

KR-30 Ink-Jet Printer Mechanism Specification

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1 Overview and General Description

This document provides the electrical, mechanical, and interface specifications of the KR-30 Ink-Jet Printer mechanism.

1.1 General Description

The KR-30 Kiosk Printers are a series of Ink-Jet Printers for use in a wide variety of applications, including: Vending Machines, ATM's, Information Kiosks, Barcode, and Label Printers. The KR-30 has several available options, including presentation modules, cutters, and Barcode readers.

Special features include: large paper roll, quiet printing, presentation module, high resolution and high speed printing, and a choice of interfaces and power connections.

1.2 Configuration Options

The KR-30 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>
Power:	+12 V DC +24 V DC
Interface:	Serial, RS232C Parallel, (Centronics type)
Options:	Receipt Presenter Module Code-39 Barcode Reader

2 Equipment Specification

Power Requirements	
<i>Voltage</i>	12 Volts DC (+/- 10%) (Standard) 24 Volts DC (+/- 10%) (Optional)
<i>Power Consumption</i>	
<i>Operating</i>	25 Watts Maximum
<i>Standby</i>	5 Watts
Operating Environment	
<i>Temperature</i>	10 -> 40 C
<i>Humidity</i>	10 -> 90% RH (non-condensing)
Printer Unit	
<i>Type</i>	Thermal Ink Jet
<i>Ink Cartridge</i>	Hewlett-Packard #51626A
<i>Ink Detection</i>	Ink drop usage counter.
<i>Resolution</i>	300 DPI (vertical & horizontal)
<i>Speed</i>	240 CPS
Print Media / Paper	
<i>Type</i>	Roll, Plain Paper
<i>Size</i>	3 Inch Wide 6 Inch Diameter (Maximum) 5/8 Inch Core I.D.(Minimum)
<i>Paper Detection</i>	Paper-Out. Mechanical arm w/photo sensor. Top-of-Form Mark. Reflective photo sensor. In Presenter. Reflective photo sensor.
<i>Paper-Usage</i>	Electronic counter.
Paper Handling	
<i>Presenter</i>	12 Inch Withold Length.
<i>Cutter</i>	Guillotine-type full cutter.
<i>Cutter Life</i>	1 Million cuts.
<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>	6" (W) by 6.5" (H) by 14.8" (D)
<i>Weight</i>	6.0 lb. (7.5 lb. Shipping)
<i>Noise Level</i>	48 db

3 Printer Features and Specifications

Printing Features:

Printhead & Ink	
<i>Print Head</i>	Hewlett-Packard #51626A
<i>Ink Cartridge Life</i>	to be determined
<i>Print Contrast Ratio</i>	Constant throughout life of cartridge.
Paper Media	
<i>Media Type</i>	Roll Paper
<i>Recommended Stock</i>	Rittenhouse #5527063
<i>Roll Diameter</i>	6.0 inches maximum
<i>Roll Core I.D.</i>	5/8 inches minimum
<i>Thickness</i>	0.0015 to 0.03 inches
<i>Width</i>	3.00 inches (+0.1/-0.2)
Characters & Fonts	
<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
	-Standard
	-Large
	-Large Bold
	-Tiny
	-Code-39 (Barcode)
<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
	-Double-Wide / Single-Wide
	-Uni-directional / Bi-directional
	-Upside-Down / Rightside-Up

Printer Font Features:

<i>Name</i>	<i>Pitch</i>	<i>Capacity</i>
	<i>Char/Inch</i>	<i>Char/Line</i>
<i>Standard</i>	16	42
<i>Large</i>	12	32
<i>Large Bold</i>	12	32
<i>Tiny</i>	20	54
<i>Code-39</i>		16

4 Operator Controls and Indicators

4.1 Operator Controls

<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>
<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>
<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>

4.2 Operator Indicators

<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.

4.3 Operator Test & Verification

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

- printing, feeding, cutting, & ejecting,
- firmware revision level.

