Epic 950™
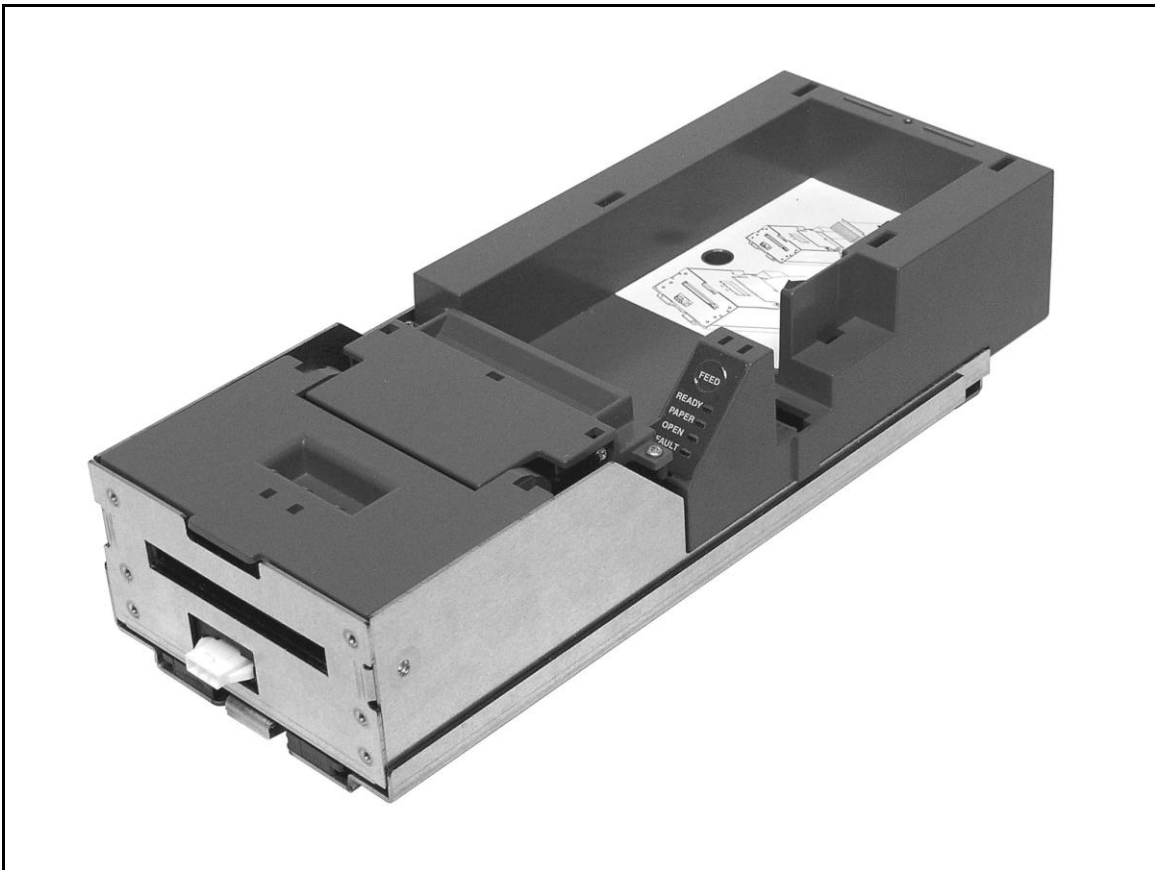
OEM Integration Manual

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Change History

Rev A	Initial release	July 2004
Rev B	Add index, table of page numbers, new commands	March 2005
Rev C	Add additional communications interface descriptions	March 2006
Rev D	Added internal/external bezels to bezel mounting section	May 2006
Rev E	Pg 22 – 95-06003L was 95-06003	May 2006
Rev F	Revised ticket specification information	Sept 2006
Rev G	Pg 13 updated max operating temp values	Feb 2007
Rev H	Added USB/Serial communications adapter Removed Ithaca logo	Dec 2009

Important:
Before installing any equipment be sure to consult the specifications in this manual. Failure to do so may cause integration problems. Portions of this integration manual may be changed without prior notice.

Note:
Losses that can be attributed to improper installation and working procedures are not the responsibility of TransAct Technologies Inc. No part of this manual may be used to recreate any part of the Epic 950^{TM} Printer. This manual is to be used for integration purposes only. If this manual contains any questionable information or mistakes please contact TransAct for assistance.

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Introducing Your Epic 950 Printer

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About Your Epic 950 Printer

The Ithaca Epic 950^{TM} printer represents the very latest technology for use in gaming ticket printing applications. It features full backward compatibility for previous users of Ithaca Series 800 printers, together with a host of new features designed to improve the performance of your gaming operations, including:

- TicketBurst^{TM}, a unique buffered transport system that prints and bursts the entire ticket internally before presenting it to the operator, solving the problem of premature ticket removal.

- Internal separation of tickets, providing consistently perfect single tickets accurately separated along perforation lines.

- QDT^{TM} (Quick Disconnect Technology) lets you remove the printer without the need to disconnect power from the unit, incorporating a one-touch hot swappable design that lets you remove and replace your printer at the touch of a front-mounted latch.

- Expanded status LEDs, giving you immediate visibility on printer, paper and fault status.

- The ability to upgrade your firmware completely via download, with no hardware modification required.

- 2-color ticket printing with user-programmable images and layout, to turn your tickets into a key part of your brand identity and marketing program.

Above all, the Epic 950 is designed for ease of programming and ease of use in your gaming operations. While supporting the full command language and macro features of the Series 800 printer, the Epic 950 introduces a new higher-level command interface which lets you quickly and easily integrate more layout and printing options than ever – while giving you the reliability, durability and uptime you have come to expect from Ithaca printers.

Who Should Read This Guide?

This document provides information useful to original equipment manufacturers (OEM) who will integrate the Epic 950 printer into their products.

What Is Included in This Guide?

This Integration Manual includes information on the mechanical, electrical and command language requirements of the Epic 950 printer. It provides the following information to support your integration efforts:

- Warranty and technical support information.
- Specifications and functionality description.
- Mounting requirements and mounting locations.
- Power and interface connections.
- Operational procedures.
- Programming information, including documentation of low-level and high-level command interfaces, as well as sample scripts to guide your own implementation efforts.

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

Warranty Options

All Epic 950 Printers come with a standard 24-month standard warranty covering both parts and labor that starts upon shipment from the factory. An optional extended warranty, covering both parts and labor for an additional 12 months, may be purchased separately. For more information concerning the warranty options, please contact the Sales Department at TransAct's Ithaca facility. You are responsible for insuring any product returned for service, and you assume the risk of loss during shipment to Ithaca C.O.D. packages are not accepted and warranty repairs are subject to the terms and conditions as stated on the Ithaca warranty policy.

Technical and Sales Support

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

On-line Technical Support

Our web site at **www.transact-tech.com** is your on-line portal to obtaining technical assistance with your Ithaca printer. Click on the Technical Support link to find documentation for your Epic 950 printer, including a current copy of this OEM Integration Manual featuring:

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

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

Telephone Technical Support

Live telephone support is available Monday through Friday from 8 AM to 5 PM Eastern US time, excluding holidays. We can provide general information about integrating Epic 950 printers with your system, technical support, documentation, or assistance in sending a printer for service. To obtain telephone support, call TransAct's Ithaca Facility at (607) 257-8901 and ask for Technical Support. To help us serve you faster, please have the following information ready when you call:

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

Return Materials Authorization and Return Policies

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

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

Service Programs

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

- Extended Warranty.
- Depot Repair.
- Maintenance Contract.
- Internet Support.

Sales Support

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

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Contact Information

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

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

chapter 2

Epic 950 Specifications and Requirements

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Epic 950 Specifications and Requirements
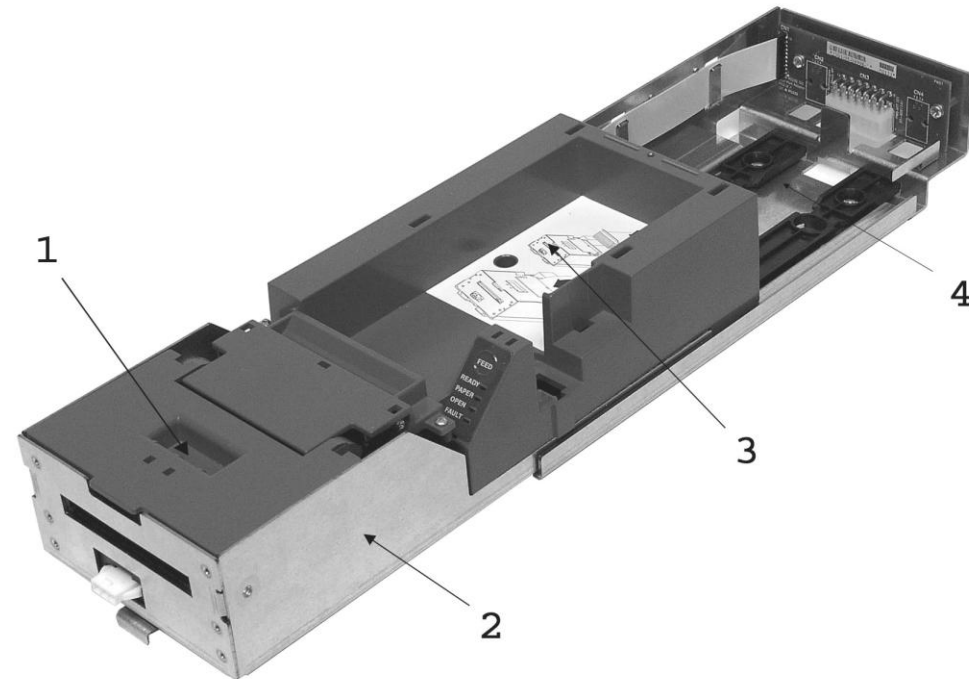
Figure 1. Epic 950 Printer Component Overview

1. Printer Mechanism
2. Inner Chassis Assembly
3. Printer Ticket Bucket Assembly
4. Outer Chassis Assembly

Standard Features

The following features are common to the Epic 950 Printers:

Key features:
- Perforated fan folded tickets in a stack of 200, 300 or 400 tickets.
- Barcode and total ticket cash-out capabilities.
- TicketBurst^{TM} – incorporating print, burst and transport zones, where the ticket is completely printed and burst before transport to operator.
- HotSwap QDT^{TM} (Quick Disconnect Technology), a hot swappable printer mechanism design for easy service.
- Modular interface PCB.

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Other standard features:
- Selections of 7.5, 10, 12, 16.5 and 20 characters per inch printing.
- Selectable printing of Normal, Double-high, Double-wide and Double-high/Double-wide.
- Sensors for Burst Ticket, Ticket Low, Top-of-Form/Ticket Out, Chassis Open, and Ticket Taken.
- Cover Open switch.
- Modular printer mechanism, ticket tray and sliding unit for easy maintenance.
- Open ticket path for ticket jam clearing.
- Operator interface: FEED button, status LED's (Ready/Paper/Open/Fault).
- Bezel lamp connection.
- imPort^{TM} firmware and graphics download port.
- Print face down.
- Page mode printing.
- Audible Buzzer.

Optional Features

- 600 count ticket capacity using optional extender walls.
- Dual port interface capable.
- RS-232 interface capable.
- USB interface capable.
- Bezels (Internal and external).

(Dimensions reflect use of 200 unit ticket bucket unless otherwise noted)

Dimensions
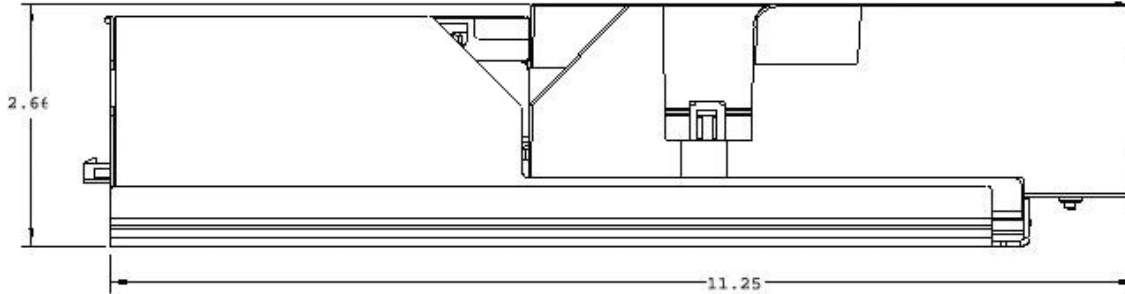
Figure 2. Epic 950 Printer: Dimensions

Stationery Module Size: H: 2.66" (66.6mm)   **W:** 4.66" (112.5 mm)   **D:** 11.25" (284.2 mm)

The Epic 950 is a stationery module, and is designed to work with any of the three interchangeable ticket capacities using extender walls. Please be sure to specify the desired box size when making your selections.

200 ticket setup: **H:** 2.66" (66.6mm)   **W:** 4.66" (112.5 mm)   **D:** 11.25" (284.2 mm)
400 ticket setup: **H:** 4.04" (102.6 mm)   **W:** 4.66" (112.5 mm)   **D:** 11.25" (284.2 mm)
600 ticket setup: **H:** 5.54" (140.7 mm)   **W:** 4.66" (112.5 mm)   **D:** 11.25" (284.2 mm)

Weight: 3.8 lbs.

Interface
Type   Bi-Directional, serial RS-232 using transmit, receive, and ground.
Protocol   Ready/Busy or XON/XOFF, 9600 baud, 8 data bits, no parity,
                1 start bit, 1 stop bit.

Printer
Printer Type: Fixed linear thermal head.

Printer Environmental Conditions
Operating Temperature Range: $5^0 \sim 60^0C$ ($41^0 \sim 140^0F$)
Shipping/Storage Temperature Range: $-10^0 \sim 50^0C$ ($14^0 \sim 122^0F$)
Operating Humidity Range: 10% ~ 90% Noncondensing only
Shipping/Storage Humidity Range: 5% ~ 90% Noncondensing only

Power Requirements
24 Vdc ± 10%.
2.2 Amps max. @ 24 Vdc @ 25% print ratio.

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Test Standards

EN50081-1-1992
EN55022-1998, Class A
FCC CFR-47, Part 15, Class A
EM55082-1-1998
EN55024-1998
EN61000-4-2, Level 3
EN6100-4-3, Level 2
EN61000-4-4, Level 2
EN61000-4-5, Level 2
EN61000-4-6, Level 2

ESD IEC 1000-4-2, 6kv direct discharge and 8kv air discharge.
Radiated RF IEC 1000-4-3, 3 v/m from 27 MHz to 1 GHz.
Fast transit (burst) IEC 1000-4-4, 2kv powerline, 1kv I/O lines (level 3, Industrial environment).

Acoustic Noise: Less than 65 decibels max. while printing a 30/30 format.
                    (measured in 10 positions @ operator level with distance of 1 meter, per ISO 779).

Mechanism Characteristics

Drawer Slide Force: TBD lbs. max.
Opening Distance: 190mm (7.5") (approximate).
Drawer Holding Force: 4.5 lbs. (out of detents).
Mechanism Operating Angle: Horizontal to 45º inclination (ticket exit slot up).

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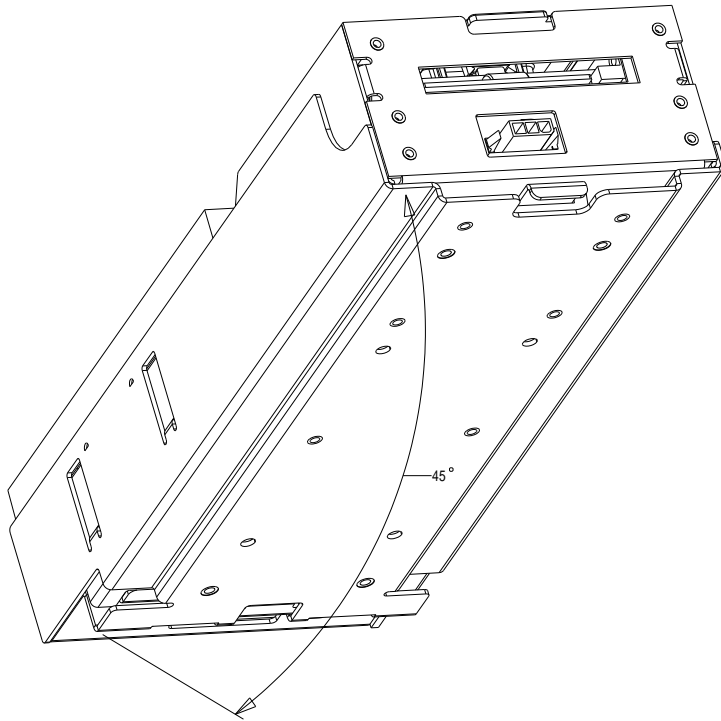
Figure 3. Maximum Mechanism Operating Angle

Printing Specifications

Print Method:	Thermal Sensitive Line Dot System.
Ticket Handling:	TicketBurst[TM] ticket buffering with burst.
Print Speed:	125 mm/sec. (5" per sec.) max. (monochrome) (in text mode).
Presentation Speed:	125 mm/sec. (10" per sec.) min.
Resolution:	203dpi x 203dpi.
Dot Pitch-Horizontal:	0.125 mm (8 dots/mm).
Dot Pitch-Vertical:	0.125 mm (8 dots/mm).
Line Feed Pitch:	3.2 mm (.125").
No. of Elements:	496 dots in-line.
Print Width:	62.0 mm (2.44").

