

# **IJ-9000 LE Ink-Jet Transaction Printer**

## **Specification**

**Options:**        *Epson / Axiohm / Siemens-Nixdorf Emulation*

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# 1 Overview and General Description

This document provides the electrical, mechanical, and interface specifications of the IJ-9000-LE Ink-Jet Printer mechanism. This model has special firmware to allow it to emulate Epson and Siemens POS printers.

This document is provided to programmers and systems integrators who will be responsible for the programming and set-up of the printer.

## 1.1 General Description

The IJ-9000 Printers are a series of Ink-Jet Transaction Printers for use in a wide variety of applications, including: Banking and Point-of-Sale. The IJ-9000 has several available options, including validation mechanisms, cutters, and interface emulations.

Special features include: plain-paper printing, validation, quiet operation, high resolution and high speed printing, and a choice of interfaces and power connections.

This printer utilizes the Lexmark 15M0340 ink-jet printhead. This printhead prints at 300 dpi using 104 nozzles, providing the capability of printing two lines during each pass of the printhead.

## 1.2 Configuration Options

The IJ-9000 can be factory configured in a variety of ways. The printer will be configured at the time of manufacture and the is not user-modifiable. This specification addresses each of the configurable options, although they may not be applicable for every unit.

<i>Items:</i>	<i>Configurations Available</i>
<i>Power Connector:</i>	MiniDIN-9 Switchcraft 722A
<i>Interface:</i>	Serial, RS232C Parallel, (Centronics type)
<i>Options:</i>	Paper cutter Validation mechanism Interface emulations Cash Drawer interface

## 2 Equipment Specification

Item	Specification
Power Requirements	
<i>Voltage</i>	24 Volts DC (+/- 10%) (Standard)
<i>Power Consumption</i>	
<i>Operating</i>	25 Watts Maximum
<i>Standby</i>	2 Watts
Operating Environment	
<i>Temperature</i>	10 -> 40 C
<i>Humidity</i>	10 -> 90% RH (non-condensing)
Printer Engine	
<i>Type</i>	Thermal Ink Jet
<i>Ink Cartridge</i>	Lexmark, # 15M0340 or 12A1970
<i>Ink Detection</i>	Ink drop usage counter.
<i>Resolution</i>	300 DPI (vertical & horizontal)
<i>Modes</i>	Standard and Ink-Saver (draft quality mode)
<i>Speed</i>	336 / 432 chars./sec (standard/tiny fonts)
Print Media / Paper	
<i>Type</i>	Roll, Plain Paper
<i>Size</i>	3 Inch Wide 3 Inch Diameter (Maximum) 5/8 Inch Core I.D. (Typical, but not req'd.)
<i>Paper Detection</i>	Paper-Out. Mechanical arm w/photo sensor. Form Inserted. Reflective photo sensor.
<i>Paper-Usage</i>	Electronic counter.
Paper Handling	
<i>Loading</i>	Drop load with smart feed.
<i>Cutter</i>	Guillotine-type full cutter.
<i>Cutter Life</i>	1 Million cuts (typical), 500,000 min.
<i>Cutter Monitor</i>	Cut usage counter.
Communications	
<i>Data Buffer</i>	4K (32K RAM standard)
<i>Interfaces</i>	RS-232C (standard) Parallel (optional)
Physical Characteristics	
<i>Dimensions</i>	8" (W) by 4.75" (H) by 11.5" (D)
<i>Weight</i>	<b>t.b.d.</b> lb. ( <b>t.b.d.</b> lb. Shipping)
<i>Noise Level</i>	48 db

### 3 Printer Features and Specifications

#### 3.1 Printer Overview

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Printer Features	
<b>Logical Unit</b>	
<i>Processor</i>	Intel 80C251
<i>RAM</i>	32K
<i>Firmware Storage</i>	128K Flash, with download procedure
<i>Variables Storage</i>	1K bit EEPROM
<b>Characters &amp; Fonts</b>	
<i>Character Height</i>	0.070 to 0.125 inch (font dependent)
<i>Character Set</i>	Code page 850 (page 437 optional)
<i>Fonts:</i>	5 Printer Fonts in Flash Memory <ul style="list-style-type: none"> <li>-Standard</li> <li>-Large</li> <li>-Large Bold</li> <li>-Tiny</li> <li>-Code-39 (Barcode)</li> </ul>
<i>Font Storage</i>	Flash Memory: 64K Bytes for Fonts
<i>Font Configurability</i>	Downloadable procedure available.
<i>Printing Modes:</i>	3 Modes: non-exclusive <ul style="list-style-type: none"> <li>-Double-Wide / Single-Wide</li> <li>-Uni-directional / Bi-directional</li> <li>-Upside-Down / Rightside-Up</li> </ul>

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Supplies: Features & Specifications	
<b>Printhead &amp; Ink</b>	
<i>Print Head</i>	Lexmark #15M0340 or #12A1970
<i>Ink Cartridge Life</i>	5,000,000 characters, standard font, ink-saver
<i>Print Contrast Ratio</i>	Constant throughout life of cartridge.
<b>Paper Media</b>	
<i>Media Type</i>	Roll Paper
<i>Recommended Stock</i>	Rittenhouse # <b>t.b.d.</b>
<i>Roll Diameter</i>	3.0 inches maximum
<i>Roll Core I.D.</i>	5/8 inches typical, (no special requirement)
<i>Thickness</i>	0.0015 to 0.03 inches
<i>Width</i>	3.00 inches (+0.1/-0.2)

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**Printer Capabilities and Capacities**

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**Printer Speed**

<i>Print Speed</i>	336 char/sec max. (standard font) 432 char/sec max. (tiny font)
<i>Print Throughput</i>	8 lines/sec. at 6 lines/inch
<i>Paper Feed Speed</i>	7 inches/sec.

**Printer Resolutions**

<i>Resolution (native)</i>	300 x 300 dpi
<i>Resolution (addressable)</i>	150 x 150 or 300 x 300 dpi

**Validation Capacity**

<i>Print Zone (Lines)</i>	8 lines at 6 lines/inch
<i>Print Zone</i>	3.68 inches wide, by 1.54 inches tall see definitions for details

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### 3.2 Printer Operating Modes Overview

<i>Category</i>	<i>Mode</i>	<i>Sub-Modes</i>	<i>Unit is:</i>
<i>Operation</i>	Operating		Operational -- may be utilized.
	Download	On-Line	On-Line. Host may send data.
		Off-Line	Off-Line. Host should not send data.
Self-Test		Firmware download procedure underway. Self-test procedure underway.	
<i>Printing</i>	Journal		Data printed to journal.
	Multi-LineValidation		Form validation procedure.
	Ink-Saver		Unit prints in draft quality conserving ink supply.
	Regular Ink		Standard printing.

### 3.3 Printing

#### Printing Overview:

Printing is accomplished by sending print data to printer and commanding a vertical motion to the print-head. Printing occurs in other cases also, but these are the exception.

The printer includes various sensors to assure that the any printing occurs on the media previously selected by the Host. For example, if Journal printing is selected, the printer will halt if a form is inserted erroneously. The printer will automatically restart when any blocking condition is cleared.

Printing will not take place if the unit is Off-Line or is out of paper. Both of these conditions are noted by operator indicators.

In absence of Host commands, the printer will use its default settings, which are:

<i>Item</i>	<i>Default Setting</i>
<i>Font</i>	Standard
<i>Line Spacing</i>	Right-side Up
<i>Ink-Saver</i>	6 lines / inch
<i>Media</i>	As specified by DIP Switch
<i>Method</i>	Journal Media
	Bi-directional printing

**Font Overview:**

The printer includes 5 internal fonts, which are given in the following table.

