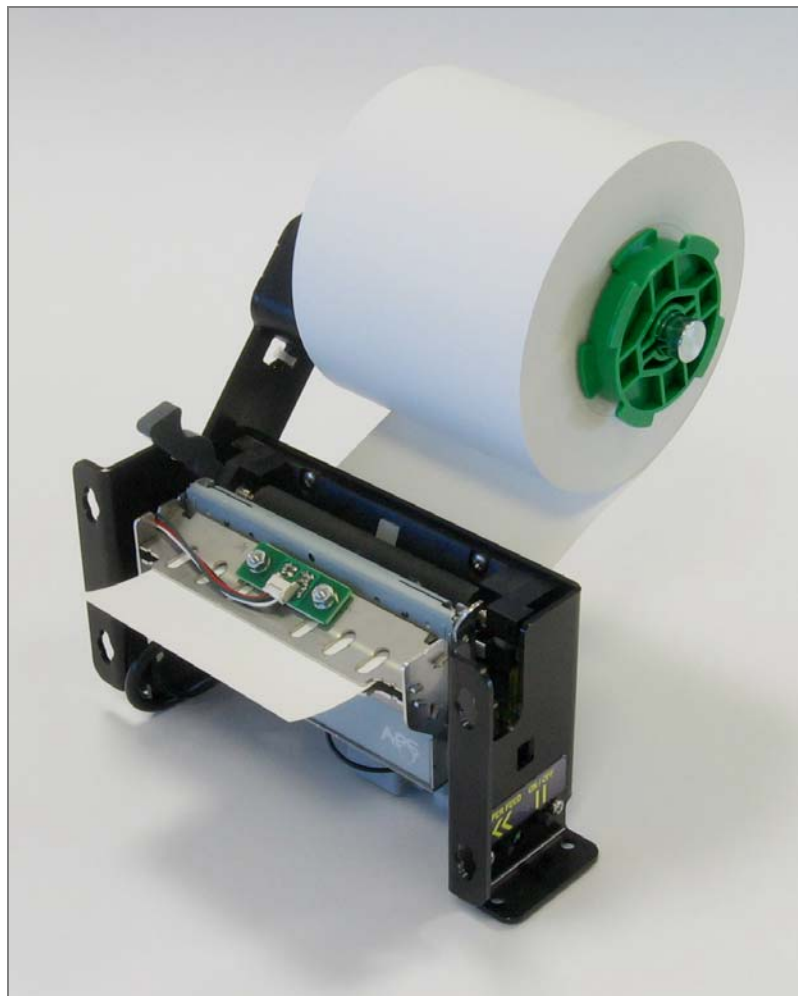


KM324-HRS-V2

Kiosk Printer Module

Technical reference





KM324-HRS-V2 Kiosk Printer Module Technical reference

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Revision history

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Table of contents

Section	Page
1. INTRODUCTION	5
2. GENERAL FEATURES	5
3. GENERAL SPECIFICATION	6
4. PRINTER DESCRIPTION	8
4.1 KM324-HRS-V2 Components.....	8
4.2 Keyboard functions	10
4.2.1 Printer Status LED	10
4.2.2 Buttons function	10
4.3 Sensors function	11
4.3.1 Paper end sensor.....	11
4.3.2 NEOP sensor (near end of paper).....	11
4.3.3 Head up sensor.....	12
4.3.4 Paper exit sensor	12
4.4 Printer connectors.....	13
4.4.1 Connectors location	13
4.4.2 Power supply connector.....	14
4.4.3 RS232 communication connector.....	14
4.4.4 USB communication connector	15
4.4.5 RS232 / USB mode selection	15
5. TEXT PRINTING FONTS	16
6. HANDLING THE KM324-HRS-V2	18
6.1 Self-test mode	18
6.2 Paper loading	19
6.2.1 Automatic paper loading	19
6.2.2 Manual paper loading	20
7. PRINTER MAINTENANCE	21
7.1 Print-head, Cutter and Paper exit guide Opening/Closing.....	21
7.2 Cleaning the thermal head.....	23
7.3 Cutter jam removing.....	23
8. OPERATING PRECAUTIONS	24
9. OPERATING CONTROL CODES	25
9.1 Control codes cross reference	25
9.2 Setup and hardware control codes	28
9.3 Text and general control codes	38
9.4 Graphic control codes	43
9.5 Cutter control codes.....	46
9.6 Bar code control codes	47
9.7 Hole / black mark detection control codes.....	51
9.8 Real time control codes	55
9.8.1 RS232	55
9.8.2 USB.....	55
10. ADDITIONAL INFORMATION	58
10.1 USB.....	58
10.2 Firmware updating	58
10.3 Font management.....	59
11. WINDOWS AND LINUX DRIVERS	59
12. PRINTER INSTALLATION	60
12.1 Paper roll setting	60
12.2 How to move the paper roll holder	61
12.3 Printer orientation.....	62
12.4 Connection to ground.....	64
12.5 Printer fixation	65
13. ENVIRONMENTAL PROTECTION	65
14. ORDERING CODES	66

1. INTRODUCTION

The **KM324-HRS-V2** is a 3 inch, 24 Volt Kiosk printer module with an integrated controller board using RS232 and USB communication ports, it consists of a **CP324-HRS** printer mounted on a sheet metal structure with paper roll holder, it is also provided with a NEOP (near end of paper sensor), a guillotine cutter and a paper exit guide.

2. GENERAL FEATURES

- **Ultra-compact printer**
- **Fully hot pluggable printers**
- **Single power supply voltage ranges from 18V to 27V**
- **Software programmable consumption (dynamic division)**
- **Full control over printing quality/speed**
 - Speed clamping via control code.
- **2 communication ports**
 - RS232 (speed up to 115200 bauds),
 - USB 2.0 (full-speed).
- **Keyboard**
 - (On-Off line/reset switch, paper feed switch and status LED)
- **End of paper detection**
- **Near end of paper detection**
- **Head-up detection**
- **Paper exit detection for correct paper path**
- **Guillotine cutter**
 - Full and partial cut modes
- **Three internal fonts**
 - Easy font update.
- **Powerful text printing modes**
 - Horizontal (normal or rotated 180°),
 - Double and quadruple width and height,
 - Underlining,
 - Inverse video,
 - 3 justifications (centred, right, left).
- **Powerful graphic modes**
 - Variable width and offset,
 - Double width and height.
- **11 Barcodes**
 - Normal and rotated 90° for 1D bar codes, PDF417 2D bar code.
- **Automatic paper loading**
 - Pause between detection of paper and printer beginning to load.
- **Hole / black mark detection**
- **Setup parameters saved in flash are recovered at next power-up**
 - One simple command saves all important parameters.
- **Easy firmware upgrades**
- **Windows and Linux drivers available**

3. GENERAL SPECIFICATION

ITEM	SPECIFICATION
Printing method	Thermal dot-line printing
Dimensions WxDxH (mm)	Approx. 159x175x111 (without paper roll)
Weight (g)	Approx. 920 (without paper roll)
Number of dots	576
Average dot resistance (ohm)	1500
Dot density (dots/mm)	8
Heat element pitch (mm)	0.125
Paper feed pitch (mm)	0.125
Paper feed tension (g)	50 or more
Paper hold tension (g)	80 or more
Paper width (mm)	82.5 +0/-1 or 80 +0/-1
Printing width (mm)	72 (centred on paper when using paper width 82.5)
Printing Speed (mm/s)	Max. 80 ⁽¹⁾
Type of paper	Thermal rolls, outside heat sensitive
Paper roll outside diameter (mm)	Max. 140 or Max. 120 (depending of roll holder position)
Roll core inner diameter (mm)	12.5 +1/-0
Roll core outside diameter (mm)	≥25
Core material	Plastic or cardboard
Paper end	Not attached to the roll core
Paper weight (g/m ²)	Min. 55 / Max.100
Paper thickness (µm)	Min. 63 / Max. 107
Recommended paper	JUJO-AF50KS-E (standard grade, 55 g/m ²) JUJO-AF50KS-E3 (high sensitivity, 55 g/m ²) Koehler KT100 P (medium sensitivity, 100 g/m ²) Kanzan KPW 460 (heat stabilized, 73 g/m ²) Equivalent types can be used

GENERAL SPECIFICATION (continued)

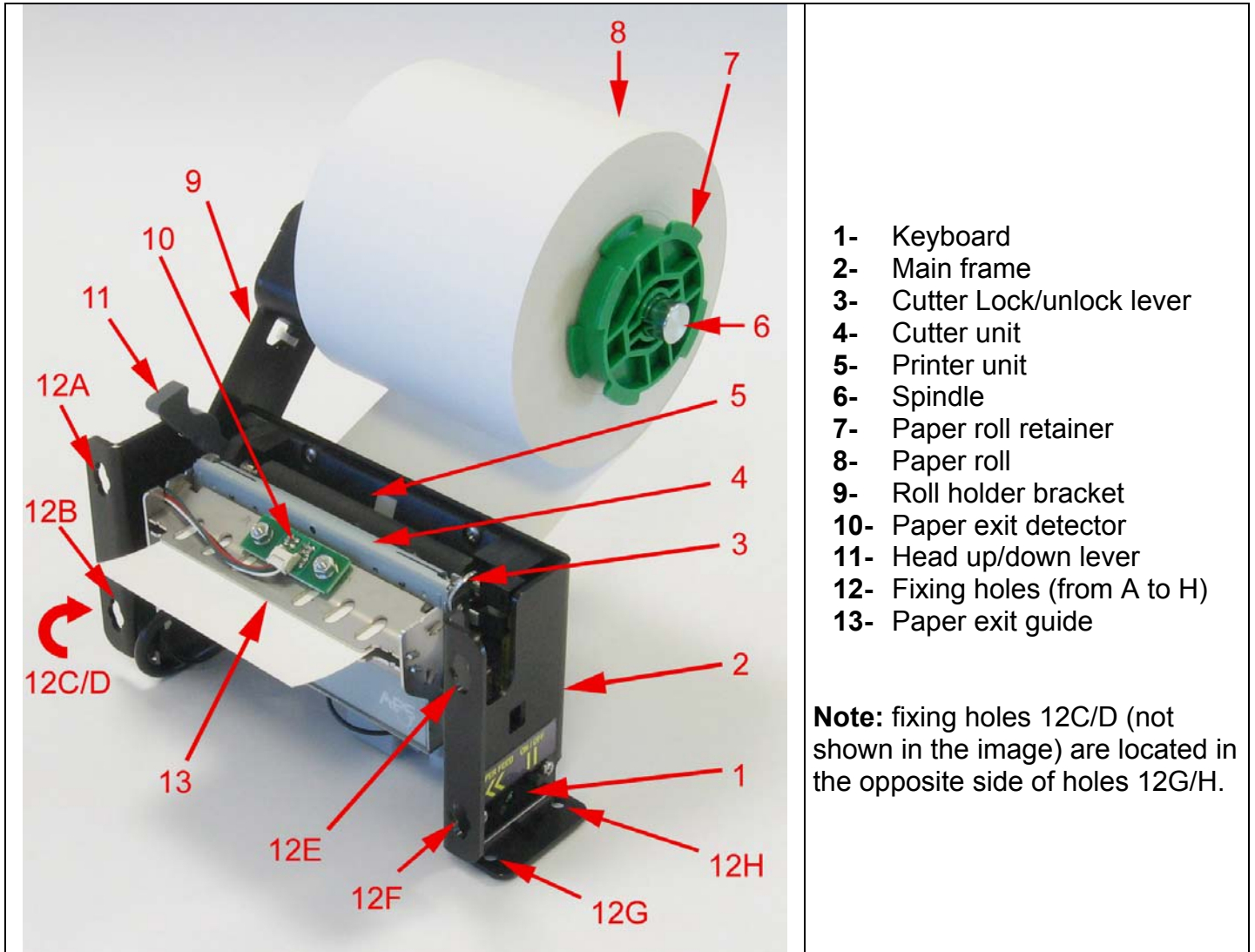
Voltage range (Volts)	From 18 to 27		
Current consumption (A) (Max instantaneous value @ 24V) <i>Starting value is when only paper feeding</i>	from 1 to 10.5 <i>Can be limited with dynamic division : 3.3A is the default value.</i>		
Operating temperature (°C)	From -10 to +60		
Operating humidity (RH%)	From 20 to 85 (no condensation)		
Storage temperature (°C)	From -40 to +85		
Storage humidity (RH%)	From 10 to 90 (no condensation)		
EMC standard	Designed to comply with FCC/CE Class B		
Cutter unit			
Cutting method	Guillotine		
Cut types	Full and partial		
Cut frequency (max.)	25 cuts/minute from 0 to 50°C 15 cuts/minute from -10 to 60°C		
Cut time (ms)	Max. 500		
Printer life			
Print head pulse life	Durability	Basic conditions	Maximum variations
	100 million pulses	<ul style="list-style-type: none"> Room temp.: 20 to 25°C Printing rate 12.5% max. Head temp.: 65 °C max. 	Max. 15% in resistance value (Ω) of any dot, from its initial value
Print head abrasion life	50 km of paper		
Cutter life	Min. 500000 cuts		

(1) **Note:** Do not set more than **80 mm/s** the maximum printing speed to avoid undesired unwinding of the paper roll and damages to the printer due to the high inertia of big diameter paper rolls that can be used on this product.

