

IJ-1000 Ink-Jet Validation Printer

Specification

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1 Overview and General Description

This document provides the electrical, mechanical, and interface specifications for the IJ-1000 Ink-Jet Validation Printer.

1.1 General Description

The IJ-1000 Printer is a validation only printer for use in a wide variety of applications, including: Banking and Point-of-Sale. The IJ-1000 has several available options, including voltage input range 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 Hewlett-Packard 51604A ink-jet printhead. This printhead prints at 144x96 dpi using 12 nozzles.

1.2 Configuration Options

The IJ-1000 can be factory configured in a variety of ways. The printer will be configured at the time of manufacture and is not user-modifiable. This specification does not address all of the configurable options. Contact the factory if your application requires a listed option.

<i>Items:</i>	<i>Configurations Available</i>
<i>Interface:</i>	Serial, RS-232C Serial, RS-422 Serial, RS-485
<i>Options:</i>	Data Stream Emulations Power Connectors Communications Connectors

2 Equipment Specification

Item	Specification
Power Requirements	
<i>Voltage</i>	120 Volts AC (+10%/-20%)
<i>Power Consumption</i>	
<i>Operating</i>	5 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>	Hewlett-Packard #51604A
<i>Ink Detection</i>	Ink drop usage counter.
<i>Resolution</i>	144 x 96 DPI (horizontal x vertical)
<i>Modes</i>	N/a
<i>Speed</i>	100 chars./sec (Large Font)
Print Media / Paper	
<i>Type</i>	Plain Paper. Cut-sheet or cut-form.
<i>Size</i>	5 Inch Wide minimum. 2 Inch Tall minimum.
<i>Paper Detection</i>	Form Inserted. Reflective photo sensor. Form Removed. Reflective photo sensor.
<i>Paper-Usage</i>	N/a
Paper Handling	
<i>Loading</i>	Always open paper throat and path.
<i>Tear Bar</i>	N/a
<i>Tear Bar Life</i>	N/a
Communications	
<i>Receive Data Buffer</i>	85 characters
<i>Interfaces</i>	RS-232C (standard) RS-422 and RS-485 (optional)
Physical Characteristics	
<i>Dimensions</i>	10.4" (W) by 3.75" (H) by 4.75" (D)
<i>Weight</i>	4 lb. (5 lb. Shipping)
<i>Noise Level</i>	48 db

3 Printer Features and Specifications

3.1 Printer Overview

Printer Features

Logical Unit

<i>Processor</i>	Intel 80C51
<i>RAM</i>	256B
<i>Firmware Storage</i>	32K EPROM or FLASH
<i>Variables Storage</i>	N/a

Characters & Fonts

<i>Character Height</i>	0.070 to 0.125 inch (font dependent)
<i>Character Set</i>	64 Upper-case ASCII Character-set
<i>Fonts:</i>	2 Printer Fonts in Memory
	-Large
	-Large Bold
<i>Font Storage</i>	EPROM
<i>Font Configurability</i>	At factory
<i>Printing Modes:</i>	1 Mode:
	-Double-Wide / Single-Wide

Supplies: Features & Specifications

Printhead & Ink

<i>Print Head</i>	Hewlett-Packard #51604A Addmaster #
<i>Ink Cartridge Life</i>	750,000 characters, standard font
<i>Print Contrast Ratio</i>	Constant throughout life of cartridge.

Paper Media

<i>Media Type</i>	Plain Paper only.
-------------------	-------------------

Printer Capabilities and Capacities

Printer Speed

<i>Print Speed</i>	100 char/sec max. (Large Font)
<i>Print Throughput</i>	N/a
<i>Paper Feed Speed</i>	N/a

Printer Resolutions

<i>Resolution (native)</i>	144 x 96 dpi (horizontal x vertical)
<i>Resolution (addressable)</i>	144 x 96

Validation Capacity

<i>Print Zone (Lines)</i>	1 line 80 characters per line maximum.
<i>Print Zone</i>	see definitions for details

3.2 Printer Operating Modes Overview

<i>Category</i>	<i>Mode</i>	<i>Sub-Modes</i>	<i>Unit is:</i>
<i>Operation</i>	Operating	On-Line	Operational -- may be utilized.
		Off-Line	On-Line. Host may send data. Off-Line. Host should not send data.
	Self-Test	Self-test procedure underway.	
<i>Printing</i>	Validation		Data printed to journal.