Ticket Specifications

Dimension: (same size as US dollars)

2.56±.04" (65±1mm)
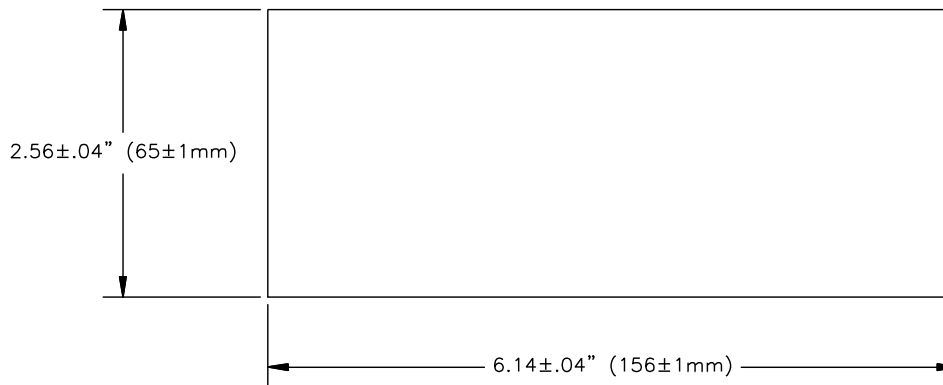
6.14±.04" (156±1mm)

Figure 4. Sample Ticket Size

Ticket Width:	65 ± 1mm (2.56" ± .03").
Ticket Length:	156 ± 1mm (6.14" ± .04") between perforations.
Ticket Thickness:	4.5-5.0 mils (.114-.127 mm).
Ticket Weight:	27# (102 g/m) Ave.
Brightness:	89% Ave. (84%Min.), Test method TAPPI T-525
Printing Colors:	Black (visible light absorption: 600 ~ 700 nm), Red, Green, Blue
Quantities Available:	Fan-folded stacks of 200, 300, 400 and 600 tickets.

Contract Transact for complete ticket specifications and approved suppliers

Bar Code Specifications

Standard Bar Code:	Interleaved. 2 of 5
Minimum Bar Width:	0.5 mm min./0.6 max.
W : N Ratio:	3 : 1 (recommended, with 12:4 wide bar width (dots):narrow bar width (dots)).

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# of Characters: 6 min./18 max.
Symbol Contrast Value: 70% min.
Applicable Standards: ANSI X3.182
                                  gsa-p0038.001.01

Design Envelope: Ticket Clearance

A minimum paper clearance distance of .75" is required above the printer's ticket buckets. The minimum clearance for all ticket buckets will vary, but should fall within the .75" minimum clearance measurement.

.75
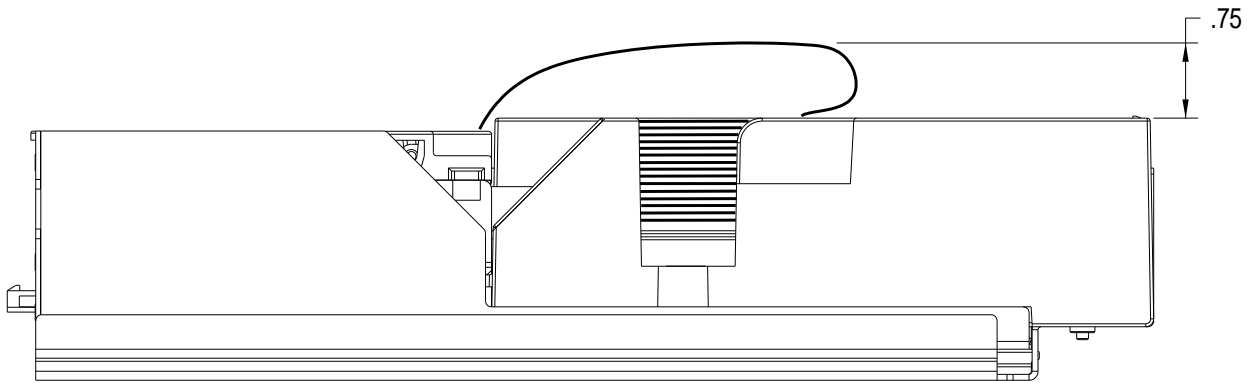
Figure 5. Design Envelope: Ticket Clearance

Black Dot Position and Presentation Scheme

All graphics preprinted on the ticket must be in thermal paper compatible ink.

Black Dot Position
The back of the ticket is used for the Black Dot/Top of Form indicator. For the printer to sense when a ticket has been indexed to the printing position, a Black Dot/Top of Form sensor is needed. It must be printed in black, thermal paper compatible, infrared readable ink. The 10.16mm area in line with the Black Dot/Top of Form indicator and the ticket edge (keep-out zone) must remain clear, as the Ticket Out Sensor will read that area while the ticket is printed and presented. The remaining area on the back of the ticket may be used for rules and disclaimer.
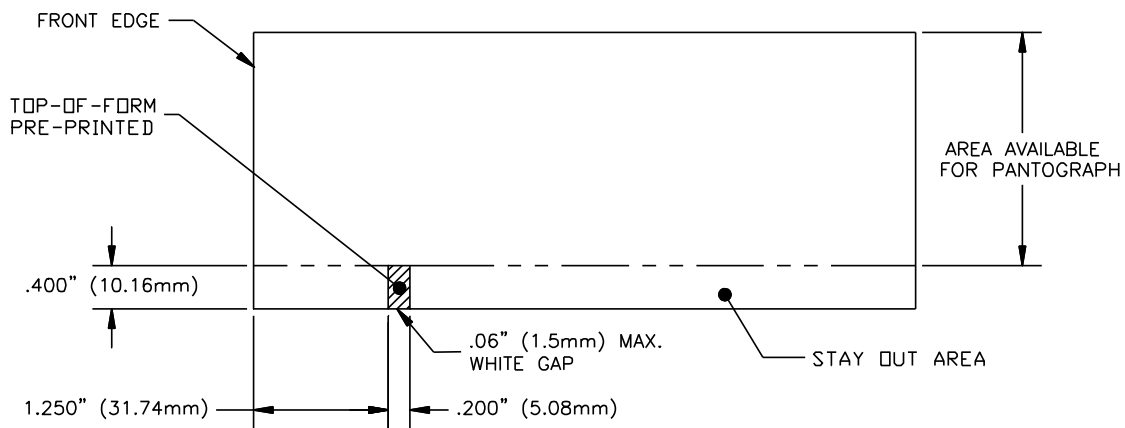
Figure 6. Location of Black Dot/Top of Form Indicator on Back of Ticket

Ticket Stack Orientation

To ensure the ticket is loaded correctly into the printer, the ticket stack must be properly loaded in the ticket box. The stack must be oriented so that the Black Dot/Top of Form mark of the tickets is on the leading edge of the ticket, not near the perforation of the next ticket. If the top ticket on the stack has the back facing upward, the perforation attaching the next ticket will be toward the front of the Ticket Tray with the Black Dot/Top of Form indicator in the rear right corner. If the print area is facing upward, the perforation attaching the next ticket will be toward the rear of the Ticket Tray. For instructions on inserting the first ticket into the printer, see the section "Loading Tickets into Feeding Mechanism".
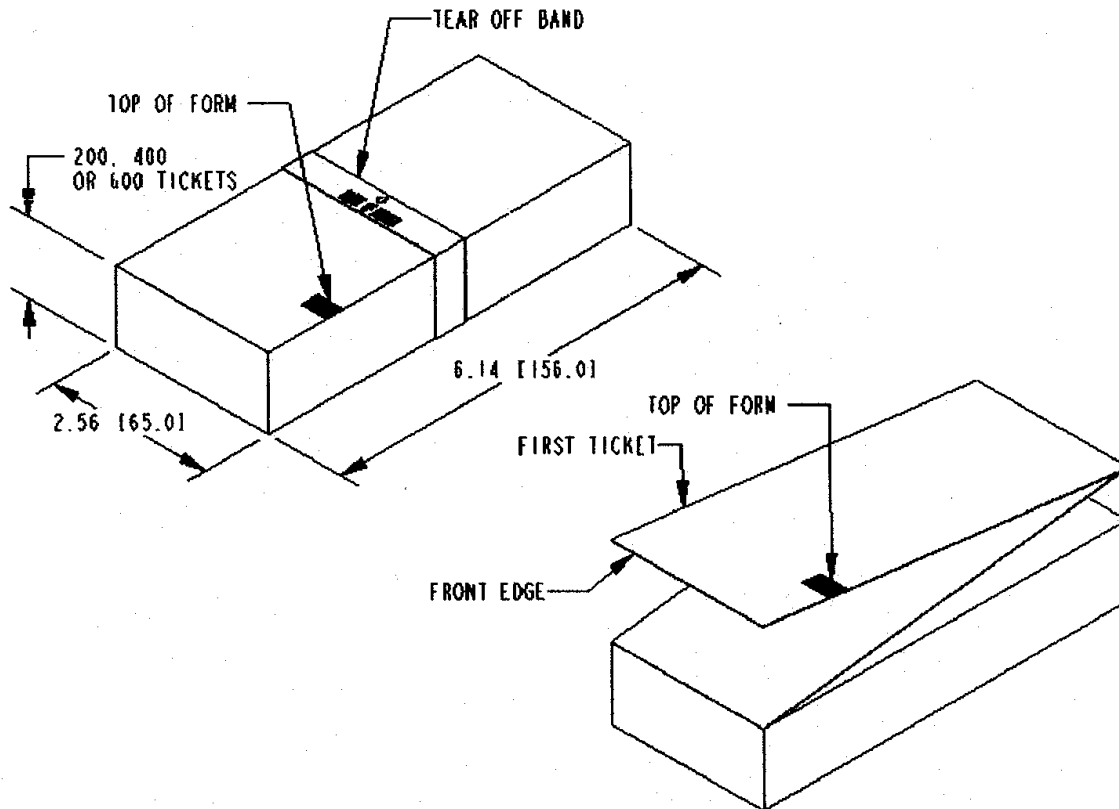
Figure 7. Ticket Stack Orientation

chapter 3

Mounting Requirements

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Mounting Requirements

Outer Chassis to Final Product

Bottom: 4x   M4x 0.7 press nuts.
                 4x   Φ.180" thru holes.
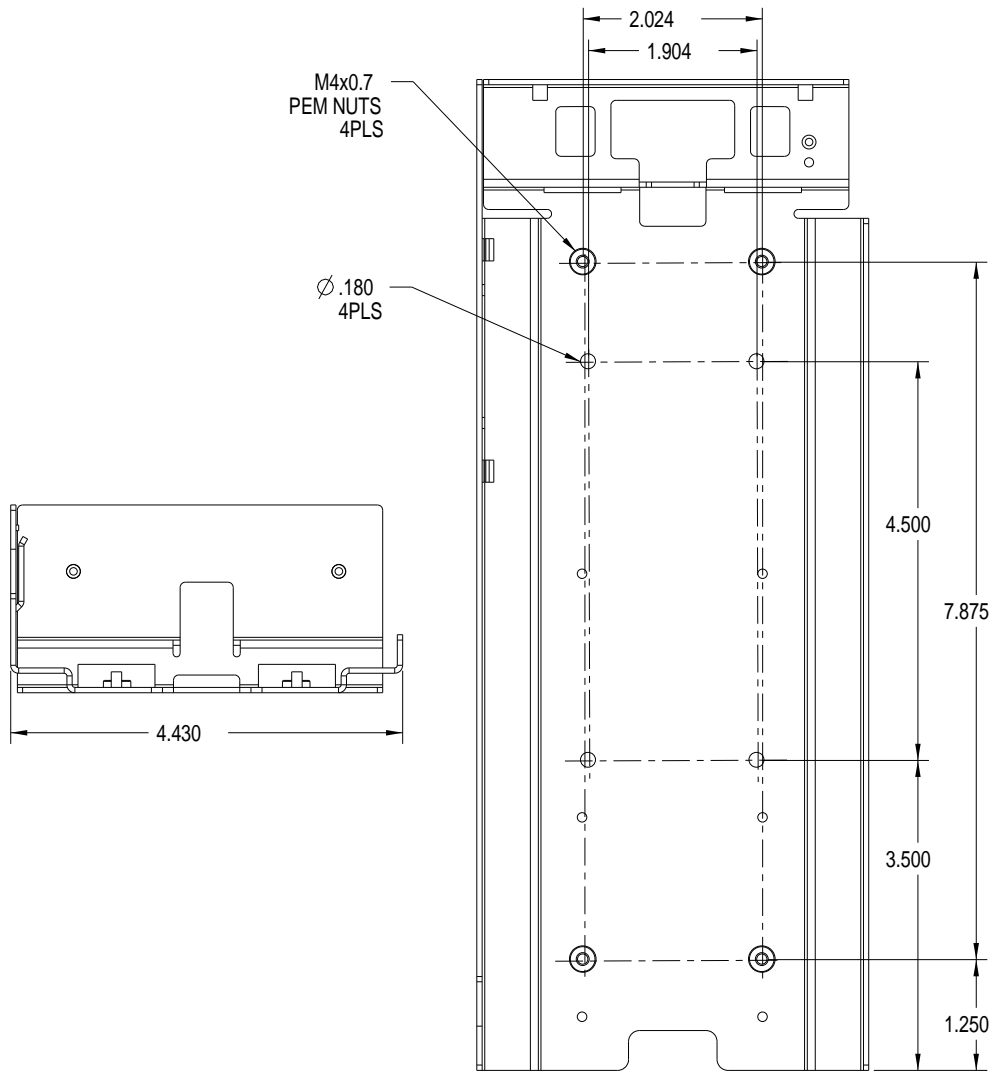
Figure 8. Outer Chassis to Final Product

Bezel Specifications and Recommendations

Bezel to Printer Mechanism mounting points
Epic 950 printers are designed to accommodate a TransAct or customer-supplied bezel assembly that is mounted following the hardware and mounting dimensions as listed. The following drawing shows the positioning and dimensions of the Epic 950 printer's mounting points.

Bezel assemblies available from TransAct include internal bezels (part nos. 95-06003L (yellow) and 95-06005 (blue), with other colors available) and an external bezel (part no. 85-04645L). Part specifications are described in the Epic 950 Maintenance Manual, document no. 95-05140. For further details, contact your TransAct sales representative.

Front: 6x   **M3x 0.5 press nuts** and interface with bezel.

Figure 9. Bezel Mounting and Hardware Requirements

Figure 10. Epic 950 Shown with Optional Internal Bezel Assembly.
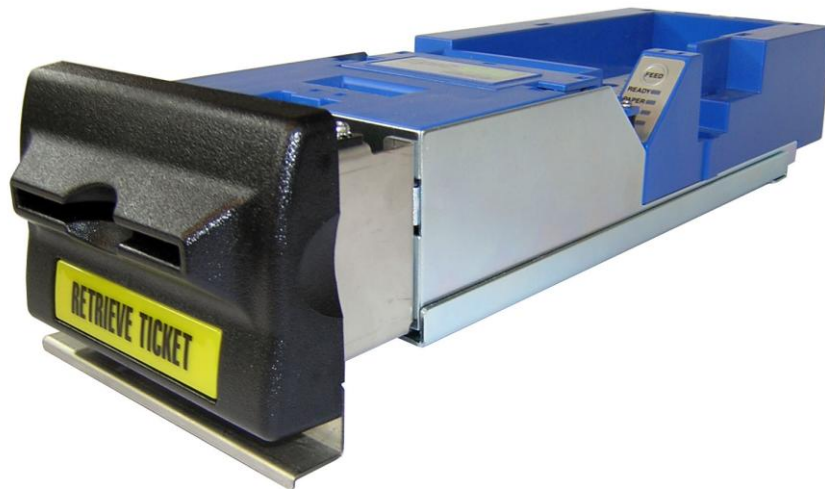
Figure 11. Epic 950 Shown with Optional External Bezel Assembly.

chapter 4

Epic 950 Printer Sensors

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Printer Sensors

The Epic 950 printers use several sensors to provide feedback to the host system. The Communications PCB handles all power and interface communications.
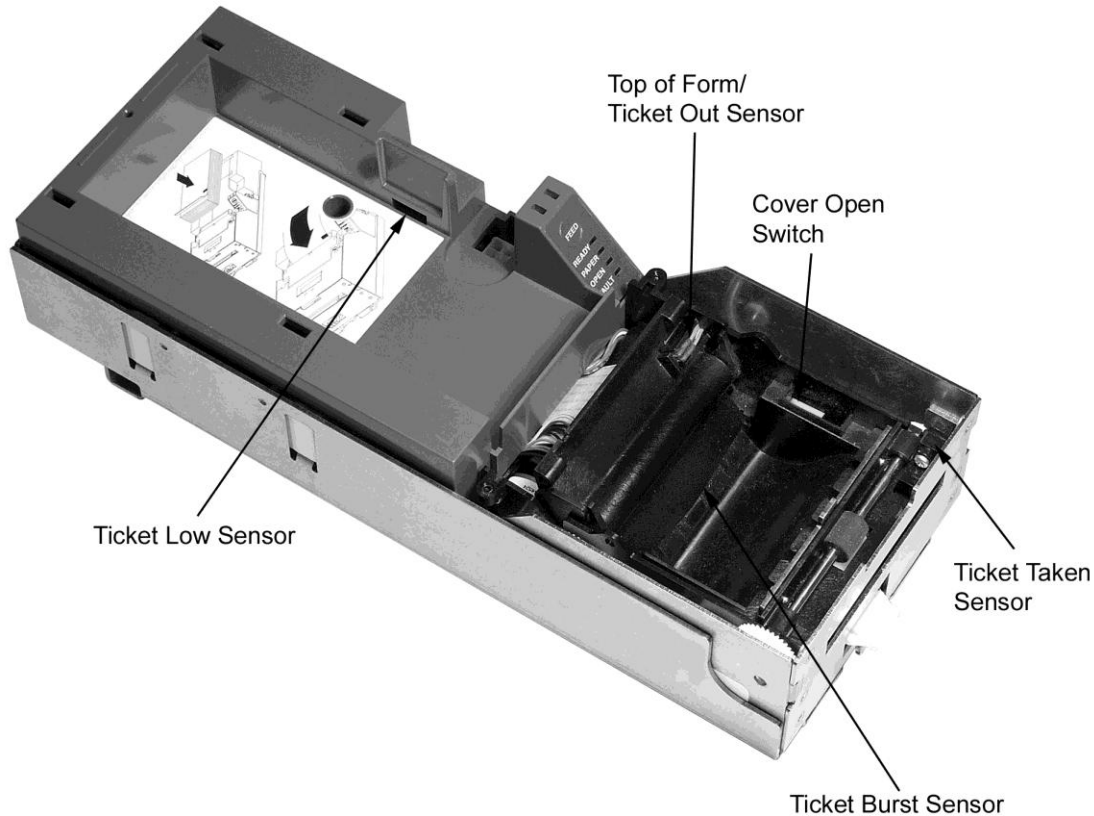
(Covers not shown for clarity)

Figure 12. Sensor Breakdown and Locations

Cover Open Switch

The Cover Open switch detects the case where the Ticket Cover is open, and halts the printing and ticket feeding process until the Ticket Cover is closed.