Although in the OPERATING CONTROL CODES section is given the possibility to set a speed up to 120 mm/s, that speed is only related to the CP324-HRS printer, when sold as stand alone product.

4. PRINTER DESCRIPTION

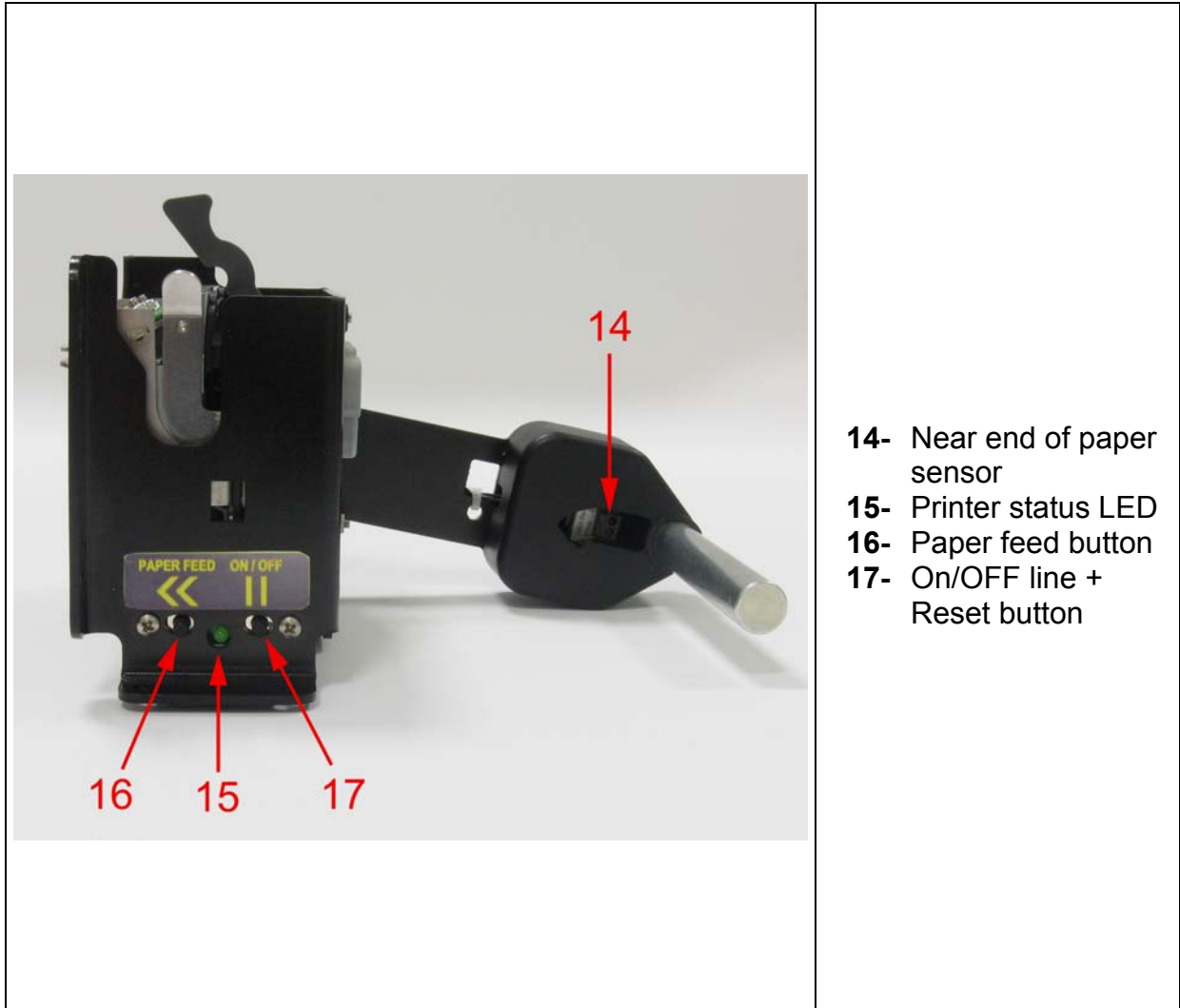
4.1 KM324-HRS-V2 Components



- 1- Keyboard
- 2- Main frame
- 3- Cutter Lock/unlock lever
- 4- Cutter unit
- 5- Printer unit
- 6- Spindle
- 7- Paper roll retainer
- 8- Paper roll
- 9- Roll holder bracket
- 10- Paper exit detector
- 11- Head up/down lever
- 12- Fixing holes (from A to H)
- 13- Paper exit guide

Note: fixing holes 12C/D (not shown in the image) are located in the opposite side of holes 12G/H.

Printer description (continued)



4.2 Keyboard functions

4.2.1 Printer Status LED



The printer status LED indicates the current state of the printer according to the following table.

Printer status	LED blink pattern
Online	Always ON
Offline	1 flash
Paper stop – printer head up or cutter error	2 flashes
End of paper or Mark error	3 flashes
Over/under voltage or temperature	4 flashes
Paper jam Not correct paper path Error condition detected	Continuous flashing

Note: Status LED is normally always ON. When an error is detected, it is blinking following a specific pattern which is function of error. Periodicity of pattern is 1,024s. Flashes last 128ms. Time between two successive flashes is also 128ms.

4.2.2 Buttons function

The functionality of the two buttons is described in the following table

Button	Printer status	Function
Paper feed 	Online or Offline	Performs a paper feed when pressed
		Performs a self test if pressed together with button ON/OFF Line (see Self-test mode section for details)
ON/OFF Line 	Online	Turns the printer Offline if pressed
	Offline	Turns the printer Online if pressed
	Online or Offline	Performs a printer reset if pressed for more than 3 seconds. Note: the printer reset includes also a cutter blade repositioning to home position. The printer turns online after reset.

4.3 Sensors function

4.3.1 Paper end sensor

The sensor detects if paper is present into the printer or not.

The printer stops to print if paper is not present.

If the paper is finished while a printout is running, the printer stops to print and eventually prints the remaining lines once a new paper roll is loaded.

4.3.2 NEOP sensor (near end of paper)

The sensor detects if the paper roll is almost finished, it changes its status when the outside diameter of paper roll is approx. **Ø28 mm** (factory setup).

The printer can continue to print although the paper is almost finished; the user must detect the status of the sensor and decide either to stop the printer or to continue printing until the paper is completely finished or to take the necessary subsequent actions for the system.

Refer to the OPERATING CONTROL CODES section on how to get the status of the sensor.

If the position of the NEOP is not suitable for the application, it could be possible to set other two positions of the NEOP, follow the next instruction on how to move the NEOP.

- 1- Unscrew the screw 1 (Fig. 1) and dismantle the NEOP's plastic case.
- 2- Unscrew the screw 2 partially (Fig.2) and rotate the NEOP in the desired position, tighten the screw 2 again with an driving torque of 25-30 Ncm.
- 3- Re-mount the NEOP case and screw 1 with a driving torque of 50-60 Ncm.

Fig. 1

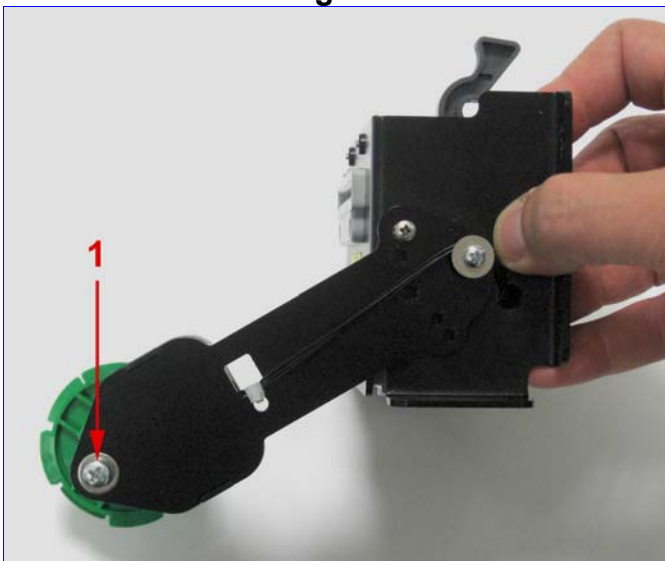
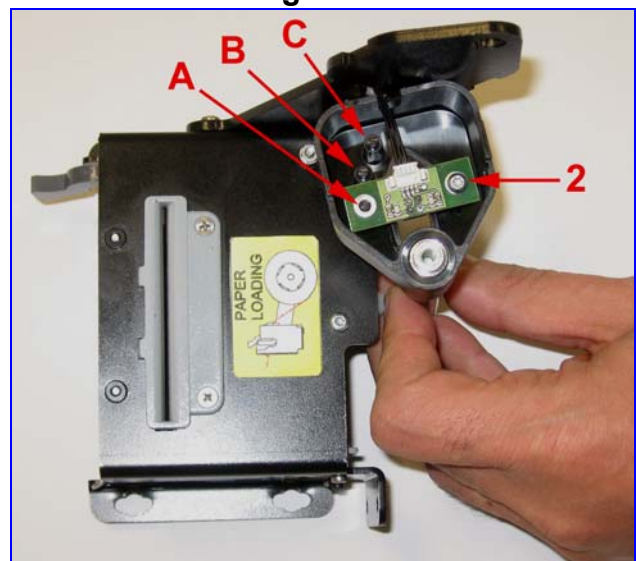


Fig. 2



NEOP Sensor (continued)

Notes:

The more you rotate the NEOP from the original assembly, (position **A**) the more the distance from the paper roll centre increases, see Fig. 2.

The Fig. 2 shows the other two possible positions for the NEOP.

Positions **B** and **C** correspond to approx. $\varnothing 36$ and $\varnothing 45$ of the outside paper roll diameter respectively, as NEOP signal threshold.

Consider that the type of paper roll in use, the way on how it is winded and other factors could have influence on the NEOP status, so, the NEOP status function has not high accuracy or repetitiveness. Due to variations of NEOP sensor specifications, and different mounting positions, it will generally be necessary to perform a calibration procedure. This is very straightforward, as the firmware has a command that will automatically perform a reflection measurement, determine an appropriate threshold, and permanently store it in the flash memory of the microcontroller. This is normally done only once in production. The application software can query for the “Near End of Paper” status, and the firmware will respond with a single yes/no answer.

Please refer to the “Near End of Paper” control codes (“ESC n ...”) in section 9.2 for more information.

IMPORTANT NOTE: to avoid paper jam, do not use paper rolls which have outside core diameter less than 25mm. If paper roll core diameter is less than specified (25mm), stop the printing as soon as the NEOP signal detects the paper diameter of 28mm, which correspond to the first position of the NEOP “A” (see Fig.2).

4.3.3 Head up sensor

The sensor (mechanical switch) detects the status of the print-head (up or down).

The printer cannot perform printing or automatic paper loading if the print-head is in up position.

If during a printout the head is moved up, the printer stops to print and eventually prints the remaining lines once the head group has been re-closed.

Refer to Fig. 3,4 for head up/down position.

