manual, a set of special Windows library functions for the printer is not available. This information may be available in future manual revisions.

13 Printer Language Features

Journal Printing and Page Mode Printing

The printer supports both line-by-line printing and page printing (see Figure 13-1). When using the printer as a line printer, it functions similar to an impact printer, which outputs data sequentially in a line-by-line fashion. For more on the line printer language, see Chapter 14.

The page printing mode (controlled by the TCL Printer Language) functions more like an intelligent laser printer whereby data is formatted by the printer not the user. This capability allows you to essentially “paste up” output data on a page in a truly rasterized format.

Page printing operation is usually most desirable for generating cashout tickets and vouchers (tickets of fixed size requiring their data formatted in a pre-set manner). For more on the TCL printer language, see Chapter 15.

Line printing is optimal for creating tabular output and variable length diagnostic reports whose data typically follows a sequential line-by-line order.

Both print languages are resident in the printer’s firmware. Selection of the print language is made by commands that exit the print mode currently in use. The system always powers up in TCL mode unless the default is changed by software command and the ESC [^] ESC command is used to place the controller in line printing mode. Once in page printing mode, you can use the ^j| command to switch back to line printer operation.



Tip: You can derive the printer language in use by polling the printer with the ENQ (05h) character and interrogating status flag 4 bit 3 (see page 96).

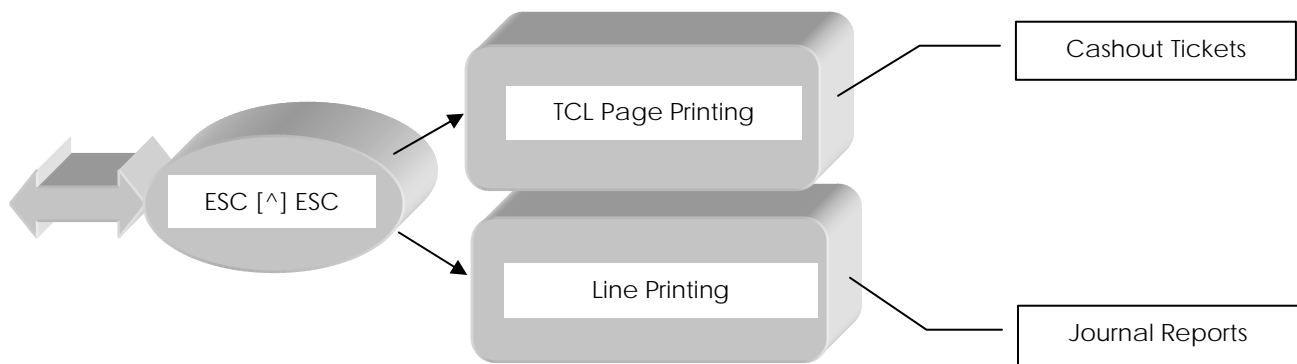


Figure 13-1 Dual Printer Languages

14 Line Printer Language

Introduction

The line printer language in the printer is primarily a text line language, supporting raster positioning of the print cursor in both the X and Y coordinates. This capability provides more flexibility for printing that does not necessarily conform to a line-by-line output. In this manner, the printer provides a bridge between traditional line printer and more sophisticated page mode printers.

Order of Commands

Since many of the printer commands can have an effect on other commands, it is recommended to follow this procedure when sending data to the printer:

1. Print data should be sent to the printer in order moving from the top of the page to the bottom.
2. Send an ESC @ command to initialize the printer.
3. Set the unit of line spacing to the minimum vertical increment necessary.
4. Set the printing area.
5. Select the font.
6. Set any supporting features for the font.
7. Set the print position.
8. Send the print data for one line.
9. End the line of data with a CR LF (carriage return, line feed).
10. Repeat steps 4 through 8 for each line on the page.
11. End the page with an FF command (form feed).
12. Repeat steps 4 through 10 for each page. Send an FF after the last page.

Setting the Print Area and Margins

The print area, left, right, top, and bottom margins must be properly set to produce optimum output on the paper. The following figure illustrates the effective print area and the relationship to the margins in the language of the controller.

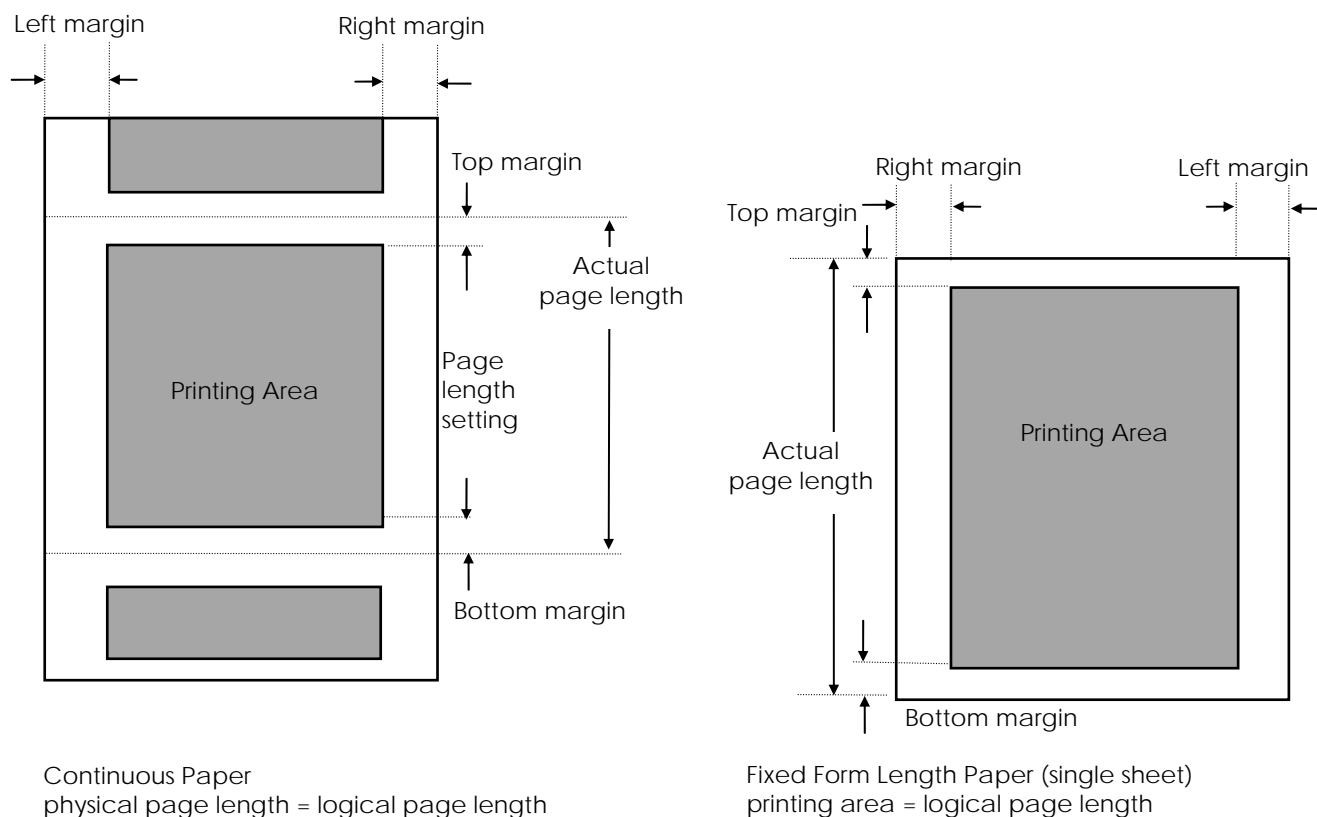


Figure 14-1 Printable Area

Use the following commands to set the print area:

Table 14-1 Print Area Commands

Command	Description
ESC (U	Set unit. This command sets the unit for horizontal and vertical measure. It is best to use selection 20 for this command since it yields a resolution of 180 dpi (which is the closest resolution supported by the 203 dpi resolution of your printer).
ESC (C	Set page length. This command sets the page length based on unit of measure.
ESC (c	Set page format. This command sets the top and bottom margins based on the selected unit. You can also select continuous or single sheet (fixed form length) paper.
ESC l	Set left margin. This command set the margin in the number of characters from the mechanical left edge of the paper. The pitch of the selected font has a direct effect on the size of the left margin. It is recommended to first select the font pitch before issuing this command. The following commands affect the pitch: ESC P, ESC M, ESC g, ESC W 1, ESC p 1, ESC SP n, SI, ESC c, and ESC X.
ESC Q	Set right margin. This command sets the margin in the number of characters from the mechanical left edge of the paper. The pitch of the selected font has a direct effect on the size of the right margin. It is recommended to first select the font pitch before issuing this command. The following commands affect the pitch: ESC P, ESC M, ESC g, ESC W 1, ESC p 1, ESC SP n, SI, ESC c, and ESC X.

Use the following order to format your page and printable area:

1. Set the unit of measure.
2. Select a character pitch.
3. Set the left and right margins.
4. Set the page length.
5. Set the page format (top and bottom margins).

The following sequence is an example of the command order above as it relates to a printer with 4.4" paper:

ESC @	;Clear all printer settings
ESC (U 1 0 20	;Set the unit of measure as 20/3600 or 180 dpi (your printer = 203 dpi)
ESC P	;Select 10-cpi printing (character width 1/10")
ESC I 5	;Set 0.5" left margin
ESC Q 35	;Set 0.5" right margin
ESC (C 2 0 132 3	;Set the page length to 5"
ESC (c 4 0 54 0 108 4	;Set the top margin as 0.3" and the bottom margin as 0.4"

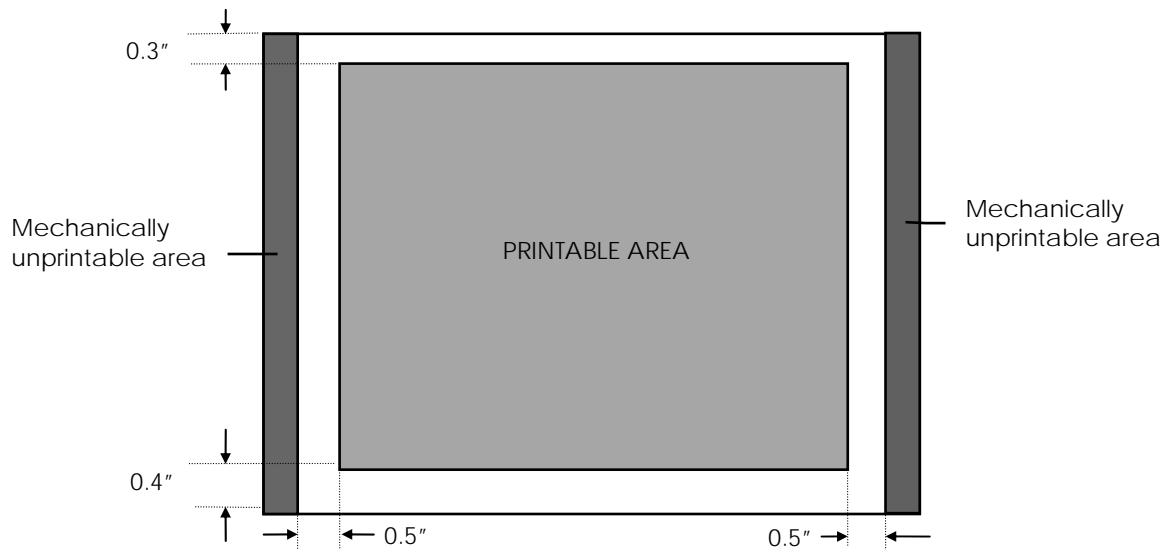


Figure 14-2 Sample Page Setup for 4" Printer

Notes:

1. Once the margins are set, changing the character width does not affect the margins.
2. The margins must be set at the beginning of the line (before any printable data is sent); otherwise the printer ignores any data preceding these commands.
3. Always set the pitch before setting the left and right margins. Do not assume the pitch settings.
4. It is important when issuing positioning commands that the cursor is set so the entire character can fit within the printable area. If any part of the character should print outside the printable area, the object will either be cut off, appear on the next page, or fail to print altogether.
5. Setting the page length cancels any previously set top and bottom margins.

6. The maximum page length is 10".
7. Changing the unit after the page has been set (format, margins) does not affect the page format information.
8. Top and bottom margins are measured from the top of the page.
9. The bottom margin distance must be less than the page length; otherwise the bottom margin will become the end of the page length.

Selecting Fonts and Characters Sets

The printer supports multiple high quality resident fonts as detailed in Chapter 6. In line printer mode, the system automatically selects from its resident font set to most closely match the point and pitch settings of the appropriate commands. The current font can be selected using the ESC [F command as detailed on page 57. The system also supports the selection of different font sizes on the same printed line if desired.

Command Summary

The following sections list the commands supported by the printer in line printer mode.

Barcode Command

Set up the printer using these configuration commands.

Command	Description	Page
ESC [b]	Barcode Mode	61

Configuration Commands

Set up the printer using these configuration commands.

Command	Description	Page
ESC (c	Set the page format	53
ESC (C	Set the page length in defined unit	53
ESC (U	Set unit	54
ESC @	Initialize the printer	56
ESC 0	Cancel the bottom margin	71
ESC C	Set the page length in lines	65
ESC C NUL	Set the page length in inches	66
ESC I	Set the left margin	69
ESC N	Set the bottom margin	70
ESC Q	Set the right margin	72

Line Spacing Commands

Set interline spacing using these line spacing commands.

Command	Description	Page
ESC +	Set n/360 line spacing	63
ESC 0	Select 1/8" line spacing	63
ESC 2	Select 1/6" line spacing	63
ESC 3	Select n/180" line spacing	64
ESC EM	Control paper loading/ejecting	68
ESC SP	Set intercharacter space	73

Font Selection Commands

Set the fonts, character sets, and print styles using these font selection commands.

Command	Description	Page
DC2	Cancel condensed printing	50
DC4	Cancel double width printing, one line	50
ESC !	Master select	51
ESC (t	Assign character table	54
ESC E	Select bold font	67
ESC F	Cancel bold font	68
ESC g	Select 10.5 point, 15-cpi font	68
ESC M	Select 10.5 point, 12-cpi font	70
ESC p	Turn proportional printing on/off	71
ESC P	Select 10 point, 10-cpi font	71
ESC t	Select character table	73
ESC w	Turn double height printing on/off	74
ESC W	Turn double width printing on/off	74
ESC X	Select font by pitch and point	75
SI	Select condensed printing	76
SO	Select double width printing, one line	77

Positioning Commands

Set the position of the print cursor using these positioning commands.

Command	Description	Page
CR	Carriage return	49
ESC \$	Set absolute horizontal print position	52
ESC (v	Set relative vertical print position	55
ESC (V	Set absolute vertical print position	55
ESC \	Set relative horizontal print position	61
ESC B	Set vertical tabs	65
ESC c	Set horizontal motion index	65
ESC D	Set horizontal tabs	67
ESC J	Advance the print position vertically	69
FF	Form feed	75
HT	Tab horizontally	76
LF	Line feed	76
VT	Tab vertically	77

Special Commands

Set miscellaneous printing and system controls using these special commands.

Command	Description	Page
ESC -	Turn underline on/off	50
ESC (^	Print data as characters	52
ESC 6	Enable printing of upper control codes	64
ESC 7	Enable upper control codes	64
ESC S	Select superscript/subscript printing	72
ESC T	Cancel superscript/subscript printing	73

System Specific Commands

Use these commands exclusively for the printer system.

Command	Description	Page
⌘ ENQ	Status poll	58
ESC | c	Electric cutter command	57
ESC | C	Clear latching error status flags	57
ESC | F	Select font	57
ESC | P	Enable/disable page breaks	58
ESC | S	Status poll	58
ESC | ^ | ESC	Exit line printer mode, go to page printing mode	61

Command Details

The following sections contain detailed information on each printer language control code.

These notes are relative to how the commands appear:

- SP stands for the space character, 20h.
- ESC stands for the escape character, 1Bh.
- CR stands for the carriage return character, 0Dh.
- LF stands for line feed character, 0Ah.
- FF stands for the form feed character, 0Ch.
- ENQ stands for the ENQ character, 05h.

CR

Carriage Return

Command Format

ASCII	CR
Hex	0D
Decimal	13

Command Function

This command causes the printer to print, retracts paper, and sets cursor to beginning of the line.

Notes

1. Always send a CR at the end of each line of text data.
2. The construction of the line head printer mechanism is fundamentally different from that of a moving head dot impact printer. With a line head printer (the type used with your system) the paper must be moved every time a character line is printed, whereas a 24-pin dot impact printer head can print 24 dot lines without motion of the paper. The CR on an impact moving head printer moves the head back to home without advancing the paper. Due to this important difference, it is recommended to use a CR and LF combination when you want to print a complete line and move on to the next line for best efficiency.

DC2

Cancel Condensed Print

Command Format

ASCII	DC2
Hex	12
Decimal	18

Command Function

This command cancels condensed printing modes selected by the SI command.

Default

Normal printing (not condensed)

Note

This command cancels the HMI set by the ESC c command.

DC4

Cancel Double Wide Print

Command Format

ASCII	DC4
Hex	14
Decimal	20

Command Function

This command cancels the double wide printing selected by the SO command.

Default

Normal single wide printing

Notes

1. This command cancels the HMI set by the ESC c command.
2. This command does not cancel double wide printing mode selected by ESC W.

ESC -

Enable/Disable Underline

Command Format

ASCII	ESC	-	n
Hex	1B	2D	n
Decimal	27	45	n

Parameter Range

n = 0,1,48,49

Command Function

This command controls the underline function as follows:

n = 0,48 Underline is off n = 1,49 Underline is on

Default

Underline off

Note

Underline is not printed across horizontal blank spaces when using the following commands:

ESC \$, ESC \, and HT.

ESC !

Master Select

Command Format

ASCII	ESC	!	n
Hex	1B	21	n
Decimal	27	33	n

Parameter Range

$0 \leq n \leq 255$

Command Function

This command selects any combination of font attributes by setting the appropriate bits in variable n as shown in the table below. To select attributes, add the hex values together and send as variable n.

Bit	Hex	Function	Epson Equivalent
0	00	Selects 10-cpi	ESC P
	01	Selects 12-cpi	ESC M
1	00	Cancels proportional spacing	ESC p 0
	02	Selects proportional spacing	ESC p 1
2	00	Cancels condensed print	DC2
	04	Selects condensed print	SI
3	00	Cancels bold	ESC F
	08	Selects bold	ESC E
4	00	Unused	
	10		
5	00	Cancels double wide print	ESC W 0
	20	Selects double wide print	ESC W 1
6	00	Cancels italic font (if supported by controller)	ESC 5
	40	Selects italic font (if supported by controller)	ESC 4
7	00	Cancels underline	ESC -0
	80	Selects underline	ESC -1

Notes

1. This command cancels multipoint mode.
2. This command cancels the HMI selected by ESC c.
3. Attributes not selected are canceled.
4. Some of the above attributes may not be available on all models of controllers.

ESC \$

Set Absolute Horizontal Print Position

Command Format

ASCII	ESC	\$	n _L	n _H
Hex	1B	24	n _L	n _H
Decimal	27	36	n _L	n _H

Parameter Range

$0 \leq n_H \leq 127$ up to the limits of the paper width

$0 \leq n_L \leq 255$

Command Function

This command moves the horizontal print position according the following formulas (all values are in ESC (U defined units):

$$\text{horizontal position} = ((n_H * 256) + n_L) + \text{left margin} \quad n_H = \text{INT}((\text{horizontal position}) - (\text{left margin})) / 256$$

$$n_L = \text{MOD}((\text{horizontal position}) - (\text{left margin})) / 256$$

Notes

1. Set the defined unit with the ESC (U command.
2. Default defined unit setting for this command is 1/60".
3. The new position is always referenced to the left margin position.
4. This command is ignored if the new position is to the right of the right margin.

ESC (^

Print Data As Characters

Command Format

ASCII	ESC	(	^	n _L	n _H	d ₁ ..d _k
Hex	1B	28	5E	n _L	n _H	d ₁ ..d _k
Decimal	27	40	94	n _L	n _H	d ₁ ..d _k

Parameter Range

$0 \leq n_L \leq 255$

$0 \leq n_H \leq 127$

Command Function

This command prints bytes n_L, n_H (LSB, MSB) sent in data bytes d₁ ... d_k as characters and not as control codes.

Note

If there is no character in the currently selected character map for the control code, the control code character will be ignored and not printed.

ESC (C

Set Page Length In Defined Unit

Command Format

ASCII	ESC	(	C	n _i	n _H	m _L	m _H
Hex	1B	28	43	n _i	n _H	m _L	m _H
Decimal	27	40	67	n _i	n _H	m _L	m _H

Parameter Range

$$n_L = 2 \quad n_H = 0 \quad 0 < ((m_H * 256) + m_L) / (\text{defined unit}) < 10 \quad \text{page length} < 10''$$

Command Function

This command sets the unit in m/3600 inch increments.

This unit of measure is used in commands that position print cursor position, page length, and size.

Default

Page length = 6"

Notes

1. Set the page length when the paper is at top of form.
2. Once this command is sent, the defined unit may be changed without any effect on page length.
3. Setting the page length cancels the top and bottom margins.

ESC (c

Set Page Format

Command Format

ASCII	ESC	(	c	n _L	n _H	t _L	t _H	b _L	b _H
Hex	1B	28	43	n _L	n _H	m _L	m _H	b _L	b _H
Decimal	27	40	67	n _L	n _H	m _L	m _H	b _L	b _H

Parameter Range

$n_L = 4$ $n_H = 0$ $(t_H * 256) + t_L < (b_H * 256) + b_L$ top margin < bottom margin
 margin $((b_H * 256) + b_L) / (\text{defined unit}) < 8$ bottom margin < 8"

Command Function

This command sets the top and bottom margins in the defined units selected by the ESC (U) command. These formulas reflect the use of the control variables:

$$\begin{aligned} t_H &= INT(\text{top margin in units}) / 256 & t_L &= MOD(\text{top margin in units}) / 256 \\ b_H &= INT(\text{top margin in units}) / 256 & b_L &= MOD(\text{top margin in units}) / 256 \end{aligned}$$

Default

Continuous Paper: None

Single Sheet (fixed form length): Top margin = current top of form position
Bottom margin = last printable line

Notes

1. Margins are measured from the top of the page.
2. The first legal printable baseline position is 20/180" below the top margin position.
3. This command should be sent when the paper is at top of form position.
4. Once this command is sent, the defined unit may be changed without affecting margins.