<i>Name</i>	<i>Pitch Char/Inch</i>	<i>Capacity Journal</i>	<i>Char/Line Validation</i>
<i>Standard</i>	16	42	64
<i>Large</i>	12	32	48
<i>Large Bold</i>	12	32	48
<i>Tiny</i>	20	54	82
<i>Code-39</i>		16	24

Fonts may be mixed within a print line. If so, then the available number of characters per line will depend upon the mixture of fonts. If the print line is longer than the available media width, the print line will be truncated (no wrap-around).

Fonts are downloadable into the printer non-volatile Flash memory by a procedure documented elsewhere. Contact the factory if interested.

**Ink-Saver Mode:**

The printer has a mode of operation called *Ink-Saver Mode*. This mode produces draft quality printing and is used to economize on ink usage. On average, Ink-Saver mode will extend the ink cartridge life by about 1.8X. The actual number will vary depending on your application and font mix.

In some cases, Ink-Saver Mode may produce preferable print quality. For example, some recycled papers are very absorbent and regular ink usage may appear overly dark and fuzzy.

Ink-Saver mode is defaulted by use of a DIP Switch. It can be set also by the Host by a software command.

**Printing Considerations - 2 Lines per Pass:**

The IJ-9000 is capable of printing 2 lines per pass of the print-head. The printer will attempt to print in this manner whenever possible in order to increase the print speed. However, this can not be accomplished in all cases. The programmer should follow this section's recommendations on how to maximize the utilization of the 2 lines per pass printing capability.

The Lexmark printhead is 104 nozzles tall at 300 dpi. This provides a print swath of approximately 1/3 inches (0.347). In order that 2 lines fit in this swath, the IJ-9000 requires that the line spacing be set at 1/6 inch. This 6 lines/inch spacing is the default, so absent any setting by the Host, the printer will print 2 lines per pass by default.



If the line spacing is changed by the Host to some value not 1/6, then the IJ-9000 will not attempt to fit 2 lines into each print swath.

When the printer believes that 2 lines/pass printing is possible, then the printing logic changes somewhat. After the first line is received, its print data is loaded into a buffer and a timer is started. If a second line is received within a timeout period, then the second line is loaded into the buffer and both lines are printed concurrently. However, if the timeout period passes without a second line being received, then the IJ-9000 abandons waiting further and prints the first line.

**TIP -- For fastest speed:**

- always use 6 lines/inch spacing,
- do not insert time delays between print-lines.

### 3.5 Validation Printing

**Validation of Forms:**

For the IJ-9000, there is only one method for validation. It is called *Multi-Line Validation Mode*. On other printer models, other methods (modes) of validation may be possible. We use the full term here to prepare for that case in future specifications.

The IJ-9000 validates by clamping the cut-form, moving the print-head horizontally during printing, and feeding the cut-form vertically to ready it for the next line of print.

Validation Mode entered by sending a software command to the printer. Validation Mode remains in effect indefinitely and only exits by sending another software command. Consult Section 7 for the exact command syntax.

The Validation Mode pertains to 1 (one) document only. The printer follows these steps in validating forms. *Each* step must be undertaken for *each* document validated.

	<i>Multi-Line Validation Procedure</i>	<i>Via</i>	<i>Form LED</i>
1.	Printer enters Validation Mode.	Software cmd.	On
2.	Printer waits for Form to be inserted.		On
3.	Printer prints on Form.	Software cmd.	Off
4.	Printer replaces Form and waits for Form to be removed.	Software cmd. or excess data	Flashing
5.	Printer exits Validation Mode.	Software cmd.	Off

The following notes are important:

- If the capacity is exceeded (more than 8 lines sent), then any excess print data causes the following:
  - subsequent print data is ignored,
  - the form is returned to its original position and the clamp is opened,
  - operation will not continue until the Form is completely removed from the printer.

- *The printer remains in Validation mode until this mode is quit via a software command.*
- If the cut-form is removed during Multi-Line Validation, the printing mechanism will stop and abort the printing. It does this to prevent ink from being ejected into the printer.
- After Multi-Line Validation is completed, the cut-form is returned to its original position and the clamp is opened to allow for removal of the cut-form.
- The paper-feed button is operational during Multi-Line Validation.

**Document Media and Validation Capacity Specification:**

<i>Category</i>	<i>Item</i>	<i>Specification</i>
<b>Document Media</b>		
	<i>Document Thickness</i>	0.0015 to 0.0180 inches
	<i>Document Capacity:</i>	
	<i>Loading</i>	1 form, 0.018" max
	<i>Catch Chute</i>	10 forms, 0.040" max
	<i>Document Width</i>	
	<i>Minimum</i>	5.5 inches
	<i>Maximum</i>	9.0 inches
<b>Validation Printing</b>		
	<i>Lines</i>	8 max. at 6 lines/inch
	<i>Print Zone: 1st Line</i>	1.54 inches, baseline to form bottom
	<i>Print Zone: Last Line</i>	0.25 inches baseline to form bottom
	<i>Print Zone: Width</i>	3.68 inches

## 4 Operator Controls and Indicators

### 4.1 Operator Controls

The operator controls are clearly marked. Only three are present in this model, and their usage is given in the following table.

<i>Item</i>	<i>Usage</i>
<i>Power Switch.</i>	<p><i>Smart Power Switch.</i></p> <p>Informs controller to remove power. Controller first puts printhead into service station.</p> <p>Located: Rear panel.</p>
<i>Paper-Feed Button.</i>	<p><i>Smart Paper-Feed.</i></p> <p>Feeds paper forwards:</p> <p>Short depression: causes unit to automatically load paper into mechanism.</p> <p>Long depression: will feed paper while button is depressed. Waits ½ second before beginning to feed.</p> <p>Located: Top, rear, right side.</p>
<i>On-Line Button.</i>	<p><i>On-Line and Off-Line toggle.</i></p> <p>Toggles unit between the two modes. When unit is Off-Line, printing and communications are inhibited.</p> <p>When operator toggles unit On-Line, any paper in presenter is cut and then ejected. This puts the unit in the default position as regards to paper.</p> <p>Located: Top, front.</p>

## 4.2 Operator Indicators

The operator indicators are LED lights which are located on the top front of the unit. They are identified by markings and colors. Their usage is given in the following table.

<i>Indicator</i>	<i>State</i>	<i>Meaning</i>
<i>On-Line LED.</i>	ON	Power is ON. Printer is On-Line and ready to operate.
	FLASH	Printer is Off-Line. Flashing is very low rate.
	OFF	Power is OFF.
<i>Error LED.</i>	ON	Error or Out-Of-Paper.
	OFF	No errors.
<i>Form LED.</i>	ON	Insert form for validation.
	FLASH	Remove form from printer.
	OFF	No form attention required.

## 4.3 Printer Self-Test & Verification

The printer includes a **Self-Test Routine**. This routine tests the following features:

- Identification: Model Number, Firmware & Revision Level, Installed Options
- Operation: Printing, Feeding, Cutting, Validation Clamping & Ejecting,
- Printing: All fonts and print modes.

To perform test, follow these steps:

<b>Self-Test Procedure</b>	<b>Notes</b>
1. Turn off power	
2. Hold down Paper-Feed button	
3. Turn on power	
4. Release button after printing starts	
5. A sample tape is printed	
6. Insert Form to test validation mechanism (if present)	
7. Turn power off when done.	

### IMPORTANT NOTE:

*Printer remains in SELF-TEST routine until power is cycled OFF.*

## 5 Interfacing: Power, Communications, DIP Switches

### 5.1 Power Connections

Please use only the factory supplied power supply. If using another supply, please contact factory for proper power connections.