To perform test, follow these steps:

1. Turn off power,
2. Hold down Feed button,
3. Turn on power,
4. Release button after printing starts. One sample receipt is printed.
5. Press On-Line button to print more receipts.
6. 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

Contact factory for proper power connections.

5.2 Serial Interface

Baud Rates:	9600 or 19200 (DIP sw. 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: 9xxxxx 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 to which it receives 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.

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 KR-30, 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.

For DOS based computers, set the "mode" command as follows:

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

The "p" parameter sets the appropriate retry on the CTS line when used with printers in general.

CTS goes low (or BUSY goes high on Parallel units) when the Receive Buffer reaches 256 characters from full.

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 KR-30. 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.

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.
	<i>ESC @</i>	Initialize. Soft, at process level.
	<i>STX</i>	Clear Print-Line Buffer.
OPTIONS		
	<i>ESC > n</i>	Set print mode options. <i>n</i> is bit-mapped.
	<i>SOH</i>	Set printer initialized bit. <i>PINIT</i> .
PRINTING		
	<i>LF</i>	Line Feed. Print and feed.
	<i>CR</i>	Carriage Return. Print and no-feed.
	<i>FF</i>	Print and feed to NEXT top-of-form mark.
FONTS & PITCH		
	<i>ESC 2 n</i>	Set print font. <i>n</i> is bit-mapped. See table
	<i>SO</i>	Selects Single-Wide pitch (cancels Double-
	<i>SI</i>	Selects Double-Wide pitch.
	<i>GS</i>	Selects Large Font.
	<i>FS</i>	Selects Large Bold Font.
	<i>RS</i>	Selects Standard Font.
PRINT MODES		
	<i>SUB</i>	Set "Upside-Down Mode" printing.
	<i>EM</i>	Reset "Upside-Down Mode" printing.
	<i>ESC U</i>	Select Unidirectional Print.
	<i>ESC u</i>	Select Bidirectional Print.
LINE SPACING		
	<i>ESC : n</i>	Set line feed amount to <i>n</i> /300 inches.
GRAPHICS & IMAGES		
	<i>ESC # mn data</i>	Print graphics bit image, 300 DPI.
	<i>ESC \$ mn data</i>	Print graphics bit image, 150 DPI.
STATUS INDICATIONS		
	<i>ENQ</i>	Send printer status, immediate.
	<i>ESC ? n</i>	Send feature status. <i>n</i> =feature number
	<i>ESC ACK</i>	Send ACK after processing.

FEATURE CONFIGURATION

ESC = n Set feature value to *n*.

PAPER CONTROL

ESC A Full cut of paper roll.
ESC B Partial cut of paper roll.
VT Paper Feed forwards into Presenter
ESC C Eject receipt from Presenter.
ESC W Paper Feed forwards to top-of-form mark.
ESC 4 n Set maximum form feed to *n*/10 inches.

CONTROLS AND EXTENSIONS

ESC 6 n Set drawer pulse duration.
ESC BEL Generate specified cash-drawer pulse.
SYN Turn on LED #1.
ESC O Move print-head to docking station.
ESC P Move print-head to loading zone.
ESC V Enter Power Down state.
ESC S Engage Feed-Inhibit Latch.
ESC 1 n Adjust Right/Left Alignment.
ESC Q Perform Bar-Code read operation.

A table listing the Hex and Decimal values of each of the codes is given in the following section. Details are in the next section.

Data Stream & Commands: Detail

Detail on each of the supported commands follows in this section. The commands are grouped according to function.

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.

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

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! Does not affect *PINIT* bit.

Syntax: 1BH 40H

<i>STX</i>	Clear print line buffer and LED.
------------	----------------------------------

Soft reset, at process level. This command will clear out any partially formed print-line. Also will turn off LED #1.

Does not affect Receive Buffer!

Syntax: 02H

Options and Configuration

ESC > n Set print mode options. n is bit mapped.

This command sets or clear various operational options. Each option is set or cleared depending on parameter *n* which is interpreted in a bit-mapped manner. Consult the following table.

Bit	Setting	Usage
0 (lsb)	0	Fonts reset after each printed line
	1	Fonts stay set until changed
1-7		Reserved

This option byte is defaulted to 0. It is reset on Power-On, or by the CAN or ESC @ commands.