Fig. 3

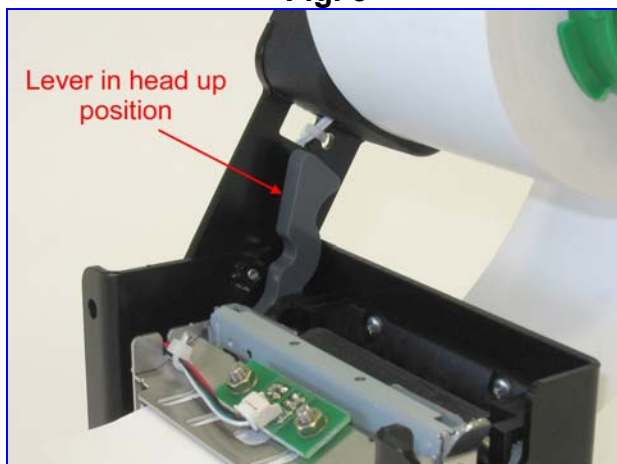
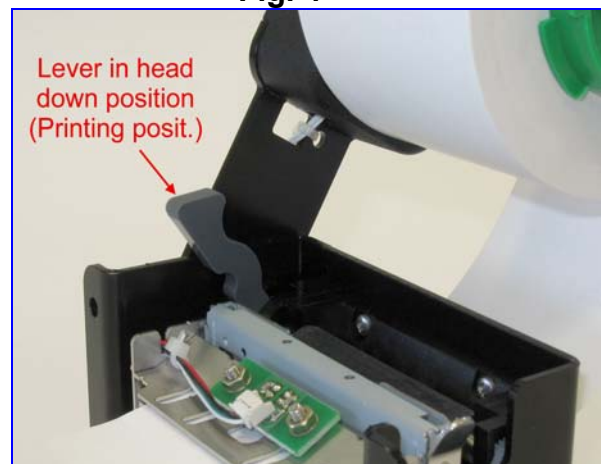


Fig. 4



4.3.4 Paper exit sensor

The sensor detects the correct paper path at the paper exit guide area of the printer.

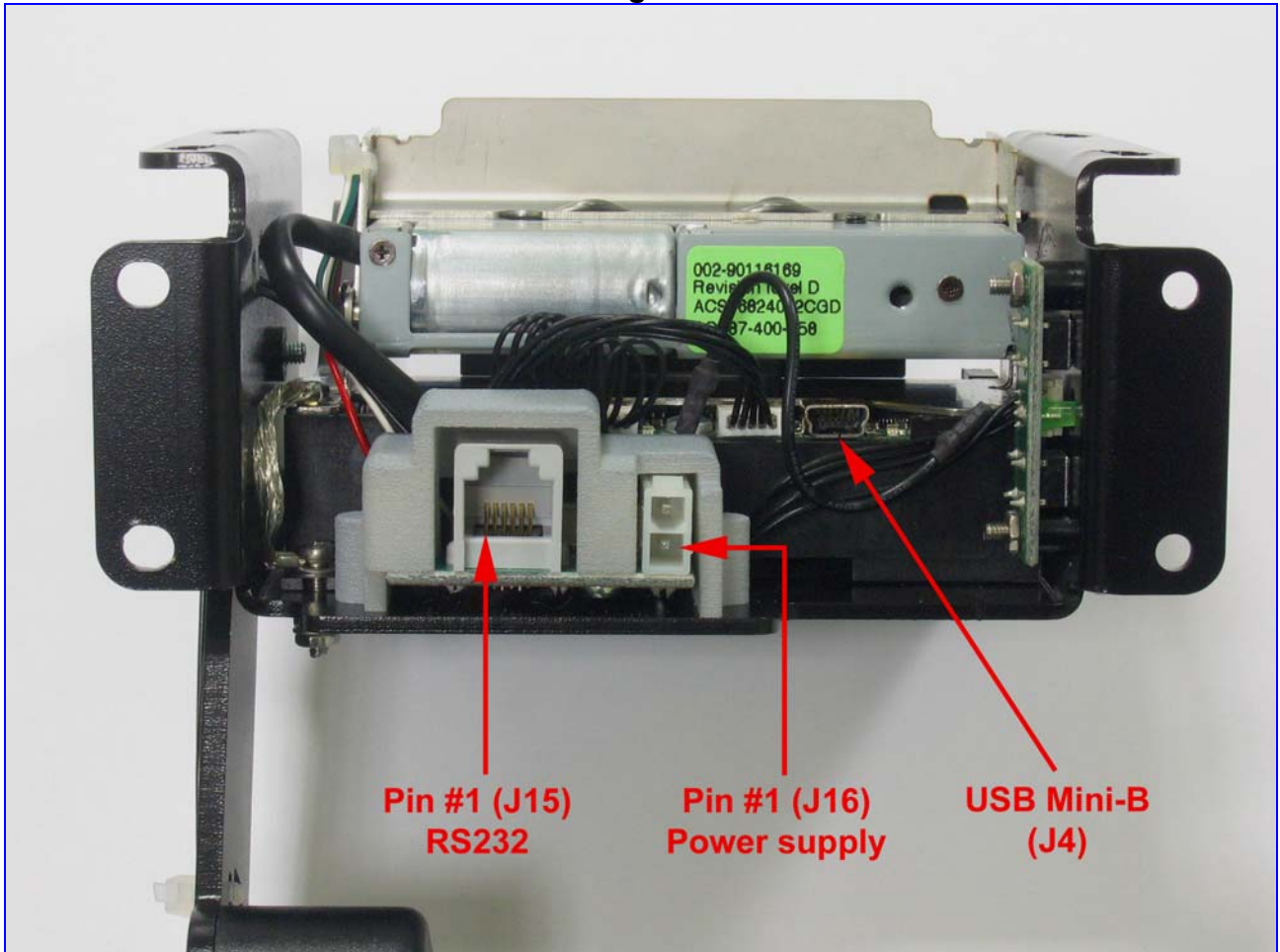
The printer doesn't print if an occlusion on the exit paper guide or paper jam is detected.

If an incorrect paper driving is detected while a printout is running, the printer stops to print and eventually prints the remaining lines once the paper driving becomes correct or the occlusion has been removed.

4.4 Printer connectors

4.4.1 Connectors location

Fig. 5



Note: The printer is fully hot pluggable, any connector hereafter can be connected or disconnected without damaging the printer.

4.4.2 Power supply connector

Connector J16: Molex 5569-02A2 series, 2 contacts. On user side Molex 39012025 connector can be used.

PIN NUMBER	SIGNAL NAME
1	VH
2	GND

IMPORTANT NOTES:

- wires AWG18 must be used in order to avoid current losses,
- power supply nominal voltage (VH) should 24V DC.

4.4.3 RS232 communication connector

Connector J15: MOLEX 52018-6615 series, 6 contacts, RJ11 type. On user side any RJ11, 6 contacts, compatible plug can be used.

PIN NUMBER	SIGNAL NAME
1	Transmit data (TxD, printer output)
2	Receive data (RxD, printer input)
3	RTS or DTR (printer handshaking output)
4	CTS or DSR (printer handshaking input, only managed during firmware updating)
5	GND
6	n.c.

Couple of signals from pins 4 and 5 should be considered as “CTS and RTS” or “DSR and DTR” in function of host handshaking implementation. They are basically managed only in hardware handshaking mode. When printer FIFO is full, RTS (or DTR) signal is set to logical level “1” to point out to host that sending should be stopped otherwise data will be lost (handshaking is OFF). As soon as this signal returns to logical level “0” (free space in printer FIFO), host sending can resume (handshaking is ON).

IMPORTANT NOTE: during firmware updating, handshaking is automatically set in hardware mode and so all signals should be connected.

4.4.4 USB communication connector

- **Connector J4:** MOLEX 54819-0578, **standard** mini-B receptacle (compatible with MOLEX mini-B plug).

Note (1): a USB LED (located in the elec. Board) indicates the state of the USB communication interface. After power-on/plug-in, during enumeration step, this LED should blink and then remains on. Once initialized, this LED then indicates the activity on the USB communication link by blinking at each data transmission.

Note (2): a secondary USB connector MOLEX 53047 (J13) is present in the elec. Board but doesn't have easy access. APS recommends not to use this connection. The J13 connection is available in the CP324-HRS printer when sold as stand alone product only.

4.4.5 RS232 / USB mode selection

Only one communication mode (RS232 or USB) can be active at a time. It is set automatically by printer as soon as first character is received. At power-up, both RS232 and USB communication lines are ready to work. The first used communication line becomes active until next power-down. Therefore, if first character is received on RS232 port, then RS232 becomes the active communication line and then all characters sent via USB will be lost. In addition, this first character will be interpreted as any other incoming byte into the printer.

5. TEXT PRINTING FONTS

The KM324-HRS controller board is provided with **3 resident sets of 224 characters: 8x16, 12x20, and 7x16**. However, it is possible to remove them and add your own fonts. Cf. “10.3 Font management” for further information.

All these resident fonts include the **Euro currency symbol** (*Position 128, 80h*).

12 characters are selectable from the international character set: refer to “ESC R n” control code for more information.

All character bitmaps are presented below with their hexadecimal code (row being the most significant nibble, and column the least significant nibble). Example: ASCII code for ‘A’ is 0x41 (or 65 in decimal).

- **8x16 characters set:** minimum character area is actually 9 *pixels* (8 “active dots” plus 1 character spacing) x 19 *pixels* (16 “active” dots plus 3 lines spacing including underline), or 1.125mm x 2.375mm. With double and quadruple height and width, maximum character area can go up to 4.5mm width x 9.5mm height. Horizontal character spacing and vertical line spacing may be adjusted via software.

Therefore, with KM324-HRS (576 pixels width), number of characters per line can be up to 64 in standard text, 32 in double width, and 16 in quadruple width.

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2		!	"	#	\$	%	&	'	()	*	+	,	-	.	/
3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_
6	'	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z	{		}	~	À
8	€	ü	é	ã	ä	à	ç	ø	ë	è	ï	í	ì	Å	Á	
9	é	æ	ff	ô	ö	ò	û	ÿ	ö	Ü	ø	£	Ø	℞	f	
A	á	í	ó	ú	ñ	ñ	º	º	¿	®	¬	½	¼	¿	«	»
B	⌘	⌘	⌘			Á	À	À	©	¶	¶	¶	¶	¶	¶	¶
C	L	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥
D	§	§	§	§	§	§	§	§	§	§	§	§	§	§	§	§
E	ó	β	õ	ò	õ	ø	μ	ρ	ρ	ó	ô	ù	ú	ú	ú	ú
F	-	±	∏	¼	¶	§	÷	,	°	°	°	°	°	°	°	°

- 12x20 characters set:** minimum character area is actually *13 pixels* (12 “active dots” plus 1 character spacing) x *23 pixels* (20 “active” dots plus 3 lines spacing including underline), or *1.625mm x 2.875mm*. With double and quadruple height and width, maximum character area can go up to *6.5mm width x 11.5mm height*. Horizontal character spacing and vertical line spacing may be adjusted via software. Therefore, with KM324-HRS (576 pixels width), number of characters per line can be up to 44 in standard text, 22 in double width, and 11 in quadruple width.

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2	!	"	#	\$	%	&	'	()	*	+	,	-	.	/	
3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_
6	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z	{		}	~	␣
8	€	ü	é	â	ä	à	â	ç	ê	ë	è	ï	î	ï	Ä	Å
9	É	æ	Æ	ö	ö	ö	ü	ü	ÿ	ö	ü	ß	£	¢	ℳ	℥
A	ã	î	ó	ú	ñ	ñ	â	â	ó	ó	¿	®	™	¼	½	¾
B	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘	⌘
C	L	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥	⊥
D	δ	θ	ê	ë	è	'	í	î	ï	↓	↑	■	■	!	!	■
E	ö	β	ö	ö	ö	ö	μ	β	β	ö	ö	ö	ö	ö	ö	ö
F	-	±	□	¼	¼	¼	÷	÷	÷	÷	÷	÷	÷	÷	÷	÷

- 7x16 characters set:** minimum character area is actually *8 pixels* (7 “active dots” plus 1 character spacing) x *19 pixels* (16 “active” dots plus 3 lines spacing including underline), or *1mm x 2.375mm*. With double and quadruple height and width, maximum character area can go up to *4mm width x 9.5mm height*. Horizontal character spacing and vertical line spacing may be adjusted via software.

Therefore, with KM324-HRS (576 pixels width), number of characters per line can be up to 72 in standard text, 36 in double width, and 18 in quadruple width.