### 5.2 Serial Interface

Baud Rates:	9600 or 19200 (DIP switch selectable)
Data Bits:	8, w/1 stop bit
Parity:	None.
Handshaking:	Printer toggles RTS, which is connected by standard cables to IBM PC's CTS signal.
Interface Connector:	DB-9 (female) RS232C interface levels.
Pin Configurations:	Standard PC compatible 9 pin. Mates directly to PC.
Cabling:	Addmaster P/N: <b>t.b.d.</b> Printer to PC compatible DB9 type serial port Cable is 9 conductor male to female straight through.

### 5.3 Parallel Interface

Interface Connector:	25 pin, male, DB-25 type connector. TTL interface levels.
Pin Configurations:	Standard PC compatible assignments.
Cabling:	Addmaster P/N: 95529 Printer to PC compatible DB25 type parallel port Cable is 25 conductor male to female straight through.

## 5.4 **Printer Communications Buffering**

The printer has two type of buffers into which it places incoming characters:

### **Receive Buffer:**

Stores incoming characters. The printer removes characters from the Receive Buffer when needed. The characters are then “processed.”

The Receive Buffer, stores 4096 characters. In some models, this buffer may be larger.

### **Print-Line Buffer:**

Stores characters (typically text characters) after processing, but before actual printing. This buffer is used to build up the complete “Print-Line” that will then be printed or validated.

In the standard IJ-9000, the Print-Line Buffer is approximately 96 characters. Therefore, you can not print a line with more than 96 characters (including any formatting commands).

## 5.5 **Hardware Interface Handshaking**

When the Receive Buffer is full or is otherwise unavailable, then the printer is unable to receive any characters. If any are sent, then they will be lost. This “un-availability” is signaled to the computer by “handshaking” lines on the interface.

### For the Serial Interface:

The printer toggles its RTS line which is connect through the standard cables to the computer’s line called “CTS”. If the computer tests CTS high, then data can be sent, and if tested low, then do not send data. This testing is usually accomplished automatically via the computer’s BIOS routines. CTS goes low when the Receive Buffer reaches 256 characters from full.

For DOS based computers, set the “mode” command as indicated below. The “p” parameter sets the appropriate retry on the CTS line when used with printers in general.

```
C:> mode com1:9600,n,8,1,p
```

For Windows 95/98/NT based computers, check the settings for the appropriated COM port. Assure that *Flow Control* is set to *Hardware*.

### For the Parallel Interface:

The printer signals that it is busy by holding the line called “BUSY” high. No characters may be sent when BUSY is high.

## 5.6 DIP Switch Settings

DIP Switches set functional features of the IJ-9000. The Switches are accessible from the bottom of the unit.

<i>DIP Switch</i>	<i>Setting</i>	<i>Usage</i>
1	ON OFF	Firmware Download Mode Printing Mode
2	ON OFF	Ink-Saver Mode Standard Ink Mode
3	ON OFF	19200 Baud 9600 Baud
4	ON OFF	Auto-LF on CR Enabled Auto-LF on CR Disabled

### Notes:

- Defaults are all OFF.
- For Parallel Units, DIP Switch 3 is not used.
- Firmware Download Mode is described in another document.
- Ink-Saver Mode is described in Section 3.3.
- Auto-LF on CR usage is described in Section 6 under the CR command.

## 6 Data Stream & Command Set

### Supported Commands - Overview:

An overview of the supported interface commands is given below. These commands are intended to replicated the actions taken by the emulated Epson compatible printers. There may be slight differences where required by the mechanical differences between the printers.

Commands particular the IJ-9000 and not found in the Epson compatible printers are indicated under the Style heading as an *Enhancement*.

Type	Sequence	Function	Style
<b>RESETS</b>			
	CAN	Reset. Hard power-on reset, at receive level.	<i>Enhancement</i>
	ESC @	Initialize. Soft, at process level.	
<b>PRINTING</b>			
	LF	Line Feed. Print and feed.	
	CR	Carriage Return. Print and no-feed.	
	ESC J n	Print and Feed n min units.	
	ESC d n	Print and Feed n lines.	
<b>MEDIA SELECTION</b>			
	ESC c 0 n	Select print station.	
	ETB	Enter <i>Multi-Line Validation</i> mode.	<i>Enhancement</i>
	FF	Exit <i>Multi-Line Validation</i> mode and eject Form.	
	ESC q	Exit <i>Multi-Line Validation</i> mode. Use FF preferably.	
<b>FONTS, PRINT MODES, &amp; CHARACTERS SETS</b>			
	ESC ! n	Select print mode & fonts.	
	ESC B n	Set print font.	<i>Enhancement</i>
	ESC R n	Select international character set.	
	ESC { n	Set/Reset upside-down print mode.	
	ESC U n	Set/Reset uni-directional print mode.	
<b>LINE SPACING</b>			
	ESC 3 n	Set line feed amount to n min.units	
	ESC 2	Select 1/6 inch line spacing.	
	ESC c 1 n	Select print station for setting line spacing.	
<b>GRAPHICS, IMAGES, &amp; BAR-CODES</b>			
	ESC * kmn data	Print graphics bit-image.	<i>Modified</i>
	GS / n	Print logo image.	
	GS k n data	Print barcodes.	



**PAPER CONTROL**

*ESC i* Full cut of paper roll.  
*ESC m* Partial cut of paper roll.

**CONTROLS AND EXTENSIONS**

*ESC p m n1 n2* Generate specified cash-drawer pulse.  
*ESC ~ n* Turn on/off Form LED  
*ESC <* Move print-head to home position and cap.  
*ESC A* Enter Power Down state.

**STATUS INDICATIONS**

*ENQ* Send printer status, immediate. *Enhancement*  
*ESC u n* Transmit peripheral device status.  
*ESC v* Transmit printer station status.  
*GS a n* Enable/disable automatic status back (ASB)  
*GS ENQ* Transmit real-time printer status.  
*DLE EOT n* Real-time printer status, feature n.

**MISCELLANEOUS COMMANDS**

*Axiom & ND-77 Compatible*  
*DLE ENQ n* Reset printer, feature n.  
*ESC SYN n* Set font pitch. Axiom style. Don't use.  
*EM* Full cut of paper roll.

**FEATURE CONFIGURATION & VERIFICATION**

*ESC | n* Adjust Right/Left Alignment. *Enhancement*  
*ESC b n* Set configuration parameter *Enhancement*  
*ESC g n* Read configuration parameter *Enhancement*  
*ESC h n* Transmit / Reset usage counters *Enhancement*  
*GS / n* Transmit printer ID

**Un-Supported Commands - Overview:**

The following commands are recognized but have no affect on the actions of the IJ-9000 LE printer. These commands are trapped and ignored so enhance the plug-compatibility of the IJ-9000 with Epson, Axiohm, or Siemens model printers.