Syntax: 1BH 3EH *n*

SOH Set printer initialized bit PINIT.

Sets *PINIT* to **1**. *PINIT* is reset to **0** by: Power On or *CAN* command.

Printer initialized bit *PINIT* can be read by the ENQ command. *PINIT* can be used by the host to determine whether the printer was reset by power failure or operator.

Syntax: 01H

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 and no line feed.
----	--

Any data previously received is printed. The paper is NOT fed.

Syntax: 0DH

FF	Print and eject.
----	------------------

Any data previously received is first printed.

Subsequently, the paper is fed to the NEXT top-of-form mark. If currently at the top-of-form mark, then unit will feed past it and find the next mark. Therefore, this command acts somewhat differently than *ESC W*.

If your paper does not include top-of-form marks, the *VT* command may be more appropriate.

Syntax: 0CH

Fonts & Pitch

<i>ESC 2 n</i>	Set print mode/fonts.
----------------	-----------------------

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

<i>n</i>	<i>Font Selected</i>
00H	Standard Font
02H	Large Bold Font.
04H	Large Font.
08H	Tiny Font
20H	Bar-Code Font, Start.
22H	Bar-Code Font, End.
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 32H *n*

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

Produces same results as the *ESC 2 n* command.

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

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

Resets to Single-Wide at the end of each line as specified by the *ESC >* command.

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

Print Modes

<i>SUB</i>	Set "Upside Down Mode" printing.
<i>EM</i>	Reset "Upside Down Mode" printing.

These modes stay in effect until reset by this command or the CAN or ESC @ commands.

The default is rightside up printing.

Syntax: 1AH (sub)
 19H (em)

<i>ESC U</i>	Select Unidirectional Print.
<i>ESC u</i>	Reset Unidirectional Print. (Bidirectional).

Use these commands to select/reset unidirectional printing. Unidirectional printing enhances the line-to-line registration, however, print speed is reduced by half. Use this mode only if required.

Default is bi-directional printing.

Syntax: 1BH 55H (unidirectional)
 1BH 75H (bi-directional)

Line Spacing

ESC : *n* Set line feed amount to $n/300$ inches.

Set line spacing to $300/n$ lines per inch.

The default is $n=50$ or 6 lines per inch.

Valid range for n is 1 to 255.

Note that the actual spacing will not be precisely as specified because the printer's feed increment is different from $1/300$ inch.

Syntax: 1BH 3AH *n*

Graphics & Images

<i>ESC # mn data...</i>	Print bit image, 300 DPI.
<i>ESC \$ mn data...</i>	Print bit image, 150 DPI.

Used to print a graphics on a bit-mapped basis, at the selected resolution.

Syntax: 1BH 23H *mn data* (300 dpi)
 1BH 24H *mn data* (150 dpi)

m and *n* specify the number of data bytes, called COUNT, which follow.

m = LSB of COUNT

n = MSB of COUNT

data... represents a sequences of bytes, whose bits specify the bit-map to be printed. The printer prints a swath 48 dots high across the paper on each pass of the print-head. Each vertical column of 48 dots is called a slice. These slices are ordered from left to right across the print field.

The native resolution of the printer is 300 DPI vertical and 300 DPI horizontal, so each slice is 48/300 inch tall, by 1/300 inch wide. Each dot on the print line may be specified by this command. However, in order to reduce communications time, the printer supports a reduced resolution command of 150 DPI. Here the user specifies every second vertical and horizontal dot, and the printer expands the data 2X in both dimensions.

At 300 DPI, each vertical slice requires 6 bytes of information. At 150 DIP, each slice vertical slice requires 3 bytes.

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 150DPI)

slice = *Byte0 Byte1 Byte2 Byte3 Byte4 Byte5* (for 300DPI)

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.

Status Indications

ENQ 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

ESC ACK Send ACK.

An ACK is returned to the host after the sequence is processed. This can be used to determine when a print job is complete. To do so, send all print data and afterwards send the ESC ACK sequence. When the ACK is returned, then all data has been printed.