Ticket Low Sensor

A Ticket Low Sensor optically senses the number of tickets remaining in the printer's ticket bucket. The sensor will detect when the number of tickets reaches below 5-10 tickets. The ticket low status will be reported on the status byte, when the host issues a status request.

Ticket Burst Sensor

A Ticket Burst sensor is used to detect that the ticket has been separated before it is presented. Note that the Epic 950 printer incorporates a TicketBurst^{TM} feature which automatically burst tickets prior to presentation to the operator.

Top-of-Form/Ticket Out Sensor

A Top of Form/Ticket Out Sensor is used to control ticket loading and printing.

Ticket Taken Sensor

A Ticket Taken Sensor is used to determine when customers have actually taken the printed ticket.

Chassis Open Sensor/Audible Alarm

The printer has a Chassis Open sensor to determine if the Inner Chassis is in the full-racked position. If the Inner Chassis is not in the fully racked position, then the printer status LED will blink, indicating the printer is not ready.

1. **Chassis Open Sensor** (Sliding Module).
2. **Audible Alarm Buzzer** (PIEZO - game controlled).
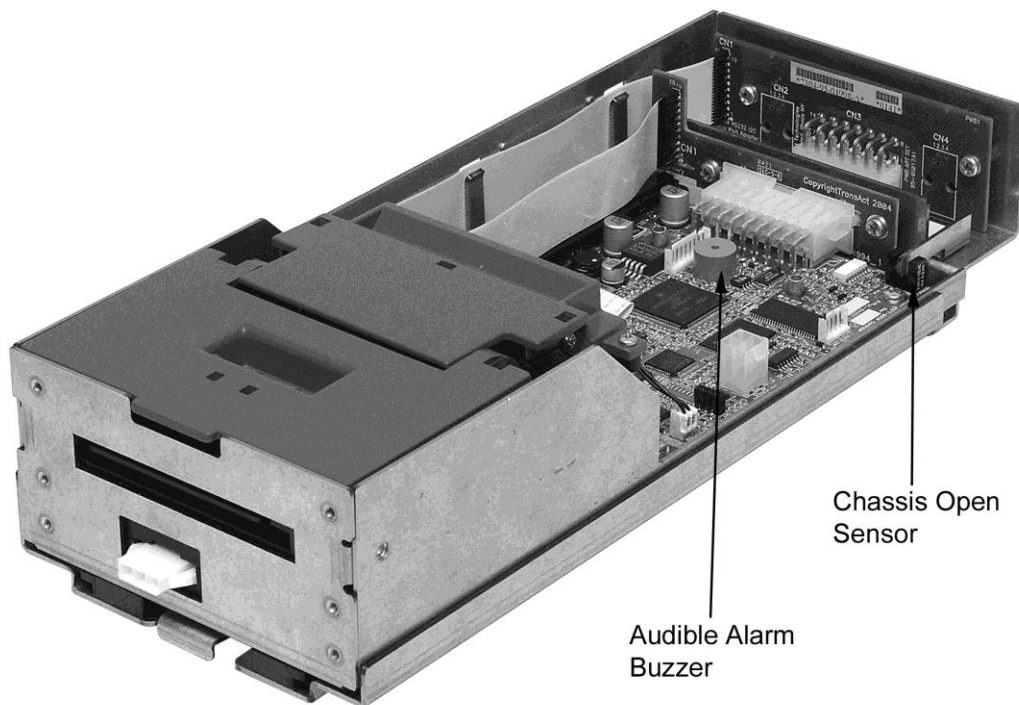
(Ticket Bucket not shown for clarity)

(Ticket Bucket not shown for clarity)

Figure 13. Open/Close Position/Audible Alarm

Printer Status LED

The printer has been outfitted with a LED panel system that provides the condition of the printer by using solid or blinking status LEDs to communicate status information. The following table lists the different LED states for specific conditions within the printer.

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Condition	Ready LED	Paper LED	Open LED	Fault LED
Unit Ready	On	Off	Off	Off
Cover Open	On	Off	On	Off
Chassis Open	On	Off	Blink	Off
Ticket Out	On	On	Off	Off
Ticket Low	On	Blink	Off	Off
Temperature Error	Blink	Off	Off	Blink
Paper Jam	On	Off	Off	Blink
Ram Error	2-Blink	Off	Off	On
Checksum Error	4-Blink	Off	Off	On

Table 2 Printer Status LED Indication Descriptions

chapter **5**

Electrical Connections

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Interface Connections

The Epic 950 printer is equipped with one of several communication interface options. In all cases power and communication connections are made to a connector or connectors located at the rear of the printer.

1. RS232 Serial
2. USB
3. NETPLEX
4. Universal USB / NETPLEX
5. Dual Port – NETPLEX
6. Dual Port – RS232
7. Universal USB/RS232 Serial

Communications interface options 3-7 utilize communications protocols that are proprietary to specific manufacturers and are subject to licensing requirements. In these cases only the interface pin connections are described in this manual.

Bottom/Rear of Printer
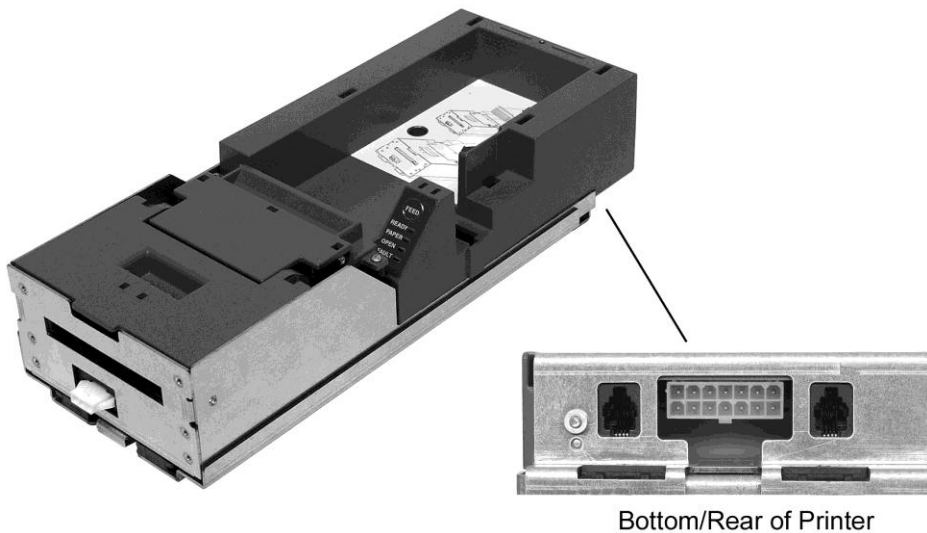
Figure 14. Interface PCB Location (Dual Port RS232 Shown)

RS232 Serial Communications Interface PCB

The RS232 Serial interface connector is a 14 position Molex Minifit Jr®., part number 39-30-1140, which mates with Molex part number 39-01-2140 or equivalent.

1	2	3	4	5	6	7
8	9	10	11	12	13	14

Serial Communication PCB Pin-Outs		
PIN #	FUNCTION	I/O
1	MRESET (Active low)	I
2	Not Connected	N/C
3	+12 VDC	I
4	Not Connected	N/C
5	GND	-
6	+24VDC	-
7	GND	-
8	+24VDC	-
9	Bezel Lamp – Switched +24VDC	O
10	Frame Ground	-
11	RS232 RXD	I
12	RS232 TXD	O
13	DTR	O
14	RTS	O

Table 1. Serial Communication PCB Pin-Outs

Default Communication Settings

The RS-232C interface default configuration settings are:

Baud Rate:	9600 BPS
Data Bits:	8 Bits
Parity:	None
Stop Bits:	1
Handshaking:	XON/XOF
Receive Error:	Prints
Input Buffer	8,192 bytes

These communications settings may be altered only through the use of the CONFIG program, special printer configuration software available from TransAct. Contact TransAct Technical Support for further information on this utility.

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USB Communications Interface PCB

The USB Communications PCB contains two connectors.

- Power - 4 position Molex Minifit Jr®., part number 39-30-1040, which mates with Molex part number 39-01-2040 or equivalent.

- USB Communications - Type B USB connector
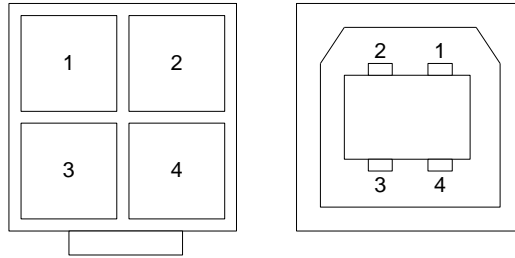
USB Communications PCB Pin-Outs		
USB Connector		
Pin #	FUNCTION	I/O
1	VBUS	-
2	D-	I/O
3	D+	I/O
4	GND	-
Power Connector		
Pin #	FUNCTION	
1	+24VDC	-
2	GND	-
3	GND	-
4	FGND	-

Table 2. USB Communication PCB Pin-Outs

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NETPLEX Communications Interface PCB

The NETPLEX Communications interface connector is a 10 position Molex Minifit Jr®., part number 39-30-1100, which mates with Molex part number 39-01-2100 or equivalent.
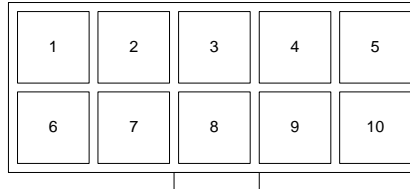
NETPLEX Communication PCB Pin-Outs		
PIN #	FUNCTION	I/O
1	MRESET (Active low)	I
2	RXD	I
3	+12 VDC	I
4	TXD	O
5	SGND	-
6	+24VDC	-
7	GND	-
8	+24VDC	-
9	Bezel Lamp – Switched +24VDC	O
10	GND	-

Table 3. NETPLEX Communication PCB Pin-Outs

Universal USB/NETPLEX Communications Interface PCB

The Universal USB/NETPLEX interface supports both USB and NETPLEX communications. This interface contains three connectors:

- Power - 4 position Molex Minifit Jr®., part number 39-30-1040, which mates with Molex part number 39-01-2040 or equivalent.

- NETPLEX communications- 6 position Molex Minifit Jr®., part number 39-30-1060, which mates with Molex part number 39-01-2060 or equivalent.

- USB Communications - Type B USB connector.

Universal USB/NETPLEX Communication PCB Pin-Outs		
USB Connector		
Pin #	FUNCTION	I/O
1	VBUS	-
2	D-	I/O
3	D+	I/O
4	GND	-
Power Connector		
Pin #	FUNCTION	
1	+24VDC	-
2	GND	-
3	GND	-
4	Frame Ground	-
NETPLEX Connector		
Pin #	FUNCTION	
1	MRESET (Active low)	I
2	RXD	I
3	+12 VDC	I
4	TXD	O
5	SGND	-
6	Bezel Lamp – Switched +24VDC	O

Table 4. Universal USB/NETPLEX Communication PCB Pin-Outs

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Universal USB/RS232 Communications Interface PCB

The Universal USB/RS232interface supports both USB and RS232 communications. This interface contains two connectors:

- RS232 Serial interface connector - 14 position Molex Minifit Jr®., part number 39-30-1140, which mates with Molex part number 39-01-2140 or equivalent.

- USB Communications - Type B USB connector.

1	2	3	4	5	6	7
8	9	10	11	12	13	14

2	1
3	4

Universal USB/RS232 Communication PCB Pin-Outs		
USB Connector		
Pin #	FUNCTION	I/O
1	VBUS	-
2	D-	I/O
3	D+	I/O
4	GND	-
RS232 Connector		
Pin #	FUNCTION	
1	MRESET (Active low)	I
2		-
3		-
4		-
5	GND	-
6	+24VDC	-
7	GND	-
8	+24VDC	-
9	Bezel Lamp – Switched +24VDC	O
10	GND	-
11	RS232 RXD	I
12	RS232 TXD	O
13	RS232 DTR	O
14	RS232 RTS	O

Table 5. Universal USB/RS232 Communication PCB Pin-Outs

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Dual Port NETPLEX Communications Interface PCB

The Dual Port NETPLEX Communications interface contains three connectors

- NETPLEX Communications. - 10 position Molex Minifit Jr®., part number 39-30-1100 for NETPLEX connections which mates with Molex part number 39-01-2100 or equivalent.

- I2C Communications - 2 modular RJH connections The connectors are electrically connected to allow daisy chaining of multiple devices.
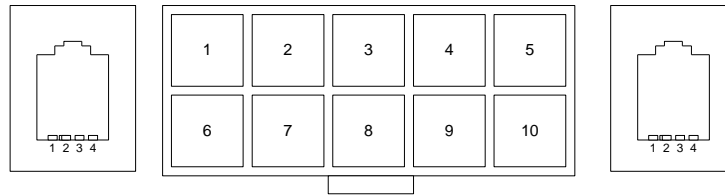
NETPLEX Communication PCB Pin-Outs		
NETPLEX Connector		
Pin #	FUNCTION	I/O
1	MRESET (Active low)	I
2	Not Connected	N/C
3	+12 VDC	I
4	Not Connected	N/C
5	GND	-
6	+24VDC	-
7	GND	-
8	+24VDC	-
9	Bezel Lamp – Switched +24VDC	O
10	GND	-
I^{2}C Port		
Pin #	FUNCTION	
1	RESET	I
2	SCL	I
3	SDA	I/O
4	GND	

Table 6 Dual Port NETPLEX Communication PCB Pin-Outs

Dual Port RS232 Communications Interface PCB

The Dual Port RS232 Communications interface contains three connectors

- RS232 Communications14 position Molex Minifit Jr®., part number 39-30-1140 which mates with Molex part number 39-01-2040 or equivalent.

- I2C Communications -2 two modular RJH connections for a secondary I^{2}C port. The two modular connectors are electrically connected to allow daisy chaining of multiple devices.
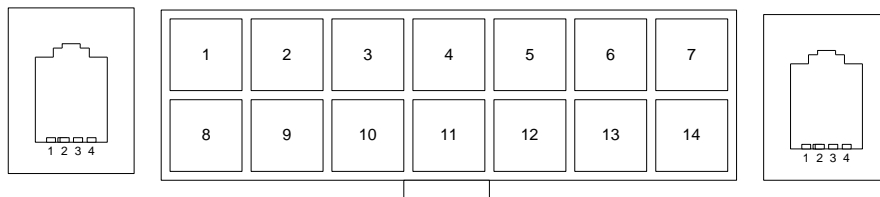
NETPLEX Communication PCB Pin-Outs		
RS 232 Connector		
Pin #	FUNCTION	I/O
1	MRESET (Active low)	I
2	Not Connected	N/C
3	+12 VDC	I
4	Not Connected	N/C
5	GND	-
6	+24VDC	-
7	GND	-
8	+24VDC	-
9	Bezel Lamp – Switched +24VDC	O
10	Frame Ground	-
11	RS232 RXD	I
12	RS232 TXD	O
13	DTR	O
14	RTS	O
I^{2}C Port		
Pin #	FUNCTION	
1	RESET	I
2	SCL	I
3	SDA	I/O
4	GND	

Table 7 Dual Port RS232 Communication PCB Pin-Outs

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Bezel Lamp Connector

The bezel connector is a Molex Minifit Jr®, part number 39-01-4032 and will mate with a Molex part number 39-01-4030 or equivalent.
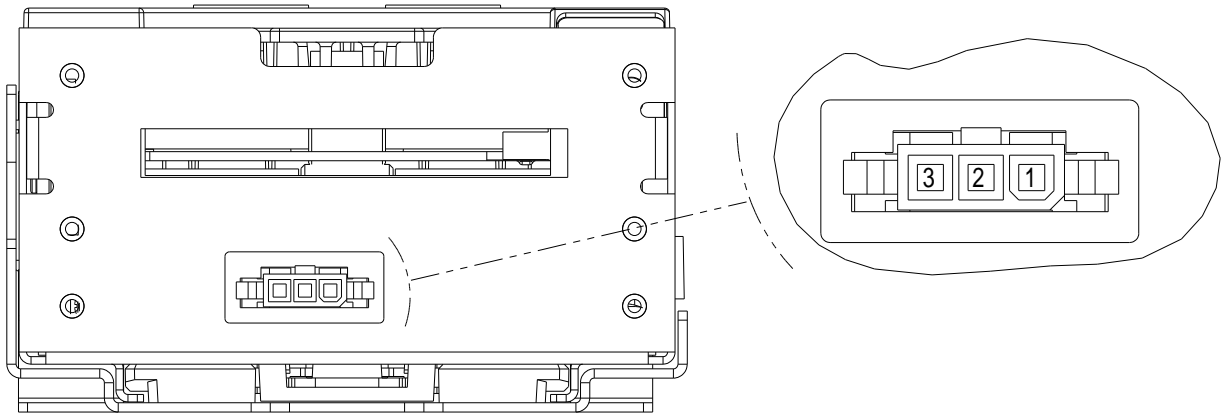
Figure 11. Bezel Lamp Connector Location and Connector Information

Bezel Lamp Connector Pin-Outs	
PIN #	FUNCTION
1	Modulated +24VDC
2	Not Connected
3	GND

Table 8. Bezel Power Connector Pin-Outs

Firmware Download Port

The Epic 950 printer features an imPort^{TM} firmware and graphics download port, as shown in the figure below. This port uses a 4-pin Molex connector with an RS-232 interface. For further details on this use of this proprietary download port, please contact TransAct Technical Support.
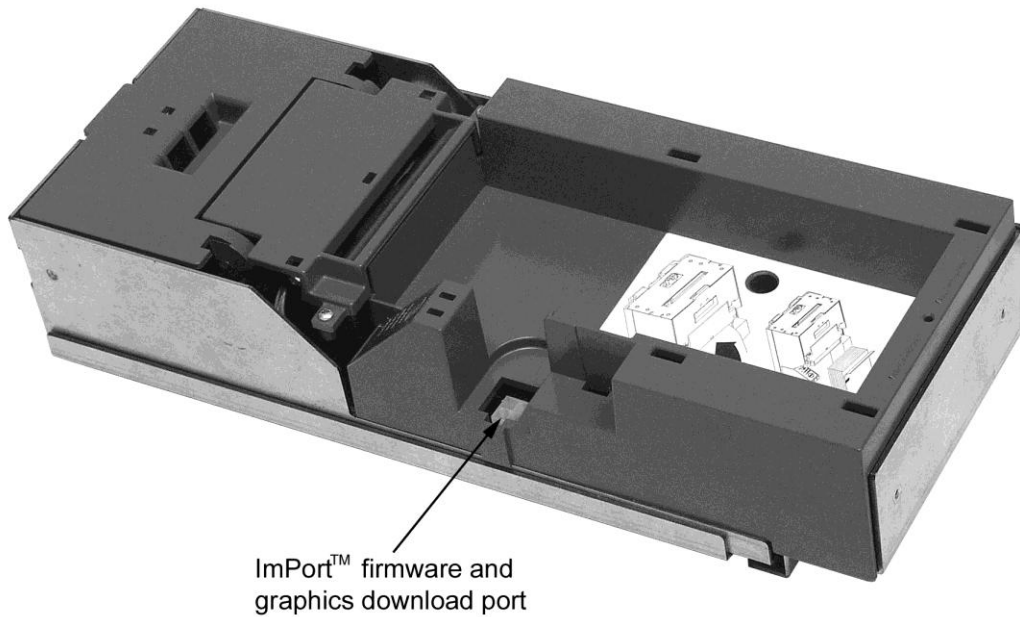
Figure 15. Firmware Download Port.