<i>Type</i>	<i>Sequence</i>	<i>Function</i>
	<i>HT</i>	Horizontal Tab
	<i>RS</i>	Journal Tab
	<i>ESC SP</i>	Set right-side character spacing.
	<i>ESC \$</i>	Set absolute print position
	<i>ESC % n</i>	Select/cancel user defined character set
	<i>ESC &amp; snm data....</i>	Define user-defined characters
	<i>ESC - n</i>	Set/Cancel underline mode.
	<i>ESC = n</i>	Select peripheral device
	<i>ESC ?</i>	Cancel user-define character
	<i>ESC C n</i>	Set slip paper eject length
	<i>ESC D nk....0</i>	Set horizontal tab positions
	<i>ESC E n</i>	Set/Cancel emphasized print mode
	<i>ESC F n</i>	Set/Cancel single sheet reverse feed.
	<i>ESC G n</i>	Set/Cancel double-strike print mode
	<i>ESC K n</i>	Print and reverse feed in min. units.
	<i>ESC V n</i>	Set/Cancel 90 degree rotation.
	<i>ESC a</i>	Select justification.
	<i>ESC c 3 n</i>	Select paper end signal output
	<i>ESC c 4 n</i>	Select paper end detector.
	<i>ESC c 5 n</i>	Enable/Disable panel switch.
	<i>ESC c 6 n</i>	Enable/Disable on-line switch.
	<i>ESC e n</i>	Print and reverse feed.
	<i>ESC f mn</i>	Set slip-paper waiting time
	<i>ESC o</i>	Stamp
	<i>ESC r n</i>	Select print color
	<i>ESC t n</i>	Select character code table
	<i>ESC z n</i>	Select/cancel parallel printing mode.
	<i>GS !</i>	Select character size
	<i>GS E</i>	Select print-speed and head energy.
	<i>GS H</i>	Select printing position of HRI characters
	<i>GS P nm</i>	Set fundamental calculation pitch
	<i>GS V</i>	Select cut-mode and cut-paper
	<i>GS W</i>	Set printing area width
	<i>GS f</i>	Select font for HRI characters
	<i>GS h</i>	Set Bar-code height
	<i>GS r</i>	Transmit Status
	<i>GS w</i>	Select bar-code width

## Data Stream & Commands: Detail

Detail on each of the supported commands follows in this section. The commands are grouped according to function. A table listing the Hex and Decimal values of each of the codes is given in Section 9.

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### Resets

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<i>CAN</i>	Reset. Hard reset, at receive level.
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#### *Enhancement.*

This command will clear out the Receive Buffer, reset any modes, fonts, and other settings to the default values, and re-initialize the interface.

This command basically emulates a Power-On Reset. It is acted upon as soon as it is received, even if the Receive Buffer contains unprocessed data. Use this command only when needed -- at Host driver power on, error condition clearing, etc.

See also the *ESC @* command.

Syntax: 17H

---

<i>ESC @</i>	Initialize. Soft, at process level.
--------------	-------------------------------------

---

This command will clear out any partially formed print-line, reset any modes, fonts, and other settings to the default values.

This command basically emulates a Soft Reset. It is acted upon removed from the Receive Buffer (after all previous commands received have been processed).

Does not affect Receive Buffer!

This command is typically used ONCE at the start of each print-job to put the printer into a known state concerning fonts, print-modes, etc

Syntax: 1BH 40H

## Printing

---

**LF** Line Feed. Print and line feed 1 line.

---

Any data previously received is printed. The paper is feed an amount specified by the current line spacing value.

Syntax: 0AH

---

**CR** Carriage Return. Print.

---

Any data previously received is printed. The paper is not fed in typical usage. If Auto-LF on CR mode is set by DIP switch, then the paper is fed 1 line.

Syntax: 0DH

---

**ESC J n** Print and feed  $n$  min units.

---

Any data previously received is printed. The paper is fed  $n$  vertical min units. The default vertical units are 1/144 inch. The printer makes a conversion to its native units of motion.

Example:  $n = 24$  results in  $24/144 = 1/6$  inch line spacing.

Range:  $0 \leq n < 255$

Syntax: 1BH 4AH

---

**ESC d n** Print and feed  $n$  lines.

---

Any data previously received is printed. The paper is fed  $n$  lines at the current line spacing.

Range:  $0 \leq n < 255$

Syntax: 1BH 4AH

## Print Media Selection

---

**ESC c 0 n** Select Print Station.

---

Select the print station depending upon the value of the bits in *n*.

Bit	Function	Value	
		0	1
7 msb	Reserved	0	
6	"	0	
5	"	0	
4	"	0	
3	Form	Enabled	Disabled
2	Form	Enabled	Disabled
1	Receipt	Enabled	Disabled
0	Receipt	Enabled	Disabled

Only 1 station should be enabled at a time. Setting either of the two Form bits will enable the Form station -- it is not required to set both. Likewise for the two Receipt bits.

Enabling the Form station puts the printer in *Multi-Line validation* mode. Consult also the command *ETB* which performs the same function.

Enabling the Receipt/Journal station, while the Multi-line validation mode is in effect, will cause the unit to first exit the validation mode. Consult also the command *FF* which would perform the same function.

Printer defaults to the receipt print station.

Example: `ESC c 0 08H` puts the printer in validation mode.

Syntax: `1BH 63H 30H n`

---

**ETB** Enter *Multi-Line Validation* mode.

---

Printer enters *Multi-Line Validation* Mode. Form LED is illuminated and printer awaits Form to be inserted before proceeding. If the printer is already in validation mode, the command is ignored.

Syntax: `17H`

---

**FF** Exit *Multi-Line Validation* mode and eject Form.

---

Any data previously received is first printed. Subsequently, if the printer includes the validation mechanism AND the printer is currently in validation mode, then:

- The FORM is replaced into its original position,
- Printer waits until FORM is removed, and while so, Flashes the FORM LED,
- After FORM is removed, returns the printer to Journal printing mode.

Syntax: `0CH`

## Fonts, Print Modes & Character Sets

---

**ESC ! n**      Set print mode/fonts.

---

The Font and Pitch selected for printing is determined by the value of *n*, which specifies the font as shown in the following table. Set undefined bits to 0 for future compatibility.

Bit	Function	Value	
		0	1
7 msb	<i>undefined</i>		
6	"		
5	Select Width	Single	Double
4	<i>undefined</i>		
3	"		
2	"		
1	"		
0	Select Font	Standard	Large

Syntax:    1BH 21H *n*

---

**ESC B n**      Set print mode/fonts.

---

### *Enhancement.*

The Font and Pitch selected for printing is determined by the value of *n*, which specifies the font as shown in the following table:

<i>n</i>	Font Selected
00H	Standard Font
02H	Large Bold Font.
04H	Large Font.
08H	Tiny Font
20H	Bar-Code 39 Font, Start.
22H	Bar-Code 39 Font, End. Select Standard Font.
40H	Single Wide Mode ON
41H	Double Wide Mode ON
50H	Ink-Saver Mode OFF
51H	Ink-Saver Mode ON
others	Reserved.

Fonts may be changed in the middle of a line. Fonts will retain their values across lines depending upon the option setting.

Standard Font is the default.

Syntax:    1BH 42H *n*

---

*ESC R n*      Select International Character Set.

---

This command a character set for the printer particular to a country. This provides a simple way to substitute special characters where required. This feature is document further in Section 10. Selecting an undefined character set results in undefined results.

<i>n</i>	<i>Character set</i>
0	USA
1	France
2	Germany
3	Great Britain
4	Denmark I
5	Sweden
6	Italy
7	Spain
8	Japan
9	Norway
10	Denmark II

Range:     0 <= *n* <= 10                                    Default:       *n* = 0  
Syntax:    1BH 52H *n*

---

*ESC { n*      Set/Reset Upside-Down print mode.

---

This command sets or resets upside-down print mode. When set all characters will be printed upside-down. Also justification changes sides of the paper to match the direction of the characters.

This print mode will remain in effect until changed via this command or one of the reset type commands *CAN* or *ESC @*.

Bit-mapping for *n*:

<i>Bit</i>	<i>Setting</i>	<i>Usage</i>
7 (msb)	0	Undefined, set to 0
-- 1		
0	1	Set upside-down print mode.
	0	Cancel upside-down (select rightside-up)

Syntax:    1BH 7BH *n*

---

**ESC U *n***      Set/Reset Uni-directional print mode.

---

Sets printer in uni-directional only printing. This will improve line-to-line registration. This is probably not required in typical usage, but may find application when printing graphics. however, print speed is reduced by half. Use this mode only if required.