ESC (t

Assign Character Table

Command Format

ASCII	ESC	(	t	n _L	n _H	d ₁	d ₂	d ₃
Hex	1B	28	74	n _L	n _H	d ₁	d ₂	d ₃
Decimal	27	40	116	n _L	n _H	d ₁	d ₂	d ₃

Parameter Range

n_L = 8 n_H = 0

0 ≤ d₁ ≤ 3, 48 ≤ d₁ ≤ 51

0 ≤ d₂ ≤ 255

d₃ = 0

Command Function

This command assigns the d₂ character table to the d₁ character table according to the values below. The d₁ character table is the one selected with the ESC t command.

d ₂	d ₃	Character Table
1	0	PC437 (US)

Notes

1. Character tables assigned to tables 0 and 1 are not cleared by the ESC @ command.
2. The character tables supported may not apply to all controller models.

ESC (U

Set Unit Of Measure

Command Format

ASCII	ESC	(	U	n _L	n _H	m
Hex	1B	28	55	n _L	n _H	m
Decimal	27	40	85	n _L	n _H	m

Parameter Range

n_L = 1 n_H = 0 m = 10,20,30,40,50,60

Command Function

This command sets the unit in m/3600 inch increments.

This unit of measure is used in commands that position the print cursor position, page length, and size. The commands affected are shown in the Default section below.

Default

ESC (V 1/180"	ESC (v 1/180"	ESC (C 1/180"
ESC (c 1/180"	ESC \ 1/180"	ESC \$ 1/60"

ESC (V

Set Absolute Vertical Print Position

Command Format

ASCII	ESC	(	V	n _L	n _H	m _L	m _H
Hex	1B	28	56	n _L	n _H	m _L	m _H
Decimal	27	40	86	n _L	n _H	m _L	m _H

Parameter Range

n_L = 2 n_H = 0

0 ≤ m_H ≤ 127 up to the limits of the maximum page length 0 ≤ m_L ≤ 255

Command Function

This command moves the vertical print position according the following formulas (all values are in ESC (U defined units):

vertical position = ((m_H * 256) + m_L) + top margin

m_H = INT ((vertical position) - (top margin)) / 256

m_L = MOD ((vertical position) - (top margin)) / 256

These formulas reflect m_H as the MSB and m_L as the LSB of a 16 bit value reflecting the position to advance to on the page.

Notes

1. Set the defined unit with the ESC (U command.
2. Default defined unit setting for this command is 1/360". Motion must be at least two increments to have an accurate move.
3. The new position is always referenced to the top margin position.
4. Moving the print position below bottom margin causes paper to move to next top of form position.

ESC (v

Set Relative Vertical Print Position

Command Format

ASCII	ESC	(	v	n _L	n _H
Hex	1B	28	76	n _L	n _H
Decimal	27	40	118	n _L	n _H

Parameter Range

n_L, n_H within the limits of the page length

Command Function

This command moves the vertical print position up or down from the current position according the following formulas (all values are in ESC (U defined units):

vertical position = ((n_H * 256) + n_L) + current position

n_H is the MSB and n_L is the LSB of a 16-bit value

for positive (down) movement: 0 < n_H , n_L < 7F4CH

n_H = MSB [(vertical position) - (current position)]

n_L = LSB [(vertical position) - (current position)]

for negative (up) movement: 7F4DH < n_H , n_L < 7FFFH -or- 8000 < n_H , n_L

The range of 7F4DH TO 7FFFH is provided for language compatibility, where each count above 7F4DH will be interpreted as moving 1 unit backwards up to a maximum value of 7FFFH. The range of 8000H and greater was added for user simplicity whereby the value is treated as a signed (negative) value. Each count over 8000H is one unit backwards.

n_H = - MSB [(vertical position) - (current position)]

n_L = - LSB [(vertical position) - (current position)]

Examples

n_H , n_L = 000AH Move forward 10 units from the current position

n_H , n_L = 7F4CH Move forward 32588 units forward from the current position (if this is within the limits of the page length)

n_H , n_L = 7F4DH Move backwards one unit

n_H , n_L = 7FE0H Move backwards 147 units from the current position

n_H , n_L = 8030H Move backwards 48 units from the current position

Notes

1. Set the defined unit with the ESC (U command.
2. Default defined unit setting for this command is 1/360".
3. The new position is always referenced to the current position.
4. Moving this position below the bottom margin causes the paper to advance to next page's top margin position.
5. The printer may ignore this command under the following conditions:
 - The motion in the negative direction is greater than 179/360 (~1/2").
 - The command would move the print position above the top margin.

ESC @

Initialize Printer

Command Format

ASCII	ESC	@
Hex	1B	40
Decimal	27	64

Command Function

This command initializes the printer to its default settings.

Notes

1. Each command section indicates the printer's default settings after the ticket of this command.
2. This command cancels multipoint mode set by ESC X.

ESC [C

Clear Error Status Flags

Command Format

ASCII	ESC	[	S
Hex	1B	5B	43
Decimal	27	91	83

Command Function

This command clears any latching error status flag bits (see ENQ poll command).

Note

Some error status flags have to do with software errors in the command streams passed to the printer. These bits can be latching to catch a mistake for review by the system developer. This command provides a vehicle for clearing these latching error bits.

ESC [c

Electric Cutter Command

Command Format

ASCII	ESC	[	c	n
Hex	1B	5B	63	n
Decimal	27	91	99	n

Parameter Range

n = "f" or "p"

Command Function



Note: This command only functions on systems equipped with electric paper cutters.

n = "f" Perform a full cut whereby the paper is completely severed.

n = "p" Perform a partial cut where a small tab at the center of the cut remains to retain the ticket.

Default

None

Note

This command will be queued in the order received.

ESC [F

Select Font

Command Format

ASCII	ESC	[	F	n
Hex	1B	5B	46	n
Decimal	27	91	70	n

Parameter Range

n = font ID number from "Fonts" on page 24, range '0' to '16' (as an ASCII number)

Command Function

This command selects current font from those available on the card (either resident or downloaded).

Default

The default font as indicated from "Fonts" on page 24.

Notes

1. Use this command at any point on the line. Different pitch and point size fonts may exist on the same line.
2. Commands that specify fonts that do not exist will be ignored.

ESC [P

Enable/Disable Page Breaks

Command Format

ASCII	ESC	[	P	n
Hex	1B	5B	50	n
Decimal	27	91	80	n

Parameter Range

n = 30,31 ('0','1')

Command Function

n = '0' This command disables page breaks.

n = '1' This command enables page breaks.

Default

n='1' page breaks enabled

Notes

1. Unless page breaks are disabled, the printer will automatically feed to the top of next form after encountering the end of form during printing or feeding.
2. If printing continuous long form reports, it is recommended to set n = '0'.

ESC [S or ♣ ENQ (05h)

Poll The Printer For Status



Note: ESC [S is for the serial interface only.

Command Format

ASCII	ENQ		ASCII	ESC	[	S	<poll_option>
Hex	05	- or -	Hex	1B	5B	53	-
Decimal	05		Decimal	27	91	83	-

where <poll_option> = optional poll control character. Range: 'e' – return extended status

Command Examples

♣ ;Return extended status
 <ESC> S ;Return regular status (serial interface only)
 <ESC> S e ;Return extended status (serial interface only)

Command Function

This command requests the printer to return its status. Note that if using the parallel interface, only the ENQ (05h) poll code is recommended (due to nibble mode reverse channel communications). The Reply Format section provides details on the controller's response to this command.



Note: See Appendix E for Status Flags Bit Definitions.

Reply Format

Standard status response (response to ESC [S):

***S | <unit_addr> | <soft_ver> | <status_flags1> | <status_flags2> | <status_flags3> | <temp_num> | ***

where:

<unit_addr> = Unit address. Always '0' for point to point systems.

<soft_ver> = Software version installed. Range 9 bytes in the format of xxxxxxxxxx where the actual characters will depend on the customer's version. This field will not contain the characters *, |, ^, or ~.

<status_flags1>...3 = Status flags 1-3 according Table 14-2.

<temp_num> = If no system errors reported, this will contain the Template I.D. of last ^P batch job processed. If a system error exists, field will contain the Template number of the last ^P batch job processed that had an error. Range: 2 bytes 'Px'. A space (20h) character will be used after the P letter if no jobs have been processed since power-up, a reset, or a clear error status ^C command was received.

Extended status response to ESC [S e or ENQ:

***S | <unit_addr> | <soft_ver> | <status_flags1> | <status_flags2> | <status_flags3> | <status_flags4> | <status_flags5> | <temp_num> | ***

where:

<unit_addr>, <soft_ver>, <status_flags1>, <status_flags2>, <status_flags3>, <temp_num> = see standard status response above.

<status_flags4>, <status_flags5> = status flags 4 and 5 according to Table 14-2.

Reply Examples

Standard status response:

S|0|v 1.0.0.0|@|@|@|P0| ;This indicates that printer address 0 is running version v1.0.0.0 software, and that the print job of Template '0' was the last to complete without an error.

S|0| v 1.0.0.0|P|H|@|PA| ;There was an error in the print data for one of the Print Regions of Template 'A' (which was requested to print via the ^P command).

Extended status response:

S|0| v 1.0.0.0|P|@|@|D|@|P0| ;This indicates that the printer detected a cutter error.

S|0| v 1.0.0.0|@|@|@|A|@|P0| ;This indicates that the printer's paper roll is low.

Status_FlagsX (SFx)

Table 14-2 Status Flags Bits Summary

Bits								
	7	6	5	4	3	2	1	0
1	0	1	0=idle 1=busy processing print or command	0=system ok 1=system error	0=platen engaged 1=platen up	0=paper loaded 1=paper out	0=head ok 1=head error	0=voltage ok 1=voltage error
2	0	1	0=temperature ok 1=temperature error	0=library refs ok 1=library ref error	0=PR data ok 1=PR data error	0=library load ok 1=library load error	0=buffer space ok 1=buffer overflow	0=job memory ok 1=job memory overflow
3	0	1	0=command ok 1=command error	0=print libraries ok 1=print libraries corrupted	0=chute clear 1=paper in chute	0=Flash ok 1=Flash prog error	0=printer online 1=printer offline	0=supply index found 1=missing supply index
4	0	1	x	x	0=TCL print mode 1=journal printing	Reserved	0=paper path ok 1=paper jam may exist	0=paper full 1=paper low
5	0	1	0=validation # clear 1=validation # done	0=not at top of form 1=at top of form	0=ready to RX 1=XOFF	0=printer pocketed 1=printer open	0=Clear 1= Barcode Data Is Accessed	0=clear 1=reset/power up

Note: Bits that list an “x” value are reserved for future use and should be ignored.

Table 14-3 Status Flags Examples under Various Conditions

Condition	status flags 1						status flags 2						status flags 3					
	5	4	3	2	1	0	5	4	3	2	1	0	5	4	3	2	1	0
Ready to print, no previous errors.																		
Ready to print, a previous batch job error exists due to an unknown library object referenced.		x						x										
Print head is up.		x	x															
Paper is out.		x		x														
A new font was just loaded and the printer is busy putting it into memory.	x																	
There exists a low battery or power supply condition and the printer is currently printing.	x	x				x												
The index mark on a label was not seen within 2030 dot lines (10').		x																x
There was a memory overflow.		x								x	x							
There is a bad connection with the print head.		x			x													
The input communications buffer overflowed most likely due to improper handshaking with the host.		x									x							
A garbled or unrecognized command was received.		x											x					
The last ticket printed taken by the operator.																x		
	5	4	3	2	1	0	5	4	3	2	1	0	5	4	3	2	1	0

Table Notes:

1. x = bit is set to a 1.
2. When more than one given conditions exist simultaneously, the flags would be OR'd together.
3. See Appendix E for Status Flags Bit Definitions.

Notes

1. The error status reply to this command can differ from error status reply for template language.
2. The character following the letter “P” in the <temp_num> field will always be a blank.

3. Hardware status flags will be cleared automatically by the system when the condition is alleviated or to reflect the status of hardware, namely:
 status_flags1: BIT4, BIT3, BIT2, BIT1, BIT0 status_flags2: BIT 5
 status_flags3: BIT 0 ext_status1: BIT3, BIT2, BIT1, BIT0
 All remaining status flags will be cleared by ticket of the ESC [S clear error status command.
4. Depending on the user interface, buzzers and/or LED's may accompany the status flags to alert the user of an error.
5. Depending on the jobs queued in the printer; there may be a short delay before response to the poll command.
6. The ENQ (05h) command is special in that the controller will recognize this command even if it is in an XOFF condition so the host may poll the controller as to the nature of an error condition.
7. Interpretation of the Paper Jam, Paper Present (in chute), and the Paper Low flags are at the discretion of the user; they are provided for informational purposes only. The Paper Jam flags will not prevent further printing and/or feeding unless the printer is specifically instructed to do so by the ^z|J command.
8. The cutter error flag will not prevent the cutter from operating on future cut commands, and is only provided for information purposes for the host system.

ESC [^] ESC

Escape To Page Printing Mode

Command Format

ASCII	ESC	[	^	]	ESC
Hex	1B	5B	5E	5D	1B
Decimal	27	91	94	93	27

Command Function

This command terminates line printer mode and enters TCL page printing mode.

Default

Line printer mode

Note

This command causes any data in the line buffer to print. TCL page mode immediately follows this command.

ESC [b]

Barcode Mode

Command Format

ASCII	ESC	[	B]
Hex	1B	5B	62	5D
Decimal	27	91	98	93

Command Function

This command enters barcode mode.

For a regular barcode: ESC [b] char | height | widthn | widthW | text |

where:

'char' = one of a to } in the ASCII table. 'height' = range 3 digits: 48 – 406.

For a PDF417 2D barcode: ESC [b] s | height | widthn | widthw | text |
where:

s = represents PDF417

height = range 3 digits: 48 – 406, fixed overall barcode height regardless of the size of data. If the barcode height is less than 48 (or 0 for clarity), the ‘wide-bar’ is used as the sub-height with ranges from 4 to 18 – the variable overall barcode height depends on the size of the barcode data.

widthn = width narrow; range 1 to 6. Greater than 6 it will be set to 6.

widthw = width wider; should greater than widthn. It can be two digit values. If height is less than 48 the width can not be greater than 18. If it is greater than 18 it is truncated.

text = range 1 digit to 768 digits. Over 768 is truncated. Data can be alphanumeric, including carriage returns.

Default

Default mode is TCL.

Note

See Chapter 8 for more information on barcodes.

ESC \

Set Relative Horizontal Print Position

Command Format

ASCII	ESC	\	n _L	n _H
Hex	1B	5C	n _L	n _H
Decimal	27	92	n _L	n _H

Parameter Range

$0 \leq n_H \leq 127$ Up to the limits of the paper width

$0 \leq n_L \leq 255$

Command Function

This command moves the horizontal print position left or right of the current position according the following formulas (all values are in ESC (U defined units):

$horizontal\ position = ((n_H * 256) + n_L) + current\ position$

for positive (right) movement:

$n_H = INT ((horizontal\ position) - (current\ position)) / 256$

$n_L = MOD ((horizontal\ position) - (current\ position)) / 256$

for negative (left) movement:

$n_H = 32768 - INT ((horizontal\ position) - (current\ position)) / 256$

$n_L = 32768 - MOD ((horizontal\ position) - (current\ position)) / 256$

Notes

1. Set the defined unit with the ESC (U command.
2. Default defined unit setting for this command is 1/180".
3. The new position is always referenced to the current position.
4. This command is ignored if the new position is outside the printable area.

ESC +

Set $n/360$ " Line Spacing

Command Format

ASCII	ESC	+	n
Hex	1B	2B	n
Decimal	27	43	n

Parameter Range

$0 \leq n \leq 255$

Command Function

This command sets the line spacing to $n/360$ ".

Default

$1/6$ " line spacing

Notes

1. Changing the line spacing will not affect previous settings for vertical tabs or page length.
2. Low values for n will not exactly match to 360 dpi spacing since the limit of printer is 203 dpi.

ESC 0

Set $1/8$ " Line Spacing

Command Format

ASCII	ESC	0
Hex	1B	30
Decimal	27	48

Command Function

This command sets the line spacing to $1/8$ ".

Default

$1/6$ " line spacing

Note

Changing the line spacing will not affect previous settings for vertical tabs or page length.

ESC 2

Set $1/6$ " Line Spacing

Command Format

ASCII	ESC	2
Hex	1B	32
Decimal	27	50

Command Function

This command sets the line spacing to $1/6$ ".

Default

$1/6$ " line spacing

Note

Changing the line spacing will not affect previous settings for vertical tabs or page length.

ESC 3

Set n/180" Line Spacing

Command Format

ASCII	ESC	3	n
Hex	1B	33	n
Decimal	27	51	n

Parameter Range

$0 \leq n \leq 255$

Command Function

This command sets the line spacing to n/180".

Default

1/6" line spacing

Notes

1. Changing the line spacing will not affect previous settings for vertical tabs or page length.
2. Low values for n will not exactly match to 360 dpi spacing since the limit of printer is 203 dpi.

ESC 6

Enable Printing Of Upper Control Codes

Command Format

ASCII	ESC	6
Hex	1B	36
Decimal	27	54

Command Function

This command sets printer to treat codes 128 to 159 as printable characters, not as control codes.

Default

Characters 128 through 159 are printable characters

Note

This command reflects the power-up default and remains in effect if the character table is changed until the command is canceled by ESC 7 command.

ESC 7

Enable Upper Control Codes

Command Format

ASCII	ESC	7
Hex	1B	37
Decimal	27	55

Command Function

This command sets printer to treat codes 128 to 159 as control codes, not as printable characters.

Default

Characters 128 through 159 are printable characters.

Note

This command remains in effect if the character table is changed until the command is canceled by ESC 6 or ESC @ commands.

ESC B

Set Vertical Tabs

Command Format

ASCII	ESC	B	n_1	$n_{2...K}$	NUL
Hex	1B	42	n_1	$n_{2...K}$	00
Decimal	27	66	n_1	$n_{2...K}$	0

Parameter Range

$0 \leq K \leq 16$ $1 \leq n \leq 255$ up to the limits of the page length $n_K > n_{K-1}$

Command Function

This command sets the vertical tab positions (in the current line spacing) at the lines specified by n_1 to n_K as measured from the top margin position.

Default

Every 8 character columns

Notes

1. The values for n must be in ascending order. A value less than the previous tab will terminate tabs setting just as if the NUL character was received.
2. Changing the line spacing does not affect current tab settings.
3. Use ESC B NUL command to cancel all vertical tab settings.
4. The tab settings move to match changes in the top margin setting.
5. Tabs beyond the printable area are saved in memory but not accessible until the bottom margin and/or page length is moved further down.
6. Tabs are calculated using 10-cpi font spacing if proportional spacing is selected (with ESC p).
7. The ESC B command clears any previous tab settings.

ESC C

Set Page Length In Lines

Command Format

ASCII	ESC	C	n
Hex	1B	43	n
Decimal	27	67	n

Parameter Range

$1 \leq n \leq 127$ $0 < n * (\text{current line spacing}) \leq 10$ page length $\leq 10''$

Command Function

This command sets the page length to n lines of the current line spacing.

Default

$n = 48$

Notes

1. Set the page length with the paper at top of form.
2. Once this command is sent, changing the line spacing will not affect the page length.
3. Setting the page length cancels the top and bottom margins.

ESC C NUL

Set Page Length In Inches

Command Format

ASCII	ESC	C	NUL	n
Hex	1B	43	00	n
Decimal	27	67	0	n

Parameter Range

$1 \leq n \leq 10$ page length $\leq 10''$

Command Function

This command sets the page length to n inches.

Default

n = 6 default is 6''

Notes

1. Set the page length with the paper at top of form.
2. Page length may only be set in 1'' increments.
3. Setting the page length cancels the top and bottom margins.

ESC c

Set Horizontal Motion Index (HMI)

Command Format

ASCII	ESC	c	n _L	n _H
Hex	1B	63	n _L	n _H
Decimal	27	99	n _L	n _H

Parameter Range

$0 \leq n_H \leq 4$ $0 \leq n_L \leq 255$ up to the limits of the paper width

$0 < ((n_H * 256) + n_L) \leq 1080$; HMI $\leq 3.00''$

Command Function

This command fixes the character width (HMI) according to the following formula:

$$\text{HMI} = ((n_H * 256) + n_L) / 360$$

$$n_H = \text{INT} (\text{HMI} * 360) / 256$$

$$n_L = \text{MOD} (\text{HMI} * 360) / 256$$

Notes

1. This command cancels and overrides intercharacter space set with the ESC SP command.
2. The HMI setting is canceled by the following commands: SO, SI, DC2, DC4, ESC W, ESC P, ESC M, ESC g, ESC p, ESC !, ESC SP, and ESC @.

ESC D

Set Horizontal Tabs

Command Format

ASCII	ESC	D	n_1	$n_{2...K}$	NUL
Hex	1B	44	n_1	$n_{2...K}$	00
Decimal	27	92	n_1	$n_{2...K}$	0

Parameter Range

$0 \leq K \leq 32$ $1 \leq n \leq 255$ up to the limits of the paper width $n_K > n_{K-1}$

Command Function

This command sets the horizontal tab positions (in the current character pitch) at the columns specified by n_1 to n_k as measured from the left margin position.

Default

Every 8 character columns

Notes

1. The values for n must be in ascending order. A value less than the previous tab will terminate tabs setting just as if the NUL character was received.
2. Changing the character pitch does not affect current tab settings.
3. Use ESC D NUL command to cancel all horizontal tab settings.
4. The tab settings move to match changes in the left margin setting.
5. Tabs beyond the right margin are saved in memory but not accessible until the right margin is moved further to the right.
6. Tabs are calculated using 10-cpi font spacing if proportional spacing selected (with ESC p).
7. Send this command to clear any previous tab settings.

ESC E

Select Bold Font

Command Format

ASCII	ESC	E
Hex	1B	45
Decimal	27	69

Command Function

This command selects the bold font style.

Default

Normal weight printing (no bold)

ESC EM

Control Paper Loading/Ejecting

Command Format

ASCII	ESC	EM	n
Hex	1B	19	n
Decimal	27	25	n

Parameter Range

n = 82

Command Function

n = 82 “R” This command ejects one form length (form feed).

Note

The “R” version of this command acts essentially as a FF command.