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

Syntax: 1BH 06H

ESC ? n Send Feature Status.

Returns Feature specific information to the host.

n specifies the feature. See table.

<i>n</i>	Feature Status Requested
00H or 02H	Send Mechanism Status
10H ... 1FH	Read Counter #0 (through #15).
20H ... 2FH	Reset Counter #0 (through #15).
30H	Send Model ID String
32H	Send Firmware Version Number String
40H ... 6FH	Read Configuration Byte #0 (through #47). See Configuration Byte Table.
others	Reserved.

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

The printer will respond to this command after the sequence is processed from the receive buffer. This command is operational only for units with the serial interface.

Syntax: 1BH 3FH *n*

Paper Control Commands

<i>ESC A</i>	Full cut, receipt.
<i>ESC B</i>	Partial cut, receipt.

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

If the unit has a Presenter module, then a Full-Cut *MUST* be performed before the paper can be ejected by the Presenter.

Syntax: 1BH 41H (full cut)
 1BH 42H (partial cut)

<i>VT</i>	Feed Paper Forwards into Presenter.
-----------	-------------------------------------

Feeds last printline past cut position and into Presenter. After printing a receipt, use VT command to feed the last line through cutter. Then cut the paper and eject the receipt.

Alternately, you can insert approximately 12 lines of text at 6 LPI, to perform almost the same function.

Syntax: 0BH

<i>ESC C</i>	Presenter eject receipt.
--------------	--------------------------

If the unit has a Presenter, then the previously cut document is fed out of the presenter. The user should insure that no printing or feeding operations occur between cutting and ejecting the receipt.

Syntax: 1BH 43H

<i>ESC W</i>	Feed Paper Forwards to Top-of-Form mark.
--------------	--

Paper will be fed forward until any top-of-form mark on the paper is sensed. The feed mechanism will then seek the mid-point of the mark.

The maximum permitted move is set by the ESC 4 command. If the paper is already pre-positioned at the mark, no movement takes place.

To determine if this command executes successfully, send ESC W ESC ACK. When the ACK is returned, send ENQ and determine whether the mark is sensed, and if not, the command was not successful.

Syntax: 1BH 57H

ESC 4 n Set maximum paper feed to n/10 inches.

Sets the maximum paper movement that will be allowed by any of the following commands:

FF or *ESC W*

The above commands feed to optical paper marks. If these marks should be absent or obscured, this setting will prevent the entire paper from being fed in error.

The default value is n=65 or 6.5 inches. It is defaulted on Power-On, or by the CAN or ESC @ commands.

Syntax: 1BH 34H *n*

External I/O Commands

ESC 6 n Set drawer pulse duration.

Sets pulse width for any subsequent drawer pulse command. Pulse width is set to n x 2ms. This pulse width setting gives the pulse ON (energized) time. The OFF (de-energized) time is fixed at 100ms.

Syntax: 1BH 36H *n*

ESC BEL Generate specified cash drawer pulse.

Pulse is activated on cash-drawer connector. Pulse voltage depends upon model. Contact factory.

Syntax: 1BH 07H

SYN Turn LED #1 ON.

The LED will remain ON until turned OFF by the STX command. The Form LED may toggle during printing. This may change in the future.

Syntax: 16H

Printhead & Service Station Commands

ESC O Move print head to 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.

Syntax: 1BH 4FH

ESC P Move print head to loading zone.

Print-head will be moved to an clear area with easy access to enable the user to quickly change the Ink-Jet cartridge.

Print-head will be returned to its docking station after: (1) the next command is sent, or (2) a time-out period.

The host should return the head as soon as possible

The printer becomes NOT-READY (see ENQ command) while head is positioned in loading zone.

Syntax: 1BH 50H

Miscellaneous Commands

ESC V 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 56H

ESC S Engage Feed Inhibit Latch.

Feed-inhibit latch is engaged. Latch will remain engaged until any feed command is sent to the printer. After which, the latch will disengage, and remain so, until another ESC S command is sent.