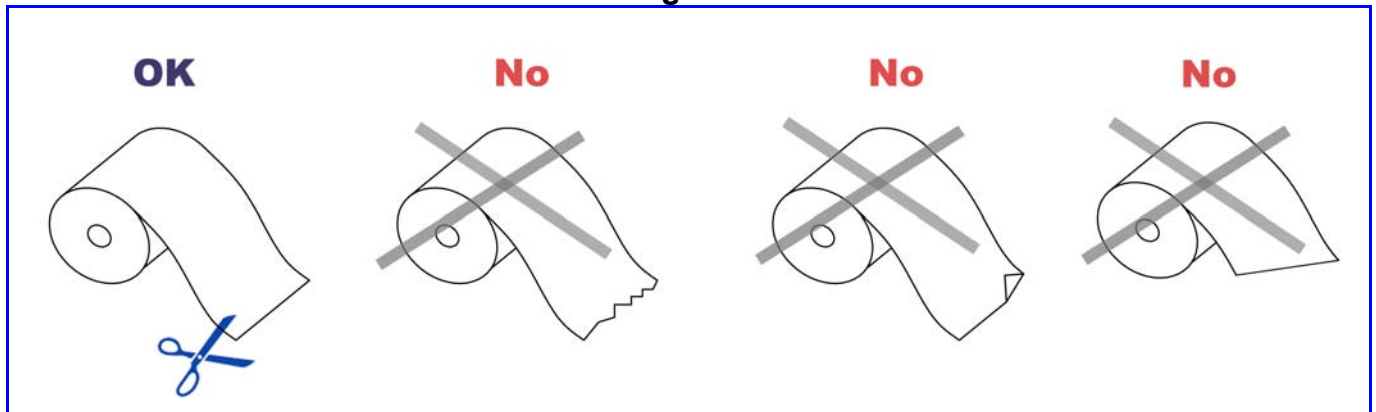
This font includes the Katakana characters set.

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
2	!	"	#	\$	%	&	'	()	*	+	,	-	.	/	
3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5	P	Q	R	S	T	U	V	W	X	Y	Z	[\]	^	_
6	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7	p	q	r	s	t	u	v	w	x	y	z	{		}	~	␣
8	€	ü	é	â	ä	à	â	ç	ê	ë	è	ï	î	ï	Ä	Å
9	É	æ	Æ	ö	ö	ö	ü	ü	ÿ	ö	ü	ß	£	¢	ℳ	℥
A	◦	「	」	、	・	ヲ	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	サ
B	シ	ス	セ	ソ	タ	チ	ツ	テ	ト	ナ	ニ	ノ	ネ	ヘ	フ	ブ
C	ミ	メ	モ	ム	ヤ	ユ	ヨ	ラ	リ	ル	レ	ロ	ワ	ヰ	ヱ	ヰ
D	ヱ	ヰ	ヱ	ヰ	ヱ	ヰ	ヱ	ヰ	ヱ	ヰ	ヱ	ヰ	ヱ	ヰ	ヱ	ヰ
E	ヱ	ヰ	ヱ	ヰ	ヱ	ヰ	ヱ	ヰ	ヱ	ヰ	ヱ	ヰ	ヱ	ヰ	ヱ	ヰ
F	▲	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

6.2 Paper loading

For correct paper loading, manual or automatic, cut the paper at the beginning of the roll according to the following recommendations (Fig. 7).

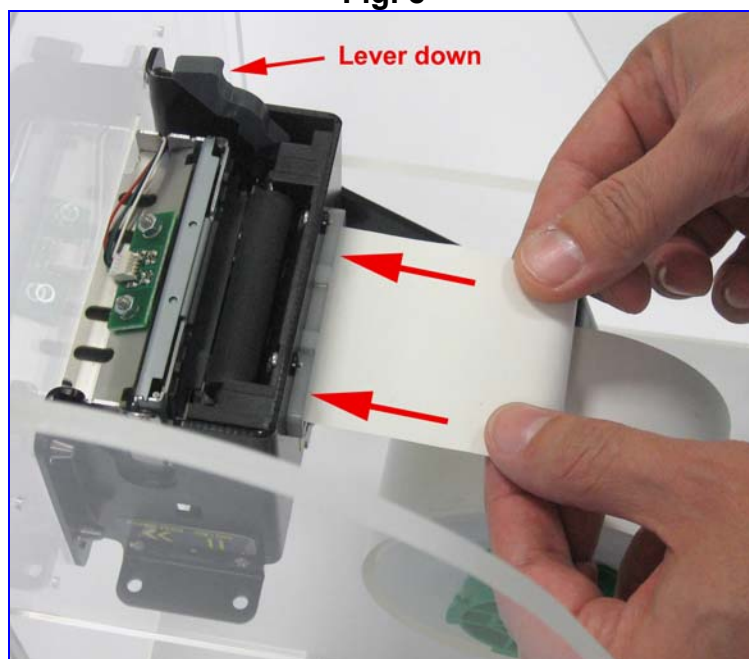
Fig. 7



6.2.1 Automatic paper loading

With the grey head-up lever in the down position, insert the paper inside the printer (Refer to fig. 8) and then the roller will automatically feed the paper for a few centimetres. When continuous paper feed mode is active and if printer has a cutter, this one will cut the paper just after the loading step (if option enabled). When hole/black mark detection mode is active, paper will be only moved to the TOF position just after the loading step (no cut). In every case, printer is then ready to print. This function can be performed only if power supply is valid (between 18 and 27 volts).

Fig. 8

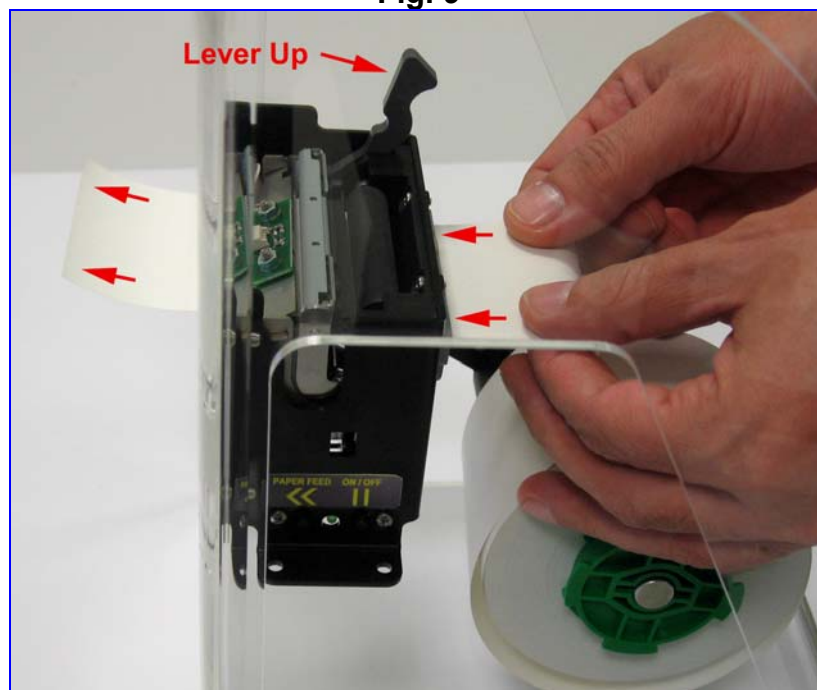


Paper loading (continued)

6.2.2 Manual paper loading

- Move the grey head-up lever in the up position.
- Manually feed the paper into the printer until it exits completely from the printer.
- Turn the grey lever to the head-down position.
Refer to Fig. 9

Fig. 9



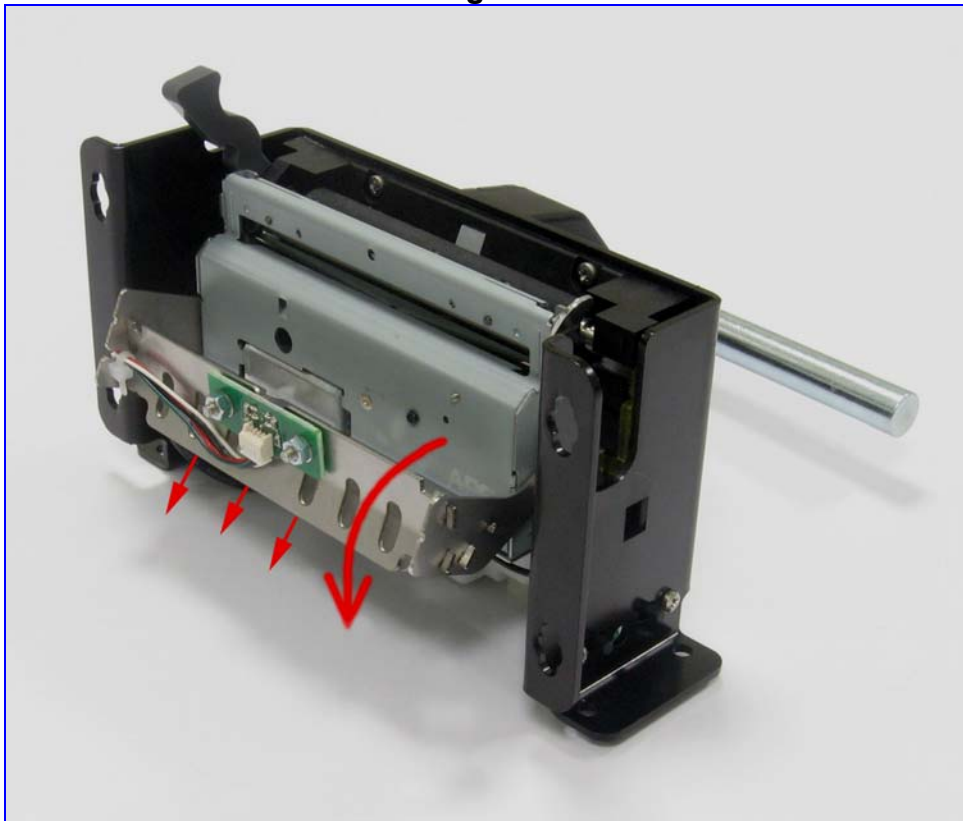
Important note: after a paper loading, manual or automatic, it is necessary to perform a paper feeding for few centimetres of paper, until you have seen a correct alignment of the paper with the printer guides. The *paper feed* button can be used to perform this action.

7. PRINTER MAINTENANCE

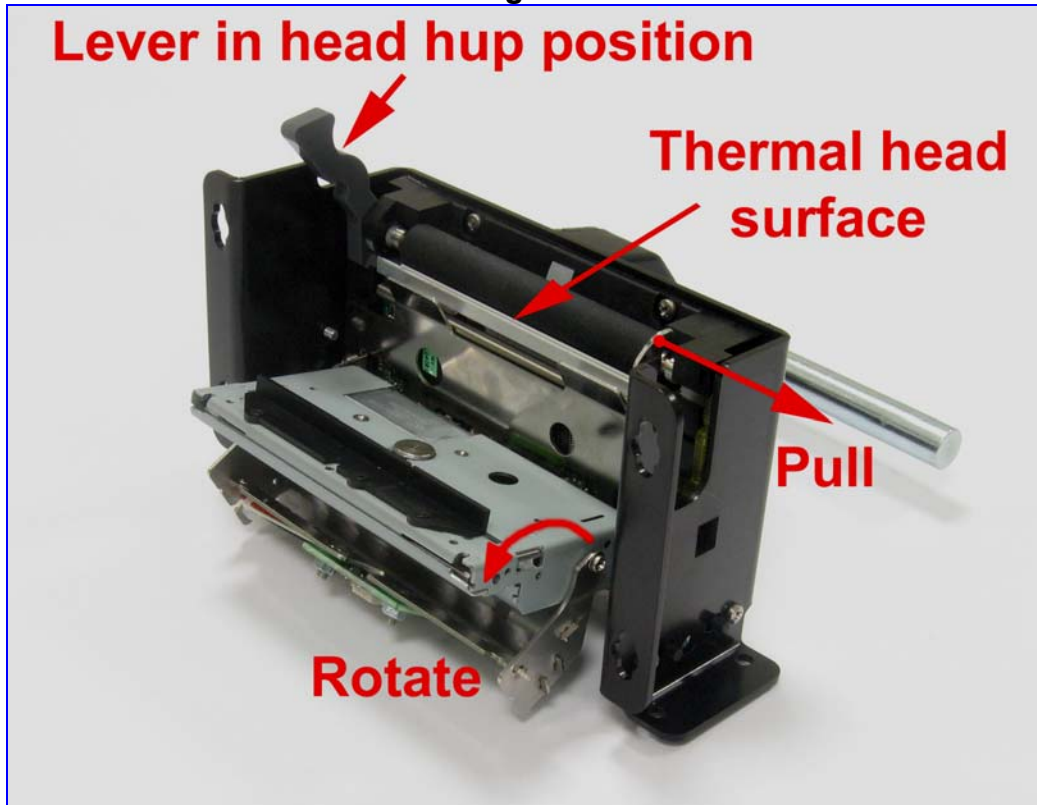
7.1 *Print-head, Cutter and Paper exit guide Opening/Closing*

- The print-head , the paper exit guide and the cutter unit can be open in case of cleaning or paper jam removing.
- Before proceeding, use a grounded wrist strap or touch a safely grounded object or a metal part, such as a metal housing of your device to avoid damaging the printer electric components due to static electricity.
- Pull the paper exit guide with hands, it is clipped only with magnets on the cutter unit, rotate the group to have access to the internal part. (Fig. 10).