Printer Block Diagram
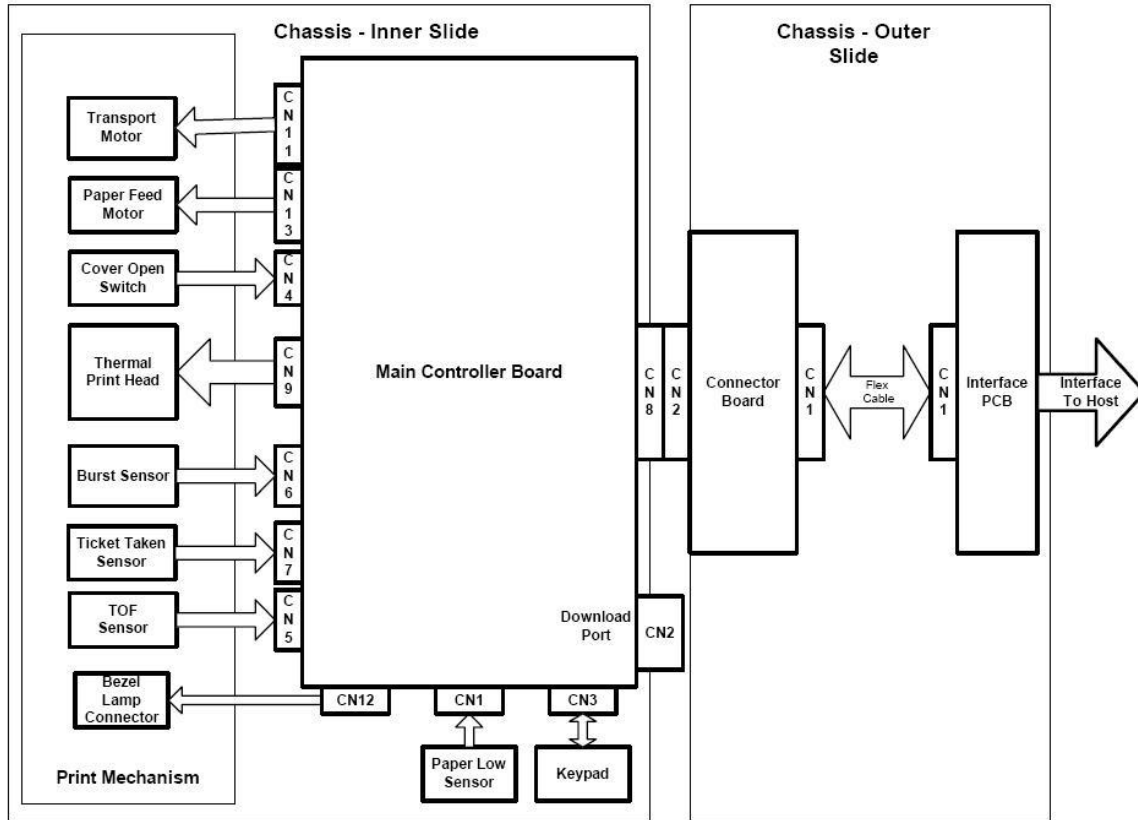
Figure 16. Epic 950 Electrical Operations Diagram

chapter **6**

Operational Procedures

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Racking/Unracking the Inner Chassis

All Epic 950 printers use a slider/detent/latch system with latch arms to retain the Inner Chassis from accidentally being separated from the Outer Chassis. The Epic 950 is opened for service by simply pulling on the ticket cover, pulling the Inner Chassis forward from the Outer Chassis as you would a filing cabinet. If accessible, a front-mounted release lever can also be pulled on to disengage and slide the Inner Chassis.
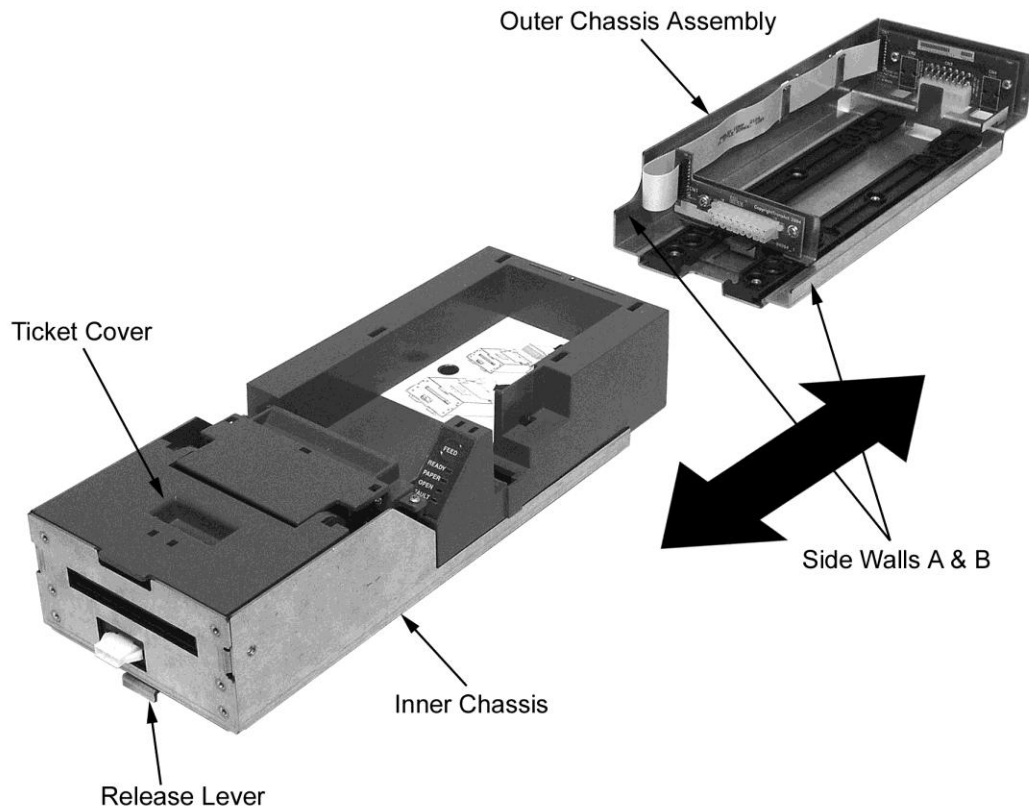
Figure 17. Racking/Unracking the Inner Chassis

To remove the Inner Chassis, perform the following steps:

- Pull on the Ticket Cover to release the rear detents, pulling the Inner Chassis towards you until its latches catch the forward detent slots in the Outer Chassis Slides.
- Pull on the Release Lever and pull forward on the Inner Chassis to disconnect from the Outer Chassis. (This assembly incorporates a HotSwap QDT (Quick Disconnect Technology) design, which may be removed while power is still on to the unit.)

To return the Inner Chassis to its base, perform the following steps:

- Align the base of the Inner Chassis with the outer walls of the Outer Chassis, seating it within side walls A and B as shown in Figure 17.

- While pulling outwards on the Release Lever, slide the Inner Chassis towards the rear of the Outer Chassis until it latches at the rear of the Outer Chassis.

Loading Tickets into Feeding Mechanism

When loading new ticket stacks, be sure that there is power to the printer. The first ticket of the stack must be inserted into the printer by hand. The Epic 950 printers' ticket tray is integrated with a guide to direct the ticket into the printer mechanism. Once the leading ticket enters the Top of Form sensor, the ticket will be automatically fed into the Printer Mechanism.
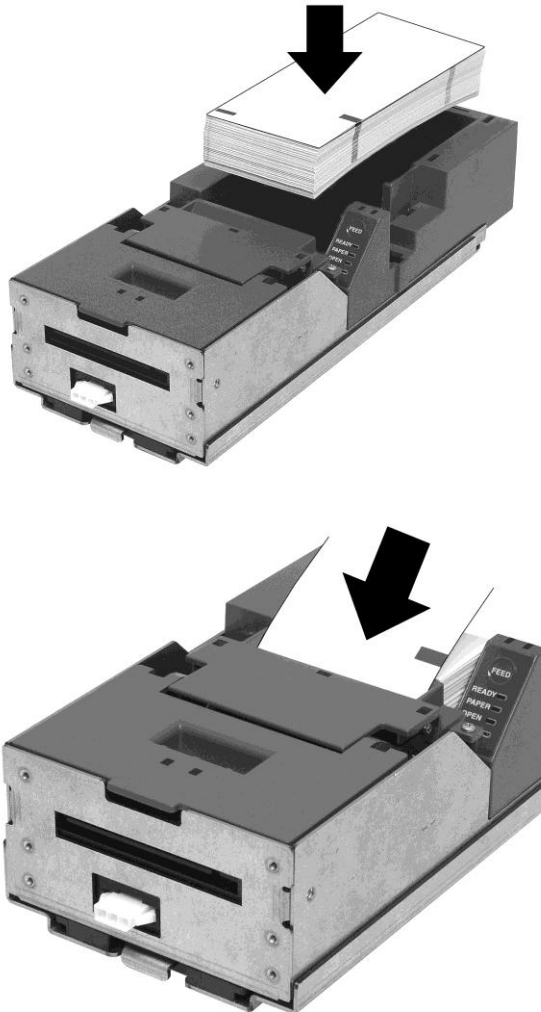
Figure 18. Ticket Loading and Ticket Feed Mechanism

Loading tickets into the ticket supply box: (Refer to the label on printer)

- Load tickets into the ticket supply tray, making sure that the Black Dot is positioned as shown in Figure 18.

- Orient the tickets so that the Black Dot is towards the leading edge of the ticket.

Feeding tickets into the Printer Mechanism: (Refer to the label on printer)

- Check to ensure that the tickets have been placed in the ticket tray with the proper black dot orientation.

- Insert the leading ticket into the Printer Mechanism's insertion guide area. The ticket should be fed about a ½" into the mechanism; at this time, the machine automatically completes the feeding process.

- If printer has been slid out from rack, make sure that the printer is closed.

- The printer is ready to receive information.

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Removing Loaded Tickets

The Epic 950 printers have two ways to remove unused tickets from the printer mechanism:

- The first way is to release the Ticket Cover by lifting and rotating backward, this will relieve pressure to the platen and tickets can be removed. This also will allow an opening that provides space to check the printer for ticket jams, or prepare the paper path for ticket replenishing.

- The second way is to use the feed button, which will feed out tickets from within the printer mechanism.
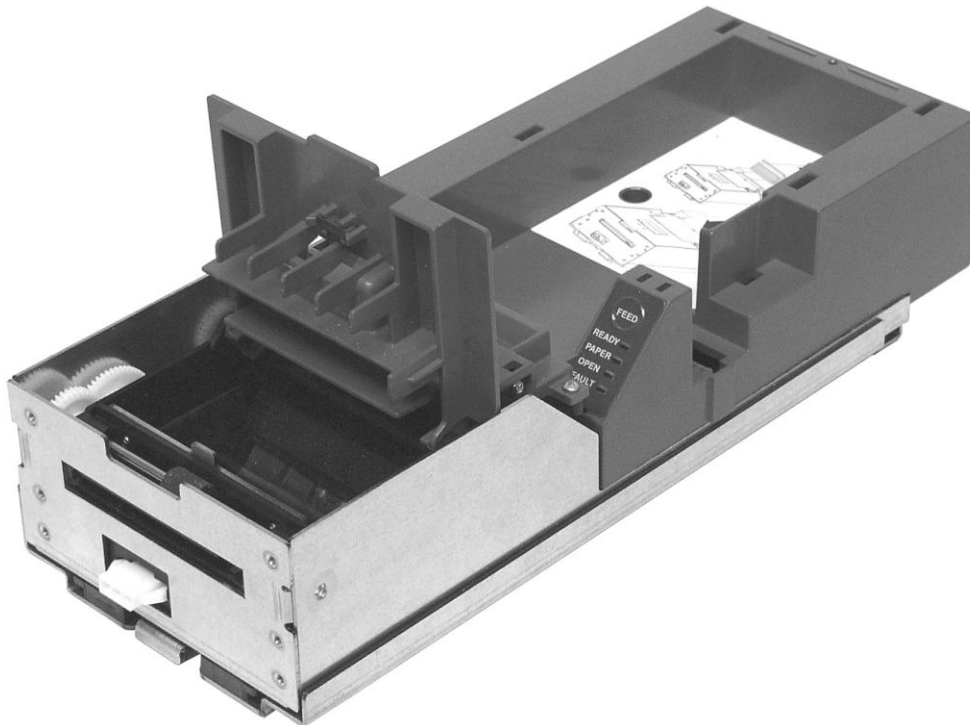
Figure 19. Ticket Cover Shown Open for Ticket Removal

Unloading Tickets from the Printer by opening the Ticket Cover

1. Pull Inner Chassis away from the Outer Chassis until it stops in the open position.
2. Lift and rotate the Ticket Cover backwards, towards the rear of the printer.
3. Remove all tickets from the ticket path and check for any debris.
4. Remove any remaining tickets from the ticket tray.
5. Rotate the Ticket Cover into its original closed and latched (Magnetic) position.

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6. Proceed with ticket loading procedure.

Cleaning the Print Head

Two kinds of periodic cleaning operations will ensure continued high print quality from your Epic 950 printer:

1. Paper dust removal. Use a soft brush to clean the paper dust from inside the printer and chassis area. The paper dust should also be removed from the sensor optics.

2. Cleaning thermal print head. If streaking on the printed ticket is evident, the thermal print head may need to be cleaned. This can be done by inserting a thermal printer cleaning card, as shown in the instructions below:
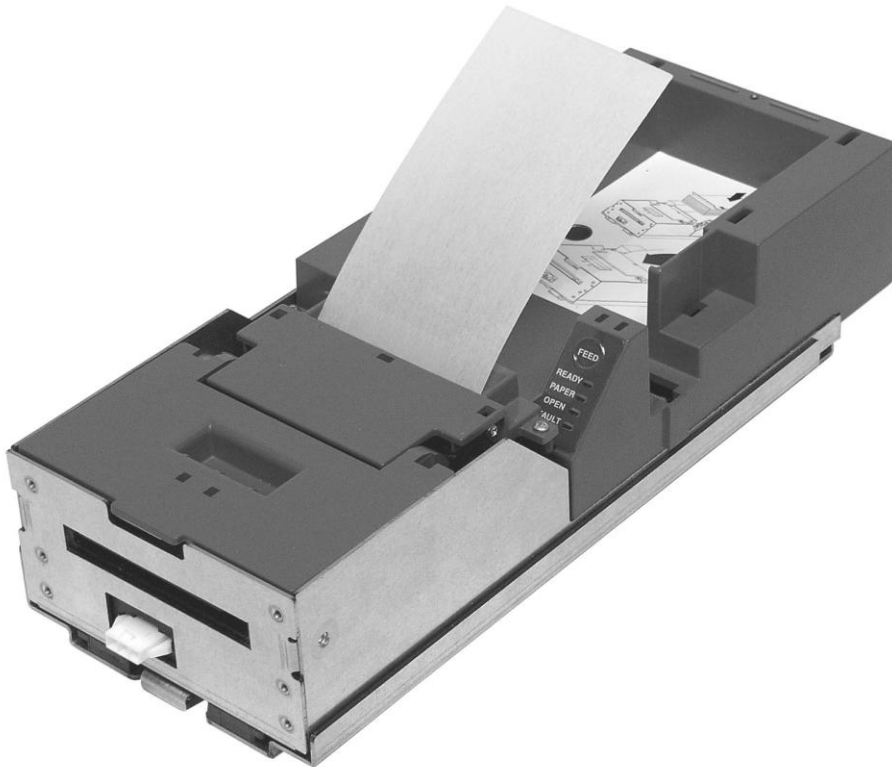
Figure 20. Cleaning the Print Head

Detailed instructions

1. Open the cover and remove all tickets from ticket feed path.
2. Close the cover.
3. Open cleaning card pouch and remove cleaning card.
4. Insert cleaning card into feed path.
5. The cleaning card will automatically be drawn into the feed path.

6. Open the cover and then remove the cleaning card by gently pulling it back.
7. Repeat process if necessary.
8. Properly dispose of used cleaning card.

Purchasing Cleaning Cards

Cleaning cards are available through TransAct – consult Chapter 1 for contact information by telephone or the Internet. Cards can also be purchased direct from Enefco International Ltd. at (888) 578-0141.

Description:	Part Number:
2.5" x 6" Thermal Cleaning Card (box of 25)	100-03322 (TransAct)
2.5" x 6" Thermal Cleaning Card (box of 25)	GTP250PB (Enefco)

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Printing a Self-test Ticket

The Epic 950 printer has the ability to print a pre-defined self-test ticket, to test the normal printing functionality of the unit, and create a printout of the current printer configuration. To print a self-test ticket, perform the following steps:

1. Unrack the Inner Chassis.
2. Open the Ticket Cover. Do not remove a currently loaded ticket.
3. Press and hold the feed button until the Open LED goes out, then release this button.
4. Now close the Ticket Cover, and the self-test ticket will then print.
5. Close the Inner Chassis to resume normal operation.