ESC F

Cancel Bold Font

Command Format

ASCII	ESC	F
Hex	1B	46
Decimal	27	70

Command Function

This command sets the font weight attribute to normal (no bold).

This command also cancels the ESC E command.

Default

Normal weight printing (no bold)

ESC g

Select 10.5pt, 15-cpi Font

Command Format

ASCII	ESC	g
Hex	1B	67
Decimal	27	103

Command Function

This command selects 10.5pt, 15-cpi font for printing.

Default

10.5pt, 10-cpi

Notes

1. This command cancels the HMI value set by the ESC c command.
2. This command cancels multipoint mode.
3. If this command is sent when in proportional mode, the change will take effect when proportional mode is exited.

ESC J

Advance The Print Position Vertically

Command Format

ASCII	ESC	J	n
Hex	1B	4a	n
Decimal	27	74	n

Parameter Range

$0 < n \leq 255$ within the limits of the page length

Command Function

This command advances the print position $n/180''$.

Notes

1. This command does not affect the horizontal print position.
2. Advancing below the bottom margin moves the paper to the top margin of the next page.

ESC I

Set Left Margin

Command Format

ASCII	ESC	1	n
Hex	1B	6C	n
Decimal	27	108	n

Parameter Range

$1 \leq n < (\text{paper width in inches}) / 3$

$0 \leq (\text{left margin}) < (\text{right margin})$

Command Function

This command sets the left margin to n columns in the current character pitch (as measured from the left most printable position).

Default

Left most printable position

Notes

1. If using this command, send it at the start of the line. This command will cancel any previous data in the line buffer.
2. These commands affect the character pitch (and thereby affect the right margin set by this command): ESC P, ESC M, ESC g, ESC W, ESC p, ESC SP, SI, SO, ESC !, ESC X, and ESC c.
3. If you use proportional spacing, the printer calculates the columns based on 10-cpi characters.
4. Set the pitch before setting the margins.
5. Moving the left margin position moves the existing tab settings by the same distance.

ESC M

Select 10.5pt, 12-cpi Font

Command Format

ASCII	ESC	M
Hex	1B	4D
Decimal	27	77

Command Function

This command selects 10.5pt, 12-cpi font for printing.

Default

10.5pt, 10-cpi

Notes

1. This command cancels the HMI value set by the ESC c command.
2. This command cancels multipoint mode.
3. If this command is sent when in proportional mode, the change will take effect when proportional mode is exited.

ESC N

Set Bottom Margin

Command Format

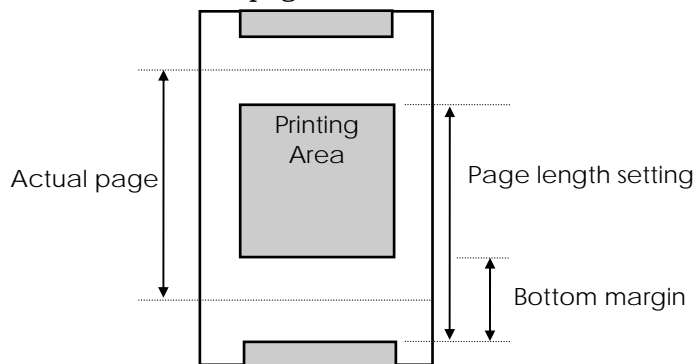
ASCII	ESC	N	n
Hex	1B	4E	n
Decimal	27	78	n

Parameter Range

$1 \leq n \leq 127$ $0 < (\text{current line spacing}) * n < (\text{page length})$

Command Function

This command sets the bottom margin on continuous paper to n lines (in the current line spacing) from the top of form position on the next page.



Default

Bottom margin = 0.5"

Notes

1. This is an older command and is not recommended. Instead, use the ESC (c command.
2. This command is ignored in single sheet mode (fixed form length).
3. This command cancels the top margin setting.

ESC O

Cancel Bottom Margin

Command Format

ASCII	ESC	O
Hex	1B	4F
Decimal	27	79

Command Function

This command cancels the bottom margin settings and sets the bottom margin as 0".

ESC P

Select 10.5pt, 10-cpi Font

Command Format

ASCII	ESC	P
Hex	1B	50
Decimal	27	80

Command Function

This command selects 10.5pt, 10-cpi font for printing.

Default

10.5pt, 10-cpi

Notes

1. This command cancels the HMI value set by the ESC c command.
2. This command cancels multipoint mode.
3. If this command sent when in proportional mode, change takes effect when proportional is exited.

ESC p

Proportional Spaced Print On/Off

Command Format

ASCII	ESC	p	n
Hex	1B	70	n
Decimal	27	112	n

Parameter Range

n = 0,1,48,49

Command Function

This command turns on/off proportionally spaced character printing according to the following:

n = 0,48 Select fixed character pitch n = 1,49 Select proportional spacing

Default

Fixed character pitch

Notes

1. This command cancels the HMI value set by the ESC c command.
2. This command cancels multipoint mode.
3. Changes made to fixed pitch settings using ESC P, ESC M, or ESC g will take effect when the printer exits proportional spacing mode.

ESC Q

Set Right Margin

Command Format

ASCII	ESC	Q	n
Hex	1B	51	n
Decimal	27	81	n

Parameter Range

$1 \leq n \leq (\text{paper width in inches}) / (\text{characters per inch})$
 $(\text{left margin}) < (\text{current pitch}) * n \leq (\text{printable area width})$

Command Function

This command sets the right margin to n columns in the current character pitch (as measured from the left most printable position).

Default

Right margin = right most printable column

Notes

1. If using this command, send it at the start of the line. This command will cancel any previous data in the line buffer.
2. These commands affect the character pitch (and thereby affect the right margin set ESC Q): ESC P, ESC M, ESC g, ESC W, ESC p, ESC SP, SI, SO, ESC !, ESC X, and ESC c.
3. If using proportional spacing, the columns are calculated based on 10-cpi characters.
4. Set the pitch before setting the margins.
5. The right margin must be at least on column greater than the left margin.

ESC S

Select Superscript/Subscript Printing

Command Format

ASCII	ESC	S	n
Hex	1B	53	n
Decimal	27	83	n

Parameter Range

n = 0,1,48,49

Command Function

This command controls superscript/subscript printing as follows:

- n = 0,48 Characters following print as superscript
n = 1,49 Characters following print as subscript

Default

Regular characters (not super or sub script)

Notes

1. Use the ESC T command to cancel superscript/subscript printing.
2. When the smallest point size character is selected, superscript and subscript characters will be no smaller than this smallest point size.
3. The size of the superscript and subscript depends on the currently selected point size.

ESC SP

Set Intercharacter Space

Command Format

ASCII	ESC	SP	n
Hex	1B	20	n
Decimal	27	32	n

Parameter Range

$0 \leq n \leq 127$

Command Function

This command sets the space between characters to $n/180^{\circ}$.

Default

0 intercharacter spacing

Notes

1. This command will cancel the HMI value set with the ESC c command.
2. Spacing set with this command doubles during double wide printing.

ESC T

Cancel Superscript/Subscript Printing

Command Format

ASCII	ESC	T
Hex	1B	54
Decimal	27	84

Command Function

This command cancels superscript/subscript printing enabled by the ESC S command.

Default

Regular position printing

Note

This command returns the superscript/subscript printing to the default: disabled.

ESC t

Select Character Table

Command Format

ASCII	ESC	t	n
Hex	1B	74	n
Decimal	27	116	n

Parameter Range

$0 \leq n \leq 3, 48 \leq n \leq 51$

Command Function

This command selects the character table to use for printing:

n = 0,48	Character table 0	n = 2,50	Character table 2
n = 1,49	Character table 1	n = 3,51	Character table 3

Default

table 0 US 96 table 1 PC 437 table 2 Undefined table 3 PC 437

Notes

1. The ESC (t command assigns various character tables to the ESC t mapped tables 0 through 3.
2. The ESC @ command will return tables 2 and 3 to their defaults, whereas tables mapped to 1 and 2 are not affected.

ESC W

Double Wide Print On/Off

Command Format

ASCII	ESC	W	n
Hex	1B	57	n
Decimal	27	87	n

Parameter Range

n = 0,1,48,49

Command Function

This command turns on/off double wide printing of characters, spaces, and intercharacter spacing (set with the ESC SP command) according to the following codes:

n = 0,48 Turn off double wide print n = 1,49 Turn on double wide print

Default

Single wide print

Note

This command cancels the HMI value set by the ESC c command.

ESC w

Double Height Print On/Off

Command Format

ASCII	ESC	w	n
Hex	1B	77	n
Decimal	27	119	n

Parameter Range

n = 0,1,48,49

Command Function

This command turns on/off double high printing of characters measured from their standard height baseline according to the following codes:

n = 0,48 Turn off double high print n = 1,49 Turn on double high print

Default

Normal high print

Notes

1. This command does not affect line spacing.
2. The first line of a page is not doubled if ESC w is sent on the first printable line. All following lines are double high.

ESC X

Select Font By Pitch And Point

Command Format

ASCII	ESC	X	m	n _L	n _H
Hex	1B	57	m	n _L	n _H
Decimal	27	87	m	n _L	n _H

Parameter Range

$$5 \leq m \leq 127 \quad m = 0, 1$$

$$0 \leq n_L \leq 255 \quad 0 \leq n_H \leq 127$$

Command Function

This command places the printer in multipoint mode (scalable fonts) and selects the pitch and point according to the following:

Pitch

m = 0 no change in pitch m = 1 selects proportional spacing
m > 5 selects fixed pitch equal to 360/m cpi

Point (72 points = 1")

$$point\ size = ((n_H * 256) + n_L) / 2 \quad n_H = INT (point\ size) * 2 / 256 \quad n_L = MOD (point\ size) * 2 / 256$$

Default

Pitch = 10-cpi (m=36) Point = 10.5 (n_H = 0, n_L = 21)

Notes

1. The following point sizes are available: 8, 10 (10.5), 12, 14, 16, 18, 20 (21), 22, 24, 26, 28, 30, and 32.
2. During multipoint mode the printer will ignore: ESC W, ESC w, ESC SP, SI, ESC SI, SO, and ESC SO.
3. These commands cancel multipoint mode, returning to 10.5 pt characters: ESC P, ESC M, ESC g, ESC p, ESC !, and ESC @.

FF

Form Feed

Command Format

ASCII	FF
Hex	0C
Decimal	12

Command Function

This command prints all data in the buffer, advances the vertical print position to the top of margin position on the next page, and moves the horizontal print position to the left margin position.

Notes

1. Always send a FF at the end of each page and each complete print job.
2. It is recommended to send a CR before a FF command.
3. This command cancels one line double wide set by the SO or ESC SO commands.

HT

Horizontal Tab

Command Format

ASCII	HT
Hex	09
Decimal	9

Command Function

This command moves the new print position to the next tab position to the right of the current print position.

Notes

1. This command is ignored if no tab is set to the right of the current print position or if the next tab is to the right of the right margin.
2. Character scoring (underline, overscore, and strikethrough) is not printed between the current print position and the next tab position when using this command.

LF

Line Feed

Command Format

ASCII	LF
Hex	0A
Decimal	10

Command Function

This command causes the printer to print, advances the paper to the next line, and positions the cursor at the left margin position.

Notes

1. It is recommended to send a CR before every LF.
2. This command cancels one line double wide set by the SO or ESC SO commands.
3. If LF moves the paper below the bottom margin, the paper advances to the top of next page.

SI

Select Condensed Print

Command Format

ASCII	SI
Hex	0F
Decimal	15

Command Function

This command enters condensed printing mode, in which character width is reduced as follows:

Selected Pitch	Condensed Pitch
10-cpi	17-cpi
12-cpi	20-cpi
proportional	~½ width

Default

Normal selected pitch printing

Notes

1. This command cancels the HMI value selected by the ESC c command.
2. The DC2 command cancels condensed printing.

SO

Select Double Wide Print (One Line)

Command Format

ASCII	SO
Hex	0E
Decimal	14

Command Function

This command doubles the width of all characters, spaces, and intercharacter spacing for the line (until CR, LF, or line buffer full) following this command.

Default

Normal single wide printing

Notes

1. This command cancels when the buffer is full or the printer receives the following commands: LF, FF, VT, DC4, and ESC W 0.
2. This command is not canceled by the VT command when it functions the same as the CR command.
3. This command cancels the HMI set by the ESC c command.

VT

Vertical Tab

Command Format

ASCII	VT
Hex	0B
Decimal	11

Command Function

1. This command moves vertical print position to next vertical tab below current print position.
2. This command also moves the horizontal print position to the left margin position.

Notes

1. The paper advances to the top margin position of the next page if the next vertical tab is below the bottom margin or there is no vertical tab below the current print position.
2. This command functions the same as the CR command (moves the horizontal print position to the left margin column) if all tabs have been canceled with the ESC B NUL command.
3. This command functions the same as the LF command (advances one line in the current line spacing and moves the horizontal print position to the left margin position) if no tabs have been set since the printer was turned on or was reset with the ESC @ command.
4. This command functions the same as the FF command (advances to the top margin of the next page) if some tabs have been set but no tab is set between the current print position and the bottom margin position.
5. This command cancels double wide print set by the SO or ESC SO commands.

15 TCL Printer Language

Template Printing with TCL Language

The TCL (Thermal Controller Language) page mode language is the most powerful feature of the system controller. Page mode printing places most of the work of creating complicated tickets on the printer instead of the host application.

The following section provides a primer on how TCL printing works. A short study of the principles involved, followed by experimentation with some of the print examples given, should allow you to quickly learn both the function and usefulness of Template printing.

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TCL Coordinate System

The coordinate system in TCL is an X,Y system that uses the upper left hand corner of the paper (as viewed as the paper exits the printer) as a 0,0 coordinate. This axis can also be thought of as the dot line axis and the paper axis as described below. Each coordinate position represents a single dot position.

- **Dot Line Axis.** The dot line axis is the axis parallel to the plane of the print head. It can be thought of as the X direction when looking at the paper as it exits the printer. The 0 coordinate is at the left hand side.
- **Paper Axis.** The paper axis is the axis parallel to the plane of paper travel. It can be thought of as the Y direction when looking at the paper as it exits the printer. The 0 coordinate is at the upper corner.

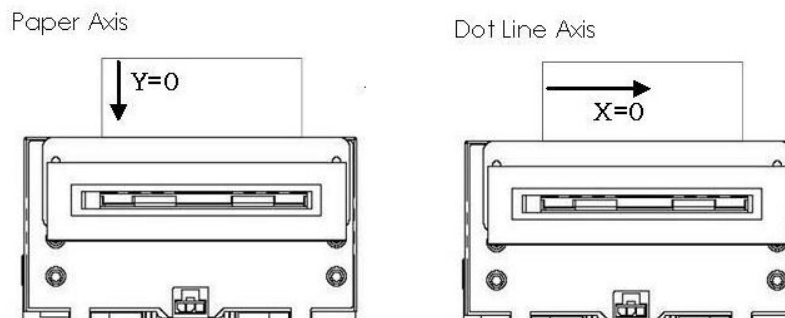


Figure 15-1 TCL Printer Language Coordinate System

Command Summary

This section provides an overview of the basic structure of a TCL command string, and a summary of the various commands divided by category.

TCL commands follow this basic structure:

^<cmd_ltr>|<data_field1>|<data_field2>|...|<data_fieldx>|^ ;comment

where:

- ^ = The '^' up caret character. This is the start and end marker for a command.
- <cmd_ltr> = Command identifier letter.
- <data_fields1-x> = Fields that contain information relative to the command.
- | = Pipe character. This serves as the delimiter between data fields in a command.
- ; = Semi-colon. This is a comment field designator. A semi-colon **must precede** any comment field. A comment field **may not** contain the reserved control character '^'. A comment may be any text within these limits terminated by a CR,LF.

Some notes on the TCL command syntax:

- The reserved control characters for TCL are: ^, |, and ~. To print any of these three characters on a ticket, use the tilde escape sequence plus their ASCII codes:

Table 15-1 TCL Printer Language Reserved Characters

Printed Character	Tilde ASCII
^	~094
~	~126
|	~124

Example: To print the following string: "A tilde is the ~ character"

In this string, the ~ character would have to be replaced by the ~ Escape sequence producing the following TCL acceptable string:

"A tilde is the ~126 character".

The reserved characters may not be used in a comment field.

- The ';' character must always precede a comment field. A comment may be placed following any TCL command and will be ignored.

TCL commands are either queued or asynchronous. TCL allows for the buffering of multiple commands that are either performed immediately (in the case of an asynchronous command) or placed in a queue to occur in the order received. Printer resident command queuing relieves the host system of the burden of sequencing commands. As an example, it is possible to define a set of Print Regions, define a Template, request a print job, request a paper feed, and send a delete Print Region command in a continuous string. The printer will manage the sequenced processing of these commands so that all events will be performed in the order requested.

Print Control Commands

Set printing controls using these print control commands.

Command	Description	Queued Type	Page
^F	Flush commands	asynchronous	83
^P	Print a Template	queued	89
^R	Define Print Region	queued	91
^T	Define Template	queued	100

Configuration Commands

Set up the printer environment and paper type using these configuration commands.

Command	Description	Queued Type	Page
^A	Set Communications protocol and handshaking control	asynchronous	81
^L	Set paper specifications	queued	86
^O	Select printer operation mode	queued	87

Library Command

Load graphics or soft fonts to the printer using these library commands.

Command	Description	Queued Type	Page
^G	Obtain program CRC	queued	84
^I	Library management commands	queued	87

Polling Commands

(For serial communications only) Query the printer using these polling commands.

Command	Description	Queued Type	Page
♣ (ENQ)	Printer status request (identical to ^S)	asynchronous	96
^C	Clear error status	asynchronous	82
^h	Historical data command	asynchronous	85
^S	Printer status request	asynchronous	96

System Control Commands

Access the operating system features of the controller using these commands.

Command	Description	Queued Type	Page
^>	External control port command	queued	
^b	Beep command	queued	82
^c	Paper cutter command	queued	83
^f	Paper feed	queued	84
^h	Historical data command	asynchronous	85
^j	Enter journal mode	queued	85
^r	Reset printer	asynchronous	91
^s	Low power standby mode command	asynchronous	96
^tavg	Adjust print darkness	asynchronous	100
^z	Special control commands	async/queued	102

Command Details

The following sections contain specific information on each TCL printer command.

^A

Set Communications Protocol and Handshaking

Command Description



Note: The PSA-66-ST2RU printer does not support handshaking.

This command sets the communication interface, handshaking, and protocol. The new protocol requested by this command will go into effect a short time after the last byte of this command is received. When using this command, it is important to select proper communications and handshaking that will match the host system. This prevents unpredictable behavior.

Command Format

^A | <baud_rate> | <parity> | <data_bits> | <handshake> | ^

where:

- <baud_rate> = New baud rate or parallel interface. Range 1 byte: 'P' – parallel interface digits for serial baud rate; '1' – 110, '2' – 300, '3' – 600, '4' – 1200, '5' – 1800, '6' – 2400, '7' – 4800, '8' – 9600, '9' – 19200, '10' – 38400, '11' – 57600.
- <parity> = Parity setting: 'N' – none, 'E' – even.
- <data_bits> = Data bits in serial byte: '8' – 8 bits, '7' – 7 bits (use only with 'E' parity).
- <handshake> = Handshaking flow control: 'X' – XON/XOFF, 'R' – RTS hardware, '+' – XON/XOFF+RTS.

Command Examples

^A|3|N|8|X|^ ;This will program for serial 2400 baud, no parity, 8 data, 1 stop bit, XON/XOFF handshake.

^A|P|^ ;This will switch the system to a parallel interface.

Default

The default communications is parallel port.

Sequencing

Asynchronous

Notes

1. A delay of ~50 ms is required for the printer to re-synchronize communications before it will properly recognize data with the new protocol.
2. If the protocol is changed from a hard wire (RTS/CTS, DTR/DST) handshake to software handshake (XON/XOFF), an XON character will be sent after the serial port is reconfigured.
3. All serial communications use 1 stop bit.

^b

Beep

Command Description

This command causes suitably equipped systems to beep according to the parameters specified. As this is a queued command, it can be easily coordinated to the printing/cutting/feeding functions.

Command Format

^b | <beep_style> | ^

where <beep_style> = Beep style: '1' = turn buzzer on; '0' = turn buzzer off

Command Examples

^b|1|^ ;Turn the buzzer on steady state.

^b|0|^ ;Turn the buzzer off.

Default

No default

Sequencing

Queued

^C

Clear Error Status

Command Description

This command resets the error status bits in the printer status reply (see ^S| command), and returns software error indicators such as LEDs and/or buzzers to their default state. Most hardware flag bits such as Paper error, Head Up error, Voltage error, Temperature error, etc., are not affected by this command. These hardware error bits are cleared automatically by the printer when the condition is removed.

A special sub-field on this command allows the clearing of the Paper Jam condition.

Command Format

^C | <sub_field1> | ^

where <sub_field1> = Optional field for clearing paper jam errors. Range 1 byte: 'j' – clear Paper Jam flag.

Command Examples

^C|^ ;Clear all software error status flags (does not include Paper Jam errors).

^C|j|^ ;Clear the paper jam flag.

Default

No default

Sequencing

Asynchronous

^C

Paper Cutter Command

Command Description



Note: This command is ignored by systems that do not support an electric paper cutter.

This command configures and operates the electric paper cutter in systems so equipped. As this is a queued command, it can be easily coordinated to the printing/feeding functions.

This command provides the option of full and partial cuts (with appropriate cutter).

Command Format

^c | <cut_spec> | ^

where <cut_spec> = The cut type: 'f' indicates a full cut where paper is completely severed.

'p' indicates a partial cut where a small tab of paper is left after the cut.

Command Examples

^c|f|^ ;Perform a full cut. **^c|p|^** ;Perform a partial cut.

Default

The default for *eject_distance* is product-dependent and factory set to match the appropriate print engine and its associated cutter.

Sequencing

Queued

^F

Flush Commands

Command Description

This command deletes print jobs that have been queued ahead of this command being received.

Command Format

^F | <job_spec> | ^

where <job_spec> = Flush specifier. Range: 'A' – all print batch jobs queued in the printer;

'C' – current print batch job.

Command Examples

^F|C|^ ;Abort the current print batch.

Default

No default

Sequencing

Asynchronous

Note

If a print batch is running, the flush will occur after the next complete label has been printed.

^f

Feed Command

Command Description

This command controls paper feeding. Select from forward or reverse feeding, in continuous, and top of form motions.