This print mode will remain in effect until changed via this command or one of the reset type commands *CAN* or *ESC @*.

The printer defaults to Bi-Directional printing.

Bit-mapping for *n*:

<i>Bit</i>	<i>Setting</i>	<i>Usage</i>
7 (msb)	0	Undefined, set to 0
-- 1		
0	1	Set uni-directional print mode.
	0	Cancel uni-directional (select bi-directional)

Syntax:    1BH 55H *n*

## ***Line Spacing***

---

**ESC 3 *n***      Set line feed amount to *n* min-units (inches).

---

Set line spacing to (min-units / *n*) lines per inch. For this print min-units = 144.

Line spacing is set only for the print station previously specified via the *ESC c 1* command.

Note that the actual spacing will not be precisely as specified because the printer's feed increment is different from 1/144 inch.

The default is *n*=24 or 6 lines per inch.

Range: 1 <= *n* <=255.

Syntax:    1BH 33H *n*

---

**ESC 2**          Select 1/6 inch line spacing.

---

Set line spacing to 6 lines per inch.

Line spacing is set only for the print station previously specified via the *ESC c 1* command.

Syntax:    1BH 32H



---

ESC c 1 *n*      Select Print Station for Line Feed Command.

---

Select the print station depending upon the value of the bits in *n*. The selected print station will modify its line spacing as specified in any following *ESC 2* or *ESC 3 n* commands.

<i>Bit</i>	<i>Function</i>	<i>Value</i>	
		<i>0</i>	<i>1</i>
7 msb	Reserved	0	
6	"	0	
5	"	0	
4	"	0	
3	Form	Enabled	Disabled
2	Form	Enabled	Disabled
1	Receipt	Enabled	Disabled
0	Receipt	Enabled	Disabled

Printer defaults to the receipt print station.

Syntax:    1BH 63H 31H *n*

## Graphics & Images

---

*ESC \* k m n data...* Print graphics bit image.

---

Used to print a graphics on a bit-mapped basis, at the selected resolution. The variables *k*, *m*, *n*, and *data* take on these meanings:

<i>Variable</i>	<i>Meaning</i>
<i>k</i>	Resolution & density of graphics
<i>m</i>	MSB of <i>COUNT</i>
<i>n</i>	LSB of <i>COUNT</i>
<i>data</i>	Image bit-map. Number of bytes = <i>COUNT</i> Ordered as specified below.

Different graphics resolutions are supported:

<i>k</i>	<i>Graphics Resolution</i>	<i>Graphics Density</i>
00H	72 x 150 dpi (vert x hor)	Single Density
01H	72 x 300 dpi	Double Density
81H	150 x 150	
others	reserved	

Data is sent left-most slice to right-most slice. Within each slice, each byte represents 8 dots. Bytes are ordered top-most dots to bottom-most dots. Within each byte, bits are ordered top-most dot to bottom-most dot.

*data...* = *slice1 slice2 ... sliceN*

*slice* = *Byte0 Byte1 Byte2*

For *ByteN*, the dots are specified by the bits as follows:

bit7 (msb) = top dot,  
 bit6 = 1 down from top dot,  
 etc..  
 bit0 = bottom dot

The line spacing should be 48/300 inches to make graphics match up from line to line. Also select Unidirectional Print mode to get best line-up results. If you are printing a one swath logo, these steps would be unnecessary.

The printer's native units are 1/300 inch. Therefore the printer makes a conversion between the specified resolution and the printers resolution.

Syntax: 1BH 2AH *k m n data*

---

GS / *n*                      Print logo image.

---

Used to print a logo. Logo images are prestored into the printer using a procedure described elsewhere. The variable *n* is not used at this time. Set *n*=0 for future compatibility.

Syntax:    1DH 2FH *n*

---

GS k *n data...*              Print barcodes.

---

Used to print a barcode. Barcodes are printed centered on the receipt paper and are 104/300 inches tall. Paper is automatically fed. It is not necessary to follow this command with a *CR* or any other vertical motion command.

Syntax:    1DH 6BH *n data...*

The variables *n*, and *data* take on these meanings specified below.

<i>Variable</i>	<i>Meaning</i>
<i>n</i>	Type of barcode
<i>data</i>	Barcode data. Termination depends on type of barcode. Ordered as specified below.

Supported barcode types:

<i>n</i>	<i>Type of Barcode</i>
49H	Code-128
others	reserved

Format of *data* depends on barcode type:

Code-128 *data* format:

<i>Byte#</i>	<i>Value</i>	<i>Meaning / Usage</i>
1	<i>Count</i>	number of characters following
2	105	Start Character for type C
3 ...	0 - 102	Barcode symbols

Notes:

- Printer provides stop symbol for Code-128.
- Only Type C Code-128 is supported.
- Type C Code-128 encodes pairs of digits as one symbol. Consult Code-128 specification for more details.

## Paper Control Commands

<i>ESC i</i>	Full cut, receipt.
<i>ESC m</i>	Partial cut, receipt.

Cut the roll paper, using specified cut. Requires cutter option. Otherwise no action is performed.

Syntax: 1BH 69H (full cut)  
 1BH 6DH (partial cut)

## Controls and Extensions

<i>ESC p m t1 t2</i>	Generate specified cash drawer pulse.
----------------------	---------------------------------------

A pulse is activated on cash-drawer connector. Pulse voltage depends upon model -- contact factory. The variables in the command specify the following parameters.

<i>Variable</i>	<i>Specifies</i>	<i>Range</i>
<i>m</i>	Cash drawer number	m=0 only
<i>t1</i>	Pulse ON (energized time). [t1 * 2] ms	0 <= t1 <= 255
<i>t2</i>	Pulse OFF (de-energized time). [t2 * 2] ms	0 <= t2 <= 255

Difference: On Epson, the time per unit is 10ms. On IJ-9000, the time per unit is 2ms.

Syntax: 1BH 70H *m t1 t2*

---

*ESC ~ n*            Turn Form LED On/Off.

---

Specifies state of Form LED depending on bits in *n*.

<i>Bit</i>	<i>Function</i>	<i>Value</i>	
		<i>0</i>	<i>1</i>
7 - 1	Not used	0	
0	Form LED	Off	On

The LED will remain ON until: turned OFF or mechanical print actions or reset commands. The Form LED may toggle during printing. This may change in the future. Set unused bits to 0 for future compatibility.

Syntax:    1BH 7EH *n*

---

*ESC <*            Move print head to home / docking station.

---

Print-head will be moved to docking station. Perform this command before killing power to unit to insure Ink-Jet cartridge is properly docked.

This command is NOT NEEDED in typical operation provided the operator uses the printers Power Switch.

Syntax:    1BH 3CH

---

*ESC A*            Enter Power down/Sleep Mode.

---

Print-head is docked and capped. All LED's (except power) are turned off, buttons and interface commands are ignored.

The printer stays in sleeps mode until: (1) power is turned off, or (2) the CAN command is received. The CAN command will emulate a hardware Power-On reset.

Syntax:    1BH 41H

## Status Indications

---

**ENQ**                      Send Printer Status, immediate.

---

The printer will respond to this command immediately after receiving it. Response is 1 (one) byte in length. Command is operational only for units with the serial interface.

This command is particular to the IJ-9000 and is not included in any emulated printer.

See also Section 8 for example of use.