Figure 21 shows an example of the information printed. Your printer may print more or less information, depending on the version and revision of the printer.

INSERT THIS SIDE UP

```
Model      : Epic 950TM
Firmware   : S00102
Date       : Jul 22 2004
S/N        :

Baud Rate: 9600 BPS
     8 Bit No Parity
     1 Stop Bit
Handshaking : XON/XOFF
Receive Error : Prints '?'
Code Page      : 437
Smoothing      : Enabled.
Bar Code Width: 3
Line Spacing  : 6.3 LPI
Mono Paper     : Custom Black
Gray Eo   : 0.12 mJ/sq.mm
Black Eo  : 0.24 mJ/sq.mm
Color Paper    : Custom Color
Color     : Black/Red
Color Eo  : 0.18 mJ/sq.mm
Black Eo  : 0.38 mJ/sq.mm
Density: 0
PreHeat : Off
```

INSERT THIS SIDE UP

Figure 21. Sample self-test ticket.

Programming for the Epic 950

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Programming for the Epic 950

NOTE: This programming guide applies only to printers equipped with RS232 interface and running standard RS232 firmware.

The first step in programming the Epic 950 is to understand how the printer works. This section covers all the points that need to be understood to program the Epic 950 Printer correctly, including both basic and advanced topics.

As an ASCII-based printer, the Epic 950 accepts 8-bit ASCII characters as both data and commands. The ASCII table in the Character Codes section shows the relationship between the 8-bit values and the characters they represent. Most environments either use the ASCII character table as the default for character values or support an ASCII mode where characters are interpreted by the ASCII values.

The following subsections discuss general information that is needed for programming the Epic 950 Printer.

Resetting the Printer

Each print job should begin with a printer reset command. This ensures that the printer always begins in a known state.

The command characters used to reset the Epic 950 are **ESC** (decimal value 27) and ***** (decimal value 42).

Command Parameters

When sending a command, all of the command characters and parameters that make up a command must be sent. This is especially important when using the bar code and graphics commands. Sending too few characters to fill the required parameters for a command will either cause the command to fail or result in subsequent data being lost.

Character Evaluation

Most of the parameters that are sent to the Epic 950 Printer are evaluated based on their decimal value.

Some commands accept parameters by either their decimal value or the representative character. For example, the set print orientation command (**GS V**) interprets both a **NULL** (ASCII decimal value of 0) and the '0' character as meaning the same thing.

16-bit Character Parameters

The maximum value a single 8-bit character can represent is 255. Some commands, though, can take values that are greater than 255. The set horizontal starting position command (**ESC X**), for example, specifies a distance (in dots) that the next text object will print from the left margin. Because a dot is only 1/8 of a millimeter, a value of 255 would place the object only a little over 31 mm from the left margin. To allow for longer distances to be specified, two 8-bit characters are used to specify the value, by combining them into one 16-bit character. Though the calculations are all done within the Epic 950 Printer, it is important to understand how the characters are handled.

For two specified 8-bit parameter values *n1* and *n2*, the resulting 16-bit value is computed as follows:

$$\textbf{Value = (\textit{n1} * 256) + \textit{n2}}$$

In other words, the decimal value of the first character that is sent (*n1*) is multiplied by 256, and then the decimal value of the second character sent (*n2*) is then added to this.

To send a value under 256 to a command that takes the *n1* and *n2* parameters, simply send the first character with a 0 value. For values greater than 255 but less than 512, the first parameter should be sent with a value of 1. For values greater than 511 but less than 768, the first parameter should be set to 2, and so on.

Conversions

The table below lists some common values and their relationship for converting from dots to inches using the n1 n2 parameters.

Inches	Dots	n1	n2
0.5	101	0	101
1.0	203	0	203
1.5	304	1	48
2.0	406	1	150
2.5	507	1	251
3.0	609	2	97
3.5	710	2	198
4.0	812	3	44

Table 9. Conversion from Dots to Inches

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Font Statistics

The information below lists the statistics for the five internal fonts the Epic 950 Printer supports. Height and width are expressed in terms of dots.

Font	Height	Width	Horizontal cpi	Vertical cpi
ESC S	24	10	20.0	8.4
ESC P	24	12	16.9	8.4
ESC M	32	16	12.7	6.4
ESC U	32	20	10.2	6.4
ESC T	56	28	7.3	3.6

Table 10. Font Statistics

Objects

Objects are the basic units that the Epic 950 prints. An object can be either a line of text characters, a bar code, a landscape graphic, a landscape line, or a bitmap dot line. Each of these objects has different rules relating to them, as discussed below.

Objects can also be either active or complete. An active object is one that is still receiving the data that composes it. A completed object is one that has been terminated. A line of text that has not yet received a line feed or carriage return is a good example of an active object. Until a terminator character, like a line feed, is sent, more text characters can be added to the text object. Bar code and graphic objects do not require special terminator characters (such as line feeds). Instead they are considered complete as soon as they receive the correct amount of data.

Print Modes

The Epic 950 provides three modes of printing: bitmap graphics mode, portrait printing mode, and landscape printing mode. Each mode operates under very different rules. These rules are detailed below.

Bitmap Graphics Mode

At its most basic level, a Epic 950 Printer is a direct thermal printer that creates images on a ticket by heating the individual elements of its print head. The print head has 496 elements (or dots). When it prints, some of these dots will be turned on (heated), and the printer's motor will advance the ticket by a step. The ticket stock that is under a heated element will then turn black. For each motor step, a dot line is printed in 203 x 203 dpi resolution. Each dot line is a complete object and is printed by the Epic 950 as soon as it is processed. Because of this, a bitmap dot line should not be sent while a portrait object or a landscape page is being constructed.

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Figure 22. Portrait and Landscape Print Modes

Portrait Printing Mode

On power-up, the Epic 950 Printer is set for portrait printing. In portrait printing mode, text characters exit the printer from the top of the character to the bottom. It is also possible to switch to this mode using the set print orientation command (**GS V**).

Portrait printing mode is also referred to as immediate mode printing, because each object that is sent to the printer while the printer is in portrait printing mode is printed as soon as the object is completed. No two objects may be printed on the same line in this mode because the ticket is advanced as each object is completed and printed.

Certain commands are disabled or work differently while the Epic 950 is in portrait printing mode. Exact details can be found under each command's description.

Landscape Printing Mode

By using the set print orientation command (**GS V**), the Epic 950 Printer can be configured for landscape printing. In landscape printing, text characters exit the printer from the left side of the character to the right. Before the Epic 950 Printer can be switched to landscape printing mode, the set characters per line command (**GS t**) must be set. This command defines the width of the landscape page. A landscape page is defined as the area allocated by the Epic 950 in which landscape text, graphics, bar codes, and line objects may be printed. The height of this landscape page always equals the width of the Epic 950' print head. The width of the landscape page is calculated when the set characters per line command (**GS t**) is sent. The width of the page is equal to the number of characters per line multiplied by the width of the current font. The default font is 16 dots wide (2 mm), and the default number of characters per line is 80.

In landscape printing mode, completed objects are placed within a memory buffer in the Epic 950 and are only printed when the landscape page is terminated. A form feed (FF) character is usually used to terminate a landscape page. This causes the Epic 950 to print the objects that have been placed on the landscape page and advance to the next ticket. After a landscape page is printed, the Epic 950 will remain in landscape printing mode. If more objects are sent to the Epic 950, a new landscape page will be allocated

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with a width equal to the previous page. To change the width of a landscape page, you must send the set characters per line command (**GS t**) followed by the set print orientation command (**GS V**). Because the Epic 950 does not print objects immediately in landscape mode, multiple objects can be placed on the same line. The set horizontal starting position (**ESC X**) and set vertical starting position (**ESC Y**) commands allow objects to be placed at any location within a landscape page. In the case of objects positioned to overlap each other, the first object that is sent to the printer will be printed in the overlapping area.

Objects that would normally print below the bottom of the landscape page can be either wrapped to the next ticket or truncated by using the select line wrap/truncate modes command (**GS T**). Unless the set vertical starting position command (**ESC Y**) is used, the first object sent will be printed at the top of the landscape page.

General Notes

The Epic 950 Printer may be in only one print mode at a time. Multiple areas may be printed in different print modes on a single ticket, but these areas may only be adjacent to one another, they may not overlap.

In any mode, the set feed length command (**GS L**) is used to determine how far the Epic 950 will feed in search of a Black Dot/Top of Form indicator. If the Epic 950 finds a Black Dot/Top of Form indicator before the maximum feed distance is reached, it will stop at that point, rather than continuing. This command is only needed when dealing with continuous-feed tickets.

Text Objects

A text object is simply a line of printable characters. A text object is created whenever the Epic 950 receives a printable character that is not otherwise part of a command. Once it is created, a text object will remain active until it is terminated.

While a text object is active, any printable characters sent to the Epic 950 will be added to that text object. The only exceptions are printable characters that are sent as part of a command. While a text object is active, commands that alter text line attributes (such as font and double-high character commands) are ignored. Commands that alter text character attributes (such as double-wide and inverse) may be sent at any time, though.

Line attributes include the five basic fonts (P, M, U, and T), plus the double-high font command (**GS DC2**). These commands may not be issued while a text object is active; instead they should be issued before a text object is begun. The font line attribute persists until another font command is received. The double-high line attribute persists either until the cancel double-high command (**GS DC3**) is sent or the current font is changed. The character attribute commands include the set font to double wide (**SO**) and set inverse print mode (**GS RS**) commands. These commands may be issued or canceled at any time. Character attributes persist only until the end of a text object.

A text object can be terminated with a carriage return, a line feed, or both, in either combination. If the length of the text object exceeds the space allowed for printing, it will either wrap to the next line or truncate at the end of the printable area. The decision to wrap or truncate is determined by the select line wrap/truncate mode command (GS T). By default, text objects will wrap to the next line.

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Bar Code Objects

A bar code object is created by the print bar code command (**GS k**). Specified within the command is the symbology to be used, amount of data to be encoded, and data itself. Other attributes of the bar code, such as height and width, can be set using other commands.

The set bar code height command (**GS h**) specifies the height of the bar code in dots, or 1/8 mm. The maximum height for a bar code is 256 dots or 32 mm. In cases where a taller bar code is needed, a second bar code can be printed below the first at the same left offset. The set bar code module width (**GS w**) and set bar code element width (**GS W**) commands can be used to alter the width of the bar code. See the command descriptions later in the next section for a full explanation of the differences between these two commands.

The limitations of each symbology must be adhered to when sending data for a bar code. For example, you should not send alphabetic characters to symbologies that only accept numeric data (like the UPC/EAN symbology).

Other items must also be considered when printing bar codes:
(If any of these items are ignored, the printed bar code may be unreadable.)

- Sufficient blank space on either side of the bar code must be left to create a quiet zone.
- A good ratio/element size must be selected if the default values are not being used.
- Adequate room must be available for the bar code to be printed on the ticket.
- Bar codes may only be printed in black, for accurate infrared scanning, using thermal media with a visible light absorption of 600-700 nm for black printing.

A bar code object is self-terminating and will be processed as soon as the proper amount of data has been sent to it. The print bar code command's (**GS k**) second parameter specifies whether a fixed amount of data will be sent or whether delimiters will be used. In either case, the data sent must match the parameter setting. If a fixed number of characters are specified, then the exact number of characters specified must be sent. If delimiters are indicated, then matching characters must be sent before and after the bar code data to specify the beginning and end of the data. If an incorrect number of characters or delimiters are sent, the Epic 950 will not print correctly.

Bar codes that are too long to fit within the printable area of a ticket are truncated. This usually results in an unreadable bar code being printed. To correct this condition, a narrower ratio must be set, fewer digits encoded, or a more compact symbology used.

Bar codes
Codabar
Code 3 of 9
Code 128-A
Code 128-B

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Code 128-C
Code 128-Auto
EAN-8
EAN-13
Interleaved 2 of 5
UPC-A
UPC-E
Code93

Graphic Objects

Graphic objects are created by the landscape printing mode graphics command (**GS ***). Graphic objects may only be printed as part of a landscape page. To print a graphic without entering landscape printing mode, you must use bitmap graphics mode.

No landscape graphic may be wider than 256 dots, though they may be as tall as the width of the Epic 950' print head. If a graphic needs to be printed wider than 256 dots, either subdivide it into narrower sections or print it using bitmap graphics commands.

Line Objects

Line objects are created using the draw line in landscape printing mode command (**GS l**).

Line objects may only be printed as part of a landscape page. If the length of a line object is set to exceed the printable area of a ticket, the line will be truncated at the end of the printable area.

The POR.INI File

The POR.INI file contains system/printer initialization parameters. This file follows the standard INI file format of sections defined in brackets (ie. [POR]) followed by single-line parameter settings.

The main section of this file is the [POR] section, which contains default initialization information that the printer will use when it powers on or does a reset. In addition to the [POR] section, the file may contain other sections that are specific to individual dip switches, of the form [Dipswitch*n*] where *n* is the number of the dip switch.

Example

```
; Lines in this file must be cr+lf terminated.
; Use no tabs.
```

[POR]
; There may be additional information here that initializes various internal
; functions. These parameters should not be altered.
PeriodicStatusOn = n
ColorMode = Off
DemoMode = Off
ErrorLog = Off
ZstatusBit3AlwaysHigh = Off ; Set to off for older versions of the Series 800
CommSave = Off

[Dipswitch3]
DemoMode = On

[Dipswitch4]
ErrorLog = On

[Dipswitch5]
CommSave = On

[Dipswitch7]
PeriodicStatusOn = y

[Dipswitch8]
ColorMode = On

POR.INI File Parameter Definitions

[Dipswitch*n*]
The parameter after the [Dipswitch*n*] will be set if the corresponding dip switch is active. The list on the previous page is the default settings for dip switches. The dip switch definitions may be changed as required.

> NOTE: Dip switches 1 and 2 cannot be altered in the POR.INI file.

DefaultFont
This parameter defines the font to be used to print text in this field. The first number is the point size of the font and the second number is the font width ratio (a parameter which is currently reserved for future use, but must have a value specified). The third number is the attribute where 0=No attribute, 1=Bold, 2=Italics, and 3=Bold and Italics.
Example:
DefaultFont = 10:45:1

BezelLength
This parameter specifies the length of the paper feed needed to accommodate various bezels. This parameter is in millimeters.
Example:
BezelLength = 30

Substitute
This parameter defines the Substitute text printed in place of the text sent by the host. This is a global setting.
Example:
Substitute = ticket|voucher   (replaces occurrences of ticket with voucher)

Zstatusbit3alwaysHigh
This parameter defines the status response on the [GS]z command. If this is set On bit 3 on the status response will always be set high. This is to maintain backward compatibility to older Series 800 firmware versions.
Example:
ZstatusBit3AlwaysHigh = Off

ColorMode
This parameter set the printer in mode to print color tickets. It should be set On when using color ticket stock.
Example:
ColorMode = Off

DemoMode
This parameter will force the printer in print a pre-defined ticket for demo purposes only. The printer will print the pre-defined ticket when it receives a Form Feed Command.
Example:

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DemoMode = Off

ErrorLog
This parameter sets the printer in a mode to collect information on any errors that occur. This is used to help diagnose problems in the field. This should remain off for normal operation.
Example:
ErrorLog = Off

CommLog
This parameter allows the printer to collect information on all data received and transmitted by the printer. This is used to diagnose problems in the field. This should remain off for normal operation.
Example:
CommLog = Off

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DIP Switch Settings

The majority of these dip switch operations are defined in the POR.INI file, as documented in the previous pages.

Outside Edge of printer
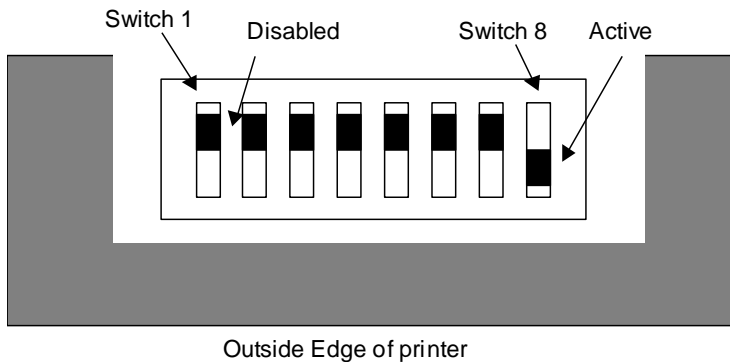
Switch 1 is the furthest to the back. The Active position is toward the outside edge of the printer.

Switch 1
Switch 1 is reserved and must be in the Disabled position. If activated, the printer will be held in reset.

Switch 2
Switch 2 configures Ticket Low. The Disabled position prevents ticket low from being detected.

Switch 3
Switch 3 activates Demo mode. It must be in the Disabled position for normal operation.

Switch 4
Switch 4 activates the Error log. This is useful for debugging but should not be on by default.

Switch 5
Switch 5 activates Com Save. This is also a debugging feature, and will be used with future TransAct tools to help debug printer operations.

Switch 6
Switch 6 is reserved

Switch 7
Switch 7 activates the Smart Suite features. This activates a mode of operation that is an enhancement of Series 800 emulation. It should not be activated when replacing a Series 800 printer. To see what features are available in the Smart Suite enhancements, refer to the Epic 950 Smart Suite Supplement. To activate the progress status features in the Demo program, you must turn this feature on.

Switch 8

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Switch 8 activates 2-color operation.

Flash Memory and Firmware Download Port

The Epic 950 is equipped with a download port with enhanced features, referred to as imPort™. The printer firmware may be updated through this port. Graphics and coupons may also be added to the printer and updated as needed.

The flash memory contains firmware and non-firmware information. The intent is that the firmware can be verifiable and fixed, and that the non-firmware information can be adjusted as required. The non-firmware information contains variable coupon layout and graphic information. This allows coupon images to change without affecting the controlled ticket formats.

Flash memory can be altered only through the imPort™. This flash memory cannot be updated or altered in any way through the game communication interface.

Firmware Memory Features

The firmware memory has the following features:
1. It is in a verifiable format
2. It is verified when the printer is initially powered on or reset for any reason.
3. The firmware is verified in the background and scanned about every 60 seconds.
   NOTE: The scan period depends on printer activity. If the firmware appears to have been altered, the printer will fault and stop.
4. Can only be accessed via an authenticated download link.
5. Verification tool supplied to run on a PC that provides CRC checking.