This is a queued command that will be performed in sequence with ^P and other ^f jobs.

Command Format

^f | <fd_spec> | <fd_repeat> | ^

where:

<fd_spec> = Continuous paper: Distance in dot lines to feed. Range 4 signed digits: '-1000' to '2030'

Indexed paper: Top of form specifier: 'T' – seek forward to top of next form, 'R' – seek backwards to top of previous form.

<fd_repeat> = Continuous paper: Ignored.

Indexed paper: Number of index forms to feed. Range 1 digit: '1' – '5'

Command Examples

^f | 1000 | ^ ;Feed paper 1000 dot lines in the forward direction.

^f | -320 | ^ ;Feed paper 320 dot lines backwards.

^f | I | ^ ;For indexed paper, feed to top of next form.

^f | I | 3 | ^ ;For indexed paper, feed to top of next form 3 times.

Default

No default

Sequencing

Queued

^G

Obtain Program CRC

Command Description

This command obtains the program CRC.

Command Format

^G | <4 bytes start address> <2 bytes seed> | ^ ;(LSB first for both fields)

where: <4 bytes start address> = 00h 00h 00h 00h <2 bytes seed> = 00h 00h

Command Examples

^G | 00h 00h 00h 00h 00h 00h | ^ ; 5eh 47h 7ch 00h 00h 00h 00h 00h 7c 5e

After sending this command, the printer will respond within 40 seconds.

***G | <2 bytes CRC> | *** ;(the CRC is oriented <LSB MSB>)

2Mb (29F200) Memory will return: ***G | b0h d8h | *** ; 2ah 47h 7ch b0h d8h 7ch 2ah.
CRC = d8b0h.

4Mb (29F400) Memory will return: ***G | 0fh 32h | *** ; 2ah 47h 7ch 0fh 32h 7ch 2ah.
CRC = 320fh.

Default

No default

Sequencing

Queued

^h

Historical Data Command

Command Description



Note: This command is ignored in systems that do not support battery backed RAM.

This command prompts a reply from the printer concerning the wear history of its print head. This command is valid only for systems that provide non-volatile storage of data.

Command Format

^h | <h_func> | <hsub> | ^

where:

- <h_func> = Historical data function to perform: 'S' – poll for status, the printer will reply with the historical data reply as shown below. If 'S', skip the <hsub> field;
'U' – update historical data (used to reprogram the historical data value when a print mechanism is changed).
- <hsub> = Historical data update value. If <h_func> is 'U', this field is 'mm=xxxxxxx' where the 8 x's are an 8-digit number representing the millimeters of paper you want to record as the current service life of the head. This field is omitted if <h_func> is 'S'.

Command Examples

^h | S | ^ ;Request the printer to return historical data of its print head.

^h | U | mm=00323462 | ^ ;An old print head was installed into new system; set historical record of this head in new system to match that of the original, 323,462 millimeters of paper.

Reply Format

***h | mm:xxxxxxx | ***

where xxxxxxxx = 8-digit quantity of total millimeters of paper that ran through the print head.

^j

Enter Journal Mode

Command Description

This command causes the printer to exit page printing mode and enter line printer mode (see Chapter 14). Following the ticket of this command, the printer will not respond to TCL commands until the exit line printer mode command is received.

Command Format

^j | ^

Sequencing

Queued

Notes

All jobs queued will be finished before the printer enters line printer mode. As soon as the jobs are finished, the printer will enter line printer mode.

^L

Set Paper Specs

Command Description

This command configures the printer to use different forms of paper: regular paper, 2-ply paper, and labels. Additionally, the paper selection may be continuous, continuous with fixed form length, or black mark indexed. Indexed paper stock is paper that has a black mark indicating the top of form. This command enables the controller to automatically handle top of form registration for such paper.

Command Format

^L | <stock_type> | <idx_to_tof> | ^

where:

<stock_type> = Paper type. Range 2 bytes as per Table 15-2.

Table 15-2 Paper Stock Types and <stock_type> Codes

Code	Paper Type	Description
C	Continuous paper	Continuous journal paper without any set form size
2C	Continuous 2-ply paper	2-ply version of paper type 'C'
Cl	Continuous label stock	Continuous length labels without fixed form lengths
F	Black mark indexed labels	Label stock which uses black marks to register top of form
2F	Black mark indexed 2-ply paper	2-ply paper stock which uses black marks to register top of form
Fp	Black mark indexed paper	Paper stock which uses black marks to register top of form

<idx_to_tof> = Black mark indexed paper stock: Top of form in dot lines from black index mark. Range 4 digits: '0' – '2030'.

Continuous paper stock: Continuous stock form size in 203 dpi printers. Range four digits: '0' – '2030'. This value sets the amount of paper fed when the **FEED** button is pressed for a form feed (long press). This field may be left blank and has a default value of 10" form length. If this value is '0', the printer will feed continuously while the **FEED** button is pressed.

Command Examples

^L|C|500|^ ;Select continuous paper. Form feed length for long **FEED** button press is 500 lines (~2.5").

^L|2C|0|^ ;Select 2-ply continuous paper. Paper continuously fed when **FEED** button is pressed.

^L|F|132|^ ;Select indexed label stock with a mark to top of form distance of 132 dot lines.

Default

<stock_type> = type 'C' continuous paper

<idx_to_tof> = 2030 lines

Sequencing

Queued

Notes

1. If switching from continuous paper to black mark indexed stock, a feed to top of next form will result. If the printer cannot find a black mark within the maximum ticket length distance of 2030 dot lines (~10"), then an indexed paper error will result.
2. If indexed paper selected, printer performs a registration top of form seek on every power cycle.
3. If using paper types "F" or "2F", a top of next form distance less than a Template length in the paper axis (<t_dim_pa> field of the ^T command) will be ignored.

^I|I|^ Inventory Poll

Inventory Request Command

Command Description

This command (lowercase L) requests the printer's inventory.

To get a report on the contents of the printer's library, specify the 'I' sub field to return a complete CRT ready report on the contents of the printer.

Command Format

^I | <lib_func> | ^

where:

^I = 0x5E, 0X6C

<lib_func> = Operation to perform: 'I' (0x49) – inventory request, 'Ic' (0x49,0x63) – condensed (templates only) inventory request.

Command Examples

^I|I|^ ;This command will poll the printer for its current library inventory. See the section below on details of the printer's reply to this command.

^I|Ic|^ ;This command will poll the printer for its current template inventory. See the section below on details of the printer's reply to this command.

Default

No default

Sequencing

Queued

^I|I|^ Inventory Poll Reply Description

The ^I|I|^ inventory request command causes the printer to return a complete report as to its library contents. The reply is structured to be CRT ready—complete with all formatting for easy readability. This report is most useful during the application development phase when it is important to determine which print objects (fonts and graphics) are resident in the printer and which Print Regions and Templates are available for use. Figure 15-2 demonstrates the reply issued from the controller in response to this command.

The actual data stream for this command is:

ASCII	^	I	|	I	|	^
HEX	5E	6C	7C	49	7C	5E

Inventory Poll Reply Format

*** II | <data_fields> | ***

where: <data_fields> = CRT formatted information on the contents of the printer's libraries as shown in Figure 15-2.

```

*II|
-----
LI1 FLASH seg used: zzzzzz
-----
LI3  FLASH seg free: zzzzzz
-----
LI5 Templates: x,x,x,...x
LI6 Print Regions: x,x,x,...x
LI7 fonts: x(b):yyyyy,
x(b):yyyyy,...x(b):yyyyy
LI8 graphics(a): x,x,...x
-----
|*

```

Figure 15-2 ^I|I|^ Poll Command Reply

In reference to Figure 15-2:

- z is a digit generated by the printer.
- x is <obj_id> identification byte used to select the print region template font or graphic.
- b is the orientation of the resident font in degrees.
- a is undefined.
- y is the TCL font identification tag, 4 characters.
- seg used refers to the amount in bytes currently in use for Flash storage.
- seg free undefined.

^I|Ic|^ Condensed Inventory Poll Reply Description

The ^I|Ic|^ condensed inventory request command causes the printer to return a list of printer resident templates available for use. Figure 15-2 demonstrates the reply issued from the controller in response to this command.

The actual data stream for this command is:

ASCII	^	I	|	I	c	|	^
HEX	5E	6C	7C	49	63	7C	5E

Condensed Inventory Poll Reply Format

-----<CR><LF>

LI5<20h>templates:<20h> x,x,x,...x <CR><LF>

There are 20 ‘x’ characters at the start of the stream. The numbers of templates (shown by the x character) in the list is variable depending on the templates resident in the printer.

```

-----
LI5 Templates: 0,1,2,3,4,5,6,7,8,9,A,B

```

Figure 15-3 ^I|Ic|^ Poll Command Reply for Factory Default

Note

Be sure that Print Regions defined to hold graphics are dimensionally defined to be the exact size in dots in the <da_len> and <pa_len> fields as the graphic symbol to be printed in them, and the size in the <da_len> coordinate is an even 8 bit multiple.

^O

Select Printer Operational Mode

Command Description

This command selects the printer operational mode: Online, On-Demand or Auto-Demand.

- **Online mode.** All tickets in a batch will be printed when the printer receives the ^P command.
- **On-Demand mode.** A ^P command loads printer with a batch of tickets, and one ticket of the batch is printed for each press of FEED button until all tickets in batch have been printed.
- **Auto-Demand mode.** Only supported by printers equipped with a Paper Taken sensor and will hold new print jobs until it has been detected that the previous ticket has been taken by the customer.

Command Description

^O| <mode>|^

where <mode> = 'C' – Online printing mode, 'D' – On-Demand mode (only supported in TCL page mode), 'd' – Auto-Demand mode (only supported by printers with a Paper Taken sensor).

Command Examples

^O|D|^;Select on-demand printing mode.

Default

<mode> is 'C', Online

Sequencing

Queued

Note

If the target system is not equipped with a paper taken sensor port, the 'd' <mode> option will be ignored.

^p

Print Batch Command

Command Description

This command triggers printing. It specifies the ticket type, the data to print on the ticket, and the amount of tickets to print.



Note: The ^P command field <temp_id> must reference a Template already defined in the printer.

Often, a print command results in a long string (due to the length of print data fields). To assist with readability of the command, a line break option for ^P command is allowed to make these commands easy to build in a standard ASCII text editor. This is explained in the <prN_data> field definition below.

Command Format

^P | <temp_id> | <copies> | <pr1_data> | <pr2_data> ... | <prN_data>|^

where:

- <temp_id> = Library resident Template to print. Range 1 byte: 30h–7bh.
- <copies> = # of copies to this ticket to print (number of tickets in the batch).
Range 4 digits: '1' – '9999'.

<pr1_data>...<prN_data> = Contains the <obj_id> which identifies the graphic that goes in that region. For example, <pr1_data> may = ~120 which means use graphic ~120.

Print Region data in an order matching the Print Region list of the selected Template definition. Note that for a Print Region containing text, a <CR>, <LF> or <CR><LF> combination in this field will result in a new line. If a <CR><LF> is seen immediately following the '|' field divider character, this will be interpreted as an editor line break and not a new line in the Print Region. This can be of assistance when building print Template commands in a word processor. If a blank line is desired as the first text line in a Print Region, then a space character must proceed the <CR><LF> so that it will not be interpreted as a line break.



Note: The <pr_data> contains the <obj_id> which identifies which graphic goes in that region (for example, <pr_data> may be "~120" which specifies to use graphic "~120").

Command Examples

```
^P|0|51|01234532|This is a test|Field # 3 data|Field #4 data|^
```

;This command will print 51 copies of Template #0 which is comprised of four Print Regions. The Print Regions, when produced, will contain the following data:

- '01234532' for the 1st Print Region defined in the Template 0 list.
- 'This is a test' for the 2nd Print Region defined in the Template 0 list.
- 'Field #3 data' for the 3rd Print Region defined in the Template 0 list.
- 'Field #4 data' for the 4th Print Region defined in the Template 0 list.

```
^P|A|1|Ticket Title|ABC123|||^
```

;This command will request one copy of Template A to print. Template A has five Print Regions. It is assumed that the 2nd, 4th, and 5th Print Regions were built with fixed print data since no data appears for these regions in the print command string shown here.

```
^P|7|9|string #1|string #2|Print Region string #3|
```

This is an example of an unusually long string that uses an editor break. |

;This Print Region string is like any other for a four Print Region Template (I.D. #7), but it also demonstrates an editor line break by inserting a <CR><LF> immediately after the | delineator character. If you actually wished to place the string 'This is an example...break.' on the 2nd line of the Print Region print field, it would be necessary to insert a space character before the <CR><LF> after the | character.

Default

No default

Sequencing

Queued

Note

The order of the print data fields in the ^P command is very important and must correspond to the order of the Print Regions for the Template selected so that every Print Region contains the proper data.

^R

Define Print Region

Command Description

This command defines the four basic types of Print Regions: text, barcode, graphics, and line/box draw. A Print Region is a print field used in a Template to format print data.

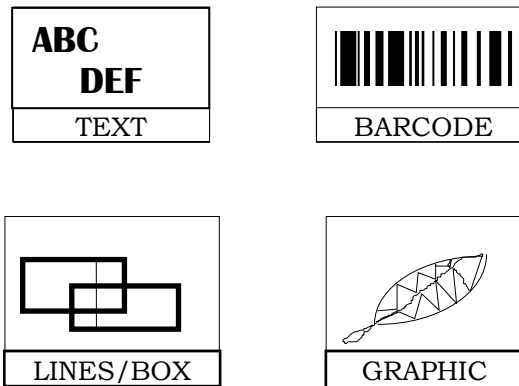


Figure 15-4 Different Types of Print Regions

The Define Print Region command defines the particular font, barcode, graphic, or line style to use, and provides special formatting information on how it is used. Once a Print Region definition is sent to the printer, it is available for accessing until erased by a delete command, power is cycled, or the controller is reset. The ^z command allows Print Region commands to be saved permanently in Flash memory.

TCL provides overwrite security to prevent the inadvertent loss of Print Regions once they are loaded. A Print Region must be deleted before a new Print Region with the same ID may be defined. If this rule is not followed, the new redundant Print Region definition will be discarded and an online error will result.

Since a Print Region is a formatting box, multiple text lines may be placed in a text Print Region. TCL performs all the formatting and justification. Each new line within a Print Region is signaled by a <CR><LF> in the data stream. Left, right, and center justification within a Print Region text box are all supported, making this feature very handy for simplifying ticket construction. Characters that overflow the boundaries of the box will be truncated and cause a Print Region truncation error, but will not affect normal printing. Figure 15-5 illustrates how the following Print Region data will print.

This is line #1 within the text Print Region<CR><LF>

This is line #2<CR><LF>

<CR><LF>

Note truncation in line #1<CR><LF>

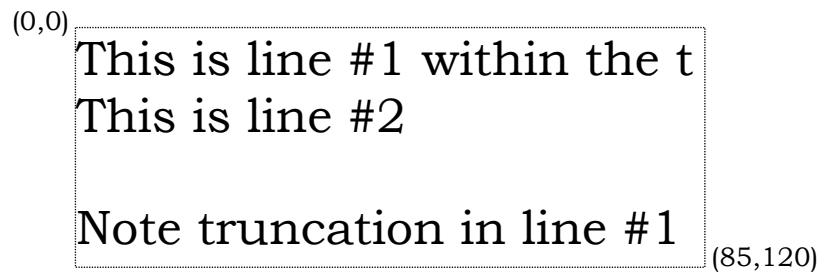


Figure 15-5 Text Print Region with Several Lines

Command Format

^R | <r_id> | <targ_mem> | <da_start> | <pa_start> | <da_len> | <pa_len> | <unused1> | <rot> | <just> | <obj_id> | <mul_1> | <mul_2> | <obj_att> | <pr_att> | <pr_data> | ^

where:

- <r_id> = Print Region identifier. Range 1 byte, 30h – 7dh (excluding TCL reserved characters ~ ^ |). '\$' indicates all Print Regions and is only used with the delete function. If a delete command with \$ for <r_id> is specified, all resident Print Regions will be deleted. Additionally, all Templates will be deleted since the printer must have Print Region definitions to have valid Template definitions.
- <targ_mem> = Target memory storage. Range 2 bytes: 'R' – RAM, 'DR' – delete from RAM library. 'D' in front of a memory target indicates the Print Region is to be deleted and the command string is terminated after this field (see example below).
- <da_start> = Dot axis start position in dots. Range 3 digits:
'0' – '383': 58mm systems; '0' – '447': 60mm systems; '0' – '511': PSA-66 Gaming Printers; '0' – '575': 80mm systems; '0' – '831': 112mm systems
- <pa_start> = Paper axis start position in dots. Range 4 digits: '0' – '2028'.
- <da_len> = Dot axis length of Print Region in dots. Range 3 digits:
'0' – '383': 58mm systems; '0' – '447': 60mm systems; '0' – '511': PSA-66 Gaming Printers; '0' – '575': 80mm systems; '0' – '831': 112mm systems
Note that <da_start> + <da_length> must not overflow the width of the print head in dots; otherwise the Print Region will be rejected and a Print Region truncation error will result.
- <pa_len> = Paper axis length of Print Region in dots. Range 4 digits: '0' – '2028'. Note that <pa_start> + <pa_length> may not exceed 2028 dots. If this is the case, the Print Region will be rejected and a Print Region truncation error will result.
- <unused1> = This field is ignored.
- <rot> = Rotation of strings or data within Print Region.
Text and barcodes: See Figure 15-6. Range 1 digit: '0' = 0°, '1' = 90°, '2' = 180°, '3' = 270°
Graphics and lines: Ignored.

Figure 15-6 demonstrates the various orientations for the given rotational field and the location of the origin reference points <da_start> and <pa_start> relative to the Print Region box for each orientation.

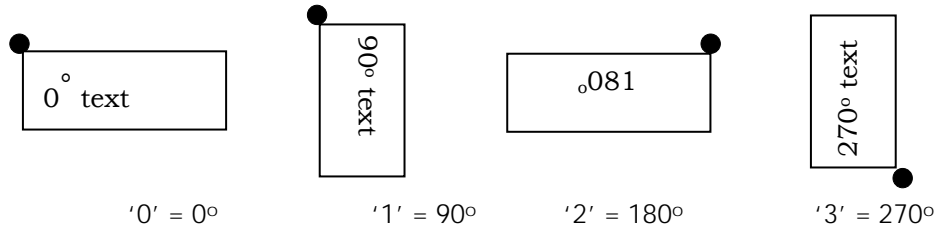


Figure 15-6 Print Region Orientation and (0,0) Origin Reference Points

<just> = Justification of data within Print Region.

Text: Justification may be applied to any text Print Regions with the exception of incrementing/decrementing Print Regions that always default to left justification. See Figure 15-7. Range 1 digit: '0'=left justification, '1'=center justification, '2'=right justification

Barcodes, graphics, and lines: Ignored.

Left justified print Print region line #2 - demo	Center justified print Print region line #2 - demo	Right justified print Print region line #2 - demo
--	--	---

Figure 15-7 Text Justified in a Print Region

<obj_id> = Print object identifier. Range 1 byte as per Table 15-3. This is the print object (barcode, font, line/box, or graphic) used to format print the data from the ^P print command.

Table 15-3 Legal Print Object I.D.'s

Object Type	Hex Range	ASCII Range*
Fonts	30h – 30h 35h	'0' through '15' (see Chapter 7)
Lines	41h – 44h	'A' through 'D'
Graphics	45h – 60h	'E' through ''
Barcodes	61h – 7dh	'a' through 'z' (see Chapter 8)

*Never use the special reserved characters '^', '|', and '~' as I.D.s.



Note: For graphics, this specifies the "object type", that is, "E" through ASCII 60dec identifies a graphic. It is not the object ID used in the ^I and ^P commands.

<mul_1> = Print object multiplier 1:

Text: Font width multiplier. Range 1 digit: '1' – '6'.

Barcode: Narrow bar width or modulo bar width. Range 1 digit: '1' – '6'. See Chapter 8 for dimensions.

Line: Thickness of the line in dots. Range 2 digits: '1' – '30'. **Graphic:** Always '0'.

<mul_2> = Print object multiplier 2:

Text: Font height multiplier. Range 1 digit: '1' – '6'.

Barcode: Wide bar width ('0' for modulo width barcodes). Range 2 digits: '2' – '24'. See Chapter 8 for dimensions.

Line: Always '0'. **Graphic:** Always '0'.

- <obj_att> = Object printing attributes. This contains special instructions on how to treat the print objects within the Print Region:
Text: '0'=normal, '1'=inverse print
Barcode: Height of barcode in dots. Range 3 digits: '48' – '406'
Line: Always '0' Graphic: Always '0'
- <pr_att> = Print Region attributes. This contains special instructions on handling the Print Region. Range:
Text and barcodes:
'0' = Dynamic text Print Region. Text will be sent in the ^P print batch command.
'1' = Stored text Print Region. Use text that follows in <pr_data> field for this Print Region.
'2' = Incrementing Print Region. This Print Region will auto increment with each ticket in a batch. This option only applies to numerical data. The base value is stored in <pr_data> field.
'3' = Decrementing Print Region. This Print Region will auto decrement with each ticket in a batch. This option only applies to numerical data. The base value is stored in <pr_data> field.
Line: Always '0' Graphic: Always '0'
- <pr_data> = Permanently stored data that always appears in this Print Region. This field contains stored text if requested by entering a '2' in <pr_att> field. Range: Leave this field blank if not used.

Command Examples

```
^R|1|R|10|20|100|180|0|0|0|3|2|2|0|1|THIS WILL PRINT ON EACH TICKET|^
```

;This Print Region definition will yield a text Print Region starting at 10,20 on the ticket. The text will be left justified in the 0 degree orientation using character set '3'. The font will be multiplied by 2x in both height and width; the text will be printed normally (not inverse). The text for this Print Region is stored controller resident and is 'THIS WILL ...TICKET'.

```
^R|2|R|0|0|80|0||0|0|A|5|0|0|0||^
```

;This Print Region draws a line 5 dot lines thick from 0,0 to 80,0 on the ticket.

```
^R|3|R|0|0|80|30||0|0|A|3|0|0|0||^
```

;This Print Region draws a box with lines 3 dots thick from 0,0 to 80,30.

```
^R|0|DR|^
```

;Delete Print Region '0' in the RAM library.

```
^R|$|DR|^
```

;Delete all Print Regions in the RAM library. This will also cause the automatic deletion of all Templates since without a library of Print Regions, there can be no Templates.