Fig. 10



- To open the cutter unit, pull the lock/unlock lever on the side, rotate the cutter to have access to the internal part.
- To open the thermal head, move the grey lever in up position. (Fig. 11)

Fig. 11

7.2 *Cleaning the thermal head*

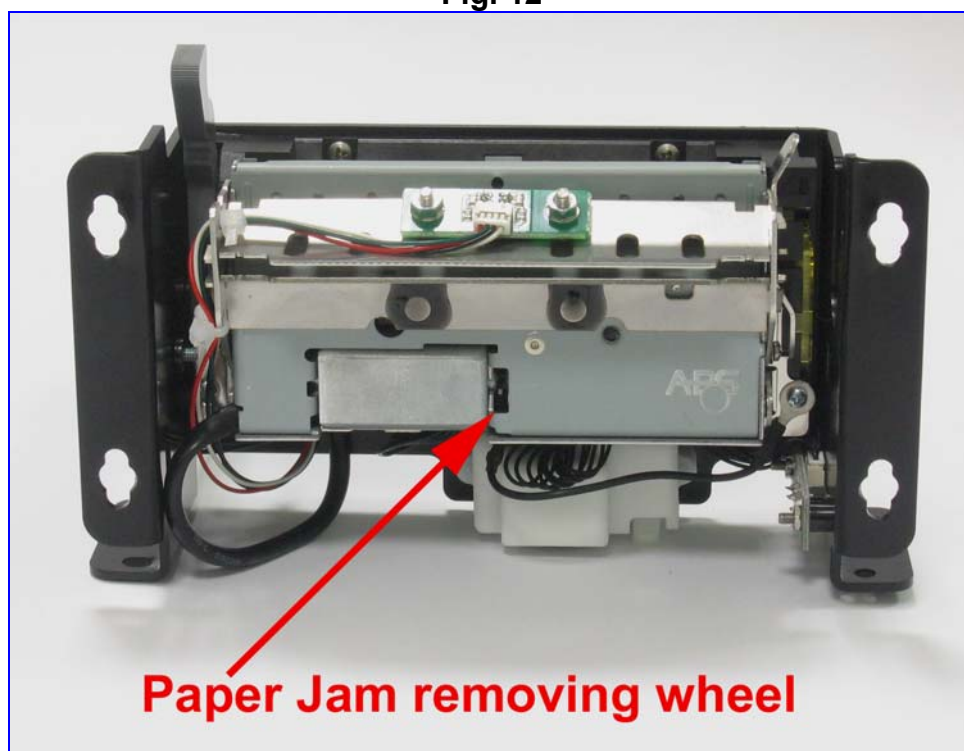
- Clean the thermal head only if printing is degraded due to dirty elements on its surface.
- Before proceeding, use a grounded wrist strap or touch a safely grounded object or a metal part, such as a metal housing of your device to avoid damaging the printer electric components due to static electricity.
- Disconnect the printer power supply cable.
- Open the thermal head, use a soft cloth or cotton wool dampened with isopropyl or ethyl alcohol and clean softly.
- Close the head after the alcohol has been dried completely.

Important note: the thermal head dots line is located internally the printer, close to the rubber roller, about 2/3 mm from the upper edge of the heat-sink (the aluminum part), it is the area to be cleaned usually. For easy operation use a thin cloth or cotton, 1-2mm max. as thickness, do not clean deeper than 4-5mm from the upper edge, otherwise the thermal head will get damage.

7.3 *Cutter jam removing*

In case of paper jam inside the cutter it's possible to move the cutter moving blade back to home position by rotating the black gear inside the cavity shown in Fig. 12. This operation may be easily performed using the tip of a pen or a small screwdriver.

Fig. 12



8. OPERATING PRECAUTIONS

- Before to operate with the printer, take actions to prevent static electricity issues.
- Do not touch the printer connectors or other electrical parts with naked hands.
- Don't touch cutter blades, especially when operating.
- Don't introduce objects inside the printer mechanism, neither the cutter unit..
- Don't touch by fingers or other objects the jamming removal wheel during cut operation.
Design your device in order to have some free space around the cutter jam removing wheel to operate correctly.
- The print-head surface is coated with glass, for this reason, mechanical stresses, shocks, dust and scratches should be avoided to prevent damage.
- Do not operate in dusty environments otherwise the life of printer will be shorten.
- When paper other than that specified is used, the following problems may occur: proper print density cannot be obtained; printer head reliability is lowered.
- Ensure the paper does not have high abrasion factor, low sensitivity or abnormal chemicals, use only the specified paper.
- Avoid condensation, if condensation occurs, do not switch ON the printer until condensation has disappeared.
- Print quality would become degraded if paper or ink residue were stuck on the head surface, in this case, clean the print-head according to the instructions given in the present document, do not use sandpaper or other hard objects as this will destroy the heating elements.
- If the printer emits smoke, smell of burning, or unusual noise while printing, immediately stop the current print session and disconnect the power supply.

9. OPERATING CONTROL CODES

Control codes are non-printable characters or sequences of characters that control the operation of the printer. Within the following description, a control code causes the printer to interpret the following byte(s) as part of a command and not as a printable character.

9.1 Control codes cross reference

Setup and hardware control codes

CONTROL CODE	DESCRIPTION
GS / n	Set maximum peak current via dynamic division
GS s n1 n2	Set maximum printing speed
GS a n	Set acceleration smoothing (not implemented in 24V printers)
GS D n	Set printing intensity
ESC @	Reset printer
ESC v	Send printer status
ESC I	Send printer identity
GS B n	Set serial communication settings
ESC o n	Set "End of Paper" optosensor type
GS O n1 n2	Do an "End of Paper" optosensor calibration
ESC O	Send "End of Paper" optosensor parameters
GS o	Send "End of Paper" optosensor current level
ESC s	Save in flash setup parameters
ESC d	Recover factory setup parameters
GS p n	Set paper loading pause
GS P n1 n2	Set paper loading length
GS e n	Eject paper (not implemented)
GS M n1 n2	Set paper loading speed
GS c n	Enable/disable historic heat
GS A msk1 msk2 app1 app2	Set some applicative behaviours
ESC n p	Send "Near End of Paper" extension presence
ESC n c	Do a "Near End of Paper" optosensor calibration
ESC n s	Send "Near End of Paper" status
ESC n l	Send "Near End of Paper" optosensor current level

Text and general control codes

CONTROL CODE	DESCRIPTION
ESC % n	Select internal font
ESC R n	Select international characters set
ESC 2 n	Set line pre-spacing
ESC 3 n	Set line spacing
ESC SP n	Set character spacing
ESC b n	Set normal/inverse video mode
ESC c n	Set maximum number of columns
ESC C n	Set text justification
ESC ! n	Set printing modes
ESC { n	Set normal/rotated text line
LF	Do a text line feed
CR	Do a carriage return
ESC J n	Feed paper forward (n dot lines)
ESC j n	Feed paper backward (n dot lines)
CAN	Cancel text line data buffer

Graphic control codes

CONTROL CODE	DESCRIPTION
ESC * n1 n2 n3 n4 n5 n6 <data>	Print graphic in full mode
ESC \$ n1 n2	Set graphic offset in line mode
ESC V n1 n2 n3 <data>	Print graphic in line mode

Cutter control codes

CONTROL CODE	DESCRIPTION
ESC m	Do a partial cut
ESC i	Do a full cut

Bar code control codes

CONTROL CODE	DESCRIPTION
GS k n [Start] <data> [Stop]	Print bar code
GS h n	Set bar code height
GS w n	Set bar code magnification
GS H n	Set bar code text position
GS R n	Set normal/rotated bar code

Hole and black mark detection control codes

CONTROL CODE	DESCRIPTION
GS L n	Set mark length, switch continuous/mark mode
GS E	Move to "Top Of Form" (TOF) position
GS T n1 n2	Set "Mark" to TOF position length
GS Y n1 n2	Set "Optosensor" to "Head dot line" length
GS X n1 n2	Set "Mark" to "Cut" position length
GS x n1 n2	Set "Head dot line" to "Cut" position length

9.2 Setup and hardware control codes

GS / n

Description: Set maximum peak current via dynamic division (impact on printing speed).

Format: <1Dh> <2Fh> <n>

Comments: n = 0 : enable maximum peak current on power supply (and so maximum printing speed).

n = 1 to 32 : software programmable consumption (dynamic division). The maximum number of black dots which can be simultaneously heated is (n+1) x 8. So maximum printing speed may be never reached because successive heats can take a lot of time.

Default : n = 17

Example : n = 5 => maximum black dots simultaneously heated : (5+1)*8 = 48.

Printer peak consumption @24V =

(0.72A (stepper motor) + 0.2A (logic power supply) + 24*48/1500) = 1.69A

1500 Ohms is the dot resistance.

For the moment, minimum available regarding n is 15

GS s n1 n2

Description: Set maximum printing speed.

Format: <1Dh> <73h> <n1> <n2>

Comments: This control code may be used to reduce printing speed in case of paper roll diameter above 120mm and/or if rewinding mechanism is connected to the printer.

Bytes n1 and n2 set the time T (in μ s) between each step: $T = (256*n1) + n2$.

Default : T = 1562 μ s (80mm/s).

Example : (n1 = 6, n2= 26) => T = 1562 μ s

=> Maximum printing speed = (1 / (8 * 1562e-6)) = 80 mm/s

8 dot lines/mm is the line pitch.

Notes : If parameter T = 0 the command is ignored and the speed remains the same of the last setting or the default value is it has never been changed.

Note: even if allowed, we strongly recommend not to set a speed higher than **80 mm/s** just to avoid undesired unwinding of the paper roll, bad printing results or damages to the printer gears.

GS D n

Description: Set printing intensity.

Format: <1Dh> <44h> <n>

Comments: n=80h (128d) : nominal printing intensity (default value).

n>80h (128d) : printout becomes darker (until n = FFh : +60% intensity).

n<80h (128d) : printout becomes lighter (until n = 00h : -60% intensity).

ESC @

Description: Reset printer.

Format: <1Bh> <40h>

Comments: Reset printer device. This is a real time request. See section 9.8 for further details.

ESC v

Description: Send printer status.

Format: <1Bh> <76h>

Comments: Printer returns a single byte that reflects its status in accordance with the following table:

BIT	FUNCTION	BIT = 0	BIT = 1
0	Head temperature	OK	Too high or too low
1	Head-up	No	Yes
2	End of Paper	No	Yes
3	Power supply	OK	Too high or too low
4	Printer in use	Ready	Action in progress
5	ON/OFF line	OFF	ON
6	Hole/mark detection error	No	Hole/mark not found
7	Cutter error	Yes	No

This is a real time request. See section 9.8 for further details.

ESC I

Description: Send printer identity.

Format: <1Bh> <49h>

Comments: Printer returns an ASCII string ended by zero (00h) that reflects the printer identity. The string is formed by the concatenation of printer mechanism name and firmware revision, as below:

KM324-HRS-V2 xx.yy

The string always has a fixed format, that is : the printer mechanism name padded to 16 bytes, a space, then 5 bytes for the firmware revision (the dot being in the middle), ended with zero. So it is a 23 bytes length string.

GS B n

Description: Set serial communication settings.

Format: <1Dh> <42h> <n>

Comments: Sets serial communication speed and handshaking mode.

Bit 7: b7 = 0: "Xon/Xoff" handshaking mode (software control),
 b7 = 1: "RTS or DTR" handshaking mode (hardware control).
 Bits 6, 5, 4, 3: not used.
 Bits 2, 1, 0: speed.

b2b1b0	SPEED (BAUDS)
0	1200
1	2400
2	4800
3	9600
4	19200
5	38400
6	57600
7	115200

Default: n = 83h : "RTS or DTR" handshaking mode, 9600 bauds, 8 bits of data, no parity bit, 1 stop bit.