The non-firmware memory features will be addressed below.

Proprietary format

The format of the firmware is TransAct proprietary. This format can only be understood by the Epic 950 printer. It is compressed and encoded in such a way that any modification to it will be detected and cause a printer fault.

Verified when run

The firmware is verified at initial power up or after any reset. Any tampering or corruption of the firmware will be detected and the firmware application will not run. The printer will show an error condition via the Fault LED indicator. The printer will be disabled and will not be able to print or receive communications from the host system.

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imPort^TM authenticated download link

The firmware can only be accessed through the imPort^TM and is an authenticated link. The authentication is proprietary to TransAct and controlled by TransAct. This authentication is included with the TransAct firmware verification tool.

Verification Tool

TransAct will provide, to any regulatory body, a firmware verification tool. This tool has the ability to compare a firmware file (provided by TransAct) with the actual firmware in the Epic 950 printer. This tool verifies that the cyclical redundancy check (CRC) performed on the firmware memory is identical to the firmware file provided by TransAct.

Non-Firmware Memory Features

The non-firmware memory contains such items as graphics and coupon layouts.

The non-firmware memory has the following features:
1. It is verified when transferred to the printer via cyclical redundancy check (CRC).
2. It can only be accessed via an authenticated down load link.
3. A verification tool can be supplied, to run on a PC that provides CRC checking.

Verified when transferred

When non-firmware information is transferred to the printer (i.e. graphics, coupon layout), the information is verified via a cyclical redundancy check (CRC). The utility that transfers this information/data to the printer calculates a CRC when the information is sent to the printer. When the transfer is done, the printer calculates a CRC on the data it has received. The two CRCs are compared and an error is generated if they are different. This CRC checking ensures that corrupted graphics or ticket layout information will not be loaded into the printer.

Authenticated download link

The non-firmware information can only be accessed via an authenticated down load link. The authentication is proprietary to TransAct and controlled by TransAct. This authentication is included with the TransAct Download Utility.

Verification tool

TransAct's Download Utility provides CRC verification of the information stored in the printer's memory. There is a CRC sum of all the non-firmware information stored in the printer. This CRC can be used to verify the entire non-firmware information stored in the Epic 950 printer.

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Smart Suite Features

The Epic 950 includes a suite of smart features and tools to facilitate and enhance the printer's integration and performance. This list includes:

- Programmable automatic periodic status reporting (128 bytes of information, or more)
- Support for industry standard .ini files
- Support for unlimited customizable (text based) ticket layout files
- Support for industry standard graphics files (.bmp)
- Support for downloading custom fonts (created on the PC in an industry standard format)
- Flat file system with link authentication and CRC data verification
- Proprietary tamper-proof firmware file format.
- Communications packet protocol (with CRC) for ensuring data integrity
- Print progress reporting (0-100% done)
- Field complete reporting

For further details on Smart Suite features, consult the Epic 950 Smart Suite Supplement, available from TransAct technical support.

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chapter 8

Command Reference

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This section describes the commands for programming the Epic 950 Printer. Each section contains a description of each command, listed by name in alphabetical order. The ASCII, hexadecimal, and decimal values for each command are also provided. See Appendix A for a list of ASCII, hexadecimal, and binary codes.

Some of the tasks that can be accomplished with these commands include the following:

- Define bar code size and position.
- Return firmware revision and printer status information.
- Define ticket orientation.
- Print graphics in inverse text mode and print enlarged characters.
- Send line feeds and carriage returns.

Appendix A also contains a list of all commands, and their functions.

Nomenclature

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

[ ]	Encloses a control character. [ ] represents a single, 8-bit value as defined in the standard ASCII tables. The ASCII Code Table in Appendix B lists the control codes. An example would be [ESC], which would represent a 1BH or 27 decimal.
< >	Encloses an 8-bit value in decimal format. The value is from zero to 255. An example is <2>, which represents 02H or 2 decimal.
<xNN>	Encloses an 8-bit value in hexadecimal format. The value is from x00 to xFF. An example is <x12>, which represents 12H or 18 decimal.
<n>	Indicates a variable parameter. The variable parameter, <n>, can have a value from zero to 255. The meaning of <n> is described and defined in the description of the command.
<n1> <n2>	Indicates that there are two parameters, <n1> and <n2>, where both can have values from zero to 255.
x	All other characters in control strings represent ASCII characters. For example, [ESC] 1 represents 1BH followed by 31H.

In many cases, applications require that control sequences be specified in hexadecimal or decimal codes. In most cases, commands are specified in ASCII, hexadecimal, and decimal. The table in **Appendix A** lists ASCII, hexadecimal, and decimal equivalents.

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BEL – Audio Alert

Description

Generates an audio alert. The default is a single sound, lasting the period of time defined by the audio alert setting defined by the **ESC BEL** command. If the audio alert is turned off by setting the number of alert cycles in **ESC BEL** to zero, this command does not function.

See also:
ESC BEL <n1> <n2> <n3> – Configure Audio Alert

Expression

ASCII	[BEL]
Hexadecimal	07H
Decimal	<7>
Parameters	None

HT – Horizontal Tab

Description

Moves the cursor position to the next multiple of eight single-width characters. If the HT command causes the cursor to move beyond the printable area, the text will wrap to the next line.

 Note that double-width characters count as two single-width characters.

Expression

ASCII	[HT]
Hexadecimal	09H
Decimal	<9>
Parameters	None

LF – Line Feed

Description

Prints the current line of text, and advances the text position to the beginning of the next line. Note that the line feed, line feed/carriage return, carriage return, and carriage return/line feed instructions all behave as a single line feed. If the current line extends beyond the printable area, the text will wrap to the next printable area.

The double-wide text attribute will be cleared after the line is printed.

Expression

ASCII	[LF]
Hexadecimal	0AH
Decimal	<10>
Parameters	None

FF – Form Feed

Description

This command prints the contents of the text buffer, and then advances the print media. The form is advanced until either of the following two conditions occurs:

- The feed distance specified by the **GS L** command has been reached.

-or-

- A Black Dot/Top of Form indicator has been detected on the print media.

When the printer is initially powered on, the default feed distance stored in NVRAM is used. This value has a factory default of 7.5 inches, and can be overridden by specifying a new value using the **GS L** macro command.

Feed distances specified via **GS L** are cleared whenever the printer is powered down, or by issuing the **ESC @** or **ESC *** reset commands.

This command shares identical functionality with the escape command **ESC E**.

See also:
ESC E – Form Feed

Expression

ASCII	[FF]
Hexadecimal	0CH
Decimal	<12>
Parameters	None

CR – Carriage Return

Description

Prints the current line of text, and advances the text position to the beginning of the next line. Note that the line feed, line feed/carriage return, carriage return, and carriage return/line feed instructions all behave as a single line feed. If the current line extends beyond the printable area, the text will wrap to the next printable area. The double-wide text attribute will be cleared after the line is printed.

Expression

ASCII	[CR]
Hexadecimal	0DH
Decimal	<13>
Parameters	None

SO – Set Font to Double-wide

Description

Causes all the text that follows the command on the same line to be printed as double-wide characters. Double-wide characters are canceled by a line feed (**CR** or **LF**) or the **DC4** command.

Double-wide is a character attribute which is available on a character-by-character basis. Double-wide text can be canceled at any point on the line, and is automatically canceled at the end of the line. Therefore, subsequent lines will not be printed as double-wide text unless the **SO** command is reissued at the beginning of each line.

See also:
DC4 – Cancel Double-wide Mode

Expression

ASCII	[SO]
Hexadecimal	0EH
Decimal	<14>
Parameters	None

DC4 – Cancel Double-wide Mode

Description

Cancels double-wide text printing and returns the text to normal.

See also:
SO – Set Font to Double-wide
ESC W – Wrap Data

Expression

ASCII	[DC4]
Hexadecimal	14H
Decimal	<20>
Parameters	None

ENQ – Request Combined Printer Status

Description

Returns four status bytes: **GS y** (so that the status string can be recognized/parsed by the host), followed by the response byte for the **GS S** Return Printer Status command and then by the response byte for the **GS z** Request Printer Status command.

The **ENQ** and **GS y** commands are the same and produce the same result.

See also:
GS y – Request Combined Printer Status
GS S – Return Printer Status
GS z – Request Printer Status

Expression

ASCII	ENQ
Hexadecimal	05
Decimal	<5>
Parameters	None

20h – FFh – Printable Characters

Description

These characters, while not part of an escape (command) sequence, will be printed using the currently selected font. The standard, printable ASCII characters are associated with their normal values, which range from decimal value 32 to decimal value 255.

Expression

ASCII	See Appendix A for a summary of character codes.
Hexadecimal	20H-FFH
Decimal	<32>-<255>
Parameters	None

ESC ENQ 1 – Return Version Information

Description

Returns version information for your Epic 950 printer, in the format:

[ENQ]1<length byte><Name/version string>

Example output:
[ENQ]1<20>TransAct M950 S00114

Expression

ASCII	[ESC] ENQ 1
Hexadecimal	1BH 05H 1
Decimal	<27> <5> 1
Parameters	None

ESC BEL – Configure Audio Alert

Description

The **ESC BEL** command alters the way the audio alert sounds when the **BEL** command is issued. The default is a single sound lasting the period of time defined by the audio alert setting parameters below.

See also:
BEL – Audio Alert

Expression

ASCII	[ESC] [BEL] *<n1> <n2> <n3>*
Hexadecimal	1BH 07H *<n1> <n2> <n3>*
Decimal	*<27> <7> <n1> <n2> <n3>*
Parameters	*<n1>* is the number of alert cycles *<n2>* is the on time of the alert cycle in ten Ms intervals *<n3>* is the off time of the alert cycle in ten Ms intervals

ESC SP – Set Right-Side Character Spacing

Description

This command sets the character spacing for the right side of the character. The spacing value *<n>* is specified in dots, where 1 dot = 1/203 inch.

Expression

ASCII	[ESC] [SP] *<n>*
Hexadecimal	1BH 20H *<n>*
Decimal	<27> <32> *<n>*
Parameters	*<n>* = spacing value in dots, where 1 dot = 1/203 inch Range: 0-255

ESC ! – Select Print Mode(s)

Description

Selects the font and right-side character spacing, using the convention shown below.

Expression

ASCII	[ESC] ! *<n>*
Hexadecimal	1BH 21H *<n>*
Decimal	<27> <33> *<n>*

Parameters	*<n>* = value from 0-4 which selects one of the following options:
	    n = 0 selects the 10x24 font and sets the intercharacter spacing for 20 CPI.
	    n = 1 selects the 12x24 font and sets the intercharacter spacing for 16 CPI.
	    n = 2 selects the 16x32 font and sets the intercharacter spacing for 14 CPI.
	    n = 3 selects the 20x32 font and sets the intercharacter spacing for 12 CPI.
	    n = 4 selects the 28x56 font and sets the intercharacter spacing for 7 CPI.

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ESC $ – Set Absolute Horizontal Position in page mode

Description

Sets the horizontal print position measured from the left edge of the page, for the currently selected print direction. Distance is specified in dots, where 1 dot = 1/203 inch. The n1 and n2 parameters are evaluated to form a 16-bit word as follows: first, the n1 parameter's decimal value is multiplied by 256, then the result is added to the decimal value of the n2 parameter.

Expression

ASCII	[ESC] $ *<n1><n2>*
Hexadecimal	1BH 24H *<n1><n2>*
Decimal	*<27> <36> <n1><n2>*
Parameters	n1 = most significant byte of start position n2 = least significant byte of start position

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ESC * – Reset to Defaults

Description

Returns the printer to its power-up condition, clears all buffers, and resets all character attributes. The ESC * command is the same as the ESC @ command.

See also
ESC @ – Reset to Power-up Condition

Expression

ASCII	[ESC] *
Hexadecimal	1BH 2AH
Decimal	<27> <42>
Parameters	None

ESC @ – Reset to Power-up Condition

Description

Returns the printer to its power-up condition, clears all buffers, and resets all character attributes. The ESC @ command is the same as the ESC * command.

See also
ESC * – Reset to Defaults

Expression

ASCII	[ESC] @
Hexadecimal	1BH 40H
Decimal	<27> <64>
Parameters	None

ESC B – Print Bitmap (BMP) Image

Description

This command will print a bitmap (Microsoft BMP file format) image.

To use this command, send the ESC (1Bh) character followed by the complete BMP file. Note that the first character of a bitmap file is always "B", therefore ESC B is recognized by the Epic 950 as the code to print a bitmap file.

The printer decodes the BMP file header and will print the image data after checking important parameters, such as width, height and number of colors.

Note: Only monochrome or 4-bit color BMP file images are supported. Other BMP file formats are ignored.

Further information about the Microsoft BMP bitmap file format is available on-line at http://www.faqs.org/faqs/graphics/fileformats-faq. Note that this site is not affiliated with TransAct Technologies

Expression

ASCII	[ESC] <BMP file>
Hexadecimal	1BH <BMP file>
Decimal	<27> <BMP file>
Parameters	<BMP file> - contents of a Microsoft bitmap (BMP) format file, with the ASCII letter B as the first byte.

ESC E – Form Feed

This command prints the contents of the text buffer, and then advances the print media. The form is advanced until either of the following two conditions occurs:

- The feed distance specified by the **GS L** command has been reached
                                    -or-
- A Black Dot/Top of Form indicator has been detected on the print media

When the printer is initially powered on, the default feed distance stored in NVRAM is used. This value has a factory default of 7.5 inches, and can be overridden by specifying a new value using the **GS L** macro command.

Feed distances specified via **GS L** are cleared whenever the printer is powered down, or by issuing the **ESC @** or **ESC *** reset commands.

This command shares identical functionality with the **FF** command.

See also:
FF – Form Feed

Expression

ASCII	[ESC] E
Hexadecimal	1BH 45H
Decimal	<27> <69>
Parameters	None

ESC F – Select Fonts

Description

The ESC F command selects a font based on the specified point size, width ratio and attributes.

Expression

ASCII	[ESC] F *<n1><n2><n3>*
Hexadecimal	1BH 46H *<n1><n2><n3>*
Decimal	*<27> <70> <n1><n2><n3>*
Parameters	n1 = Point size of font n2 = Font width ratio. This parameter is currently reserved for future use, but must have a value specified. n3 = Attributes, where n3=1 selects double strike, and values with the most significant bit (MSB) set to 1 will select fixed pitch fonts.

ESC G – Turn Double-strike Mode On/Off

This command turns double-strike mode on or off. When the least significant bit (LSB) of the parameter *n* is 0, double-strike mode is turned off. When the LSB is 1, double-strike mode is turned on.

Expression

ASCII	ESC G *<n>*
Hexadecimal	1BH 47H *<n>*
Decimal	<27> <71> *<n>*

Parameters	*n* = value ranging from 0 to 255, where:
	    LSB = 0 turns off double-strike mode
	    LSB = 1 turns on double-strike mode

ESC J − Feed *n* Sublines

Description

Feeds *n* number of sublines (n/203 inch). This command causes the printer to print data stored in the buffer and then feed *n* number of dot lines. This command is similar in functionality to the **GS d** command.

See also
GS d – Feed *n* Text Lines

Expression

ASCII	[ESC] J
Hexadecimal	1BH 4AH
Decimal	<27> <74>
Parameters	*n* = the desired number of sublines to feed

ESC M – Set Font to 12 cpi

Description

Changes the character size for subsequent characters to the 12 cpi normal font. This is the default font.

Fonts may only be changed at the beginning of a line, prior to any printable characters. This font will remain in effect until the printer is reset (by the ESC @ or ESC * command) or another font is selected.

See also
ESC P – Set Font to 16 cpi
ESC S – Set Font to 20 cpi
ESC U – Set Font to 10 cpi
ESC T – Set Font to 7 cpi

Expression

ASCII	[ESC] M
Hexadecimal	1BH 4DH
Decimal	<27> <77>
Parameters	None

Comparison table of font sizes

Font	Height (dots)	Width (dots)	Horizontal cpi	Vertical cpi
ESC S - mini	24	10	20.0	8.4
ESC P - mini	24	12	16.9	8.4
ESC M – normal (default)	32	16	12.7	6.4
ESC U - headline	32	20	10.2	6.4
ESC T - headline	56	28	7.3	3.6

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ESC P – Set Font to 16 cpi

Description

Changes the character size for subsequent characters to the 16 cpi mini font.

Fonts may only be changed at the beginning of a line, prior to any printable characters. This font will remain in effect until the printer is reset (by the ESC @ or ESC * command) or another font is selected.

See also
ESC M – Set Font to 12 cpi
ESC S – Set Font to 20 cpi
ESC U – Set Font to 10 cpi
ESC T – Set Font to 7 cpi

Expression

ASCII	[ESC] P
Hexadecimal	1BH 50H
Decimal	<27> <80>
Parameters	None

Comparison table of font sizes

Font	Height (dots)	Width (dots)	Horizontal cpi	Vertical cpi
ESC S - mini	24	10	20.0	8.4
ESC P - mini	24	12	16.9	8.4
ESC M – normal (default)	32	16	12.7	6.4
ESC U - headline	32	20	10.2	6.4
ESC T - headline	56	28	7.3	3.6

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ESC S – Set Font to 20 cpi

Description

Changes the character size for subsequent characters to the 20 cpi font.

Fonts may only be changed at the beginning of a line, prior to any printable characters. This font will remain in effect until the printer is reset (by the ESC @ or ESC * command) or another font is selected.

See also
ESC P – Set Font to 16 cpi
ESC M – Set Font to 12 cpi
ESC U – Set Font to 10 cpi
ESC T – Set Font to 7 cpi

Expression

ASCII	[ESC] M
Hexadecimal	1BH 4DH
Decimal	<27> <77>
Parameters	None

Comparison table of font sizes

Font	Height (dots)	Width (dots)	Horizontal cpi	Vertical cpi
ESC S - mini	24	10	20.0	8.4
ESC P - mini	24	12	16.9	8.4
ESC M – normal (default)	32	16	12.7	6.4
ESC U - headline	32	20	10.2	6.4
ESC T - headline	56	28	7.3	3.6

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ESC T – Set Font to 7 cpi

Description

Changes the character size for subsequent characters to the 7 cpi headline font.