Default

No default

Sequencing

Queued

Special Notes on Incrementing and Decrementing Print Regions

An Incrementing/Decrementing Print Region allows you to print a batch of tickets that will have an ascending or descending serial type number and/or a barcode on each ticket in the batch. For example, to print 10 tickets, each with a sequential serial number printed in text and coded in a barcode. The incrementing/decrementing <pr_att> option (either '2' or '3') will enable the printer to handle this automatically such that you need only request a single batch of 10 tickets.

There are some special rules governing the use of incrementing and decrementing Print Regions:

1. There may only be one incrementing/decrementing barcode Print Region and one incrementing/decrementing number text Print Region in a Template. The inc/dec text and barcode Print Regions are not linked and do not have to have the same data.
2. Incrementing/decrementing Print Regions may only contain numbers 0 through 9.
3. Incrementing/decrementing text Print Regions have a maximum of 11 digits.
4. The roll over of a number Print Region is controlled by the amount of digits it is defined to contain. For example, if an incrementing Print Region is defined to have the start initial count of '33', then the ticket following '99' will be printed as '00'. If the user wishes the count to roll over after '999', then the initial count would have to be sent as '033'. Decrementing Print Regions roll over from 0 in a similar manner as do incrementing ones, going from '9' to '0'.
5. An incrementing/decrementing Print Region is considered a special case stored Print Region, and thus the initial count for the Print Region must be in the <pr_data> field of the Print Region definition.
6. Incrementing/decrementing Print Regions may only be left justified.

Notes

1. Print Regions must be deleted before new ones with the same ID may be defined; otherwise an online error results and the new definition is discarded.
2. See the ^z command for storing of the RAM library of Templates to Flash for permanent retention.
3. The <da_start> + <da_length> for a Print Region definition must not overflow the width of the print head in dots, otherwise the Print Region will be rejected and a Print Region truncation error will result.
4. The <pa_start> + <pa_length> must not exceed 2028 dots. If so, the Print Region will be rejected and a Print Region truncation error will result.
5. If experiencing difficulty creating Print Regions, examine replies to the ^S status poll. The online error flags are fairly specific for describing the nature of an error.
6. Modulo bar width barcodes are those with bars and spaces all of the same width, i.e., UPC, EAN, Code 128, etc.
7. If a delete command with \$ for <r_id> is specified, then all resident Print Regions will be deleted. Additionally, all Templates will be deleted since the printer must have Print Region definitions to have valid Template definitions.

^r

Reset Printer

Command Description

This command causes the printer to execute a hardware reset.

Command Format

^r | ^

Sequencing

Queued

Notes

1. All functions that occur during a power-up reset will occur after ticket of this command.
2. If the printer is currently printing a batch, the printer will wait to reset until the batch has concluded.
3. Resetting the printer causes a loss of all commands in the queue.

^S or ♣ (ENQ)

Request Printer Status

Command Description

This command requests the printer to return its status. The printer is capable of returning both a regular and extended status report. The extended status function was added to report on the status of potential paper jams, paper low, the electric paper cutter, and other future functions if the printer is equipped with these items. If the printer does not support this equipment, those bits in the extended status reply should be ignored. The Reply Format section below provides details on the controller's response to this command.



Notes: Use the ^S command only for a serial interface or ENQ (05h) for a parallel interface.
See Appendix E for Status Flags Bit Definitions.

Command Format

ENQ (05h) -or- ^S <poll_option> | ^

where <poll_option> =Optional poll control character. Range: 'e' – return extended status.

Command Examples

♣ ;Return extended status.

^S | ^ ;Return regular status (serial interface only).

^Se | ^ ;Return extended status (serial interface only).

Sequencing

Queued

Reply Format

Standard status response (response to ^S|^):

***S | <unit_addr> | <soft_ver> | <status_flags1> | <status_flags2> | <status_flags3> | <temp_num> | ***

where:

- <unit_addr> = Unit address. Always '0' for point-to-point systems.
- <soft_ver> = Software version installed. Range 9 bytes in the format of xxxxxxxxx where the actual characters depend on the customer's version. This field will not contain the characters *, |, ^, or ~.
- <status_flags1>, <status_flags2>, <status_flags3> = Status flags 1 – 3 (see Table 15-4).
- <temp_num> = If no system errors reported, this will contain the Template I.D. of the last ^P batch job processed. If a system error exists, the field will contain the Template number of the last ^P batch job processed that had an error. Range: 2 bytes 'Px'. A space (20h) character will be used after the P letter if no jobs have been processed since power-up, a reset, or a clear error status ^C command was received.

Extended status response (response to ^Se|^ or ENQ):

***S | <unit_addr> | <soft_ver> | <status_flags1> | <status_flags2> | <status_flags3> | <status_flags4> | <status_flags5> | <temp_num> | ***

where:

- <unit_addr>, <soft_ver>, <status_flags1>, <status_flags2>, <status_flags3>, <temp_num> = See standard status response above.
- <status_flags4>, <status_flags5> = Status flags 4 and 5 according to Table 15-4.

Reply Examples

Standard status response:

- *S|0|| v 1.0.0.0|@|@|@|P0|* ;This indicates that printer address 0 is running version v1.0.0.0 software, and the print job of Template '0' was the last to complete without an error.
- *S|0|| v 1.0.0.0|P|H|@|PA|* ;There was an error in the print data for one of the Print Regions of Template 'A' that was requested to print via the ^P command.

Extended status response:

- *S|0| v 1.0.0.0|P|@|@|D|@|P0|* ;This indicates that the printer detected a cutter error.
- *S|0| | v 1.0.0.0|@|@|@|A|@|P0|* ;This indicates that the printer's paper roll is low.

Status_FlagsX (SFx)

Table 15-4 Status Flags Bits Summary

Bits								
	7	6	5	4	3	2	1	0
1	0	1	0=idle 1=busy processing print or command	0= system OK 1= system error	0=platen engaged 1=platen up	0=paper loaded 1=paper out	0=head OK 1=head error	0=voltage OK 1=voltage error
2	0	1	0=temperature OK 1=temperature error	0=library refs OK 1=library ref error	0=PR data OK 1=PR data error	0=library load OK 1=library load error	0=buffer space OK 1=buffer overflow	0= job memory OK 1=job memory overflow
3	0	1	0=command OK 1=command error	0=print libraries OK 1=print libraries corrupted	0=chute clear 1=paper in chute	0=Flash OK 1=Flash prog error	0=printer online 1=printer offline	0=supply index found 1=missing supply index
4	0	1	x	x	0=TCL print mode 1=journal printing	Reserved	0=paper path OK 1=paper jam may exist	0=paper full 1=paper low
5	0	1	0=validation # clear 1=validation # done	0=not at top of form 1=at top of form	0=ready to RX 1=XOFF	0=printer pocketed 1=printer open	0=Clear 1= Barcode Data Is Accessed	0=clear 1=reset/power up

Table Notes:

1. BIT 4 of status_flags1 is a global error flag. It will set any time any of the other error flags are set in any of the status register. This global error flag will reset automatically anytime no error conditions exist in the system.
2. Bits that list an "x" value are reserved for future use.
3. See Appendix E for Bit Definitions.

Table 15-5 Status Flags Examples under Various Conditions

Condition	status flags 1						status flags 2						status flags 3					
	5	4	3	2	1	0	5	4	3	2	1	0	5	4	3	2	1	0
Ready to print, no previous errors.																		
Ready to print, a previous batch job error exists due to an unknown library object referenced.		x						x										
Print head is up.		x	x															
Paper is out.		x		x														
A new font was just loaded and the printer is busy putting it into memory.	x																	
There was an error in the last batch job in one of the Print Regions due to improper batch data.		x							x									
There exists a low battery or power supply condition and the printer is currently printing.	x	x				x												
The index mark on a label was not seen within 2030 dot lines (10').		x																x
There was a memory overflow.		x								x	x							
Data within a Print Region was truncated since it did not fit within the Print Region box.		x							x									
There is a bad connection with the print head.		x			x													
The input communications buffer overflowed most likely due to improper handshaking with the host		x									x							
A garbled or unrecognized command was received.		x											x					
Paper is present in the chute.																x		

Table Notes:

1. x = bit is set to 1.
2. When more than one given conditions exist simultaneously, the flags are OR'd together.

Notes

1. A space (20h) character will be used after the letter P in <temp_numb> if no jobs have been processed since power-up, a reset, a clear error status ^C command was received, or the printer is operating in line printer mode.
2. Hardware status flags are cleared automatically by the system when the condition is alleviated or to reflect the status of hardware, namely:
 - status_flags1: BIT4, BIT3, BIT2, BIT1, BIT0 status_flags4: BIT2, BIT1, BIT0
 - status_flags2: BIT 5 status_flags5: -
 - status_flags3: BIT3, BIT 0
3. All remaining status flags are cleared by ticket of the ^C, clear error status command.
4. Depending on the user interface, buzzers and/or LEDs can accompany the status flags to alert the user of an error.
5. Depending on the jobs queued in the printer, there may be a short delay before response to the ^S command.
6. The controller will recognize the ENQ (05h) command even if it is in an XOFF and error condition. This is provided so that the host may poll the controller as to the nature of an error condition.
7. Interpretation of the Paper Jam, Paper Present (in chute), and the Paper Low flags are at the discretion of the user; they are provided only for informational purposes. The Paper Jam flags will not prevent further printing and/or feeding unless the printer is specifically instructed to do so by the ^z|J command.
8. The cutter error flag will not prevent the cutter from operating on future cut commands. It is provided only for information purposes for the host system.

^S

Low Power Standby Mode Command

Command Description



Note: This command is ignored by systems that do not support operation from batteries.

This command manages the low power sleep mode for systems which support low power standby. In low power sleep mode, the printer consumes a fraction of its idle mode current, typically around 2.5mA. Use this command to conserve battery power if the printer is required to idle for long periods between print jobs.

The printer is capable of putting itself to sleep either upon ticket of this command or automatically after a user-defined interval of inactivity. Once a printer is asleep, it must be awakened before it can resume operation. There are several methods of awakening the printer:

1. Pressing the ON/OFF key.
2. Sending a character on the serial port.
3. Toggling the CTS line.
4. Sending a character on the parallel port.

Once awakened, the printer will be ready for operation within ~50 ms.

Command Format

^s | <s_cmd> | <sleep_time> | ^

where:

<s_cmd> = Sleep command operation: 'G' – enter sleep mode now, 'A' – adjust automatic sleep mode time using <sleep_time> field, 'D' – disable automatic sleep mode, 'E' – disable ON/OFF key to trigger sleep, 'O' – enable ON/OFF key to trigger sleep.

<sleep_time> = Autosleep time in seconds. Range 4 digits: '10' – '5909'. Omit this field blank if <s_cmd> = 'G', 'D', 'E', or 'O'.

Command Examples

^s|A|900|^ ;Set the printer to go to sleep automatically after 900 seconds of inactivity.

^s|O|^ ;Enable power ON/OFF button.

Default

Automatic sleep mode disabled

ON/OFF key sleep mode enabled

Sequencing

Asynchronous

^T

Define Template

Command Description

A Template is used to describe the format of an entire ticket and is comprised of a collection of Print Regions as illustrated in Figure 15-8. One Template is used for each desired ticket style. Once a Template definition is sent to the printer, it is available for accessing until erased by a delete Template command, power is cycled, or the printer is reset. The ^z command may be used to memorize a Template definition in Flash permanently.

TCL provides overwrite security to prevent the inadvertent loss of Templates once they are loaded. A Template must be deleted before a new Template with the same ID may be defined. If this rule is not followed, the new redundant Template definition will be discarded and an online error will result.

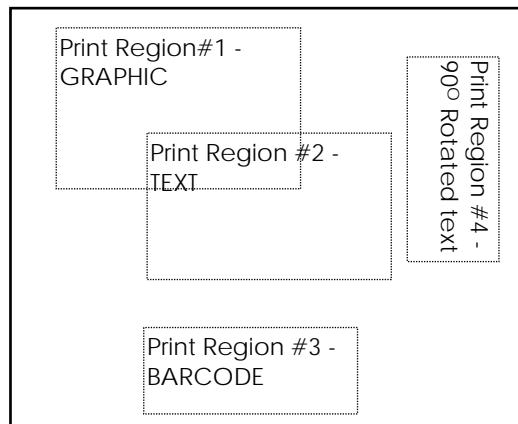


Figure 15-8 Example Template

Command Format

^T | <t_id> | <targ_mem> | <t_dim_da> | <t_dim_pa> | <pr#1> | <pr#2> | ... | <pr#n> | ^

where:

- <t_id> = Template I.D. Range 1 byte: 30h–7dh or '\$' (excludes TCL reserved characters ~ ^ |). '\$' indicates all Templates and is used only with the delete function. If a delete command with \$ for <t_id> is specified, all resident Templates will be deleted.
- <targ_mem> = Target memory storage. Range 2 bytes: 'R' – RAM, 'DR' – delete from RAM. 'D' in front of a memory target indicates the Template is to be deleted and the command string is terminated after this field (see example below).
- <t_dim_da> = Template dimension on the dot line axis in dots. Range 3 digits: '0' – '511': PSA-66 Gaming Printers; '1' – '383': 58mm systems; '1' – '447': 60mm systems; '1' – '575': 80mm systems; '1' – '831': 112mm systems
- <t_dim_pa> = Template dimension in dots in the paper axis. Range 4 digits: '1' – '2030'.
- <pr#1>...<pr#n> = List of library resident Print Regions ID's used in the format of this ticket. Range 1 byte: as per resident Print Region ID's. These fields are the method by which all Print Regions used on a ticket are linked together and to the Template. Please note that the order of the Print Regions in this list is important since print data sent with the ^P command **must be in the order of Print Region ID's** in this list.

Command Examples

^T|0|R|340|711|1|2|3|4|^ ;Small box ticket. The small box ticket is Template #0, its dimensions are 340 dots wide by 711 dots high, and it is composed of Print Regions 1,2,3,4.

^T|0|DR|^ ;Delete Template '0' in the RAM library.

^T|\$|DR|^ ;Delete all Templates in RAM library.

Default

No default

Sequencing

Queued

Notes

1. Template must be deleted before new ones with the same ID may be defined, otherwise an online error results and the new definition is discarded.
2. See the ^z command for storing of the RAM library of Templates to Flash for permanent retention.
3. If the <t_dim_da> and <t_dim_pa> fields overflow the width of the print head in dots, the Template will be rejected and an online error will occur.
4. If a Print Region is referenced in the <pr_#n> list that does not exist, the Template will not be created and an online error will result. Always define all Print Regions to use in a Template before defining any Template that uses them.

^tavg

Adjust Print Darkness

Command Description

This command adjusts the print darkness to accommodate different types of paper. The adjustment percentage specified is a percent increase or decrease from the base imaging time recommended by FutureLogic, Inc. for the given thermal mechanism installed on the controller (using the recommended 65 um thermal paper). Each percentage point of adjustment is approximately equal to a 3.22 uJ increase or decrease from this base imaging time value.

Command Format

^tavg | <adj> | <adj_percent> | % | ^

where:

<adj> = Adjustment: '+' to darken, '-' to lighten.
 <adj_percent> = Darkness adjustment percent. Range 2 signed digits: for + '0' to '40';
 for - '0' to '20'.

Command Examples

^tavg | + | 27 | % | ^ ;Set the imaging time as 27% greater than the base image time.

^tavg | - | 14 | % | ^ ;Set the imaging time as 14% less than the base imaging time.

Default

0% off the base imaging time

Sequencing

Asynchronous

Notes

1. Requested percentages that are outside the maximum and minimum range are ignored and the image adjust is set back to 0.
2. If the adjustment ranges do not provide sufficient darkness, try using ^L to select label stock. Label stock uses more head energy.
3. If adjusting the image time, study output carefully. The label should not be over blush or bloom on dense print.
4. Increasing the image time will slow down print speed.

^z

Special Control Commands

Master Command Description

The ^z (lowercase z) command provides access to the available operating system control features. The ^z section is divided into several sections that explain each of the commands, their function and usage.

Master Command Format

^z | <ctrl_spec> | <csbx> | ^

where:

<ctrl_spec> = Control command letter from Table 15-6.
 <csbx> = One or more sub fields which serve as qualifiers for the <ctrl_spec> command type. The amount of <csbx> fields is optional depending on the <ctrl_spec> field. Note the <csbx> field is omitted for some commands.

Table 15-6 ^z Special System Control Codes

<ctrl_spec>	Parameter	<csb> fields required	Page
V	Select ticket package version for status reply.	2	107
P	Set dynamic power management peak current value.	1	106
A	Select automatic paper loading enable/disable.	1	104
S	Select extended sensor options.	1-2	106
L	Select default printer language.	1	105
c	Set cutter control options.	1	104
l	Enable/disable Flash		105
D	Set Paper Low's level counter		105

^z|\$|

Flash Transfer Command

Command Description

It is important to understand the internal handling of the Flash and RAM memory of the controller to make best use of its data retention features.

On power-up, the parameters of Table 15-7 are copied from Flash into a RAM mirror area. The printer operation is controlled only by the data in this mirror RAM area, not the source tables in Flash. Any changes you make to these parameters will be made to the shadowed RAM area and will be available until the printer is reset or power is cycled.

If you want the printer to 'memorize' any of the changes made to these variables, including the addition and deletion of Print Regions and Templates, you must use the ^z|\$|^ command to replace the Flash source tables with the contents of the mirror RAM area.

This command causes an erase/program cycle of the Flash memory, of which there is a finite limit (~10,000), and takes approximately 2 seconds to execute. Therefore, it is recommended that you use the ^z|\$|^ command only at the end of a parameters modification session. After this command is received, the printer will disable communications either through an XOFF or hardware handshake, and will go offline for a period while Flash is programmed. After programming is completed, the printer will re-enable communications with the host.

Printer power should not be interrupted while the printer is programming the Flash memory.

Table 15-7 User-Definable Flash Memorized Control Parameters

Cmd	Parameter	ID
^T	Templates	0
^R	Print Regions	1
^A	Communications parameters	2
^L	Paper supply parameters	3
^O	Printer operational mode	4
^s	Sleep mode parameters	5
^tavg	Print darkness	6
^z	User-defined system configuration parameters	7

Command Format

^ z | \$ | ^

Sequencing

Asynchronous

Default

No default

Notes

1. Do not interrupt power for 3 seconds after this command is issued.
2. The low power standby mode described as SLEEP in the power management section does not constitute a power down and has no effect on the shadowed RAM parameters.

^z|A|

Enable/Disable Automatic Paper Loading

Command Description

This command enables and disables the automatic paper loading feature (described in Chapter 5).

Command Format

^z | A | <alcode> | ^

where <alcode> = '0' indicates disable; '1' indicates enable

Command Examples

^z|A|1|^ ;Enable automatic paper loading.

Default

Automatic paper loading enabled

^z|C|

Cutter Setup Parameters

Command Description

This command establishes the cutter control settings.

Command Format

^z | c | <eject_dist> | ^

where <eject_dist> = Number of dot lines to feed before a cut when a cut command is received. This function causes enough paper to advance automatically to ensure that the end of the ticket clears the cutter blade. Range: '0' – '609'.

Command Examples

^z|c|100|^ ;Before performing a cut, eject 100 dots lines of paper.

Default

<eject_dist> = Set to the mechanical distance between the printer mechanism the cutter blade.

Note

This value is usually factory set to match the mechanical distance between a given printer mechanism and its associated cutter blade. There is generally no reason to adjust this value.

^z|D|

Set Paper Low's Level Counter

Command Description

This command uses a number that users send down to printer as a starting point once the paper low condition is activated. The number will be decremented after every print job. When it is zero, the printer will report the paper low condition. Normally, the paper low condition will set when there are about 14 tickets (for the older version sensor). The recommend number is sent down to the printer is 10. Note: For the Paper Low Sensor effective March 2008, the paper low condition is set when there are approximately 2 tickets.

Command Format

^z|D|XX|^

where XX is two-digit number

Command Examples

^z|D|10|^ ;5eh 7ah 7ch 44h 7ch 31h 30h 7ch 5eh

This will set the counter to 10, and this counter will start to activate when paper-low condition is activated.

^z|L|

Select Default Printer Language

Command Description

The printer supports both line printer mode and page printing mode.

This command selects the printer language mode the printer enters upon power-up or a reset.

Command Format

^z | L | <language> |^

where

<language> = The default printer language.

'T' – TCL page mode language;

'J' – Line printer mode (journal printing or for use a Windows system printer)

Command Examples

^z|L|T|^ ;Select TCL page printer language as the power-up default.

Default

<language> = T

^z|||

Enable/Disable Paper Low Bezel LED

Command Description

This command enables or disables the flash on the Paper Low bezel LED control port.

Command Format

^z | 1 | <number> |^

where <number> = '0' = Disable the flash; '1' = Enable the flash.

Command Examples

^z|1|0|^ ; 5eh 7ah 7ch 6ch 7ch 30h 7ch 5eh **^z|1|1|^** ; 5eh 7ah 7ch 6ch 7ch 31h 7ch 5eh

^z|P|

Select Dynamic Power Limit Values

Command Description

The controller supports the limiting of peak current draw during printing. This command allows you to select a current index number ranging from 1-n, which will set the allowable peak current. The lower the <peak> current index number, the lower the peak current draw. In general, allowing a higher peak current draw will translate into faster print speed.

Command Format

^z | P | <peak> | ^

where <peak> = Decimal code for the allowable peak current index. The higher the number, the greater the peaks current allowed. Range 1 digit: 1 – 7.

Command Examples

^z|P|3|^ ;Select current index setting 3.

Default

Current index = 1

Notes

1. **Be careful when using this command!** Specifying a high number can lead to significant current draw that can destroy some batteries and power supplies. Always consult power source specifications concerning peak draw before using this command.
2. The maximum current index is mechanism dependent and can range from 3 for the 2" head to 7 for the 4" head. If selected current index exceeds maximum allowed by the thermal mechanism manufacturer, the maximum value permitted will automatically be substituted by the controller.
3. A value greater than the <peak> legal range results in the selection of the maximum value.

^z|S|

Select Extended Sensor Modes

Command Description

This command selects the system operational modes that rely on the extended sensors (for systems that support such sensors). Extended sensors include the Paper Present sensing function and the Paper Jam detected function. Chapter 9 provides more information on these sensor functions.