Syntax:     05H

Bit Mapped Response Detail:

<i>Bit</i>	<i>Name</i>	<i>Usage &amp; Meaning</i>
7	<i>PWRDWN</i>	Used to determine if printer is in power down state =1     • power down state =0     • operational state
6	<i>BEMP</i>	Used to determine if any data is waiting to be printed. =1     • if the Receive Buffer is empty and has processed all received data (processed data may not yet have been printed), =0     • if Receive Buffer has any unprocessed data.
5	<i>TREMP</i>	Reserved
4	<i>PINIT</i>	Used by the host to determine whether the printer was reset by power failure. =1     • if printer has received SOH command =0     • if printer has been: (1) powered off/on, (2) reset via the CAN command.
3	<i>ERROR</i>	=1     • error during validation =0     • no error detected or error condition cleared
2	<i>VMP</i>	Used to determine if machine is process of performing a mechanical task that may take an indeterminate amount of time =1     • if a valid message has been received and machine is performing an action or printing a line. =0     • otherwise.
1	<i>PRDY</i>	Used to determine if printer can print =1     • if printer is ready and no error conditions are sensed, =0     • if printer not ready because: (1) Form improperly inserted, (2) Paper-Out, (3) printhead in loading zone, (4) printhead jam.
0	<i>FORM</i>	Used to determine if Form is inserted into Validation Mechanism =1     • FORM is detected =0     • no FORM detected

---

*ESC u n* Transmit peripheral device status.

---

One character (1 byte) is returned to the host after the sequence is processed. This character provides bit-mapped information specifying the state of attached peripheral devices. *n* specifies peripheral in question, however, *n* is a “don’t care” at this time.

This command is operational only for units with the serial interface.

Range:  $0 \leq n \leq 255$

Syntax: 1BH 75H *n*

Bit Mapped Response Detail:

<i>Bit</i>	<i>Name</i>		<i>Usage &amp; Meaning</i>
7 - 1		=0	not used
0	<i>CashDr #1</i>	=1	Used to determine state of cash drawer. <ul style="list-style-type: none"> <li>• Cash drawer interface not connected or installed</li> <li>• drawer sensor = 1 (HIGH voltage)</li> </ul>
		=0	<ul style="list-style-type: none"> <li>• drawer sensor = 0 (LOW voltage)</li> </ul>

---

*ESC v* Transmit print station status.

---

One character (1 byte) is returned to the host after the sequence is processed. This character provides bit-mapped information specifying the paper sensors in each of the print stations.

This command is operational only for units with the serial interface.

Syntax: 1BH 76H

Bit Mapped Response Detail:

<i>Bit</i>	<i>Function</i>	<i>Value</i>	
		0	1
7 msb	Not used	fixed 0	
6	Document sensor	Paper sensed	No paper
5	Document sensor	Paper sensed	No paper
4	Not used	fixed 0	
3	Not used	fixed 0	
2	Not used	fixed 0	
1	Receipt near end	Paper sensed	No paper
0	Receipt near end	Paper sensed	No paper

---

GS a *n* Enable/disable automatic status back (ASB).

---

Enables automatic status back (ASB). When enabled, the printer constant checks its own status. When a change in the status is determined, the printer immediately sends 4 (four) bytes of status to the host. Enabling ASB economizes on host processing requirements because polling for status is not required.

*n* sets the status checked for ASB. At this time, if any status is selected, all are selected. The printer will send back ASB status also when this command is processed for all non-zero values of *n*.

*n* specifies ASB as

<i>Bit</i>	<i>Function</i>	<i>Value</i>	
		<i>0</i>	<i>1</i>
7 msb	Not used	fixed 0	
6	Not used	fixed 0	
5	Document sensor	disabled	enabled
4	Not used	fixed 0	
3	Roll paper sensor	disabled	enabled
2	Not used	fixed 0	
1	On-line / Off-line	disabled	enabled
0	Cash Drawer Input	disabled	enabled

Syntax: 1DH 61H *n*

Bit Mapped Response Detail:

**Byte #1: Printer Status - Switches**

<i>Bit</i>	<i>Function</i>	<i>Value</i>	
		<i>0</i>	<i>1</i>
7 msb	Not used	fixed 0	
6	Paper Feed Switch	not feeding	feeding
5	Not used	fixed 0	
4	Not used	fixed 0	
3	On-line status	On-Line	Off-Line
2	Cash Drawer Status	Low	High
1	Not used	fixed 0	
0	Not used	fixed 0	



**Byte #2: Printer Status - Errors**

<i>Bit</i>	<i>Function</i>	<i>Value</i>	
		<i>0</i>	<i>1</i>
7 msb	Not used	fixed 0	
6	Not used	fixed 0	
5	Printer Error	no error	error, no recovery
4	Not used	fixed 1	
3	Cutter Error	no error	error
2	Mechanism Error	no error	error
1	Not used	fixed 0	
0	Not used	fixed 0	

**Byte #3: Printer Status - Paper Sensors**

<i>Bit</i>	<i>Function</i>	<i>Value</i>	
		<i>0</i>	<i>1</i>
7 msb	Not used	fixed 0	
6	Form Ejection Sensor	paper	no paper
5	Form Insertion Sensor	paper	no paper
4	Not used	fixed 0	
3	Not used	fixed 1	
2	Receipt Paper Sensor	paper	no paper
1	Not used	fixed 1	
0	Receipt Paper Sensor	paper	no paper

**Byte #4: Printer Status - Validation**

<i>Bit</i>	<i>Function</i>	<i>Value</i>	
		<i>0</i>	<i>1</i>
7 msb	Not used	fixed 0	
6	Not used	fixed 0	
5	Not used	fixed 0	
4	Not used	fixed 0	
3	Not used	fixed 0	
2	Not used	fixed 0	
1	Validation Status	OK to print	impossible to print
0	Validation Selection	selected	not selected

---

**GS ENQ**      Transmit real-time printer status.

---

One character (1 byte) is returned to the host after the sequence is received. This character provides bit-mapped information specifying the paper sensors in each of the print stations.

This command is operational only for units with the serial interface.

NOTE: On Epson / ND-77 printers, this sequence is acted on even if found in the midst of a data stream, for example, in a graphics bit-image. This action is not repeated in the IJ-9000. This may cause some differences in rare instances.

Syntax:    1DH 05H

Bit Mapped Response Detail:

Bit	Function	Value	
		0	1
7 msb	Not used	Fixed to 1	
6	Mechanical error	no error	error
5	Document sensor	Paper sensed	No paper
4	Cash drawer sensor voltage	LOW	HIGH
3	Online / Offline	Online	Offline
2	Cover open / close	Closed	Open
1	Receipt near end	Paper sensed	No paper
0	Receipt near end	Paper sensed	No paper

---

**DLE EOT n**      Transmit real-time printer status.

---

Transmit 1 byte of real-time status to the host. Status is sent as soon as command is received

*n* specifies requested status as

<i>n</i>	Status Requested	Returns
1	Printer status	1 byte per table below
2	Off-Line status	"
3	Error status	"
4	Paper roll sensors	"
5	Form paper sensors	"
others	undefined action	undefined action

Syntax:    10H 04H *n*

Status Response Detail:

**n=1: Printer Status**

Bit	Function	Value	
		0	1
7 msb	Not used	fixed 0	
6	undefined		
5	undefined		
4	Not used	fixed 1	
3	On-line status	On-Line	Off-Line
2	Cash Drawer Status	Low	High
1	Not used	fixed 0	
0	Not used	fixed 1	