3.3 Printing

Printing Overview:

Printing is accomplished by sending print data to printer terminated with a print command. Printing occurs in other cases also, but these are the exception.

The printer includes various sensors to assure that the any printing occurs properly on the media. In absence of Host commands, the printer will use its default settings, which are:

<i>Item</i>	<i>Default Setting</i>
<i>Font</i>	Large Single Wide
<i>Line Spacing</i>	N/a
<i>Turbo</i>	N/a
<i>Media</i>	Validation Media
<i>Method</i>	N/a

Font Overview:

The printer includes 2 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>Large</i>	16	80	80
<i>Large Bold</i>	16	80	80

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).

3.5 Validation Printing**Validation of Forms:**

For the IJ-1000, there is one method of validation.

- *Single-Line Validation Mode:* The IJ-1000 validates by moving the cut-form horizontally across the print-head.

	<i>Multi-Line Validation Procedure</i>	<i>Via</i>	<i>Form LED</i>
1.	Host sends print data stream with proper termination.	Software	Off
2.	Printer then enters Validation Mode.		On
3.	Printer waits for Form to be inserted.		On
4.	Printer prints on Form.		Off
5.	Printer waits for Form to be printed and ejected fully.		Off
6.	Printer exits Validation Mode.		Off

The following notes are important:

- If the capacity is exceeded, then any excess print data causes the following:
 - subsequent print data is ignored,
- If the cut-form is removed during Validation, the printing mechanism will stop and abort the printing. It does this to prevent ink from being ejected into the printer.

- After Validation is completed, the cut-form is ejected into the “Catch Chute” and the clamp is opened to allow for removal of the cut-form.
- The Reprint button is not operational during Validation.

Document Media and Validation Capacity Specification:

<i>Item</i>	<i>Single Line Validation</i>
Document Media	
<i>Document Thickness</i>	0.0015 to 0.0180 in.
<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
Validation Printing	
<i>Lines</i>	1 Line
<i>Print Zone: (Base-Line)</i>	0.5 inches from bottom edge of paper
<i>Print Zone: (First Character)</i>	1.75 inches from left edge of paper
<i>Print Zone: Width</i>	80 characters max.

4 Operator Controls and Indicators

4.1 Operator Controls

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

<i>Item</i>	<i>Usage</i>
<i>Power Switch.</i>	<i>Power Switch.</i> Cuts power to printer. Located: Front, lower left.
<i>Reprint Button.</i>	<i>Reprint / Self-test button.</i> Initiates self-test mode or reprints last form. Located: Top, front, right side.

4.2 Operator Indicators

The operator indicators are LED lights which are located on the top rear 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>Form LED.</i>	ON	Insert form for validation.
	FLASH	<ul style="list-style-type: none"> • Remove cut-form from printer. • Error condition: cut-form or printhead jammed, or other error
	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:

Self-Test Procedure	Notes
1. Turn off power	
2. Hold down Reprint 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 cord.

5.2 Serial Interface

Baud Rates:	9600, 4800, 2400, or 1200 (DIP switch selectable)
Data Bits:	8 or 7
Parity Bit:	None, Even, or Odd
Stop Bits:	1
Handshaking:	Printer toggles RTS, which is connected by standard cables to IBM PC's CTS signal.
Interface Connector:	RJ-45 (phone-jack type plug) RS232C interface levels.
Pin Configurations:	Standard PC compatible 9 pin. Mates directly to PC.
Cabling:	Addmaster P/N: 95078 Printer to PC compatible DB9 type serial port

5.3 Parallel Interface

Not available on this model.

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 2 characters only. In some models, this buffer is 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-1000, 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*.

5.6 DIP Switch Settings

DIP Switches set functional features of the IJ-1000. The Switches are accessible from the bottom of the unit.

<i>DIP Sw. 2</i>	<i>DIP Sw. 1</i>	<i>Baud Rate Setting</i>	
OFF	OFF	9600	
OFF	ON	4800	
ON	OFF	2400	
ON	ON	1200	Default

<i>DIP Switch</i>	<i>Setting</i>	<i>Usage</i>	
3	ON	8 Data Bits, No Parity	Default
	OFF	7 Data Bits, 1 Parity Bit	
4	ON	Odd Parity (if used)	Default
	OFF	Even Parity (if used)	

Notes:

- Defaults are all ON.

6 Data Stream & Command Set

An overview of the supported interface commands is given below.