Syntax: 1BH 53H

ESC 1 n Adjust Right/Left Alignment.

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 ?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 31H *n*

ESC Q Perform Bar Code Read.

The carriage will be swept across the paper with the Bar-Code reader enabled. After the sweep, the results will be returned to the host in this format:

STX mn R data ETX

<i>STX</i>	02H
<i>m</i>	LS Byte of COUNT
<i>n</i>	MS Byte of COUNT
<i>R</i>	Return Code
<i>data</i>	Decoded Bar-Code Information
<i>ETX</i>	03H
<i>COUNT</i>	Number of bytes in R, data and ETX
<i>R</i>	Error Code

<i>Error Code</i>	<i>Meaning</i>
30h	Good Read. No errors.
31h	Error: Too few bars found.
32h	Error: Too many bars found.
33h	Error: Bar-Code read error.

Syntax & Example: Read Bar-Code

Send: *ESC Q*

Syntax: 1BH 51H

Receive: 02h 09h 00h 30h 2Ah 31h 32h 33h 34h 35h 2Ah 03h

Decoded: *12345*

7 Status Indications

There are three commands used to retrieve information from the printer:

<i>Command</i>	<i>Usage</i>
<i>ENQ</i>	Send printer status, immediate.
<i>ESC ? n</i>	Send feature status.
<i>ESC ACK</i>	Send ACK after processing.

This section gives more detail on the first two of these commands. The ESC ACK sequence is trivial and needs no explanation. See the previous section for any need information.

7.1 Send Printer Status, Immediate.

Host Sends: *ENQ*

Printer Response: Short Response - 1 byte, or
Long Response - 4 bytes.

Printer Responds: Immediate response.

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 either 1 or 4 bytes in length. These are called Short and Long Responses, respectively. The user specifies the type of response in the following manner: At power-on, DIP Switch #2 is checked and the response set as:

DIP#2 OFF - Short Response
DIP#2 ON - Long Response

The host can overwrite this setting by using the *ESC > n* command.

Short Response Format:

A single byte returned to Host which has the following bit-mapped definition:

Bit	Name	Meaning	1 (set)	0 (clear)
(msb) 7	<i>PWRDWN</i>	Power Down / Sleep	Power Down	Active
6	<i>BEMP</i>	Receive Buffer Empty	Empty	Not Empty
5	<i>TEMP</i>	Transmit Buffer Empty	Empty	Not Empty
4	<i>PINIT</i>	Printer Initialized	Initialized	Not Initialized
3	<i>ERR</i>	Error	Error	No errors
2	<i>VMP</i>	Valid Operation Pending	Op. Pending	No pending op.
1	<i>PRDY</i>	Printer Ready	Ready	Not Ready
0	<i>MARK</i>	Top-of-Form Mark Sensor	Mark Sensed	Not sensed.

Bit	Usage & Meaning
<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.
<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.
<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.
<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) Paper-Out, (2) printhead in loading zone, (3) printhead jam.

Long Response Format:

Four bytes are returned to the host as follows:

Byte Number	Contains
1	00H
2	ENQ Short Response (see above)
3	Mechanism Status, byte #1
4	Mechanism Status, byte #2

7.2 Send Feature Status.

Host Sends: ESC ? *n*

Printer Responce: 1 Byte, or
2 Bytes, or
Multi-byte Sequence,.

Printer Responds: After processing command out from Receive Buffer

Usage Details:

By specifying *n*, the host can obtain information on the following features:

<i>n</i>	<i>Feature Status Requested</i>
00H or 02H	Send Mechanism Status
10H ... 1FH	Read Counter #0 (through #15).
20H ... 2FH	Reset Counter #0 (through #15).
30H	Send Model ID String
32H	Send Firmware Version Number String
40H ... 6FH	Read Configuration Byte #0 (through #47).
others	See Configuration Byte Table. Reserved.