**n=2: Off-line Status**

Bit	Function	Value	
		0	1
7 msb	Not used	fixed 0	
6	Error	no error	error
5	Paper End - Printing Stopped	OK	Printing stop
4	Not used	fixed 1	
3	Paper Feed Switch	not feeding	feeding
2	Cover Status	Closed	Open
1	Not used	fixed 1	
0	Not used	fixed 0	

**n=3: Error Status**

Bit	Function	Value	
		0	1
7 msb	Not used	fixed 0	
6	Not used	fixed 0	
5	Unrecoverable error	no error	error, no recovery
4	Not used	fixed 1	
3	Cutter Error	no error	error
2	Mechanism Error	no error	error
1	Not used	fixed 0	
0	Not used	fixed 0	

**n=4: Paper Roll Sensor Status**

Bit	Function	Value	
		0	1
7 msb	Not used	fixed 0	
6	Receipt Paper Sensor	paper	no paper
5	Not used	fixed 0	
4	Not used	fixed 1	
3	Not used	fixed 0	
2	Receipt Paper Sensor	paper	no paper
1	Not used	fixed 1	
0	Not used	fixed 0	

**n=5: Validation Paper Status**

Bit	Function	Value	
		0	1
7 msb	Not used	fixed 0	
6	Form ejection sensor	paper	no paper
5	Form insertion sensor	paper	no paper
4	Not used	fixed 0	
3	Form insertion pending	not waiting	waiting
2	Form station selected	selected	not selected
1	Not used	fixed 0	
0	Not used	fixed 0	

**Miscellaneous Commands**


---

*DLE ENQ n*                      Reset printer, feature *n*.

---

This command resets printer features in real-time. Command included for compatibility with some Axiohm printers.

Syntax:    10H 05H *n*

---

*ESC SYN n*                      Set font pitch. Axiohm style.

---

This command set pitch and font. Command included for compatibility with some Axiohm printers. Deprecated. Don't use.

Syntax:    1BH 16H *n*

---

*EM*                                  Full cut of paper roll,

---

This command performs a full cut of the paper roll.

Syntax:    19H

## Feature Configuration and Verification

---

*ESC | n*      Adjust right/left alignment, temporary.

---

### *Enhancement.*

The Right/Left Alignment adjustment value is changed to *n* dots.

This DOES NOT affect the value store in Non-Volatile memory, NOR the value reported back to the host via the *ESC g n* command.

The setting remains valid until any reset or power on/off sequence.

This value is used for purposes of 1) special effects, 2) testing out various values before making a final selection, 3) future uses.

Syntax:    1BH 7CH *n*

---

*ESC b nm*      Set Configuration Parameter.

---

*ESC g n*        Read Configuration Parameter.

---

### *Enhancement.*

Use to set or read a configuration parameter. These settings are stored in EEPROM are non-volatile. Usually, they are preset in the factory.

*n* specifies the parameter.

<i>n</i>	<i>Parameter Specified</i>	<i>Units</i>
1	Firmware version	
2	Firmware revision	
3	Manufacture/Distributor ID Number	
4	Factory ID Number (MSB)	
5	Factory ID Number (LSB)	
6	Ink-Low Setting	millions of dots
8	Paper-Low Setting	thousands of inches
14	Alignment Setting	dots (signed)

*m* specifies the new value.

Defaults:    *m* = 0

Syntax:    1BH 62H *n m*            - *Set parameter*  
               1BH 67H *n*            - *Read parameter*

Example:    1BH 62H 0EH 0FFH - *Set alignment to -1 dot.*

---

*ESC h nm*      Read / Reset Counter

---

*Enhancement.*

Use to set or read or reset an internal printer counter. These counters are stored in EEPROM are non-volatile. Counters keep track of the use of consumables.

*n* specifies the counter ID number.

<i>n</i>	<i>Counter Specified</i>	<i>Units</i>
0	Power on resets	
8	Paper cuts	x256 cuts
9	Ink-drops printed	x64K dots
10	Paper usage	inches
other	Reserved	

*m* specifies the operation performed on the counter:

<i>m</i>	<i>Operation Specified</i>	<i>Value Returned</i>
0	Read Counter	2 bytes
1	Reset Counter	--
other	Reserved	

Syntax:    1BH 68H *n* 00h      - *Read counter*  
               1BH 68H *n* 01h      - *Reset counter*

---

*GS / n*      Transmit printer ID.

---

This command transmits information concerning certain feature installed in the printer. Included for Axiohm compatibility.

<i>n</i>	<i>Printer ID</i>	<i>Specifications</i>	<i>ID (hexl)</i>
01H, 31H	Model	IJ-9000	29H
02H, 32H	Type		00H
03H, 33H	Firmware Rev Level		00 to 0FFH
04H, 34H	Unknown		04H

Syntax:    1DH 2FH *n*

## 7 Status Commands

Status commands are used by the Host to retrieve information back from the printer. This information is typically used to pace the operation of the printer, provide error detection and correction, or provide prompts to the operator. These commands are only available through the serial interface.

There are 2 basic types of status commands. Those operating via polling and those which are automatic. Automatic status must be enabled by software commands and is not the default. Both of these are discussed.

### 7.1 Status Commands: Polling Type

There are six commands used to retrieve information from the printer via a polling procedure. Polling is where the Host sends one request for information and the printer responds with one response. If more information is needed, the Host must again poll the printer.

The six polling commands are repeated in the following table.

<i>Command</i>	<i>Usage</i>	<i>Style</i>
<b>Immediate Response</b>		
<i>ENQ</i>	Send printer status, immediate.	<i>Enhancement</i>
<i>GS ENQ</i>	Transmit real-time printer status.	
<i>DLE EOT n</i>	Real-time printer status, feature n.	
<b>Processed Response</b>		
<i>ESC u n</i>	Transmit peripheral device status.	
<i>ESC v</i>	Transmit printer station status.	
<i>GS a n</i>	Enable/disable automatic status back (ASB)	

These status commands are grouped into two categories:

#### **Immediate Response:**

Printer will respond immediately after receiving this command. This response will occur regardless of the state of operation and any pending commands or data.

#### **Processed Response:**

Printer will put this request into the Receive Buffer just as it would with any print data or commands. When all prior and pending data and commands are processed from the Receive Buffer, then the request will be processed and the response sent back to the Host.

Thus, there is an indeterminate delay between the Host sending Processed Response status requests and the Host receiving an answer back. Most often the delay will be a few milliseconds, but it can be seconds long. For example, a print job is sent and followed by the *ESC v* command.

The printer will respond to the *ESC v* command after the print job is complete, which may take many seconds or even be delayed indefinitely if the printer is out of paper.

## 7.2 Status Commands: Automatic Type

An automatic status is one initiated by the printer. Without any prompting the printer will send a message to the Host indicating its status. This usually occurs when the printer senses a change in some aspect of its operation, for example, a Form is inserted.

By default, automatic status is not enabled. It can be enabled or disabled by use of the *GS a n* command, which is described in Section 6. When automatic status (often abbreviated ASB) is enabled, the printer continuously checks its status and responds with a 4 (four) byte message when a change is noted. This response is in the bit-mapped format specified by the *GS a n* command defined in Section 6. For reference, the ordering of these bytes is:

<i>Byte Number</i>	<i>Printer Status Information</i>
1	Switches
2	Errors
3	Paper Sensors
4	Validation

When ASB is enabled, and the Host also sends polling type status requests, there exists the problem of deciphering the responses. For example, if a polling request is sent and 2 messages are received, one is certainly attributable to the polling request, and one is apparently due to an ASB. Which is which?

A careful study of the bits in the ASB shows that they can be distinguished from the polling requests (such as *ESC v*). This a modestly involved programming effort. A good suggestion, though, is to attempt to avoid these situations by very judicious and economical use of the ASB. Another simple suggestion is to trap this situation and re-poll.