ESC o n

Description: Set "End of Paper" optosensor type.

Format: <1Bh> <6Fh> <n>

Comments: n = 0 : reflective optosensor is mounted.
 n = 1 : transmissive optosensor is mounted.

Default : reflective optosensor.

GS O n1 n2

Description: Do an "End of Paper" optosensor calibration.

Format: <1Dh> <4Fh> <n1> <n2>

Comments: Due to dispersions in optosensor mounting and sensitivity and due to paper features (reflection efficiency, black mark ...), calibration may be required to update thresholds at which an "End of Paper" will be set or a "Black Mark" will be detected. These updated thresholds are also saved in flash memory and will be recovered at next power-on. In addition, "Black", "Mark" and "Paper" optosensor levels will be saved in flash too for information.

This control code makes printer to perform a calibration procedure which features depends of bytes n1 and n2 :

- n1 : length in cm of paper loading before starting actually calibration,
- n2 : length in cm of paper required for calibrating the optosensor.

At the end of procedure, printer returns a single byte:

- 0x01 if calibration and saving are successful,
- 0x00 if calibration or saving failure.

CAUTION : before sending this control code, paper should absolutely be removed from printer, otherwise, calibration will fail (no robustness) and only a hardware RESET could make printer work again. In addition, 1st loaded paper length should not contain any black mark which could cause calibration failure too. For information, when reflective optosensor is used, calibration can be performed even with a paper length without any black mark.

- Notes :
- For the moment, saving of these new thresholds causes saving of all setup parameters too as “ESC s” request (flashing of only few parameters at a time is not available). So it is advised to perform a calibration procedure only in a stable and known context.
 - Calibration procedure can take a lot of time in function of paper loading lengths. In addition, during saving, communication is not guarantee (risk of loss of data in RS232) because flashing operation cannot be performed simultaneously with normal operating function. So it is advised for host to wait for printer return status with a sufficient timeout before resuming communication.
 - An “End of Paper” optosensor calibration application note and calibration tools are available. Please contact APS for further details.

ESC O

Description: Send “End of Paper” optosensor parameters.

Format: <1Bh> <4Fh>

Comments: Printer returns the 6 next bytes :

- Byte 1 : optosensor type (0 : reflective / 1 : transmissive),
- Byte 2 : black optosensor level (no paper),
- Byte 3 : mark/backing optosensor level,
- Byte 4 : paper optosensor level,
- Byte 5 : paper presence threshold,
- Byte 6 : mark detection threshold.

Levels are basically analogical/digital conversion results and thresholds are also coherent with level type.

All these parameters are determined automatically during “End of Paper” optosensor calibration procedure. This command is intended for test purpose.

Default : reflective / 255 / 255 / 0 / 249 / 249. These values should make most of applications to work properly.

GS o

Description: Send "End of Paper" optosensor current level.

Format: <1Dh> <6Fh>

Comments: Printer returns 1 byte representing the optosensor current level (analogical/digital conversion result). Smaller value means more reflection (paper is closer). This control code is intended mostly for test purpose.

ESC s

Description: Save in flash setup parameters.

Format: <1Bh> <73h>

Comments: Setup parameters are saved in the internal flash memory of controller. Therefore, they are not lost when power is removed or printer is reset, and are recovered at each power-on/reset.

Printer returns 1 byte representing the status of this request :

- 0x01 : saving successful,
- 0x00 : saving failure.

Saving can take more or less time in function of action in progress. During saving, communication is not guarantee (risk of loss of data in RS232) because flashing operation cannot be performed simultaneously with normal operating function. So it is advised for host to wait for printer return status with a sufficient timeout before resuming communication (100ms minimum, more if printing operation was in progress when request has been sent).

The following parameters are saved by this command. Basically, they represent all setup operations performed with control codes.

"Custom" parameters

- maximum peak current,
- maximum printing speed,
- intensity,
- RS232 settings,
- paper loading pause,
- paper loading length,
- paper loading speed,
- historic heat management,
- active font,
- active international character set,
- pre-line spacing,
- line spacing,
- character spacing,
- maximum number of columns,
- text rotation,
- inverse video,
- text justification,
- text mode (simple/double/quadruple width/height and underlining),
- bar code height,

- bar code magnification,
- bar code “human readable interpretation” position,
- bar code rotation,
- applicative behaviours.

“Calibration” parameters

- mechanism configuration,
- “End of Paper” optosensor type,
- “Black” optosensor level,
- “Mark” optosensor level,
- “Paper” optosensor level,
- “End of Paper” threshold,
- “Mark” threshold,
- “Near End of Paper” additive pullup,
- “Near End of Paper” threshold,
- “Mark” length,
- “Mark” to “Top Of Form” position length,
- “Mark” to “Cut” position length,
- “Optosensor” to “Head dot line” length,
- “Head dot line” to “Cut” position length.

ESC d

Description: Recover factory setup parameters.

Format: <1Bh> <64h>

Comments: Revert all setup parameters (cf. above) to their factory default values. This updating is temporary. Indeed, if printer is reset or power is cycled, setup parameters will be initialized with the last set saved in flash (with “ESC s”). If you want to permanently set the parameters to their factory default values, you must send an “ESC d” “ESC s” sequence. Combining the use of this command and the “Reset printer” one enables you to compare the effects of the new saved values with default ones without altering them.

Printer returns 0x01 when recovering is done. It is advised for host to wait for this acknowledgement before resuming printing operations so as to be sure to work with coherent parameters. As above, timeout value is function of action in progress when request has been sent.

Note : be careful regarding possible change of RS232 baudrate. Indeed, after sending this request, host should quickly update its baudrate too in order to be able to receive printer acknowledgement. Basically, it is advised to keep baudrate constant between default and new parameters values.

GS p n

Description: Set paper loading pause.

Format: <1Dh> <70h> <n>

Comments: Set time pause between the moment when printer detects the insertion of paper and the moment when roller starts turning. This allows accurate manual positioning of paper. n is in 125 millisecond units (=> 0 to 32s).

Default: n = 0 (instantaneous).

Example: n = 16 => printer will wait for 2 seconds before starting paper loading.

GS P n1 n2

Description: Set paper loading length.

Format: <1Dh> <50h> <n1> <n2>

Comments: Set length of paper to feed during the automatic paper loading. Bytes n1 and n2 set the length L (in dot lines) of feeding : $L = (256 * n1) + n2$

Default : L = 40mm.

Example : (n1 = 3, n2= 32) => L = 800 dot lines => L = 800 / 8 = 100mm
8 dot lines/mm is the line pitch.

GS e n

Not implemented

~~Description: Eject paper.~~

~~Format: <1Dh> <65h> <n>~~

~~Comments: Printer will feed paper until an "End of Paper" condition is detected. It will then feed an extra n millimeter (0 to 255), useful for ejecting paper totally.~~

GS M n1 n2

Description: Set paper loading speed.

Format: <1Dh> <4Dh> <n1> <n2>

Comments: This control code is used to adapt loading speed to various conditions.

Bytes n1 and n2 set the time T (in μ s) between each step:

$$T = (256 * n1) + n2 \quad \text{with} \quad 1042 \leq T \leq 12500 \mu\text{s} \quad (10 \leq \text{speed} \leq 120 \text{mm/s}).$$

Default : T = 12500 μ s (10mm/s).

Example : (n1 = 24, n2= 106) => T = 6250 μ s
=> paper loading speed = $(1 / (8 * 6250e-6)) = 20 \text{ mm/s}$
8 dot lines/mm is the line pitch.

GS c n

Description: Enable/disable historic heat.

Format: <1Dh> <63h> <n>

Comments: When high printing speed is set ($\geq 60\text{mm/s}$), historic heat is required to improve printing quality especially if text is printed. However, this additional heat makes controller to work more and in some case it can cause that maximum speed cannot be reached (too many processing to be done in a few time). So a compromise should be chosen : either speed or quality.

n = 0 : historic heat is disabled,
 other values : historic heat is enabled.

Default : enabled.

Note : When picture graphic is printed, historic should be generally disabled because it makes printout darker. Basically, intensity modification is more suitable to get good printing quality; idem for curve graphic. On the contrary, regarding text graphic, historic is generally required so as to increase edge density. Therefore, user should set suitable historic mode just before transmitting his graphic.

GS A msk1 msk2 app1 app2

Description: Set some applicative behaviours.

Format: <1Dh> <41h> <msk1> <msk2> <app1> <app2>

Comments: This control code is used to customize a little bit printer behaviour.

Couple (msk1; msk2) is the activation mask of the next couple (app1; app2) : if *mskX.n* is set to 1, then *appX.n* is taken into account.

For the moment, only 2 applicative behaviours can be customized :

BYTE	BIT	APPLICATIVE BEHAVIOUR	BIT = 0	BIT = 1
app1	all	unused	-	-
app2	7 to 2	unused	-	-
	1	full cut after automatic paper loading	No	Yes
	0	full cut after self-test ticket printing	No	Yes

Default : always full cut after automatic paper loading and self-test ticket printing.

Example : msk1= 0b00000000 msk2= 0b00000010
 app1= 0b00000000 app2= 0b00000000
 ⇒ no full cut after automatic paper loading

ESC n p

Obsolete (kept for compatibility with old MRS)

Description: Send "Near End of Paper" extension presence.

Format: <1Bh> <6Eh> <70h>

Comments: Printer checks for the presence of a "Near End of Paper" extension and returns a single byte:

- 0x01 if it was found,
- 0x00 if not.

CAUTION : CP324-HRS cannot detect extension presence. Therefore it always returns 0x01 to ensure compatibility with old MRS tools regarding "Near End of Paper" management. In practice, host should know actual configuration (extension present or not) before taking into account "Near End of Paper" status.

ESC n c

Description: Do a "Near End of Paper" optosensor calibration.

Format: <1Bh> <6Eh> <63h>

Comments: Due to dispersions in optosensor mounting and sensitivity, calibration may be required to update threshold at which a "Near End of Paper" will be set. This updated threshold is also saved in flash memory and will be recovered at next power-on. This control code makes printer to perform a calibration procedure. At the end of procedure, printer returns a single byte:

- the new threshold if saving is successful,
- 0x00 if not.

Default : 245 (this value provided by firmware is suitable for most of applications; calibration is often optional).

Notes : - For the moment, saving of this new threshold causes saving of all setup parameters too as "ESC s" request (flashing of only one parameter at a time is not available). So it is advised to perform a calibration procedure only in a stable and known context.

- As "ESC s" operation, saving can take more or less time in function of action in progress. During saving, communication is not guarantee (risk of loss of data in RS232) because flashing operation cannot be performed simultaneously with normal operating function. So it is advised for host to wait for printer return status with a sufficient timeout before resuming communication (100ms minimum, more if printing operation was in progress when request has been sent).

- A "Near End of Paper" optosensor calibration application note and calibration tools are available. Please contact APS for further details.

ESC n s

Description: Send “Near End of Paper” status.

Format: <1Bh> <6Eh> <73h>

Comments: Printer returns a single byte representing the “Near End of Paper” status, that is, if current optosensor level is under or above calibrated threshold. Value is :

- 0x00 : OK, enough paper still present,
- 0x01 : “Near End of Paper” condition.

ESC n l

Description: Send “Near End of Paper” optosensor current level.

Format: <1Bh> <6Eh> <6Ch>

Comments: Printer returns 1 byte representing the optosensor current level (analogical/digital conversion result). Smaller value means more reflection (paper is closer). This control code is intended mostly for test purpose.

9.3 Text and general control codes

ESC % n

Description: Select internal font.

Format: <1Bh> <25h> <n>

Comments: n = 0: **8x16** font is selected.
 n = 1: **12x20** font is selected.
 n = 2: **7x16** font is selected.

Default: 8x16.

These are the 3 resident fonts provided by default. For customized fonts, cf. "10.3 Font management".