The number of bytes returned depends upon *n* in the following manner:

Value of <i>n</i>	Bytes returned.
00H <= <i>n</i> < 30H	2
30H <= <i>n</i> < 40H	Multi-byte Sequence.
40H <= <i>n</i>	1

Two byte values are returned as MSB first and LSB last. Multi-byte Sequences are returned in this form:

STX mn data ETX

<i>STX</i>	02H
<i>m</i>	LS Byte of COUNT
<i>n</i>	MS Byte of COUNT
<i>data</i>	data returned
<i>ETX</i>	03H

COUNT Number of bytes in data and ETX

More information is provided on each available feature.

Feature: 00H / 02H = Mechanism Status.

Provides bit-mapped information on the current state of the printer mechanism. Two bytes of information are returned, Byte #1 first.

Byte #1: Print-head and Ink-Cartridge

Bit	Meaning	1 (set)	0 (clear)
(msb) 7	0 - reserved		always 0
6	0 - reserved		always 0
5	0 - reserved		always 0
4	Print-head jam	jammed	not jammed
3	Print-head docked	docked	not docked
2	Print-head at loading station	at loading sta.	not loading sta.
1	Ink-Cartridge empty	empty	not empty
0	Ink-Cartridge removed	removed	installed

Byte #2: Paper and Misc. Sensors

Bit	Meaning	1 (set)	0 (clear)
(msb) 7	0 - reserved		always 0
6	Paper loaded	loaded	paper out
5	Paper Top-of-Form Mark	sensed	not sensed
4	Paper in Presenter	in presenter	not in presenter
3	Paper feed fault	fault	OK
2	0 - reserved		always 0
1	Door #2 Sensor	contact open	contact closed
0	Door #1 Sensor	contact open	contact closed

Features: 10H - 1FH = Read Counters.**Features: 20H - 2FH = Reset Counters.**

These features are used to track supplies usage.

<i>n</i>	<i>Counter</i>	<i>Units</i>
18H	Cutter Usage	cuts / 256
19H	Ink-Drops	Number of drops / 256*256
1AH	Paper Usage	Length of feed (inches)
28H	Reset Cutter Counter	
29H	Reset Ink-Drop Counter	
2AH	Reset Paper Usage	

The Counters are reset by accessing feature numbers 20H through 2FH. No values are returned.

Features: 30H - 32H = Information Strings

These features are used to identify the printer to the host.

<i>n</i>	<i>Item</i>	<i>Returns</i>
30H	Model ID	Model ID String
32H	Firmware	Firmware Number and Revision

Features: 40H - 6FH = Configuration Bytes

These features are used to configure various options. Most of the options are for factory use.

<i>n</i>	<i>Item</i>	<i>Returns</i>
4EH	R2L Alignment	Current adjustment in dots. Signed value.

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 LF*

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>VT</i>	- feed into present & past cutter
<i>ESC A</i>	- full cut
<i>ESC C</i>	- eject receipt

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	{		}	~	•

10 Associated Features & Options

10.1 Presenter

The Presenter Module holds printed paper inside the printer until the print job is complete. After which, the paper must be fully cut with the *ESC A* command. Then the *ESC C* command will eject the receipt from the Presenter.

The Presenter holds at most 12 inches of receipt.

10.2 Cutter

The Cutter Module can perform either a Full or a Partial Cut. These are initiated via the *ESC A* or *ESC B* 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 ?n* 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.

10.3 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 ?n* command.

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

10.4 Barcode Reader

The Barcode reader is an option which can be installed on the print-head carriage. The reader can read Code-39 symbology. The symbols should be a minimum of 1/6 inch tall.

10.5 Top-of-Form Sensor

The printer has an optical sensor which looks at the paper roll and can determine the existence of a pre-printed black mark. This mark is typically used to index the paper to a known position within the mechanism. This can be used to align pre-printed information of the paper roll.

11 Document Revision Information

<i>Revision</i>	<i>Date</i>	<i>Changes</i>
1.1	03-24-98	Initial release.
1.2	05-04-98	Correct minor typographical errors.
1.3	07-22-99	Changed format of document. Added graphics commands. Typeset for PDF format.
1.4	02-07-00	Corrected errors in ESC ?n command concerning counter ID numbers.