## 8 Interfacing Examples

To illustrate the various modes, this section presents examples. The following type-styles are used:

Text	- Text characters to be printed
ESC	- Control characters in symbol form, consult table for hex values
19H	- Control characters is hex form. Only 1 byte is send.
spaces	- Ignore spacing. Included for easy of reading only.
-Notes	- Notes

### Example #1: Print 1 line

This prints 1 line. *CR*

This prints 1 line and feeds 1 line. *CR LF*

### Example #2: Barcode Printing. Code-39

*ESC 2 20h \*12345678\* ESC 2 2h CR L F*

Note that the "\*" start/stop character must be included, if the printed code is to be properly decoded.

### Example #3: Print, Cut, Eject Receipt.

Receipt text, line #1. <i>CR LF</i>	- print & feed
Receipt text, line #2. <i>CR LF</i>	- print & feed
Receipt text, line #3. <i>CR LF</i>	- print & feed
Receipt text, line #4. <i>CR LF</i>	- print & feed
<i>LF LF LF LF LF</i>	- feed into present & past cutter
<i>ESC i</i>	- full cut

### Example #4: Multi-line Validation Print-job

<i>ESC @</i>	- soft initialize
<i>ETB</i>	- enter validation mode
Validation text, line #1. <i>CR LF</i>	- print & feed
Validation text, line #2. <i>CR LF</i>	- print & feed
Validation text, line #3. <i>CR LF</i>	- print & feed
Validation text, line #4. <i>CR LF</i>	- print & feed
<i>FF</i>	- eject form

Notes:

- *ESC c 0 08H* command may be substituted for the *ETB* command.
- *ESC q* can be substituted for the *FF* command.

**Example #5: Inquiries**

See Section 7 for inquiry and status examples for this printer.

**Example #6: Monitoring Cut-Form Validation**

When validating Forms, it is often important for the applications program to monitor and control the flow at the printer. This is typically done to coordinate prompts on a computer terminal with the validation.

Method #1: Test for Form inserted before sending data.

<i>Host</i>	<i>Printer</i>	<i>Meaning</i>
<i>ETB</i>		Prompt Operator to insert cut-form Wait for cut-form insertion
<i>ENQ</i>	62H	Printer Ready, No Form
<i>ENQ</i>	63H	Printer Ready, Form Inserted
<i>Send print data</i>		
<i>FF</i>		Eject Form

Method #2: Send print job, wait until completed.

<i>Host</i>	<i>Printer</i>	<i>Meaning</i>
<i>ETB</i>		Prompt Operator to insert Form
<i>Send print data</i>		
<i>FF</i>		Eject Form command Wait for print job to complete.
<i>ENQ</i>	23H	Buffer not empty, printing in progress...
<i>- - -</i>		Continue polling...
<i>ENQ</i>	62H	Buffer empty, printing complete... Print job complete.

Method #3: Wait until printer idle, send new print-job.

<i>Host</i>	<i>Printer</i>	<i>Meaning</i>
		Wait for printer idle
<i>ENQ</i>	23H	Buffer not empty, command uncompleted...
- - -		Continue polling...
<i>ENQ</i>	62H	Buffer empty, prior printing complete.
<i>ETB</i>		Prompt Operator to insert Form
<i>Send print data</i>		
<i>FF</i>		Eject Form command

Method #4: Test for Form inserted before sending data.

Same as Method #1, but enable ASB. Wait instead for Host to send message indicating presence of form

## 9 Control Codes and Character Set Tables

The following table lists potential control codes and their Hex values.

### Control Code Table: 00H - 1FH

Code Symbol	Ctrl Char	Hex Value	Code Symbol	Ctrl Char	Hex Value
NUL	^@	00	DLE	^P	10
SOH	^A	01	DC1	^Q	11
STX	^B	02	DC2	^R	12
ETX	^C	03	DC3	^S	13
EOT	^D	04	DC4	^T	14
ENQ	^E	05	NAK	^U	15
ACK	^F	06	SYN	^V	16
BEL	^G	07	ETB	^W	17
BS	^H	08	CAN	^X	18
HT	^I	09	EM	^Y	19
LF	^J	0A	SUB	^Z	1A
VT	^K	0B	ESC	^[	1B
FF	^L	0C	FS	^\	1C
CR	^M	0D	GS	^]	1D
SO	^N	0E	RS	^^	1E
SI	^O	0F	US	^_	1F

### ASCII Character Set: 20H - 7FH

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
20	sp	!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/
30	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
60	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	p	q	r	s	t	u	v	w	x	y	z	{		}	~	•

### Code Pages Supported:

- Code Page 850

## 10 Associated Features & Options

### 10.1 Cutter

The Cutter Module can perform either a Full or a Partial Cut. These are initiated via the *ESC i* or *ESC m* commands.

If the printer also includes a Presenter, then only a Full cut is available.

The cutter has a life of 1 million cuts. The host can check the current cutter accumulated usage by using the *ESC h* command. If cutter usage approaches its expected life, it may be replaced on a preventative basis. If replaced, the host should clear the usage counter.

### 10.2 Supplies Usage Counters

The printer uses counters to account for the supplies in use. Ink dots and paper use are tracked and current status is available via *ESC h* command.

When the usage of ink or paper approaches its expected life, it may be replaced on a preventative basis. If replaced, the host should clear the usage counter.

### 10.3 Cash Drawer Interface

The printer has an optional interface to a cash-drawer. This option is factory installed and includes the following inputs and outputs.

<i>Item</i>	<i>Usage</i>
<i>Cash Drawer Pulse Output</i>	A 24V pulse of user specified width is provided to operate standard cash drawers.
<i>Cash Drawer Sensor</i>	A sensor is provided which can sense the state of an external switch. Typically the sensor is attached to a switch on a cash drawer. The host computer can determine if the drawer is open or closed.

**Interface Connector:**

Type: RJ-11 (6 pin phone-jack type)

Pin Out: See table.

Pin	Name	Input/ Output	Usage
1	GND	--	<i>Signal Ground</i>
2	+24V	Output	<i>24 Volts Power</i> <ul style="list-style-type: none"> <li>• Max.current output during drawer pulse is 500 mA.</li> <li>• Do not use this signal for any other purpose.</li> <li>• The output is un-regulated 24 Volts, however, the output can be internally switched to an slightly lower (approximately 17V) unregulated power supply, if required.</li> </ul>
3	n/c	--	
4	DWR_IN	Input	<i>Drawer Sensor</i> <ul style="list-style-type: none"> <li>• Attaches to an external sensor which determines whether the cash drawer is open or closed. This condition is returned to the host via the Inquiry Command if required.</li> <li>• Attach switch between this pin and GND.</li> <li>• The signal should be driven by either a mechanical switch or an open-collector type driver. This signal is pulled up to 5 Volts internally via a 2.2KOhm resistor. Whether this signal is active high or active low depends on the application.</li> </ul>
5	PULSE/	Output	<i>Drawer Kick Out Pulse</i> <ul style="list-style-type: none"> <li>• An output which can be used to open cash drawers.</li> <li>• This is an open collector darlington type output, which can sink 500 mA maximum. If this signal drives a solenoid from the +24V supply, the impedance of the solenoid must be greater than 24 Ohms.</li> <li>• When the signal is active, the voltage on this pin is pulled low to about 1V with respect to GND.</li> </ul>
6	CGND	--	<i>Chassis/Frame Ground</i>

## 11 Document Revision Information

<i>Revision</i>	<i>Date</i>	<i>Changes</i>
1.1	11-22-99	Initial release in PDF format.