ESC R n

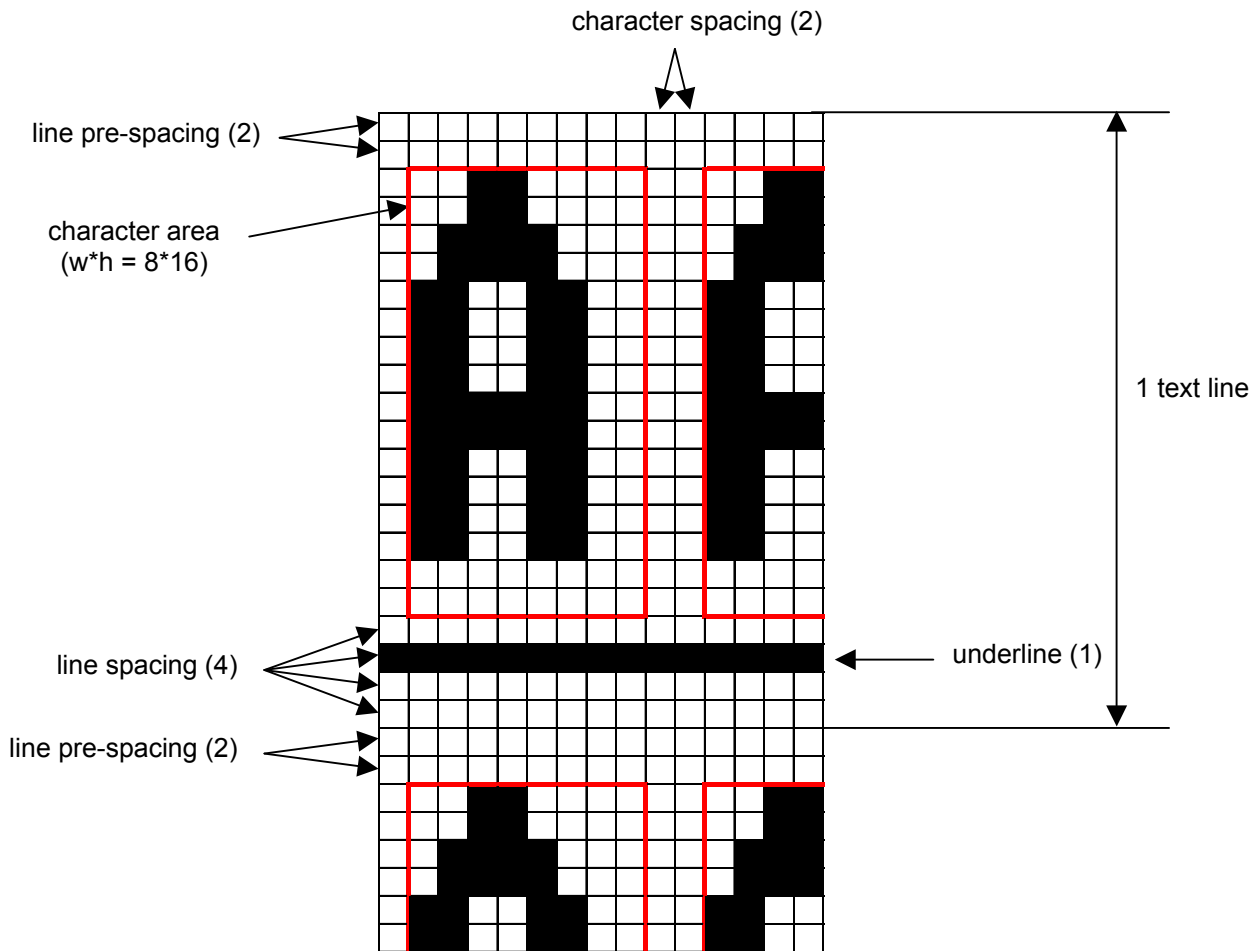
Description: Select international characters set.

Format: <1Bh> <52h> <n>

Comments: 12 characters are defined as international characters. This control code enables to set which international characters set should be used: n value selects one of the 13 available countries:
 Default: USA.

n	COUNTRY	23h	24h	40h	5Bh	5Ch	5Dh	5Eh	60h	7Bh	7Ch	7Dh	7Eh
0	USA	#	\$	@	[\]	^	'	{		}	~
1	France	#	\$	à	°	ç	§	^	'	é	ù	è	“
2	Germany	#	\$	§	Ä	Ö	Ü	^	'	ä	ö	ü	ß
3	UK	£	\$	@	[\]	^	'	{		}	~
4	Denmark 1	#	\$	@	Æ	φ	Å	^	'	æ	Φ	å	~
5	Sweden	#	¤	É	Ä	Ö	Å	Ü	é	ä	ö	å	ü
6	Italy	#	\$	@	°	\	é	^	ù	à	ò	è	ì
7	Spain 1	Pt	\$	@	ı	Ñ	¿	^	'	"	ñ	ı	~
8	Japan	#	\$	@	[¥]	^	'	{		}	~
9	Norway	#	¤	É	Æ	φ	Å	Ü	é	æ	Φ	å	ü
10	Denmark 2	#	\$	É	Æ	φ	Å	Ü	é	æ	Φ	å	ü
11	Spain 2	#	\$	à	ı	Ñ	¿	é	'	ı	ñ	ó	ú
12	Latin Amer.	#	\$	à	ı	Ñ	¿	é	û	ı	ñ	ó	ú

Example of text settings:



ESC 2 n

Description: Set line pre-spacing.

Format: <1Bh> <32h> <n>

Comments: Set the number of dot lines to insert before starting actually character dot lines. This is very useful when printing in inverse video mode some characters which pixels start from first dot line.

n may vary from 0 to 15 dot lines. Line pre-spacing pitch is 1/8mm.

Default: 0.

CAUTION: actual line pre-spacing is calculated from this user value n and updated proportionally in function of current height mode (simple (n*1), double (n*2), quadruple (n*4)).

ESC 3 n

Description: Set line spacing.

Format: <1Bh> <33h> <n>

Comments: Set the number of dot lines to insert just after last character dot line and before next one.

n may vary from 0 to 15 dot lines. Line spacing pitch is 1/8mm.

Default: 3.

Note: underline is managed only from line spacing of 3 and then it will be always the 2nd dot line of this set of dot lines.

CAUTION: actual line spacing is calculated from this user value n and updated proportionally in function of current height mode (simple (n*1), double (n*2), quadruple (n*4)).

ESC SP n

Description: Set character spacing.

Format: <1Bh> <20h> <n>

Comments: Set the number of dots to insert just after last character dot and before next one.

n may vary from 0 to 16 dots. Character spacing pitch is 1/8mm.

Default: 2.

Note : a last character can be possible provided it holds in the line even if next character spacing overlaps.

CAUTION: actual character spacing is calculated from this user value n and updated proportionally in function of current width mode (simple (n*1), double (n*2), quadruple (n*4)).

ESC b n

Description: Set normal/inverse video mode.

Format: <1Bh> <62h> <n>

Comments: n = 0 : normal video mode,

n = 1 : inverse video mode.

Default: normal video.

Note: this setting is valid for the whole printing text line. Spaces at the beginning of a text line will be printed as a dark rectangle. In order to shift the black printing from the left margin, one can send TAB (ASCII 0x09) instead SP (ASCII 0x20). This enables an accurate control of white/black edges.

ESC c n

Description: Set maximum number of columns.

Format: <1Bh> <63h> <n>

Comments: Set the maximum number of printable characters that printer accepts in a same text line before automatically going to the next text line.
n may vary from 3 to 255.

Default: 255.

ESC C n

Description: Set text justification.

Format: <1Bh> <43h> <n>

Comments: Set how text will be justified:
n = 0: text will be centred,
n = 1: text will be right justified,
n = 2: text will be left justified.

Default: left justification.

ESC ! n

Description: Set printing modes.

Format: <1Bh> <21h> <n>

Comments: Select various printing modes as described below:

Bit of n	Function	Bit = 0	Bit = 1
0	Not used	-	-
1	Quadruple Height	Cancelled	Set
2	Quadruple Width	Cancelled	Set
3	Not used	-	-
4	Double Height	Cancelled	Set
5	Double Width	Cancelled	Set
6	Not used	-	-
7	Underlined	Cancelled	Set

Default: simple height and width, no underlining.

Notes:- several printing widths can be mixed on the same text line,

- only one printing height is enabled per text line (change of height requests are ignored and lost),
- underline is actually managed only if enough line spacing (≥ 3).

ESC { n

Description: Set normal/rotated text line.

Format: <1Bh> <7Bh> <n>

Comments: n = 0 : printout is normal,
n = 1 : printout is rotated of 180°.

Default: normal.

LF

Description: Do a text line feed.

Format: <0Ah>

Comments: Move the print position to the beginning of the next text line.

Note: if LF follows a CR, printer will ignore LF. So, CR = LF = CR+LF.

CR

Description: Do a carriage return.

Format: <0Dh>

Comments: Move the print position to the beginning of the next text line.

Note: if CR is followed by LF, printer will ignore LF. So, CR = LF = CR+LF.

ESC J n

Description: Feed paper forward (n dot lines).

Format: <1Bh> <4Ah> <n>

Comments: Paper is fed forward for n dot lines. Print position is reset to the beginning of the next dot line.
n may vary from 1 to 255. Dot line pitch is 1/8mm.

ESC j n

Description: Feed paper backward (n dot lines).

Format: <1Bh> <6Ah> <n>

Comments: Paper is fed backward for n dot lines. Print position is set to the beginning of the next dot line.
n may vary from 1 to 255. Dot line pitch is 1/8mm.

CAN

Description: Cancel text line data buffer.

Format: <18h>

Comments: Text line data buffer is cancelled and print position is set to the beginning of the next text line.

Note : cancel operation is not applied on received data buffer (communication buffer) but only on text line data buffer (buffer used to stock all characters of the current text line).

9.4 Graphic control codes

ESC * n1 n2 n3 n4 n5 n6 <data>

Description: Print graphic in full mode.

Format: <1Bh> <2Ah> <n1> <n2> <n3> <n4> <n5> <n6> <data>

Comments: Bytes n1, n2 and n3 set the number of data bytes N to be printed out:

$$N = (65536 * n3) + (256 * n2) + n1$$

Byte n4 sets graphic operator on data bytes:

- n4 = 0 : data bytes are directly printed out (normal size, full printer resolution),
- n4 = 1 : double width (each pixel is repeated horizontally),
- n4 = 2 : double height (each pixel is repeated vertically),
- n4 = 3 : expanded (double width and height).

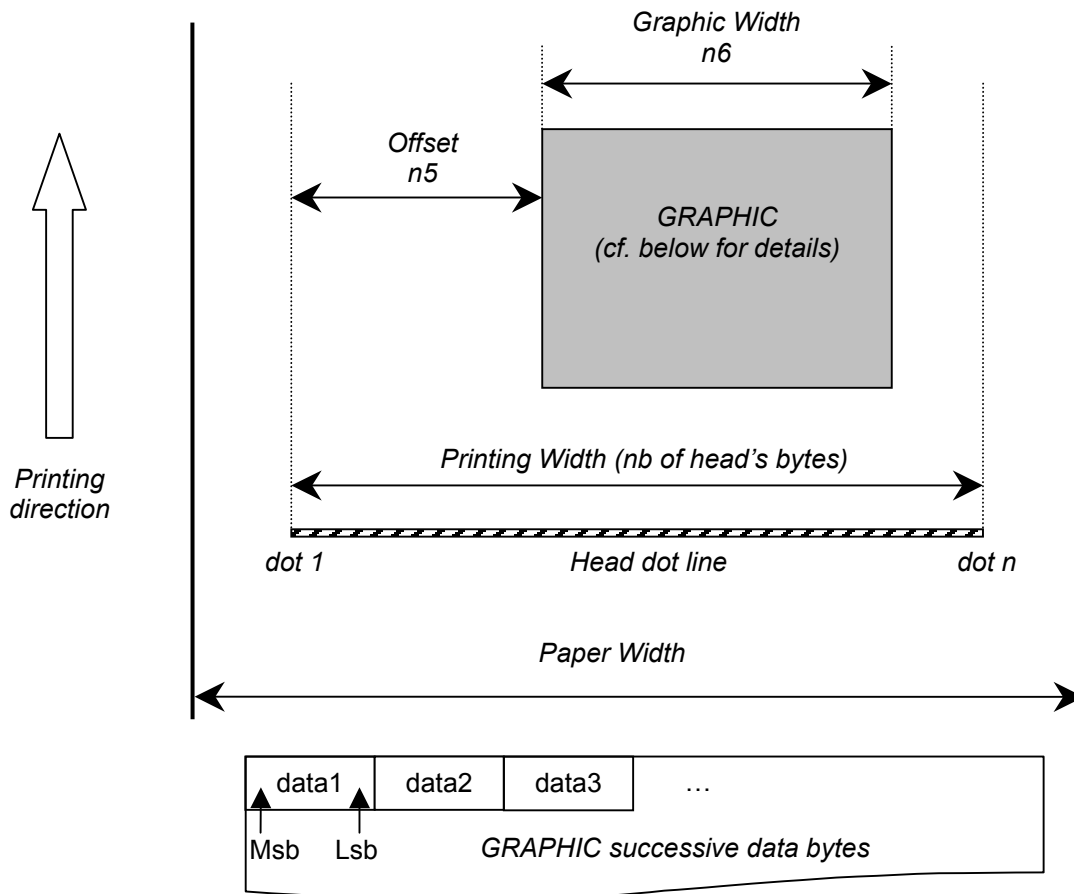
Byte n5 sets the number of dot bytes to be skipped (offset) before printing out the first graphic bit:

- 00h : first graphic bit to be printed out is dot 1 on the head,
- 01h to FFh : 1 to 255 skipped dot bytes (< total number of head's bytes).