Fonts may only be changed at the beginning of a line, prior to any printable characters. This font will remain in effect until the printer is reset (by the ESC @ or ESC * command) or another font is selected.

See also
ESC P – Set Font to 16 cpi
ESC S – Set Font to 20 cpi
ESC M – Set Font to 12 cpi
ESC U – Set Font to 10 cpi

Expression

ASCII	[ESC] T
Hexadecimal	1BH 54H
Decimal	<27> <84>
Parameters	None

Comparison table of font sizes

Font	Height (dots)	Width (dots)	Horizontal cpi	Vertical cpi
ESC S - mini	24	10	20.0	8.4
ESC P - mini	24	12	16.9	8.4
ESC M – normal (default)	32	16	12.7	6.4
ESC U - headline	32	20	10.2	6.4
ESC T - headline	56	28	7.3	3.6

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ESC U – Set Font to 10 cpi

Description

Changes the character size for subsequent characters to the 10 cpi headline font.

Fonts may only be changed at the beginning of a line, prior to any printable characters. This font will remain in effect until the printer is reset (by the ESC @ or ESC * command) or another font is selected.

See also
ESC P – Set Font to 16 cpi
ESC M – Set Font to 12 cpi
ESC S – Set Font to 20 cpi
ESC T – Set Font to 7 cpi

Expression

ASCII	[ESC] T
Hexadecimal	1BH 55H
Decimal	<27> <85>
Parameters	None

Comparison table of font sizes

Font	Height (dots)	Width (dots)	Horizontal cpi	Vertical cpi
ESC S - mini	24	10	20.0	8.4
ESC P - mini	24	12	16.9	8.4
ESC M – normal (default)	32	16	12.7	6.4
ESC U - headline	32	20	10.2	6.4
ESC T - headline	56	28	7.3	3.6

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ESC V – Return Firmware Revision

Description

This command returns two ASCII characters that represent the firmware revision.

Expression

ASCII	[ESC] V
Hexadecimal	1BH 56
Decimal	<27> <86>
Parameters	None

ESC W – Wrap Data

Description

Causes the characters *n1* and *n2* to be echoed back to the host. As soon as *n1* is received by the printer, the printer, in turn, will transmit *n1* back to the host. Your program should wait to receive *n1* before outputting *n2*. If you do not wait, you may lose *n1*.

If *n1* and *n2* are received successfully by the host, you can be reasonably assured that there is an Epic 950 attached to the serial port, and that your program can communicate with the printer.

Expression

ASCII	[ESC] W *n1 n2*
Hexadecimal	1BH 75H *n1 n2*
Decimal	<27> <87> *n1 n2*
Parameters	*n1* = first character to echo *n2* = second character to echo

ESC X – Set Horizontal Starting Position

Description

This command is used in landscape printing to set a new offset from the left margin from which to begin printing text and bar code objects. Distance is specified in dots (1 dot = 1/203 inch).

The *n1* and *n2* parameters are evaluated to form a 16-bit word as follows: first, the *n1* parameter's decimal value is multiplied by 256, then the result is added to the decimal value of the *n2* parameter.

Expression

ASCII	[ESC] X *n1 n2*
Hexadecimal	1BH 58H *n1 n2*
Decimal	<27> <88> *n1 n2*
Parameters	*n1* = high-order byte of 16-bit word that specifies distance *n2* = low-order byte of 16-bit word that specifies distance

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ESC Y – Set Vertical Starting Position

Description

This command is used in landscape printing to set a new offset from the top margin from which to begin printing text and bar code objects. Distance is specified in millimeters, with a maximum allowable value of 53 millimeters.

Expression

ASCII	[ESC] Y *n*
Hexadecimal	1BH 59H *n*
Decimal	<27> <89> *n*
Parameters	*n* = the offset distance in millimeters

ESC c − Select Color

Description

The **ESC c** command selects the current print color. Note that this command is only effective when using 2-color ticket stock.

Expression

ASCII	[ESC] c *n*
Hexadecimal	1BH 63H
Decimal	<27> <99>

Parameters	*n* = print color where
	    n = 0: primary color (black)
	    n = 1: secondary color

ESC t – Set Print Direction in Page Mode

Description

ESC t sets the print direction and starting position in page mode specified by the parameter *n,* as shown below. The default setting is *n* = 0. This command is enabled only in page mode. If this command is entered in standard mode, an internal flag is activated, and the command is enabled when the printer returns to page mode.

Commands that affect horizontal position (e.g. **ESC $**) and vertical position (e.g. **GS $**) in page mode set the position relative to the print direction set by this command, as illustrated below.

Expression

ASCII	[ESC] t *<n>*
Hexadecimal	1BH 74H *<n>*
Decimal	<27><116>*<n>*
Parameters	*n* = parameter value ranging from 0-3, 48-51 per table below
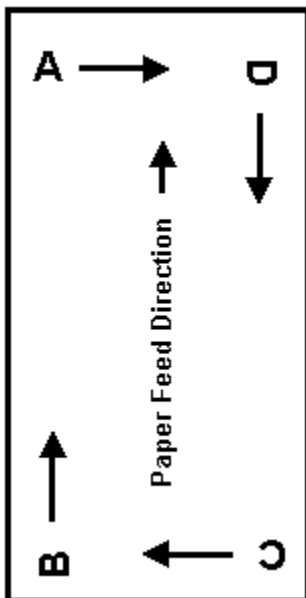
n	Print Direction	Starting Position
0, 48	Left to right	Upper left (A in figure)
1, 49	Bottom to top	Lower left (B in figure)
2, 50	Right to left	Lower right (C in figure)
3, 51	Top to bottom	Upper right (D in figure)

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GS DC2 – Set Font to Double-high

Description

Causes the current font to be printed at twice its normal height. The double-high setting will remain in effect until the current line attributes are cleared.

See also
GS DC3 – Cancel Double-high Font

Expression

ASCII	[GS] [DC2]
Hexadecimal	1DH 12H
Decimal	<29> <18>
Parameters	None

GS DC3 – Cancel Double-high Font

Description

Cancels the double-high characters and returns to normal size font. This command must be sent at the beginning of a line, in front of any printable characters.

See also
GS DC2 – Set Font to Double-high

Expression

ASCII	[GS] [DC3]
Hexadecimal	1DH 13H
Decimal	<29> <19>
Parameters	None

GS RS – Set Inverse Print Mode

Description

Causes all the data that follows the command and appears on the current line to be printed as inverse characters (white on black). Inverse characters are canceled when character attributes are canceled.

See also
GS US – Cancel Inverse Print Mode

Expression

ASCII	[GS] [RS]
Hexadecimal	1DH 1EH
Decimal	<29> <30>
Parameters	None

GS US – Cancel Inverse Print Mode

Description

Cancels the inverse print mode (white on black) and returns text back to its normal attributes for the remainder of the current line.

See also
GS RS – Set Inverse Print Mode

Expression

ASCII	[GS] [US]
Hexadecimal	1DH 1FH
Decimal	<29> <31>
Parameters	None

GS ! – Select Character Size

Description

This command selects the character height using bits 0 to 2 of parameter *n*, and selects the character width using bits 4 to 7 of this parameter, as shown below.

Expression

ASCII	[GS] ! <*n*>
Hexadecimal	1DH 21H <*n*>
Decimal	<29><33><*n*>
Parameters	*n* = parameter ranging from 0-255 Height (bits 0-2) and width (bits 4-7) values range from 1-8, per table below.

Character height selection

Hex	Decimal	Height
00	0	1 (normal)
01	1	2 (double-high)
02	2	3
03	3	4
04	4	5
05	5	6
06	6	7
07	7	8

Character width selection

Hex	Decimal	Width
00	0	1 (normal)
10	16	2 (double-wide)
20	32	3
30	48	4
40	64	5
50	80	6
60	96	7
70	112	8

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GS $ – Set Absolute Vertical Position in Page Mode

Description

Sets the vertical print position measured from the top of the page, for the currently selected print direction.   Distance is specified in dots, where 1 dot = 1/203 inch.

The *n1* and *n2* parameters are evaluated to form a 16-bit word as follows: first, the *n1* parameter's decimal value is multiplied by 256, then the result is added to the decimal value of the *n2* parameter.

Expression

ASCII	[GS] $ *<n1><n2>*
Hexadecimal	1DH 24H *<n1><n2>*
Decimal	*<29> <36> <n1><n2>*
Parameters	*n1* = most significant byte of start position *n2* = least significant byte of start position

GS * – Landscape Mode Graphics

Description

Prints a graphic image (in landscape mode only).

Expression

ASCII	[GS] * *n1 n2 t h w d1…dm*
Hexadecimal	1DH 2AH *n1 n2 t h w d1…dm*
Decimal	*<29> <42> <n1> <n2> <t> <h> <w> <d1…dm>*
Parameters	*n1* = most significant byte of left offset *n2* = least significant byte of left offset *t* = offset from top (in millimeters) *h* = height of graphic (in millimeters) *w* = width of graphic (in dots) *d1* = first data byte *dm* = last data byte (h * w)

GS ? – CRC Verification

Description

Returns the 16-bit cyclical redundancy check (CRC) value for the printer's memory.
Value is returned in the form:

[gs]?<high byte of CRC value><low byte of CRC value>

Expression

ASCII	[GS] ? *n1 n2*
Hexadecimal	1DH 3FH *n1 n2*
Decimal	*<29> <63> <n1> <n2>*
Parameters	*n1* = 4 byte start address *n2* = 2 byte seed

GS 0 – Print User Defined Image

Description

Prints an image from the EEPROM memory, if found in the directory.

Note: An image must be downloaded to the printer before it can be printed using this command. See the **GS 1** Enter Download Image mode command for details.

Expression

ASCII	[GS] 0 *<n1><n2><t><name>*[Null]
Hexadecimal	1DH 30 *<n1><n2><t><name>* 00H
Decimal	*<29> <48> <n1><n2><t><name> <0>*
Parameters	*n1* = most significant byte of left offset *n2* = least significant byte of left offset *t* = offset from top *name* = image name saved in EEPROM

GS 1 – Enter Download Image Mode

Description

Enters Download Image mode. Sends an [ACK] when download is complete.

Expression

ASCII	[GS] 1
Hexadecimal	1DH 31
Decimal	<29> <49>
Parameters	None

Notes
- If you wish to download coupon images to your printer, contact TransAct for a copy of the Ticket Layout Editor utility program.
- Image capacity is relative to available memory for storing downloaded images. Approximately 11K Bytes of memory is equivalent to one full-ticket image or more smaller images.

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GS 3 – Image Status Handler

Description

Returns status information specified by the value of the parameter *n*.

Expression

ASCII	[GS] 3 <*n*>
Hexadecimal	1DH 33 <*n*>
Decimal	<29> <51> <*n*>
Parameters	*n* = parameter value specified as follows: n = 0: Printer responds with [ACK] if valid firmware, or [NAK] if not expanded memory board. n = 1: Printer responds with checksum of the downloaded images. n = 2: Return image directory, printer responds with file names terminated with [CR].

GS A – Starting Position of Bar Code

Description

This command is used to center a bar code on a text line, and defines the distance from the left where the first bar code will print. The distance is represented in dots, where each dot represents increments of 1/203 of an inch.

Expression

ASCII	[GS] A *n1 n2*
Hexadecimal	1DH 41H *n1 n2*
Decimal	<29> <65> *n1 n2*
Parameters	*n1* = the most significant byte *n2* = the least significant byte Number of dots = Inches/203 = (*n1* * 256) + *n2*

Starting position of bar code

Length (in inches)	Number of Dots	n1	N2
0.5	102	0	102
1.0	203	0	203
2.0	406	1	150
3.0	609	2	97

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GS E – Set Validation Number Field

Description

Sets the Validation Number field flag.

Expression

ASCII	[GS] E
Hexadecimal	1DH 45
Decimal	<29> <69>
Parameters	None

Notes
- This command tells the printer that the next text sent to the printer will be a validation number. When this field has been printed on the ticket, the Validation Completed status bit will be set (see the **GS z** Request Printer Status command).
- This command will work in both Portrait Mode and Landscape Mode (Page Mode).
- In Landscape Mode (Page Mode), setting the Validation Number field flag with this command will have the same effect as setting it using the **GS F** Set Field in Page Mode command.

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GS F – Set Field in Page Mode

Description

Sets a text field in page mode, between the horizontal start position (*n2* * 256 + *n3)* and the horizontal end position (*n4* * 256 + *n5).* Positions are specified in dots, where 1 dot = 1/203 inch, relative to the left edge of the page for the currently selected print direction.

The text to be entered in this field should follow this command and should be terminated by a [CR] or [LF]. If more text is entered than can be contained within the field, the excess text characters are truncated.

Expression

ASCII	[GS] F *<n1><n2><n3><n4><n5>*
Hexadecimal	1DH 46H *<n1><n2><n3><n4><n5>*
Decimal	<29> <70> *<n1><n2><n3><n4><n5>*

Parameters	*n1* = Sets format for this field, as follows:
	    Bit 7 = Validation Number field flag
	        1 = Validation Number field
	        0 = All other fields
	    Bits 3-6 are reserved for future use
	    Bits 1, 0 = Justification mode for this field's text data
	        (Decimal value of masked bits)
	        0 = Left Justification
	        1 = Centering
	        2 = Right Justification
	n2 = most significant byte of start position
	n3 = least significant byte of start position
	    (Start position = Inches/203 = (*n2* * 256) + *n3*)
	n4 = most significant byte of end position
	n5 = least significant byte of end position
	    (End position = Inches/203 = (*n4* * 256) + *n5*)

Notes

- A Validation Number field is presumed to be defined to print on the leading edge of a ticket. When this field is printed on the ticket, the Validation Completed status bit will be set (see Request Printer Status command, on page 62).
- A field can hold a maximum of 200 characters. If more than 200 characters are entered in a field, or more than can be printed between the selected start and end positions, the excess characters are discarded without being printed.
- If the specified start or end positions are out of bounds for the page width and selected page orientation (e.g., if the start position is greater or equal to the end position, or if either position is outside the page boundaries) the field's start and end positions will default to the full width of the page. This fact can be used to

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simplify specifying a full width field, by setting *<n2><n3><n4><n5>* = <0><0><0><0>.

- Commands for setting the font and other character attributes to apply to this field should be transmitted before this command. Only printable text characters with a single [CR] or [LF] terminator should follow as data for this command.

GS G – Print Custom Graphic

Description

Prints a custom graphic. These graphics are predefined by the OEM.

Note: This command only functions in landscape mode.

Expression

ASCII	[GS] G *n1 n2 t d*
Hexadecimal	1DH 47H *n1 n2 t d*
Decimal	*<29> <71> <n1> <n2> <t> <d>*
Parameters	*n1* = the most significant byte of left offset *n2* = the least significant byte of left offset (Left offset = (n1 * 256) + n2) *t* = offset from top (in millimeters) *d* = the direction to print the arrow. Right = 0; Left = 1 0 = Arrow ($\rightarrow$) graphic with inverted "INSERT FACE UP" text inside.

The figure below shows an example of printing custom graphics. If you were looking at a ticket printed in landscape mode, the arrow will point to the right.

GS L – Set Feed Length

Description

Sets the distance the print media will advance upon receipt of a form feed (FF or ESC E) command. The distance is represented in dots, where each dot represents increments of 1/203 of an inch. The number of dots = $n1 * 256 + n2$.

Expression

ASCII	[GS] L *n1 n2*
Hexadecimal	1DH 4CH *n1 n2*
Decimal	<29> <76> *n1 n2*
Parameters	*n1* = the most significant byte *n2* = the least significant byte Number of dots = inches/203 = (n1 * 256) + n2

Set Feed Length Specifications

Length (in inches)	Number of Dots	n1	n2
0.5	102	0	102
1.0	203	0	203
2.0	406	1	150
3.0	609	2	97
4.0	812	3	44
5.0	1015	3	247
6.0	1218	4	194
7.0	1421	5	141
8.0	1624	6	88

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GS S – Return Printer Status

Description

Returns a single status byte, from which the printer status is determined by testing the individual bits within this returned status byte. Only bits that have defined values should be tested – do not test bits designated as reserved.

When polling for the status byte, your program must wait for the status byte to arrive. The printer will take several milliseconds to process the request and then transmit the status byte. If your program does not wait for a received character, you may receive erroneous results.

Expression

ASCII	[GS] S
Hexadecimal	1DH 53H
Decimal	<29> <83>
Parameters	None

Returned values from status byte

Bit	Bit = 0	Bit = 1
0 LSB	Printer Not Ready	Printer Ready
1	Not Top of Form	Top of Form
2	RESERVED	RESERVED
3	Head is Down	Head is Up
4	Chassis is Closed	Chassis is Open
5	Ticket Loaded	Out of Ticket
6	RESERVED	RESERVED
7 MSB	RESERVED	RESERVED

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GS T – Select Line Wrap/Truncate Modes

Description

Determines how to handle a text wrap condition. A text wrap condition occurs when text extends beyond the end of a line or a page. The default is to wrap at the end of a line and a page.

Expression

ASCII	[GS] T <*n*>
Hexadecimal	1DH 54H <*n*>
Decimal	<29> <84> <*n*>
Parameters	*n* = value for how to handle text wrap condition = 0 truncate in both directions = 1 wrap at end of line, but not end of page = 2 wrap at end of page, but not end of line = 3 wrap at end of line and end of page

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GS V – Set Print Orientation

Description

Causes the printer to print the data stored in the print buffer and then change to the selected orientation.

See also
GS t – Set Characters per Line in Landscape

Expression

ASCII	[GS] V <*n*>
Hexadecimal	1DH 56H <*n*>
Decimal	<29> <86> <*n*>

Parameters	*n* = Specifies the orientation and speed/resolution
	        = 0 Portrait 203 x 203 High Speed
	        = 1 Landscape 203 x 203 High Speed

The figure below shows examples of the two different print orientations on a ticket.

GS W – Set Bar Code Element Width

Description

Selects the horizontal size of a bar code element. The *Thin* parameter represents the thickness of the thin bars (in dots). The *Thick* parameter represents the thickness of the thick bars (in dots). Each dot measures 0.0049 inches in 203 dpi and 0.0073 inches in 138 dpi.

In Code 39, Interleaved 2 of 5, and Codabar, the thick bar width is set according to the *Thick* parameter, however, all other symbologies ignore the *Thick* parameter. The *Thin* parameter is used by all symbologies.