<i>Type</i>	<i>Sequence</i>	<i>Function</i>
RESETS		
	<i>CAN</i>	Reset. Hard power-on reset, at receive level.
PRINTING		
	<i>CR</i>	Carriage Return. Print and no-feed.
PRINT MEDIA SELECTION		
	<i>DC1</i>	Validate two forms. (Obsolete).
FONTS & PITCH		
	<i>SO</i>	Selects Single-Wide pitch (cancels Double-Wide).
	<i>SI</i>	Selects Double-Wide pitch.
	<i>GS</i>	Selects Large Font.
	<i>FS</i>	Selects Large Bold Font.
STATUS INDICATIONS		
	<i>ENQ</i>	Send printer status, immediate.

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.

Resets

<i>CAN</i>	Reset. Hard reset, at receive level.
------------	--------------------------------------

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.

This command also resets the Printer Initialized bit (PINIT).

See also the *ESC @* command.

Syntax: 17H

Printing

<i>CR</i>	Carriage Return. Print and no line feed.
-----------	--

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

Print Media Selection

<i>DC1</i>	Double Validation Mode. (Obsolete)
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Printer will validate the data on two different forms. Both forms should be inserted at the same time. Two Form LED's will be illuminated and printer halts awaiting the Forms to be inserted before proceeding. This command requires a double validation mechanism which is now obsolete.

Syntax: 11H

Fonts & Pitch

<i>GS</i>	Selects Large Font.
<i>FS</i>	Selects Large Bold Font.

Syntax: 1DH (GS), 1CH (FS),

<i>SO</i>	Selects Single Wide pitch
<i>SI</i>	Selects Double Wide pitch.

Selects or De-selection double-wide printing. Double-wide printing will resets to single-side at the end of each line.

Syntax: 0EH (SO) 0FH (SI)

Status Indications

<i>ENQ</i>	Send Printer Status, immediate.
------------	---------------------------------

See following section for more details on this command and its responses.

The printer will respond to this command immediately after receiving it. Command is operational only for units with the serial interface.

Syntax: 05H

7 Status Commands

This section gives more detail on the status commands are used to retrieve information from the printer. Only 1 command is available.

<i>Command</i>	<i>Usage</i>	<i>Response</i>
<i>ENQ</i>	Send printer status.	Immediate

This commands generates an immediate response.

- *Immediate* responses are sent to the host immediately after receiving the request. This response will occur regardless of the state of operation and any pending commands or data.

7.1 Send Printer Status, Immediate.

Host Sends: ENQ - 05H
 Printer Response: 1 byte
 Response Type: Immediate.

Usage Details:

The printer responds to this command immediately after receiving it. The printer will respond regardless of its current state of operation. The response to the ENQ command will be 1 byte in length. This is called the Short Response, respectively. This command has a variation which will generate a Long Response. See the next section.

Response Format Bit-map:

Bit	Name		Usage & Meaning
7	Reserved	0	Always 0
6	Reserved	1	Always 1
5	Reserved	1	Always 1
4	LMPS		Last Message Printed Status
		=1	• Last printing occurred without error.
		=0	• Last printing encountered an error.
3	LMP		Last Message Printed
		=1	• Last message sent to printer was printed.
		=0	• Last message sent to printer was canceled or overwritten.
2	VMP		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	PRDY		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	FORM		Used to determine if Form is inserted into Validation Mechanism
		=1	• FORM is detected
		=0	• no FORM detected

8 Interfacing Examples

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

Text	- Text characters to be printed
<i>ESC</i>	- 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*

Example #2: Inquiries

<i>Host</i>	<i>Printer</i>	<i>Meaning</i>
<i>ENQ</i>	62H	Printer Ready, No Form, Not awaiting Form
<i>ENQ</i>	63H	Printer Ready, Form Inserted, Not awaiting Form
<i>ENQ</i>	61H	Printer Not Ready, Form Inserted, Form needs removal or adjustment

Important Note: Printer responses are bit specific. Decode by bits, not values.

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:

- 64 character ASCII
- Lower case characters 'a' through 'z' will print as 'A' through 'Z'.
- Host controller can send both upper and lower case characters.

10 Associated Features & Options

No associated feature or options are described in this specification.

11 Document Revision Information

<i>Revision</i>	<i>Date</i>	<i>Changes</i>
1.1	01-17-2001	Initial release in PDF format.