Command Format

^z | S | <paper_jam> | ^

where <paper_jam> = Field to set the operation of the printer when a paper jam is detected:

'0' – Ignore paper jam conditions and continue print and feed operation (Default detect mode).

'1' – Prevent further printing and feeding until: (a) the main release lever is raised, or (b) the FEED button is pressed and paper motion is detected (Suspend mode).

Command Examples

^z|S|1|^ ;Suspend printing and feeding if a jam is detected.

Default

<paper_jam> = 0

Note

This command applies only to printer systems such as the PSA-66-ST2RU and KBT. It does not apply to discrete controller card products.

^z|V|

Ticket Package Version Tag Select

Command Description

The status reply of the printer to a ^S command contains a software version tag. This tag identifies the software version the printer is executing. The controller supports two methods of identifying software: one is a 9-character factory version tag, the other being a 7-character tag that you can assign for your OEM purposes. This command selects which of the two version tags is returned by the ^S status query, and is printed on the configuration ticket. The command also allows you to program the 7-character OEM tag.

Command Format

^z | V | <csub1> | <csub2> | ^

where:

<csub1> = 'P' – program user version number with the tag that follows in the <csub2> field.
'S' – select version returned in status query reply and printed on the configuration ticket.

<csub2> = 'P' in <csub1>: this field is a 7-character string used for the user version string.
'S' in <csub1>: 'T' – select TCL version string, 'U' – select user-defined version string.

Command Examples

^z|V|P|OEM-1.0|^ ;Program user version string to “OEM-1.0”.

^z|V|S|U|^ ;Select user-defined version string.

Defaults

7-character user version that is initialized as TKT-1.0

Sequencing

Asynchronous

16 Printer Resident Ticket Templates

Introduction

To simplify development, the printer (when operating in TCL mode) supports a package of printer-resident gaming cashout style tickets. These pre-canned tickets are in the form of templates. When using these templates, it is only necessary to send the variable data (such as the date, validation number, etc.) to the produce tickets.

To say that the printer has resident ticket templates means that all the print region definitions (via the ^R command) and all the template definitions (via the ^T command) are already embedded in the printer's Flash memory. Therefore, to print these tickets, it is only necessary to send the print command (^P) with the variable data.

Ticket Package Tkt-*n.n*

This section identifies the standard tickets available with FutureLogic printers. The content of each ticket may be customized according to the firmware version installed in the printer. The tickets are in a ticket package where *n.n* identifies the ticket package version.

Table 16-1 below lists the 12 standard, pre-defined tickets, each based on a ticket template. Each ticket template has a different function depending on the payout situation.

Table 16-1 Ticket Package TKT-1.0 Printer Resident Tickets

Ticket Template	Ticket Description	Validator Scanable*	Potential Function
0	Cashout Ticket	YES	Standard cashout ticket
1	Jackpot Ticket	YES	Over limit ticket
2	Demo Ticket	YES	Demonstration purposes
3	Void Ticket	NO	Void ticket for diagnostic and testing purposes
4	Jackpot Receipt	NO	Over limit ticket, handpay only
5	Voided Demo Ticket	NO	Void ticket for demonstration purposes
6	Voiding Ticket	NO	Void a partially completed ticket due to a power hit, etc.
7	Cashout Receipt	YES	Handpay cashout receipt which is game recognizable
8	Cashout Receipt	NO	Handpay cashout receipt which is not recognizable by a validator
9	Generic Ticket	YES	Standard ticket format, all data is sent dynamically to the printer
A	Offset Generic Ticket	NO	Standard offset barcode format, all data is dynamic
B	Generic "Voiding" Ticket	NO	Same format as the Voiding Ticket, except all phrases are dynamic

*Scanability is rated solely on the position of the barcode on the ticket.

The following sections cover the commands necessary to produce these tickets. The strings listed are shown in their raw format. For more information on each field, refer to the Chapter 15.

Tkt-n.n Print Regions and Template Definitions

Since the standard ticket package is defined as printer resident, it is not necessary to send the ^R and ^T commands to create the various ticket layouts. The ^R and ^T commands listed below are the actual strings that would create the tickets in the standard ticket package version (and are illustrated in the following sections). This information is provided in case you want to study these strings or send them dynamically from the host system at boot time.



Note: See file tpprdef.bin for the RS232 version.

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^R|\$|DR|^

```
^R|1|R|104|1027|65|1020|0|3|1|8|2|2|0|0|^
^R|2|R|122|1027|31|502|0|3|1|8|1|1|0|0|^
^R|3|R|122|520|31|520|0|3|0|8|1|1|0|0|^
^R|4|R|208|1027|89|1020|0|3|1|3|2|2|0|1|CASHOUT TICKET|^
^R|5|R|208|1027|89|1020|0|3|1|3|2|2|0|1|JACKPOT TICKET|^
^R|6|R|208|1027|89|1020|0|3|1|3|2|2|0|1|DEMO TICKET|^
^R|7|R|208|1027|89|1020|0|3|1|3|2|2|0|1|VOID TICKET VOID|^
^R|8|R|208|1027|89|1020|0|3|1|3|2|2|0|1|JACKPOT RECEIPT|^
^R|h|R|208|1027|89|1020|0|3|1|3|2|2|0|1|CASHOUT RECEIPT|^
^R|9|R|208|1027|89|1020|0|3|1|3|2|2|0|1|VOID DEMO VOID|^
^R|A|R|358|822|31|210|0|3|0|8|1|1|0|1|VALIDATION|^
^R|B|R|358|607|31|607|0|3|0|8|1|1|0|0|^
^R|C|R|383|841|31|220|0|3|1|8|1|1|0|0|^
^R|D|R|383|616|31|180|0|3|1|8|1|1|0|0|^
^R|E|R|383|435|31|434|0|3|0|8|1|1|0|0|^
^R|F|R|398|1027|24|1020|0|3|1|7|1|1|0|0|^
^R|G|R|419|1027|24|1020|0|3|1|7|1|1|0|0|^
^R|I|R|491|1027|69|1020|0|3|1|5|2|2|0|0|^
^R|J|R|500|987|24|327|0|3|2|7|1|1|0|1|Ticket Void after|^
^R|K|R|500|650|24|193|0|3|0|7|1|1|0|0|^
^R|L|R|500|452|24|366|0|3|0|7|1|1|0|0|^
^R|N|R|268|1027|69|1020|0|3|1|5|2|2|0|0|^
^R|O|R|279|1027|24|1020|0|3|1|7|1|1|0|0|^
^R|P|R|303|1027|24|1020|0|3|1|7|1|1|0|0|^
^R|Q|R|331|841|31|220|0|3|1|8|1|1|0|0|^
```

```

^R|R|331|615|31|180|0|3|1|8|1|1|0|0|^
^R|S|R|331|430|31|425|0|3|0|8|1|1|0|0|^
^R|T|R|361|822|31|210|0|3|0|5|1|1|0|1|VALIDATION|^
^R|U|R|361|607|31|607|0|3|0|5|1|1|0|0|^
^R|Z|R|202|263|108|624|0|3|1|1|4|8|108|0|^
^R|X|R|362|263|108|624|0|3|1|1|4|8|108|0|^
^R|a|R|18|10|490|35|0|0|1|5|1|1|0|1|VOID VOID VOID VOID|^
^R|b|R|18|55|490|35|0|0|1|5|1|1|0|1|VOID VOID VOID VOID|^
^R|c|R|18|105|490|35|0|0|1|5|1|1|0|1|VOID VOID VOID VOID|^
^R|d|R|18|160|490|35|0|0|1|5|1|1|0|1|VOID VOID VOID VOID|^
^R|e|R|18|210|490|35|0|0|1|5|1|1|0|1|VOID VOID VOID VOID|^
^R|f|R|18|275|490|35|0|0|1|5|1|1|0|1|VOID VOID VOID VOID|^
^R|g|R|427|1155|265|744|0|3|1|3|6|6|0|1|VOID|^
^R|i|R|125|8|370|31|0|0|0|8|1|1|0|0|^
^R|j|R|208|1027|89|1020|0|3|1|3|2|2|0|0|^
^R|k|R|358|822|31|210|0|3|0|8|1|1|0|0|^
^R|l|R|500|987|24|327|0|3|2|7|1|1|0|0|^
^R|m|R|361|822|31|210|0|3|0|5|1|1|0|0|^
^R|n|R|18|10|490|35|0|0|1|5|1|1|0|0|^
^R|o|R|18|55|490|35|0|0|1|5|1|1|0|0|^
^R|p|R|427|1155|265|744|0|3|1|3|6|6|0|0|^
^R|q|R|500|987|24|193|0|3|1|7|1|1|0|0|^
^T|0|R|500|1240|i|1|2|3|4|A|B|C|D|E|F|G|I|J|K|L|Z|^
^T|1|R|500|1240|i|1|2|3|5|A|B|C|D|E|F|G|I|J|K|L|Z|^
^T|2|R|500|1240|i|1|2|3|6|A|B|C|D|E|F|G|I|J|K|L|Z|^
^T|3|R|500|1240|1|2|3|7|N|O|P|Q|R|S|T|U|J|K|L|X|^
^T|4|R|500|1240|i|1|2|3|8|N|O|P|Q|R|S|T|U|J|K|L|X|^
^T|5|R|500|1240|i|1|2|3|9|N|O|P|Q|R|S|T|U|J|K|L|X|^
^T|6|R|500|1240|a|b|c|d|e|f|g|^
^T|7|R|500|1240|i|1|2|3|h|A|B|C|D|E|F|G|I|J|K|L|Z|^
^T|8|R|500|1240|i|1|2|3|h|N|O|P|Q|R|S|T|U|J|K|L|X|^
^T|9|R|500|1240|i|1|2|3|j|k|B|C|D|E|F|G|I|q|L|Z|^
^T|A|R|500|1240|i|1|2|3|j|N|O|P|Q|R|S|m|U|q|L|X|^
^T|B|R|500|1240|n|o|p|^

```

To break down the strings above:

- ^R|\$|DR|^ This command deletes all resident print regions so new ones can be defined. It is good practice to always use this command before defining new print regions.
- ^R|.... The body of the packet above is the print region definitions used for all embedded templates in the printer. You will notice that the print regions ID's range from "1" through "9", "A" through "Z", and "a" through "q"; a total of 47 print region definitions.
- ^T|.... This is the template definition for the Cashout Ticket.

A sample ^P print string that will cause template 0 (defined above) to print would be:

```
^P|0|1|00-5671-4085-4797-7327|On Casino Floor|9295 Prototype Drive|Reno NV
89511|4|A|00-5671-4085-4797-7327|09/29/1999|09:09:23|TICKET # 0045|ZERO DOLLARS AND
FIFTY CENTS|G|$$$$$$$0.50|J|30 days|MACHINE# 0003-031|005671408547977327|^
```

To break down the ^P print string into its component pieces:

- ^P Command syntax.
- | Delimiter character, termed the "pipe" character (0x7C).
- 0 The 4th character in the stream, the "0" is the template ID. The template ID for the Cashout Ticket is "0".
- 1 The 6th character in the stream, the "1" is the copy count. Only use "1" for the copy count.
- |...|... Following this first part of the stream is the data for each of the dynamic print regions, delimited by the pipe character. You can track which of the fields posts to the ticket by comparing the string to the ticket picture.

Ticket Template "0" – Cashout Ticket

Template ticket "0" is the standard Cashout Ticket used for regular payout. Its barcode is positioned to allow bill validator acceptance. Figure 16-1 illustrates a Cashout Ticket.



Note: See file ticket0.xxx where xxx is the file extension based on RS232, Netplex, or USB.



Figure 16-1 Ticket Template "0" – Cashout Ticket

To print this ticket, issue this ^P print command:

```
^P|0|1|00-0000-0000-5366-8153|YOUR ESTABLISHMENT|YOUR LOCATION|CITY / STATE /
ZIP|||00-0000-0000-5366-8153|01/01/1991|00:02:21|TICKET # 0010|FIFTY DOLLARS AND NO
CENTS||$50.00||30 days|MACHINE# 0|000000000053668153|^
```

For a description of this command string, see page 109.

Ticket Template "1" – Jackpot Ticket

Ticket template "1" is a Jackpot Ticket used for a large denomination cashout. Its barcode is positioned to allow bill validator scanning. Figure 16-2 illustrates a Jackpot Ticket.



Note: See file ticket1.xxx where xxx is the file extension based on RS232, Netplex, or USB.



Figure 16-2 Ticket Template "1" – Jackpot Ticket

To print this ticket, issue this ^P print command:

```
^P|1|1|00-0000-0000-2209-3617|YOUR ESTABLISHMENT|YOUR LOCATION|CITY / STATE /  
ZIP||00-0000-0000-2209-3617|01/01/1991|00:02:31|TICKET # 0011|TWENTY FIVE DOLLARSS  
AND NO CENTS||$25.00||30 days|MACHINE# 0|000000000022093617|^
```

For a description of this command string, see page 109.

Ticket Template "2" – Demo Ticket

Ticket template "2" is a Demo Ticket used for testing and demonstration purposes. Its barcode is positioned to allow bill validator scanning. Figure 16-3 illustrates a Demo Ticket.



Note: See file ticket2.xxx where xxx is the file extension based on RS232, Netplex, or USB.

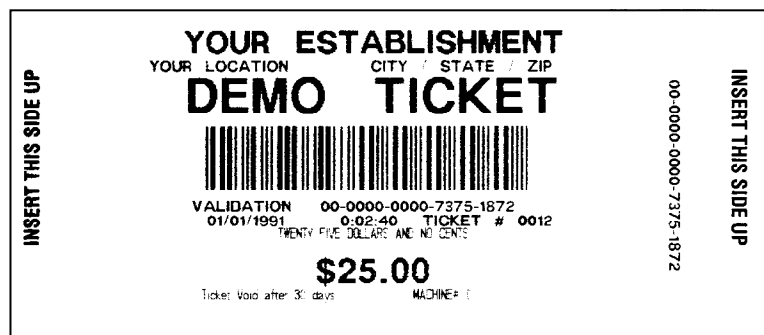


Figure 16-3 Ticket Template "2" – Demo Ticket

To print this ticket, issue this ^P print command:

```
^P|2|1|00-0000-0000-7375-1872|YOUR ESTABLISHMENT|YOUR LOCATION|CITY / STATE /  
ZIP||00-0000-0000-7375-1872|01/01/1991|0:02:40|TICKET # 0012|TWENTY FIVE DOLLARS AND  
NO CENTS||$25.00||30 days|MACHINE# 0|000000000073751872|^
```

For a description of this command string, see page 109.

Ticket Template "3" – Void Ticket

Ticket template "3" is a Void Ticket used for printing sample handpay style tickets. Its barcode is positioned to prevent bill validator scanning. Figure 16-4 illustrates a Void Ticket.



Note: See file ticket3.xxx where xxx is the file extension based on RS232, Netplex, or USB.

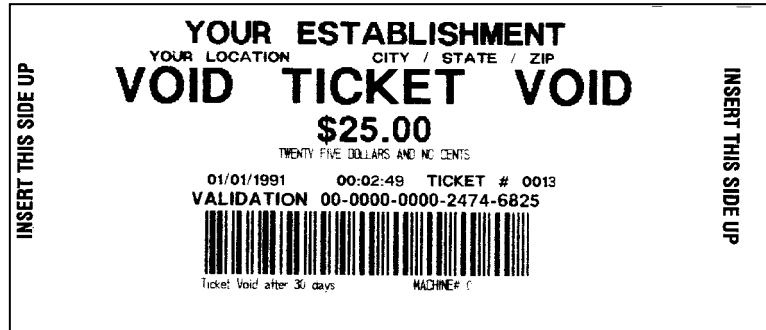


Figure 16-4 Ticket Template "3" – Void Ticket

To print this ticket, issue this ^P print command:

```
^P|3|1|YOUR ESTABLISHMENT|YOUR LOCATION|CITY / STATE / ZIP| |$25.00|TWENTY FIVE DOLLARS
AND NO CENTS| |01/01/1991|00:02:49|TICKET # 0013| |00-0000-0000-2474-6825| |30
days|MACHINE# 0|000000000024746825|^
```

For a description of this command string, see page 109.

Ticket Template "4" – Jackpot Receipt

Ticket template "4" is a Jackpot Receipt used as a receipt for a large denomination handpay cashout. Its barcode is positioned to prevent bill validator scanning. Figure 16-5 illustrates a Jackpot Receipt.



Note: See file ticket4.xxx where xxx is the file extension based on RS232, Netplex, or USB.

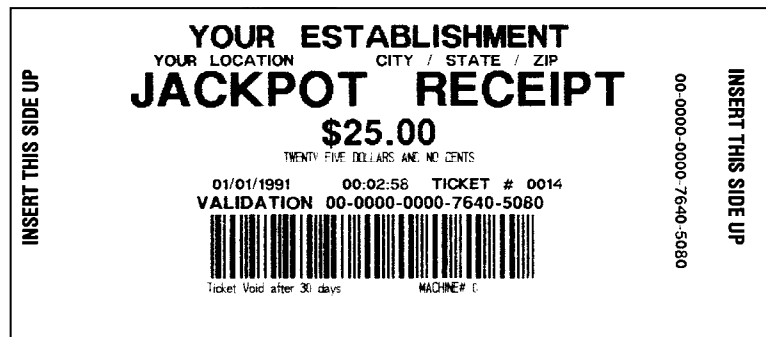


Figure 16-5 Ticket Template "4" – Jackpot Receipt

To print this ticket, issue this ^P print command:

```
^P|4|1|00-0000-0000-7640-5080|YOUR ESTABLISHMENT|YOUR LOCATION|CITY / STATE /
ZIP| |$25.00|TWENTY FIVE DOLLARS AND NO CENTS| |01/01/1991|00:02:58|TICKET # 0014| |00-
0000-0000-7640-5080| |30 days|MACHINE# 0|000000000076405080|^
```

For a description of this command string, see page 109.

Ticket Template "5" – Voided Demo Ticket

Ticket template "5" is a Voided Demo Ticket used for printing samples and testing of handpay style receipt tickets. Its barcode is positioned to prevent bill validator scanning. Figure 16-6 illustrates a Voided Demo Ticket.



Note: See file ticket5.xxx where xxx is the file extension based on RS232, Netplex, or USB.

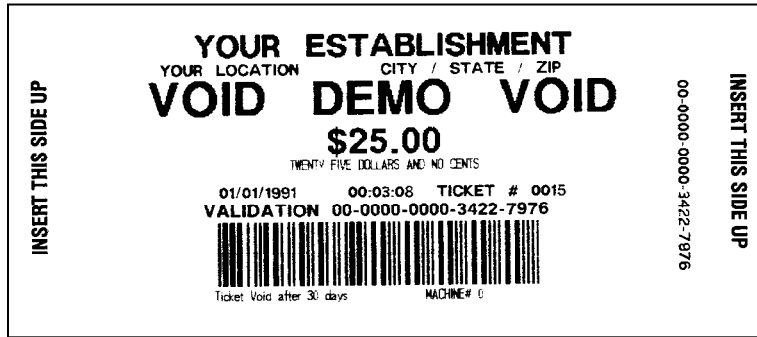


Figure 16-6 Ticket Template "5" – Voided Demo Ticket

To print this ticket, issue this ^P print command:

```
^P|5|1|00-0000-0000-3422-7976|YOUR ESTABLISHMENT|YOUR LOCATION|CITY / STATE /  
ZIP||$25.00|TWENTY FIVE DOLLARS AND NO CENTS||01/01/1991|00:03:08|TICKET # 0015||00-  
0000-0000-3422-7976||30 days|MACHINE# 0|000000000034227976|^
```

For a description of this command string, see page 109.

Ticket Template "6" – Static Voiding Ticket

Ticket template 6" is a Static Voiding Ticket used to void a partially printed ticket (as could be the case during a power hit). This ticket has all "Void" verbiage printer resident. Figure 16-7 illustrates a Static Voiding Ticket.



Note: See file ticket6.xxx where xxx is the file extension based on RS232, Netplex, or USB.

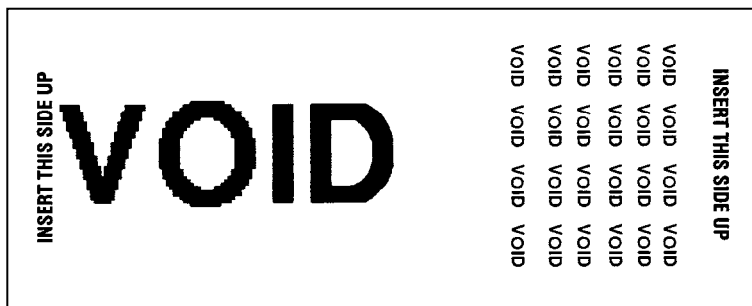


Figure 16-7 Ticket Template "6" – Static Voiding Ticket

To print this ticket, issue this ^P print command:

```
^P|6|1|||||||^
```

For a description of this command string, see page 109.

Ticket Template "7" – Cashout Receipt

Ticket template "7" is a Cashout Receipt which can be recognized by the game as a handpay ticket. Its barcode is positioned to allow bill validator scanning. Figure 16-8 illustrates a Cashout Receipt.



Note: See file ticket7.xxx where xxx is the file extension based on RS232, Netplex, or USB.

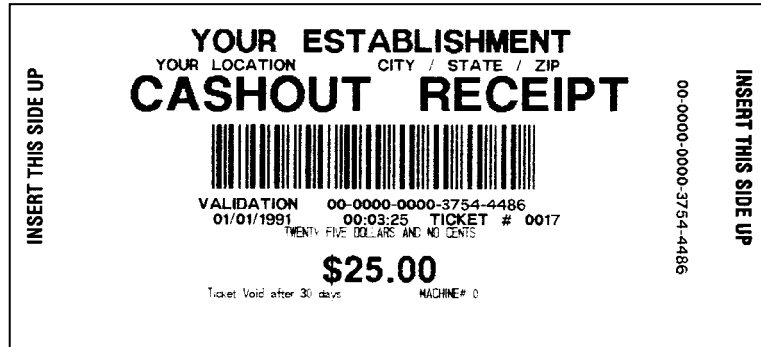


Figure 16-8 Ticket Template "7" – Cashout Receipt

To print this ticket, issue this ^P print command:

```
^P|7|1|00-0000-0000-3754-4486|YOUR ESTABLISHMENT|YOUR LOCATION|CITY / STATE /  
ZIP||00-0000-0000-3754-4486|01/01/1991|00:03:25|TICKET # 0017|TWENTY FIVE DOLLARS AND  
NO CENTS||$25.00||30 days|MACHINE# 0|000000000037544486|^
```

For a description of this command string, see page 109.