The default setting is Thin = 4, Thick = 12.

Expression

ASCII	[GS] W *Thin Thick*
Hexadecimal	1DH 57H *Thin Thick*
Decimal	<29> <87> *Thin Thick*
Parameters	*Thin* = thickness of thin bars, in dots *Thick* = thickness of thick bars, in dots

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GS d − Feed *n* Text Lines

Description

Prints the contents of the buffer and feeds *n* number of text lines. This command has the same effect as line feeds.

See also
ESC J – Feed *n* Sublines

Expression

ASCII	[GS] d <*n*>
Hexadecimal	1DH 64H <*n*>
Decimal	<29> <100> <*n*>
Parameters	*n* = the desired distance (in text lines) to advance the ticket

GS h – Set Bar Code Height

Description

Defines the height of the bars (in dots) for bar codes. The height is defined in n/203 inch increments, corresponding to the height of a single dot. For example, specify 203 as the value for n to print a 1-inch high bar code. Note that the bar code height is always rounded up to the next multiple of 8.

The default setting is 100.

Expression

ASCII	[GS] h <n>
Hexadecimal	1DH 68H <n>
Decimal	<29> <104> <n>
Parameters	n = the desired height (in dot lines) of the bar code, where n/203 represents the height in inches.

GS k – Print Bar Code

Description

Prints a bar code at the current position in the current orientation. The *n* parameter selects the symbology to be printed. The *m* parameter specifies how many characters are to be encoded as part of the bar code, except in cases where *n*=2, where *m* represents the EAN/UPC symbology to be used.

Expression

ASCII	[GS] k <*n*> <*m*> d1…dm
Hexadecimal	1DH 6BH <*n*> <*m*> d1…dm
Decimal	<29> <107> <*n*> <*m*> d1…dm
Parameters	*n* = Selects the bar code symbology to be used, based on the table below. *m* = Specifies the number of characters to be encoded. Also specifies which EAN/UPC symbology will be used, in cases where *n*=2, based on the table below. *d1..dm* = The data characters to be encoded

Character Value	Bar Code Selected	
n = 0	reserved	
n = 1	reserved	
n = 2	EAN/UPC Auto	
	m = 6	UPC-E
	m = 7	EAN-8
	m = 11	UPC-A
	m = 12	EAN-13
n = 3	reserved	
n = 4	Code 3 of 9	
n = 5	reserved	
n = 6	Codabar	
n = 7	Interleaved 2 of 5	
n = 8	Code 128-A	
n = 9	Code 128-B	
n = 10	Code 128-C	
n = 11	Code 128-Auto	
n = 12	Code93	
n = 13	reserved	
n = 14	reserved	
n = 15	reserved	

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GS l – Draw Line in Landscape Mode

Description

The GS l (lower-case "L") command draws a line in landscape mode. The thickness of the line is determined by the bit set by the parameter *m*.

Expression

ASCII	[GS] l *<n1> <n2> <L1> <L2> <m>*
Hexadecimal	1DH 6CH *<n1> <n2> <L1> <L2> <m>*
Decimal	*<29> <108> <n1> <n2> <L1> <L2> <m>*
Parameters	*n1* = most significant byte of the offset from the left (in dots) *n2* = least significant byte of the offset from the left (in dots) *L1* = most significant byte of the line length (in dots) *L2* = least significant byte of the line length (in dots) where offset = inches/203 = (*n1* * 256) + *n2* length = inches/203 = (*L1* * 256) + *L2* *m* = the data (where 0 = top and 7 = bottom)

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GS t – Set Characters per Line in Landscape

Description

Creates an internal memory buffer to store landscape text and bar codes until a form feed is received. The size of the buffer is determined by *n*, the number of characters per line.

The *n* parameter is converted internally to millimeters, so new line lengths can be automatically calculated in the event a font change takes place. The conversion to millimeters is performed by multiplying the value of *n* by the width of whatever font is currently set when the **GS t** command is sent.

This command may be used in conjunction with the **GS T** command to determine where, if at all, text wraps to the next line.

This command is similar to the **GS u** command.

See also
GS u – Set Characters per Line in Portrait
GS T – Select Line Wrap/Truncate Modes

Expression

ASCII	[GS] t *<n>*
Hexadecimal	1DH 74H *<n>*
Decimal	<29> <116> *<n>*
Parameters	*n* = the desired number of characters per line in landscape mode

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GS u – Set Characters per Line in Portrait

Description

Creates an internal memory buffer to store portrait text and bar codes. The size of the buffer is determined by *n*, the number of characters per line.

The *n* parameter is converted internally to millimeters, so new line lengths can be automatically calculated in the event that a font change takes place. The conversion to millimeters is performed by multiplying the value of *n* by the width of whatever font is currently set when the **GS u** command is sent.

This command may be used in conjunction with the **GS T** command to determine where, if at all, text wraps to the next line.

This command is similar to the **GS t** command.

See also
GS t – Set Characters per Line in Landscape
GS T – Select Line Wrap/Truncate Modes

Expression

ASCII	[GS] u *<n>*
Hexadecimal	1DH 75H *<n>*
Decimal	<29> <117> *<n>*
Parameters	*n* = the desired number of characters per line in portrait mode

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GS w – Set Bar Code Module Width

Description

Selects the horizontal size of a bar code module. The parameter *n* represents the thickness of the thin bars in dots, where each dot measures 0.0049 inches in 203 dpi and 0.0073 inches in 138 dpi. With Code 39, Interleaved 2 of 5, and Codabar, the thick bars will be automatically adjusted to 2 * *n*.

The default setting is Thin = 4, Thick = 12.

Expression

ASCII	[GS] w *<n>*
Hexadecimal	1DH 77H *<n>*
Decimal	<29> <119> *<n>*
Parameters	*n* = the desired horizontal size (in dots) of thin bar codes; with Code 39, Interleaved 2 of 5, and Codabar, thick bar codes = 2 * *n*

GS y – Request Combined Printer Status

Description

Returns four status bytes: **GS y** (so that the status string can be recognized/parsed by the host), followed by the response byte for the **GS S** Return Printer Status command and then by the response byte for the **GS z** Request Printer Status command.

The **ENQ** and **GS y** commands are the same and produce the same result.

See also:
ENQ – Request Combined Printer Status
GS S – Return Printer Status
GS z – Request Printer Status

Expression

ASCII	[GS] y
Hexadecimal	1DH 79H
Decimal	<29> <121>
Parameters	None

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GS z – Request Printer Status

Description

This command returns a single status byte reflecting the printer status, which is determined by testing the individual bits within the returned status byte. Do not test bits designated as reserved. All sensor bits defined below are a debounced reading of the hardware sensors.

For firmware compatibility with previous versions of your printer, including Series 800 printers, an earlier status bit convention may be selected at device initialization time via the **POR.INI** file described in the chapter **Programming for the Epic 950**, with status bits interpreted as documented below.

Expression

ASCII	[GS] z
Hexadecimal	1DH 7AH
Decimal	<29> <122>
Parameters	None

Default format:

Bit	Bit = 0	Bit = 1
0 LSB	Ticket not low	Ticket low
1	Ticket not in printer	Ticket in printer[1]
2	Not Top of Form State	Top of Form State
3	RESERVED	This bit is always = 1
4	Bar Code not Completed	Bar Code Completed
5	Validation not Completed	Validation Completed
6	Ticket not in path	Ticket in path
7 MSB	No paper jam	Paper Jam

Compatibility format:
When a compatibility mode for earlier printers is selected at device initialization, the above byte will instead follow the format used in Series 800 printers prior to firmware revision 8520. This mode is set using the **POR.INI** file – this file is documented in the chapter **Programming for the Epic 950**. This format is as follows:

---

[1] This status will also be cleared for a Inner Chassis Open or Head Up. Head Up and Inner Chassis Open status are available on [GS] S command.

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Bit	Bit = 0	Bit = 1
0 LSB	Ticket not low	Ticket low
1	Ticket not in printer	Ticket in printer
2	Not Top of Form State	Top of Form State
3	(logical) Ticket loaded	Ticket not loaded
4	Bar Code not Completed	Bar Code Completed
5	Ticket not Completed	Ticket Completed
6	Ticket not in path	Ticket in path
7 MSB	No paper jam	Paper Jam

Note 1: This command will reset the Ticket and Bar Code Completed Status bits

Note 2: To reset the Validation and Bar Code Complete status bits, the [ESC]@ command must be issued. In addition, the Validation Complete and the Barcode Complete are stored in Nonvolatile Memory on the printer and will remain set through a power failure.

Validation complete is set when the Validation number is printed on the ticket. Per the Gaming Control Board policy, the validation number must be printed first.

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Available Commands

Name	Description	Page
BEL	Audio alert	80
HT	Horizontal Tab	81
LF	Line Feed	82
FF	Form Feed	83
CR	Carriage Return	84
SO	Set Font to Double-wide	85
DC4	Cancel Double-wide Mode	86
ENQ	Request Combined Printer Status	87
20h - FFh	Printable Characters	88
ESC ENQ 1	Return Version Information	89
ESC BEL	Configure audio alert	90
ESC SP n	Set Right-Side Character Spacing	91
ESC ! n	Select print mode(s)	92
ESC $ n1 n2	Set Absolute Horizontal Position in page mode	93
ESC *	Reset to Defaults	94
ESC @	Reset to Power-up Condition	95
ESC B	Print Bitmap (BMP) Image	96
ESC E	Form Feed	97
ESC F	Select Fonts	98
ESC G n	Turn Double-strike mode on/off	99
ESC J n	Feed n Sublines	100
ESC M	Set Font to 12 cpi	101
ESC P	Set Font to 16 cpi	102
ESC S	Set Font to 20 cpi	103
ESC T	Set Font to 7 cpi	104
ESC U	Set Font to 10 cpi	105
ESC V	Return Firmware Revision	106
ESC W n1 n2	Wrap Data	107
ESC X n1 n2	Set Horizontal Starting Position	108
ESC Y n1	Set Vertical Starting Position	109
ESC c n	Select color	110
ESC t n	Set print direction in page mode	111
GS DC2	Set Font to Double-high	112
GS DC3	Cancel Double-high	113
GS RS	Set Inverse Print Mode	114
GS US	Cancel Inverse Print Mode	115
GS ! n	Select character size	116
GS $ n1 n2	Set Absolute Vertical Position in page mode	117
GS * n1 n2 t h w d1…dm	Landscape Mode Graphics	118
GS ?	CRC Verification	119
GS 0 n1 n2 t name NUL	Print User Defined Image	120
GS 1	Enter Download Image mode	121
GS 3 n	Image Status Handler	122
GS A n1 n2	Bar Code Start Position	123
GS E	Set Validation Number Field	124
GS F n1 n2 n3 n4 n5	Set Field in page mode	125
GS G n1 n2 t d	Print Custom Graphic	127
GS L n1 n2	Set Feed Length	128
GS S	Return Printer Status	129
GS T <n>	Select Line Wrap/Truncate Modes	130
GS V <n>	Set Print Orientation	131

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Appendix A: Character Codes

This appendix contains a list showing the ASCII characters supported by the Epic 950 printer, including a table of supported non-printable control characters, and a chart featuring supported printable characters and their hexadecimal ASCII equivalents. These character values may be up to two bytes in length.

Note that you can also select an alternate code page-mapping scheme by editing the CodePageMap.ini file that is stored in your printer. This is performed by using the download utility (supplied by TransAct) to copy this file from the printer to your PC, and then editing this file as a text file to make the character mapping parameter changes under the [Charmap] section, using the following syntax:

CHx24 = 0x00A5   ;dollar to yen re-mapping

EXAMPLE CodePageMap.ini:

;This file sets the character code page mapping to a Unicode font
;This file is included in the firmware check sum
;Code page is [8859-1 W EU Latin-1]
;CodePage index = unicode mapping
;CHx41   = 0x0041 #   LATIN CAPITAL LETTER A
;only need to include chars that are different than ISO 8859-1

[Charmap]
CHx24 = 0x00A5   ;dollar to yen re-mapping

The following pages contain the list of default character codes.

Supported Non-Printable Control Characters

Note: In the table below, the ^ symbol represents the control key on your keyboard.

Character	Name	Decimal	Hexadecimal	Binary
None	NUL	0	00	0000 0000
^A	SCH	1	01	0000 0001
^B	STX	2	02	0000 0010
^C	ETX	3	03	0000 0011
^D	EOT	4	04	0000 0100
^E	ENQ	5	05	0000 0101
^F	ACK	6	06	0000 0110
^G	BEL	7	07	0000 0111
^H	BS	8	08	0000 1000
^I	HT	9	09	0000 1001
^J	LF	10	0A	0000 1010
^K	VT	11	0B	0000 1011
^L	FF	12	0C	0000 1100
^M	CR	13	0D	0000 1101
^N	SO	14	0E	0000 1110
^O	SI	15	OF	0000 1111
^P	DLE	16	10	0001 0000
^Q	DC1	17	11	0001 0001
^R	DC2	18	12	0001 0010
^S	DC3	19	13	0001 0011
^T	DC4	20	14	0001 0100
^U	NAK	21	15	0001 0101
^V	SYN	22	16	0001 0110
^W	ETB	23	17	0001 0111
^X	CAN	24	18	0001 1000
^Y	EM	25	19	0001 1001
^Z	SUB	26	1A	0001 1010
^[	ESC	27	1B	0001 1011
^\	FS	28	1C	0001 1100
^]	GS	29	1D	0001 1101
^^	RS	30	1E	0001 1000
^	US	31	1F	0001 1111

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Supported Printable Characters

The following tables contain printable characters supported by the Epic 950 printer, with hexadecimal character codes listed above each character.

A. One-byte character codes (Hexadecimal values 20-FF).

0020	0021	0022	0023	0024	0025	0026	0027	0028	0029	002A	002B	002C	002D	002E	002F
	!	"	#	$	%	&	'	(	)	∗	+	،	‐	.	/

0030	0031	0032	0033	0034	0035	0036	0037	0038	0039	003A	003B	003C	003D	003E	003F
0	1	2	3	4	5	6	7	8	9	:	;	‹	=	›	?

0040	0041	0042	0043	0044	0045	0046	0047	0048	0049	004A	004B	004C	004D	004E	004F
@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O

0050	0051	0052	0053	0054	0055	0056	0057	0058	0059	005A	005B	005C	005D	005E	005F
P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_

0060	0061	0062	0063	0064	0065	0066	0067	0068	0069	006A	006B	006C	006D	006E	006F
`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o

0070	0071	0072	0073	0074	0075	0076	0077	0078	0079	007A	007B	007C	007D	007E	0099
p	q	r	s	t	u	v	w	x	y	z	‹	│	›	~	™

00A0	00A1	00A2	00A3	00A4	00A5	00A6	00A7	00A8	00A9	00AA	00AB	00AC	00AD	00AE	00AF
	¡	¢	£	€	¥	¦	§	¨	©	ª	«	¬		®	‾

00B0	00B1	00B2	00B3	00B4	00B5	00B6	00B7	00B8	00B9	00BA	00BB	00BC	00BD	00BE	00BF
°	±	2	3	´	µ	¶	·	¸	1	o	»	¼	½	¾	¿

00C0	00C1	00C2	00C3	00C4	00C5	00C6	00C7	00C8	00C9	00CA	00CB	00CC	00CD	00CE	00CF
À	Á	Â	Ã	Ä	Å	Æ	Ç	È	É	Ê	Ë	Ì	Í	Î	Ï

00D0	00D1	00D2	00D3	00D4	00D5	00D6	00D7	00D8	00D9	00DA	00DB	00DC	00DD	00DE	00DF
Ð	Ñ	Ò	Ó	Ô	Õ	Ö	×	Ø	Ù	Ú	Û	Ü	Ý	Þ	ß

00E0	00E1	00E2	00E3	00E4	00E5	00E6	00E7	00E8	00E9	00EA	00EB	00EC	00ED	00EE	00EF
à	á	â	ã	ä	å	æ	ç	è	é	ê	ë	ì	í	î	ï

00F0	00F1	00F2	00F3	00F4	00F5	00F6	00F7	00F8	00F9	00FA	00FB	00FC	00FD	00FE	00FF
ð	ñ	ò	ó	ô	õ	ö	÷	ø	ù	ú	û	ü	ý	þ	ÿ

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B. Two-byte character codes (Hexadecimal values 010C-2122).

E000	010C	010D	010E	010F	011A	011B	013A	0147	0148	0152	0153	0158	0160	0161	0164
	Č	č	Ď	ď	Ě	ě	Í	Ň	ň	Œ	œ	Ř	Š	š	Ť

0165	016E	016F	0178	017D	017E	0192	02C6	02DC	0401	0402	0403	0404	0405	0406	0407
ť'	Ů	ů	Ÿ		ž	ƒ	^	~	Ё	ђ	Г	Є	Ѕ	І	Ї

0408	0409	040A	040B	040C	040E	040F	0410	0411	0412	0413	0414	0415	0416	0417	0418
Ј	Љ	Њ	Ћ	Ќ	Ў	Џ	А	Б	В	Г	Д	Е	Ж	З	И

0419	041A	041B	041C	041D	041E	041F	0420	0421	0422	0423	0424	0425	0426	0427	0428
Й	К	Л	М	Н	О	П	Р	С	Т	У	Ф	Х	Ц	Ч	Ш

0429	042A	042B	042C	042D	042E	042F	0430	0431	0432	0433	0434	0435	0436	0437	0438
Щ	Ъ	Ы	Ь	Э	Ю	Я	а	б	в	г	д	е	ж	з	и

0439	043A	043B	043C	043D	043E	043F	0440	0441	0442	0443	0444	0445	0446	0447	0448
й	к	л	м	н	о	п	р	с	т	у	ф	х	ц	ч	ш

0449	044A	044B	044C	044D	044E	044F	0451	0452	0453	0454	0455	0456	0457	0458	0459
щ	ъ	ы	ь	э	ю	я	ё	ђ	ѓ	є	ѕ	і	ї	ј	љ

045A	045B	045C	045E	045F	2013	2014	2018	2019	201A	201C	201D	201E	2020	2021	2022
њ	ћ	ќ	ў	џ	–	—	'	'	‚	"	"	„	†	‡	•

2026	2030	2039	203A	203E	20AC	2116	2122								
…	‰	‹	›	‾	€	№	™								

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