Ticket Template "8" – Handpay Cashout Receipt

Ticket template "8" is a Handpay Cashout Receipt used as a regular limit handpay ticket. Its barcode is positioned to prevent bill validator scanning. Figure 16-9 illustrates a Handpay Cashout Receipt.



Note: See file ticket8.xxx where xxx is the file extension based on RS232, Netplex, or USB.

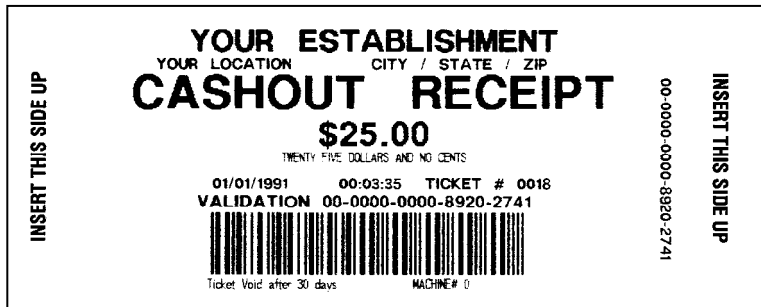


Figure 16-9 Ticket Template "8" – Handpay Cashout Receipt

To print this ticket, issue this ^P print command:

```
^P|8|1|00-0000-0000-8920-2741|YOUR ESTABLISHMENT|YOUR LOCATION|CITY / STATE /  
ZIP||$25.00|TWENTY FIVE DOLLARS AND NO CENTS||01/01/1991|00:03:35|TICKET # 0018||00-  
0000-0000-8920-2741||30 days|MACHINE# 0|000000000089202741|^
```

For a description of this command string, see page 109.

Ticket Template “9” – Generic Ticket

Ticket template “9” is a Generic Ticket with a format identical to ticket template “0”, except that all information on the ticket is sent dynamically by the host. Its barcode is positioned to allow bill validator scanning.

In the case of ticket template “0”, the phrases “Cashout Ticket” and “Validation” and the sentence “Ticket void after 30 days” which appear on the ticket are all stored printer-resident as part of the template. For ticket template “9”, the verbiage of these fields must be sent by the host using the ^P command string.

Except for this difference, ticket templates “9” and “0” are identical.



Note: See file ticket9.xxx where xxx is the file extension based on RS232 or USB.

Ticket Template “A” – Generic Offset Ticket

Ticket template “A” is a Generic Offset Ticket with a format identical to ticket template “8”, except that all information on the ticket is sent dynamically by the host. Its barcode is positioned to prevent bill validator scanning.

In the case of ticket template “8”, the phrases “Cashout Receipt” and “Validation” and the sentence “Ticket void after 30 days” which appear on the ticket are all store printer-resident as part of the template. For ticket template “A”, the verbiage of these fields must be sent by the host using the ^P command string.

Except for this difference, tickets “A” and “8” are identical.



Note: See file ticketa.xxx where xxx is the file extension based on RS232 or USB.

Ticket Template “B” – Generic Voiding Ticket

Ticket template “B” is a Generic Voiding Ticket with a format identical to ticket template “6”, except that all information on the ticket is sent dynamically by the host.

In the case of ticket template “6”, all words “Void” which appear on the ticket are stored printer resident as part of the template. In the case of ticket template “B”, the verbiage of all fields (between the “|” delimiters of the ^P string for ticket template “6”) must be sent by the host using the ^P command string.

Except for this difference, tickets “B” and “6” are identical.



Note: See file ticketb.xxx where xxx is the file extension based on RS232 or USB.

Appendix A Technical Specifications

General Specifications

This section identifies the general specifications of the printer.

General	
Dimensions (WxDxH)	110 x 304.8 x 64.3 mm
Weight	2.7 lbs.
Power Requirements	These units are to be supplied by Listed or IEC Certified Power Supplies, rated 24 VDC, minimum 2.7 A, marked "Class 2" or "LPS". (4.0A peak with 60% gaming ticket)
Sensors	Paper Low, Paper Out, Printer Drawer Open, Ticket Taken, Ticket Jam, Ticket in Chute, Black Mark (Includes a Host Controllable Buzzer)
Printing Speed	90mm/Second (3.5"/Second)
Print and Present	2.2 Seconds
Printing Width	62mm (true near-edge printing)
Storage	300 Tickets
Ticket Tray Extenders	Interchangeable, 600, 900 Ticket Tray
Resolution	8 dots/mm (203 dpi)
Firmware	Application in Memory is Reprogrammable (via Flash BIOS)
Self Test	Yes
Page Mode	Full Page Mode Printing (Simultaneous 4 Orientation Printing: 0°, 90°, 180°, 270°) Line and Box Draw Printer Resident Bitmap Graphics Printer Resident (Stored in Flash) Graphics
Paper Loading	Manual
Paper Feed	Automatic Hands Free
Method	Direct Thermal, Top Coated, Fanfolded and Perforated
Paper Specification	66mm W x 156mm L 4.5 mil, 1 Color/2 Colors
Bezel Control	Two High Current Ticket Printing Bezel Control Ports
User Interface	4 LED Indicators, Paper Advance Button
Upgrade Port	Allows for Printer Upgrades via USB Download or RS232 Main port
Hot Swappable	100%
Duty Cycle	Max. continuous feed of 1200 tickets with 8-second delay between tickets
Printing Resources	
Template Capacity	8Mb; Stores hundreds of clip art objects & thousands of graphic templates
Graphic Storage	6Mb
Color Printing	Red on Black and Blue on Black are available. Other colors can be supported as the print media becomes available. Color selection is controlled through the TCL TM language.

Characteristics	
Printer Languages	TCL Printer Language (Page Description Language) Subset of ESCP2
Fonts	8 (2.5 cpi, 3.3 cpi, 4.0 cpi, 5.5 cpi, 5.6 cpi, 7.3 cpi, 10.1 cpi, 20.5 cpi)
Font Scalability	May Be Independently Scaled from 1x – 7x in Both Height and Width
Bar codes	PDF-417, Interleaved 2 of 5, Code 39, UPC-A, UPC-E, UPC-E+2, UPC-E+5, Codabar, EAN-13, EAN-8, Code 128, MSI
Memory	2MB with 512K RAM
Interface	
Communications	USB 2.0 game interface (full speed of 12Mbps) with separate USB Download Port, Future GSA Compliant, Compliant with GSA, GDS, USB and traditional protocols RS232C and Netplex
Environmental	
Operating temperature	5°C to 50°C
Storage temperature	-20°C to 75°C
Operating humidity	5 to 85% RH non-condensing
Reliability	
Maintenance	Annual Print Head Cleaning Required Printer Completely Removable with Release Bar
Print Head Life	100km Min. (656,000 Tickets Based on US Currency Size)
Certifications	CE Certified, ISO 9001, RoHS, UL

Electrical Characteristics



CAUTION!

ESD Sensitive Equipment!

Electronic boards and their components are sensitive to static electricity. Care must be taken during all handling operations and inspections of this product in order to ensure product integrity at all times.

Do not handle this product out of its protective enclosure while it is not used for operations purposes unless it is otherwise protected.

Discharge your clothing before touching the assembly. Discharge tools before use.

Whenever possible, unpack or pack this product only at EOS/ESD safe workstations. Where a safe workstation is not guaranteed, it is important for the user to be electrically discharged before touching the product with his/her hands or tools.

Absolute Maximum Ratings



Warning: Operating the controller beyond the "Absolute Maximum Ratings" may cause permanent damage. These are only stress ratings. Operation beyond the "Operating Conditions" is not recommended and extended exposure beyond the "Operating Conditions" may affect device reliability.

DC signals measured to VSS, digital ground

Ambient Temperature Under Bias	0°C to +70°C ²
Storage Temperature	-20°C to 75°C
VDD Printer Power Supply	0V to 27.0V
Load Applied to bezel outputs	2.0A
Voltage Applied to RS232 Serial Port Inputs ¹	-13.0V to +13.0V

Notes:

¹ All serial signals follow RS232C ratings standards.

² Successful operation under the minimum rated temperature has been observed.

Operating Conditions

System Voltages

Symbol	Description	Min.	Max.	Units	Notes
T _A	Ambient temperature under bias	0	+60	°C	
V _{MAIN}	Main system supply	22.8	26.0	V	
I _L	Load applied to bezel outputs	0	1.5	A	
V _{OH}	Bezel high output voltage I _{OH} = -1A V _{DD} = 24.00V	V _{MAIN} -0.5	V _{MAIN}	V	
V _{OL}	Bezel off leakage current V _{DD} = 24.00V		10	µA	
V _{SERIAL}	Serial port RS232 voltages and currents				1

Power Supply Current

Condition ⁵	Typ.	Max.	Units	Notes
PSA-66-ST2RU active mode current	2.7	4.5	A	Peak surge current while printing 60% ratio gaming ticket with B rank head @ 24VDC. Does not include current for LED bezel outputs. Current peak for solid black ticket is 6.5A.
PSA-66-ST2RU idle mode current	80	100	mA	Draw on 24VDC supply. Does not include current for LED bezel outputs.



Note: See Chapter 11 for power-up/reset timing information.

Appendix B Paper Specifications

This appendix provides information on the paper used in the printer. For authorized ticket converters and complete paper specifications, contact your sales representative or visit our Web site:

www.futurelogic-inc.com.



Note: Use only approved paper in the printer. Use of improper paper may cause damage to the device and will void the printer's warranty.

Paper thickness: 4.5mil

Paper dimensions: 65mm x 156mm

Ticket Stack
Ticket, 300STK, 65X156, 5M, Fanfold
Ticket, 600STK, 65X156, 5M, Fanfold
Ticket, 900STK, 65X156, 5M, Fanfold

Note: Paper width is +0mm, -1mm.

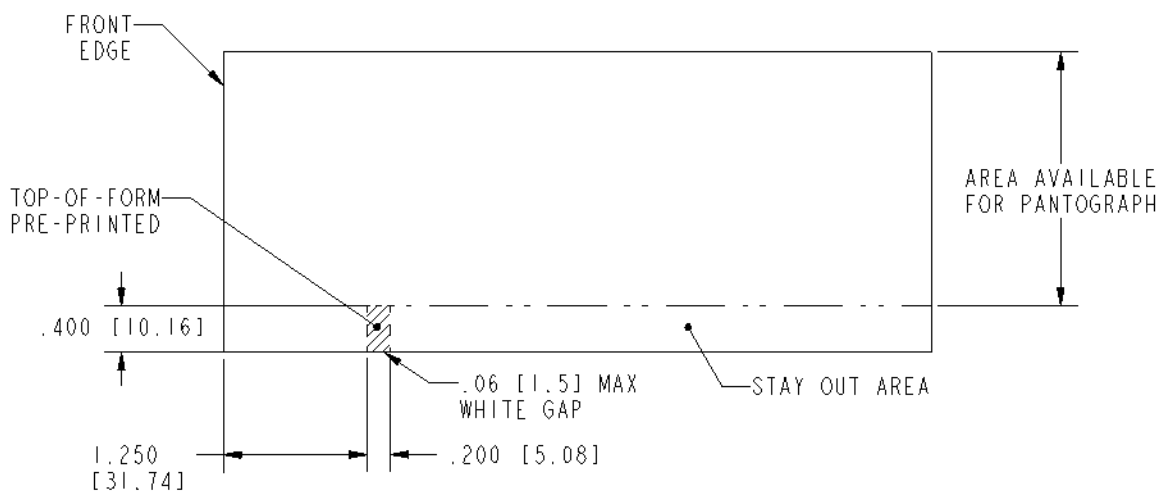




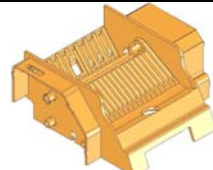




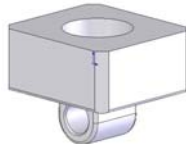
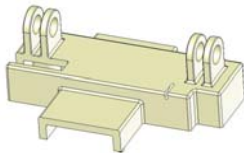


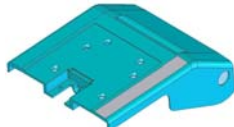
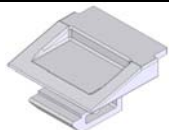
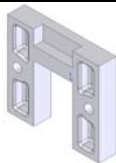
Figure B-1 Ticket Dimensional Specification

Appendix C Part Numbers – Printer/Spares

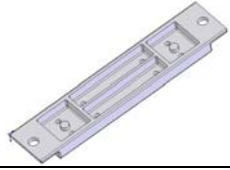
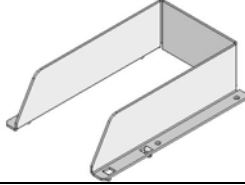
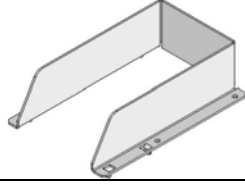
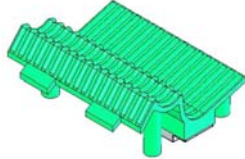
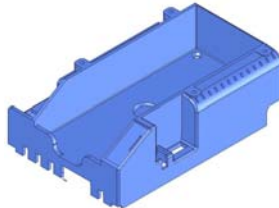
This appendix provides the part number and description of the printer and spares.

Printers – P/N	Description		
220-00086-300	GEN2 Universal Printer (RoHS) PSA-66-ST2RU USB, RS232, Future GSA Compliant*	RoHS Versions—Look for either of these labels:  	

Spares – P/N	Description	
370-00015-100	Base RoHS	
370-00170-100	Bottom Chute RoHS	
150-00176-100	Cable, USB-RS232, 14 pin RoHS	
150-00013-100	Cable, Evaluation, RS232, 14 pin RoHS	
150-00164-100	Cable, GDS Adaptor	

Spares – P/N	Description	
370-00021-100	Floating Part RoHS	
370-00024-100	Hinge RoHS	
370-00025-100	Hinge Pin RoHS	
500-00005-100	Keypad Membrane RoHS	
362-00047-107	Lid, Label RoHS	
370-00020-100	Lid, Top, Red RoHS	
370-00022-100	Locker RoHS	
370-00023-100	Locker Base RoHS	
370-00016-100	Main Bracket RoHS	

Spares – P/N	Description	
140-00099-100	Paper Taken Sensor Board RoHS	
140-00161-103	PCBA, GEN2 Mother board, with the new Low Paper Sensor (interrupter sensor) RoHS	
460-00005-100	Platen Shaft Assembly RoHS	
350-00031-102	Power Supply RoHS	
400-00007-100	Print Mech, F03-66 RoHS	
310-00112-100	Release Bar Bracket RoHS	
310-00115-100	Release Bar Guide RoHS	
460-00006-100	Roller Idler RoHS	
473-00078-100	Screws (100 pack) RoHS	
485-00008-100	Spring (50 pack) RoHS	

Spares – P/N	Description	
370-00026-100	Spring Plate RoHS	
482-00012-100	Star Washers (100 pack) RoHS	
320-00224-101	Ticket Extension Tray, 600 Tickets RoHS	
320-00224-102	Ticket Extension Tray, 900 Tickets RoHS	
370-00019-100	Top Presenter RoHS	
370-00291-100	Tray, Paper RoHS	

Appendix D Mechanical Dimensions

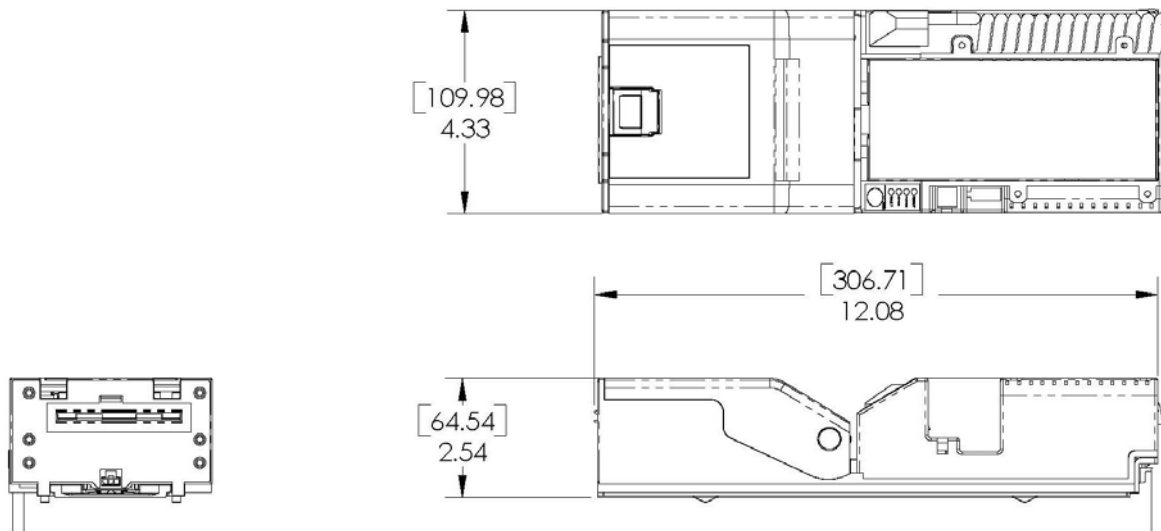


Figure D-1 PSA-66-ST2RU Printer

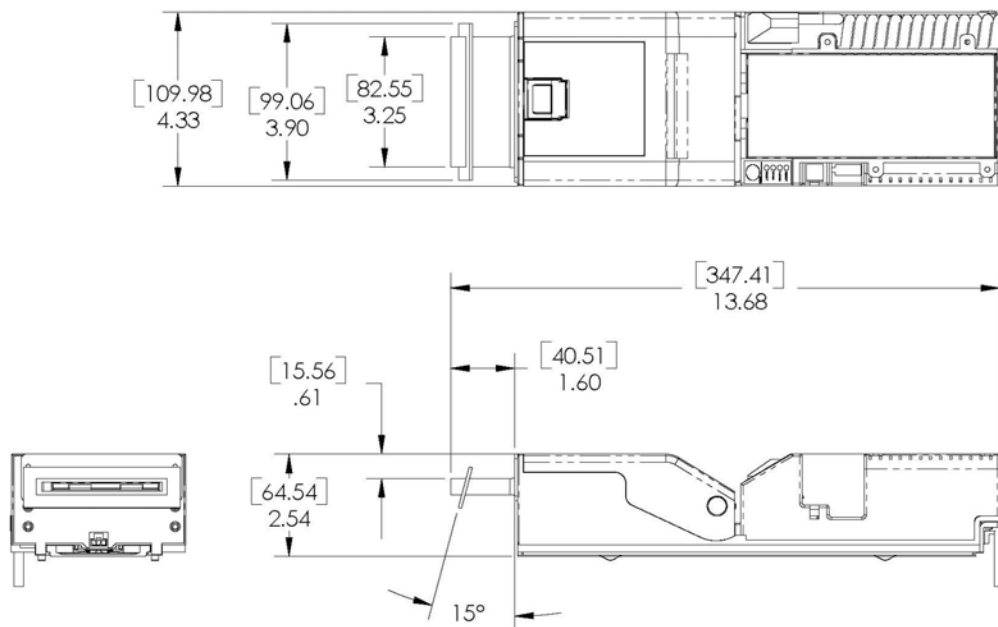


Figure D-2 PSA-66-ST2RU Printer with Green Bezel

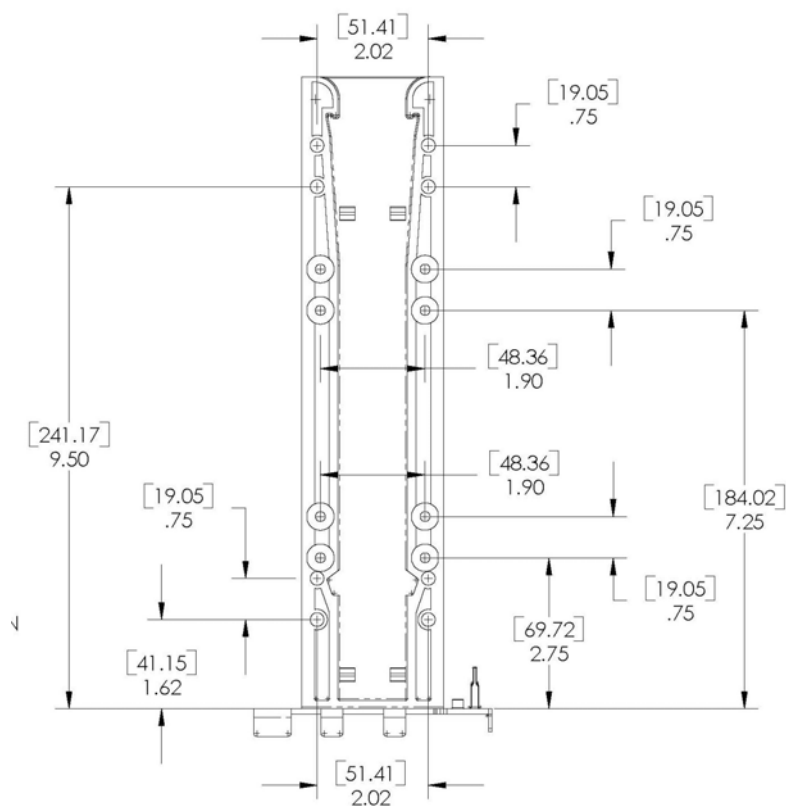


Figure D-3 Mounting Rail

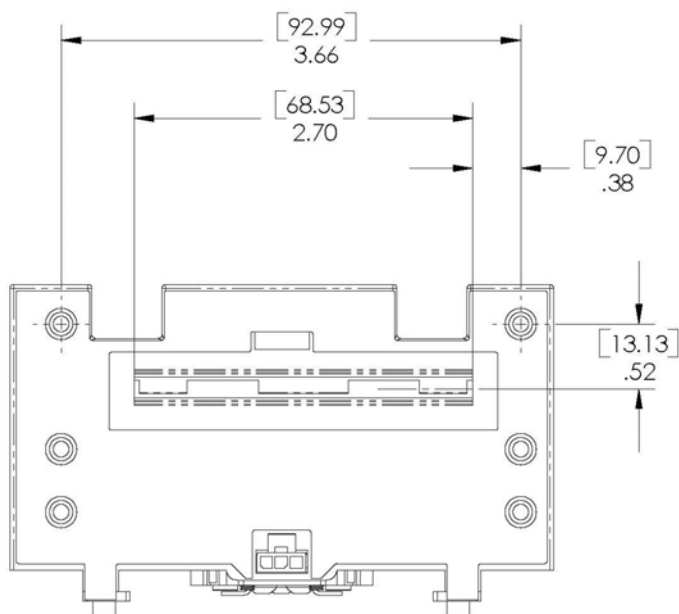


Figure D-4 Bezel Mounting Points

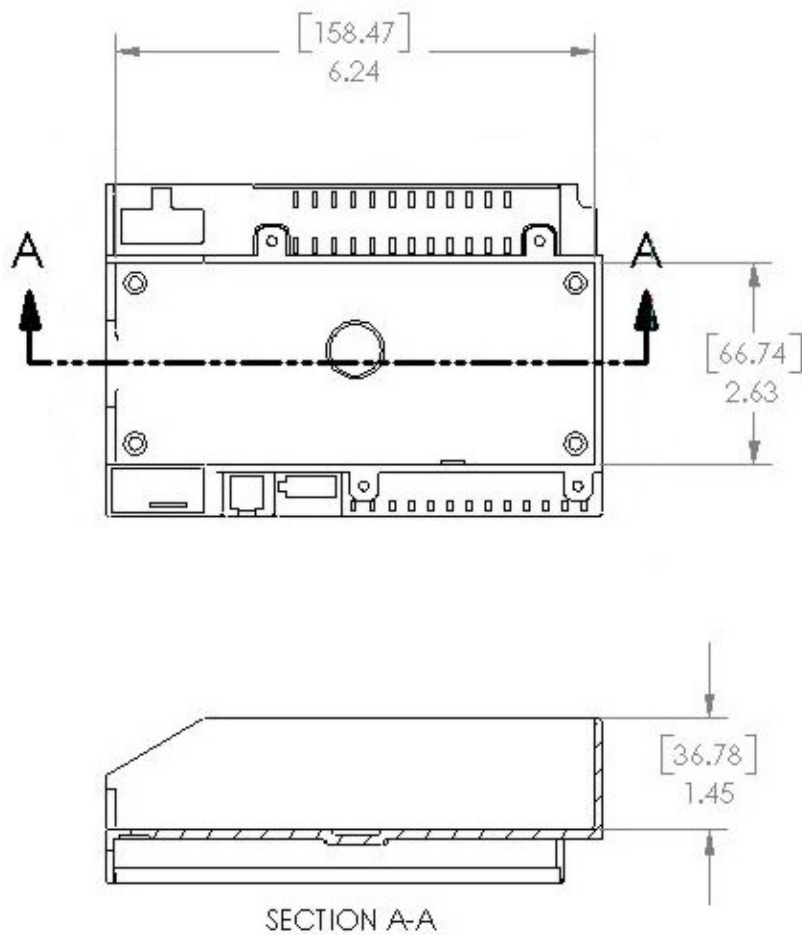


Figure D-5 Paper Tray Dimensions

Appendix E Status Flags Bit Definitions

Status_Flagx (SFx)	Bit	Method to reset bit status	Handle	Description/Use
1	5	sys	SF1_BUSY	This flag will =1 whenever the system is busy printing or processing a command. When the flag =0, the system is ready to process another command. If there are many commands in the queue, this flag will be seen to toggle frequently until all commands are processed and the system returns to idle.
1	4	sys	SF1_ERR	This flag is set whenever a system error exists or has occurred. It will remain set until no other system error flags are asserted.
1	3	sys	SF1_PLATTEN	This flag =1 when the print head is up, otherwise it will always =0.
1	2	sys	SF1_PAPER	This flag =1 when the paper is out, otherwise it will always =0.
1	1	sys	SF1_HEAD	This bit indicates that some type of hardware error exists with the print head or the printer that cannot be overcome by the system. Usually, the printer will not print when this flag is set; the printer must be serviced.
1	0	sys	SF1_VOLT	This bit indicates that a low, high, or dead voltage condition exists. If this error is due to the voltage being out of range, then printer will cease printing. If the error is due to low battery or marginal supply, the printer will continue to print until voltage is out of range.
2	5	sys	SF2_TEMP	This flag will be set if an over or under legal temperature condition is detected on the print head. The printer will cease printing.
2	1	^C	SF2_BUFF	This flag will be set if a storage buffer internal to the printer overflows, say due to an attempt to load too many Print Regions. This flag also =1 if the input communications buffer overflows (usually due to an improper handshaking setup).
2	0	^C	SF2_JOBMEM	This flag indicates that the ticket requested via a ^P command requires more free memory than is available to print. The printer will do its best to print the ticket as complete as possible and set this flag. Simplify the ticket if this flag bit =1.
3	5	^C	SF3_CMD	This flag =1 if there is a syntax or data field error with a received command, or the command is unsupported or unrecognized.
3	4	sys	SF3_LIBSAVE	This flag tracks whether the printer has any fonts loaded in its library. If this flag =1, the printer requires a font load and will not print until it is loaded.
3	3	sys	SF3_P_PRESENT	This flag indicates the paper taken status for printers equipped with Paper Taken sensors. When a ticket is present within the chute, this flag will =1, otherwise it will =0.

Status_Flagx (SFx)	Bit	Method to reset bit status	Handle	Description/Use
3	1	sys	SF3_OL_STAT	This flag indicates to the host the online/offline status of the printer. If the bit is =0, the printer is online. If the bit is =1, the printer is offline.
3	0	sys	SF3_PS	This flag will be set if the printer is configured to use indexed paper stock and does not see an index mark within the maximum ticket distance during printing or feeding. If set, the printer is using the wrong paper or there is an error with the Paper Out sensor.
4	5	-	-	Reserved
4	4	-	-	Reserved
4	3	sys	SF4_JNL_MODE	This flag =1 if the printer is in journal mode, otherwise if in TCL mode, this flag will =0.
4	2	sys	SF4_CUTTER	This flag will be set if the printer detects that a Cutter error has occurred. This flag may also be set in systems that do not support electric paper cutters. In this case, the flag should be ignored. This flag <u>will not</u> prevent the cutter from operating if requested by subsequent commands.
4	1	sys	SF4_P_JAM	This flag =1 if a potential paper jam has occurred. The flag will not prevent new tickets from printing unless the system has specifically been instructed to do so through the ^z|S command.
4	0	sys	SF4_P_LOW	This flag =1 if the paper roll level is detected as low. A Paper Low condition indicates that the paper roll has little paper remaining. This flag triggers when the paper roll diameter is approximately: ~3.5"
5	5	^C	SF5_BCODE	This sticky bit flag begins as a 0. When in TCL mode and printing a barcode (usually used for redemption information), this bit will set at the moment that the last bar of the barcode was printed. This flag in combination with SF5_TOF can be used to track whether a ticket should be reprinted upon a power hit. The host should retain the status of this bit and SF5_BCODE to determine the action(s) once the power is up. NOTE: Not available in all firmware versions. Can be implemented as sticky if requested.
5	4	^C	SF5_TOF	This sticky bit flag begins as a 0. When in TCL mode and printing, this flag will set once the ticket has completed and the printer is at the top of the next form. This flag in combination with SF5_BCODE can be used to track whether a ticket should be reprinted upon a power hit. NOTE: Not available in all firmware versions. Can be implemented as sticky if requested.
5	3	sys	SF5_XOFF	This flag tracks the XON/XOFF state of the printer. When the printers input buffer is ~80% full, this flag =1. When the printer's input buffer drops to ~20% or less, this flag =0.
5	2	sys	SF5_DOOR	This flag =1 when the printer drawer is opened, otherwise it =0.

Status_Flagx (SFx)	Bit	Method to reset bit status	Handle	Description/Use
5	1	^C	SF5_BCODE_DONE	This flag = 1 when the data for the barcode is processed. This flag in combination with SF5_TOF can be used to track whether a ticket should be reprinted upon a power hit. The host should retain the status of this bit and SF5_BCODE_DONE to determine the action(s) once the power is up. NOTE: Not available in all firmware versions.
5	0	^C	SF5_PWR_RST	This sticky bit flag = 1 when the printer has powered up or been reset. This flag notifies the host that the printer has been reset or powered up. The host would then use the ^C command to clear this bit. This bit would be watched with particular interest during a print job. Gaming regulators would determine the requirements for recovering from this situation. At power up, you must print at least one ticket to clear this bit.

Note: These abbreviations apply: sys = cleared automatically by system, ^C = cleared by issuing the ^C command.

Index

#

- ♣ (ENQ) command details, 96
- ♣ ENQ (05h) command details, 58

;

;comment, 79

^

- ^ defined, 79
- ^|I| command details, 87
- ^A command details, 81
- ^b command details, 82
- ^c command details, 83
- ^C command details, 82
- ^f command details, 84
- ^F command details, 83
- ^G command details, 84
- ^h command details, 85
- ^j command details, 85
- ^L command details, 86
- ^|I| command details, 87
- ^|Ic| command details, 88
- ^O command details, 89
- ^P command details, 89
- ^r command details, 96
- ^R command details, 91
- ^s command details, 99
- ^S command details, 96
- ^T command details, 100
- ^tavg command details, 102
- ^z command details, 102
- ^z|\$| command details, 103
- ^z|A| command details, 104
- ^z|c| command details, 104
- ^z|D| command details, 105
- ^z|l| command details, 105
- ^z|L| command details, 105
- ^z|P| command details, 106
- ^z|S| command details, 106
- ^z|V| command details, 107

|

| defined, 79

A

- Adjust Print Darkness command. *See* ^tavg
- Advance The Print Position Vertically command.
See ESC J
- Assign Character Table command. *See* ESC (t

auto demand mode, 28

B

- barcode command, line printer language, 47
- Barcode Mode command. *See* ESC [b]
- barcodes
 - Code 128, 26
 - dimensional ranges, 25
 - PDF417, 62
 - resident, 25
 - usage, 25
- Beep command. *See* ^b
- bezel, 9
- bezels
 - display status, 29
 - LED control port, GEN2 Universal, 16
- Buffer Overflow error, 32

C

- Cancel Bold Font command. *See* ESC F
- Cancel Bottom Margin command. *See* ESC O
- Cancel Condensed Print command. *See* DC2
- Cancel Double Wide Print command. *See* DC4
- Cancel Superscript/Subscript Printing command.
See ESC T
- Carriage Return command. *See* CR
- Cashout Receipt ticket, 108, 115
- Cashout ticket, 108
- Cashout Ticket, 111
- Clear Error Status command. *See* ^C
- Clear Error Status Flags command. *See* ESC [C
- clearing a paper jam, 11
- Code 128
 - characters below 20H, 26
 - function codes, 26
 - special characters, 26
 - subsets A, B, and C, 26
- Coiled Cable Connector, 14
- communications, 34
- configuration commands
 - line printer language, 47
 - TCL printer language, 80
- continuous print mode, 28
- Control Paper Loading/Ejecting command.
See ESC EM
- CR command details, 49
- Cutter Setup Parameters command. *See* ^z|c|

D

- DC2 command details, 50

DC4 command details, 50
 default detect mode, 28
 Define Print Region command. *See* ^R
 Define Template command. *See* ^T
 Demo ticket, 108, 112
 dot line axis, 78
 Double Height Print On/Off command. *See* ESC w
 Double Wide Print On/Off command. *See* ESC W
 Drawer Open sensor, 28

E

Electric Cutter command. *See* ESC | c
 Enable Printing Of Upper Control Codes command.
 See ESC 6
 Enable Upper Control Codes command. *See* ESC 7
 Enable/Disable Automatic Paper Loading
 command. *See* ^z|A|
 Enable/Disable Page Breaks command. *See* ESC | P
 Enable/Disable Paper Low Bezel LED
 command, 105
 Enable/Disable Underline command. *See* ESC -
 ENQ (05h) command details, 58
 Enter Journal Mode command. *See* ^j
 errors
 Buffer Overflow, 32
 condition recovery, 30
 Head Up, 31
 Missing Black Index Mark, 32
 Paper Jam, 32
 Paper Out, 31
 Print Head, 31
 printer status, 33
 Software, 32
 Temperature, 32
 Voltage, 31
 ESC - command details, 50
 ESC \ command details, 62
 ESC ! command details, 51
 ESC \$ command details, 52
 ESC (^ command details, 52
 ESC (c command details, 53
 ESC (C command details, 53
 ESC (t command details, 54
 ESC (U command details, 54
 ESC (v command details, 55
 ESC (V command details, 55
 ESC @ command details, 56
 ESC [c command details, 57
 ESC [C command details, 57
 ESC [F command details, 57
 ESC [P command details, 58
 ESC [S command details, 58
 ESC [^] ESC command details, 61
 ESC [b] command details, 61
 ESC + command details, 63
 ESC 0 command details, 63
 ESC 2 command details, 63

ESC 3 command details, 64
 ESC 6 command details, 64
 ESC 7 command details, 64
 ESC B command details, 65
 ESC c command details, 66
 ESC C command details, 65
 ESC C NUL command details, 66
 ESC D command details, 67
 ESC defined, 49
 ESC E command details, 67
 ESC EM command details, 68
 ESC F command details, 68
 ESC g command details, 68
 ESC J command details, 69
 ESC l command details, 69
 ESC M command details, 70
 ESC N command details, 70
 ESC O command details, 71
 ESC p command details, 71
 ESC P command details, 71
 ESC Q command details, 72
 ESC S command details, 72
 ESC SP command details, 73
 ESC t command details, 73
 ESC T command details, 73
 ESC w command details, 74
 ESC W command details, 74
 ESC X command details, 75
 Escape To Page Printing Mode command.
 See ESC [^] ESC
 evaluation unit setup, 6

F

FEED button, 8, 10, 86
 Feed command. *See* ^f
 FF command details, 75
 Firmware Upload Port, 21
 Flash, 60, 88, 91, 95, 98, 100, 101, 103, 108
 Flash Transfer command. *See* ^z|\$|
 Flush commands. *See* ^F
 fonts, 24
 line printer language, 47
 selection commands, 48
 Form Feed command. *See* FF

G

GEN2 Universal
 bezel LED control port, 16
 firmware upload port, 21
 Generic Offset ticket, 116
 Generic ticket, 108, 116
 Generic Voiding ticket, 108, 116

H

Handpay Cashout Receipt ticket, 115

handshaking

- RS232, 37
- RS232 RTS hardware, 39
- RS232 XON/XOFF, 37

Head Up error, 9, 31, 33

Historical Data command. *See* ^h

Horizontal Tab command. *See* HT

HT command details, 76

I

Initialize Printer command. *See* ESC @

Inventory Request command. *See* ^I|I|

J

Jackpot Receipt ticket, 108, 113

Jackpot ticket, 108, 112

K

keypad status lights, 9

L

LEDs, 9

LF command details, 76

library command, TCL printer language, 80

Line Feed command. *See* LF

line printer language, 44

- barcode command, 47
- character sets, selecting, 47
- configuration commands, 47
- font selection commands, 48
- fonts, selecting, 47
- line spacing commands, 47
- margins, setting, 44
- order of commands, 44
- positioning commands, 48
- print area commands, 45
- print area, setting, 44
- special commands, 48
- system specific commands, 49

line spacing commands, line printer language, 47

loading paper, 9

Low Power Standby Mode command. *See* ^s

M

main release lever, 12

Master Select command. *See* ESC !

Missing Black Index Mark error, 9, 32, 33

mounting the printer, 22

O

Obtain Program CRC command, 84

Offset Generic ticket, 108

P

paper

clearing a jam, 11

loading, 9

paper axis, 78

Paper Cutter command. *See* ^c

Paper Jam

error, 9, 32, 33

sensor, 28

Paper Low sensor, 27

Paper Out

error, 9, 31, 33

sensor, 27

Paper Taken sensor, 28

Paper Tray, 22

PDF417, 62

Poll The Printer For Status command. *See* ESC [S

polling commands, TCL printer language, 80

ports

bezel LED control, GEN2 Universal, 16

firmware upload, 21

positioning commands, line printer language, 48

power supply, 21

power-up/reset timing, 34

Presentation Chute, 22

Print Batch command. *See* ^P

print control commands, TCL printer language, 79

Print Data As Characters command. *See* ESC (^

Print Head

cleaning, 12

error, 9

Print Head error, 31, 33

printer

auto-demand mode, 89

electrical characteristics, 118

errors. *See* errors

features, 4

general specifications, 117

language features, 43

mechanical dimensions, 125

mounting, 22

on-demand mode, 89

online mode, 89

operating conditions, 119

packaging considerations, 22

part numbers, 121

power supply current, 119

power-up/reset timing parameters, 119

removing, 13

resident ticket templates, 108

self test, 11

system voltages, 119

testing, 6

Printer Open sensor, 27

Printer Platen Engaged sensor, 27

printer, removing, 13

printing

- journal printing, 43
- page mode, 43
- self test, 11
- template, 78
- testing, 6

Proportional Spaced Print On/Off command.
See ESC p

R

- release bar, 15
- removing the printer, 13
- Request Printer Status command. See ^S
- Reset Printer command. See ^r
- Return Materials Authorization, 5
- RS232
 - RTS hardware handshaking, 39
 - RTS hardware handshaking with XON/XOFF, 40
 - serial handshaking, 37
 - XON/XOFF handshaking, 37
- RS232/USB interface cable, 17
- RTS hardware handshaking, 39
 - with XON/XOFF, 40

S

- sample configuration ticket, 11
- Select 10.5pt, 10-cpi Font command. See ESC P
- Select 10.5pt, 12-cpi Font command. See ESC M
- Select 10.5pt, 15-cpi Font command. See ESC g
- Select Bold Font command. See ESC E
- Select Character Table command. See ESC t
- Select Condensed Print command. See SI
- Select Default Printer Language command.
See ^z|L|
- Select Double Wide Print (One Line) command.
See SO
- Select Dynamic Power Limit Values command.
See ^z|P|
- Select Extended Sensor Modes command.
See ^z|S|
- Select Font By Pitch And Point command.
See ESC X
- Select Font command. See ESC [F
- Select Printer Operational Mode comand. See ^O
- Select Superscript/Subscript Printing command.
See ESC S
- sensors
 - Drawer Open, 28
 - overview, 27
 - Paper Jam, 28
 - Paper Low, 27
 - Paper Out, 27
 - Paper Taken, 28
 - Printer Open, 27
 - Printer Platen Engaged, 27
- Set 1/6" Line Spacing. See ESC 2
- Set 1/8" Line Spacing. See ESC 3

- Set Absolute Horizontal Print Position command.
See ESC \$
- Set Absolute Vertical Print Position command.
See ESC (V
- Set Bottom Margin command. See ESC N
- Set Communications Protocol and Handshaking
command. See ^A
- Set Horizontal Motion Index (HMI) command.
See ESC c
- Set Horizontal Tabs command. See ESC D
- Set Intercharacter Space command. See ESC SP
- Set Left Margin command. See ESC l
- Set n/180" Line Spacing. See ESC 3
- Set n/360" Line Spacing. See ESC +
- Set Page Format command. See ESC (c
- Set Page Length In Defined Unit command.
See ESC (C
- Set Page Length In Inches command.
See ESC C NUL
- Set Page Length In Lines command. See ESC C
- Set Paper Low's Level Counter command.
See ^z|D|
- Set Paper Specs command. See ^L
- Set Relative Horizontal Print Position command.
See ESC \
- Set Relative Vertical Print Position command.
See ESC (v
- Set Right Margin command. See ESC Q
- Set Unit Of Measure command. See ESC (U
- Set Vertical Tabs command. See ESC B
- SF1_BUSY, 31, 128
- SF1_ERR, 128
- SF1_HEAD, 30, 31, 128
- SF1_PAPER, 30, 31, 128
- SF1_PLATTEN, 30, 31, 128
- SF1_VOLT, 30, 31, 128
- SF2_BUFF, 32, 128
- SF2_JOBMEM, 32, 128
- SF2_TEMP, 30, 32, 128
- SF3_CMD, 32, 128
- SF3_LIBSAVE, 32, 128
- SF3_OL_STAT, 129
- SF3_P_PRESENT, 128
- SF3_PS, 30, 32, 129
- SF4_CUTTER, 129
- SF4_JNL_MODE, 129
- SF4_P_JAM, 32, 129
- SF4_P_LOW, 129
- SF5_BCODE, 30, 31, 129
- SF5_DOOR, 129
- SF5_PWR_RST, 130
- SF5_TOF, 30, 129
- SF5_XOFF, 129
- SI command details, 76
- SO command details, 77
- Software error, 32
- software tools, 5
- SP defined, 49

spares, part numbers, 121
 special commands, line printer language, 48
 Special Control commands. *See* ^z
 Static Voiding ticket, 114
 status conditions, 9
 status flags
 bits summary, 60, 98
 examples, 60, 98
 status LEDs, 9
 status light, 8
 supporting documentation, 5
 suspend mode, 28
 system configuration, 6
 system control commands, TCL printer
 language, 80
 system specific commands, line printer
 language, 49

T

TCL printer language, 43, 78
 command summary, 79
 configuration commands, 80
 coordinate system, 78
 library command, 80
 polling commands, 80
 print control commands, 79
 reserved characters, 79
 system control commands, 80
 Temperature error, 9, 32, 33
 template printing, 78
 Ticket Package Version Tag Select command.
 See ^z|V|
 Ticket Path, 12
 tickets
 Cashout Receipt ticket, 115
 Cashout Ticket, 111
 Demo ticket, 112
 Generic Offset ticket, 116
 Generic ticket, 116
 Generic Voiding ticket, 116
 Handpay Cashout Receipt ticket, 115
 Jackpot Receipt ticket, 113

tickets (continued)

Jackpot ticket, 112
 printer-resident, 108
 sample configuration, 11
 Static Voiding ticket, 114
 template "0", 111
 template "1", 112
 template "2", 112
 template "3", 113
 template "4", 113
 template "5", 114
 template "6", 114
 template "7", 115
 template "8", 115
 template "9", 116
 template "A", 116
 template "B", 116
 template introduction, 108
 Void ticket, 113
 Voided Demo ticket, 114

U

USB/RS232 interface cable, 17

V

Vertical Tab command. *See* VT
 Void ticket, 108, 113
 Voided Demo ticket, 108, 114
 Voiding ticket, 108
 Voltage error, 9, 31, 33
 vouchers. *See* tickets
 VT command details, 77

W

warranty information, 4

X

XON/XOFF
 handshaking, 37
 RTS hardware handshaking, 40



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