Byte n6 sets the width of the graphic to be printed out:

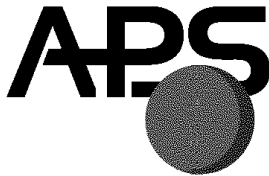
- 01h to FFh : width is 1 to 255 bytes (\leq total number of head's bytes).

Data bytes : successive graphic dot bytes to be printed out. Host should send them with meeting order requirement drawn below. "1" bit value means black dots while "0" means white dot.



Total number of head's bytes is given by the total number of dots divided by 8. For instance KM324-HRS-V2 is 576 dots / 8 = 72 bytes.

Example: with the following bitmap:



Black and white, 1 dot per pixel, 368 pixels width and 242 pixels height, printed in full resolution, and centred in a KM324-HRS-V2 (576 pixels),

Image size = $368 * 242 / 8 = 11\ 132$ bytes

$n1 = 124d, n2 = 43d, n3 = 0d, n4 = 0d, n5 = 13d, n6 = 46d$ or
 $n1 = 7Ch, n2 = 2Bh, n3 = 00h, n4 = 00h, n5 = 0Dh, n6 = 2Eh.$

ESC \$ n1 n2

Description: Set graphic offset in line mode.

Format: <1Bh> <24h> <n1> <n2>

Comments: This control code should be used with "ESC V ..." just before sending graphic data in line mode.

Set the number N of bytes to be skipped before printing out first graphic bit of all next graphic lines (< total number of head's bytes). $N = (256 * n2) + n1$. So n2 will be always 0.

Total number of head's bytes is given by the total number of dots divided by 8. For instance KM324-HRS-V2 is 576 dots / 8 = 72 bytes.

ESC V n1 n2 n3 <data>

Description: Print graphic in line mode.

Format: <1Bh> <56h> <n1> <n2> <n3> <data>

Comments: Byte n1 sets graphic operator on data bytes:

- n1 = 0 : data bytes are directly printed (normal size, full printer resolution),
- n1 = 1 : double width (each pixel is repeated horizontally),
- n1 = 2 : double height (each pixel is repeated vertically),
- n1 = 3 : expanded (double width and height).

Bytes n2 and n3 set the number of data bytes N to be printed out (\leq total number of head's bytes):

$N = (256 * n3) + n2$. So n3 will be always 0.

Data bytes : successive graphic dot bytes to be printed out. Host should send them with meeting the same order requirement as in full mode (cf. above). "1" bit value means black dots while "0" means white dot.

Total number of head's bytes is given by the total number of dots divided by 8. For instance KM324-HRS-V2 is 576 dots / 8 = 72 bytes.

IMPORTANT NOTES FOR GRAPHICS:

- It is advised when graphic printing is required with **RS232** line to set up communication speed at its maximum value (115200 bauds). Indeed, because there is a lot of data to transmit to printer, communication speed is then the main limitation factor on resulted printing speed. In addition, when user maximum printing speed is too high in comparison with RS232 communication speed and graphic features (width, zoom), it may cause some “stop&go” events which affects printing quality. To avoid this bad behaviour, firmware limits automatically and temporary maximum printing speed in function of all these previous parameters (=> lower but constant printing speed without “stop&go” event, better printing quality). However, this automatically setting is performed only in full mode. In line mode, user should set himself the right setting.
- It is advised when graphic printing is required with **USB** line to limit maximum printing speed. Indeed, because printer has a lot of data to process in a low period, when maximum printing speed is too high, it can cause also some “stop&go” which affects printing quality. Unlike RS232/full mode context, firmware does not limit automatically maximum printing speed. User should set himself the right setting.
- Please check that: “**n5 + n6 ≤ total number of head’s bytes**” (that is : *offset + width ≤ printing width*). If it is greater, graphic will be truncated, of course. So printer is robust but speed performance may be altered because useless data should be received and processed while it is not necessary. So it takes useless processing time which makes user to set a lower maximum printing speed to get best printing quality.

For the moment, these previous advices are required to get the best performance as possible. Some enhancements are forecasted to make required settings automatically without user operation.

9.5 Cutter control codes

The below operations are properly performed only with APS cutters. If any other cutter is used, please contact APS for further information.

ESC m

Description: Do a partial cut.

Format: <1Bh> <6Dh>

Comments: If cutter is present, printer performs a partial cut. Cut position is function of current mode:

- when continuous paper feed mode, partial cut is performed at the current paper position,
- when hole/black mark detection mode, first paper is fed forward until specific cut position (cf. "GS X ..." control code) and then partial cut is performed.

ESC i

Description: Do a full cut.

Format: <1Bh> <69h>

Comments: If cutter is present, printer performs a full cut. Cut position is function of current mode:

- when continuous paper feed mode, full cut is performed at the current paper position,
- when hole/black mark detection mode, first paper is fed forward until specific cut position (cf. "GS X ..." control code) and then full cut is performed.

IMPORTANT NOTE FOR CUTTER INTEGRATION:

Cutter can be the root cause of printer failures as untimely reset intervention (mainly just at cut start but also during normal printing). Indeed, in function of paper kind, ticket length and ambient air, cutter can accumulate more or less electrostatic loads due to paper friction and this can cause electrostatic discharges (ESD) and so reset of printer. So it is highly advised to take care of cutter integration.

Therefore, each printer with cutter is delivered with a grounding cable which connects cutter holder to electrical ground (GND) of PCB. It enables to flow electrostatic loads from cutter and prevent any discharge/reset issue. So this cable should not be removed.

To complete/optimize integration, it is advised to ground also cutter to system chassis by means of a large cable (braid + eyelet for example) connected between screw of cutter holder and the closest as possible screw on chassis.

9.6 Bar code control codes

GS k n [Start] <data> [Stop]

Description: Print bar code.

Format: <1Dh> <6Bh> <n> [Start] <data> [Stop]

Comments: Byte n specifies bar code standard type as described in the following table.

[Start] is an optional byte only used with Code 128.

[Stop] is an optional byte always used except with PDF417.

n	START BYTE	BAR CODE TYPE	STOP BYTE
0	No	UPC-A	00h
1	No	UPC-E	00h
2	No	EAN13	00h
3	No	EAN8	00h
4	No	Code 39	00h
5	No	Interleaved 2/5 (ITF)	00h
6	No	Codabar	00h
7	135d	Code 128 (start with subset A)	00h
	136d	Code 128 (start with subset B)	00h
	137d	Code 128 (start with subset C)	00h
	138d	Code 128 (automatic subset selection)	8Bh
8	No	PDF417	No

*Still available for backward compatibility with old host MRS applications
To be used by new applications*

Notes (intended for 1D bar codes):

- some checking are performed on <data> in function of bar code type : minimum number of data bytes, correct checksum byte, correct character type (only numerical characters for example), possible UPC-A compression. If data are wrong, bar code will not be printed out and next data bytes following to wrong data may be processed as other data. Therefore, some “unwanted” characters can be printed out instead of barcode if barcode data are not valid.
- when number of data bytes is higher than required number (required ‘Stop’ is not detected), even so bar code data are processed (checking step, ...).
- when checksum byte misses, printer will calculate it and add to <data> (except with Code 39).
- when UPC-E is selected, data to be transmitted can be either initial UPC-A data or directly corresponding compressed UPC-E data (checksum byte is then compulsory) (**not yet implemented**).

- when Codabar is selected, "Start" and "Stop" bytes are compulsory to get a valid encoding (but their presence is not tested).
- when ITF is selected, last byte will be ignored if total number of bytes is odd. Furthermore, if total is null (or = 1), no bar code will be printed out.
- when Code 39 is selected, "Start" and "Stop" bytes are automatically added and so they should not be sent.
- when Code 128 is selected, automatic mode is advised because it enables direct encoding of data. However, to keep backward compatibility with old host MRS applications, "manual" mode is still available. For information, in this last mode, 0x00 cannot be encoded because used as "Stop" byte.

PDF417 : this 2D bar code is more complex and requires further details. <data> field is made up of several sub-fields :

<n1> <n2> <n3> <n4> <n5> <data1> <data2>

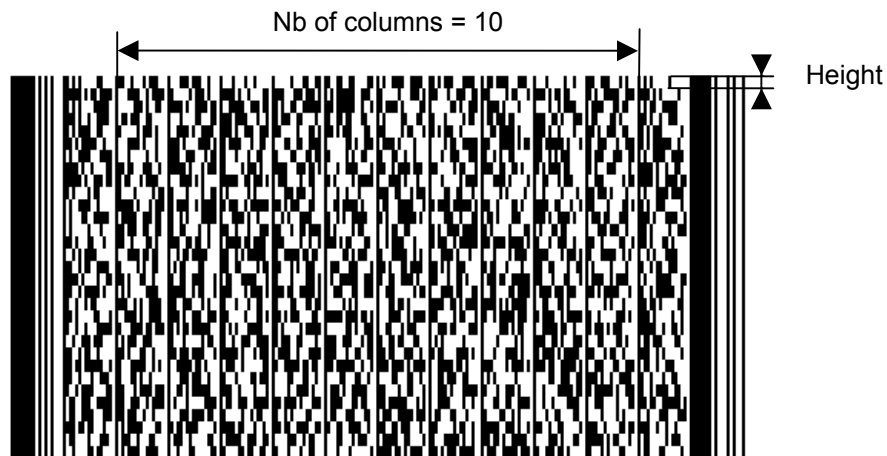
- n1 : compression mode (for the moment, "Automatic" is set automatically)
 - o 0 : Text,
 - o 1 : Numeric,
 - o 2 : Byte,
 - o 3 : Automatic.
- n2 : error level (0 to 8) (maximum of 5 for the moment),
- n3 : number of columns (1 to 30),
- n4, n5 : number of bytes transmitted in the next data blocks (n4 is MSB, n5 is LSB; 1 to 2862 bytes),
- <data1> : as many bytes of data as indicated by (n4, n5),
- <data2> : repetition of <data1>

Notes :

- <datax> contains the bytes to be encoded. The whole extended ASCII table is allowed. The maximum number of bytes depends basically of their type ("text", "numeric" or "byte" => compression efficiency) and chain of these types (insertion of specific "switches"). For information, it is possible to encode up to 1850 "text" bytes (TAB, LF, CR and from ASCII code 32d to 126d) or up to 462 "bytes" (others bytes values).
- regarding error level, printer can automatically lower it so as to make printout possible when too much bytes should be encoded. For information, printing execution time is proportional to error level. It should be low when few bytes are encoded and high when a lot of bytes. Generally, it is recommended to set level 5 only from 321 data "CodeWords".
- regarding number of columns, printer can automatically adjust it so as to meet number of lines requirements (3 to 90).
- in any case, when a feature is not valid and cannot be adjusted automatically, printing is then not performed and data are dumped.
- "Macro PDF417" is not managed.

- PDF417 bar code encoding requires big tables of data and so big space in printer flash. Basically, these tables are not part of main firmware which enables to remove them without updating firmware. Therefore, this feature enables to free flash space for customer who does not use PDF417 and who needs more flash space for bigger customized fonts. By default, these tables are provided with main firmware; cf. "10.2 Firmware updating" for removing/downloading operations. Please note that if tables have not been loaded while a PDF417 bar code is requested, printing will then not be performed and data will be dumped.

Example :



GS h n

Description: Set bar code height.

Format: <1Dh> <68h> <n>

Comments: Set bar code height as multiple of 1/8 mm. n should range from 1 to 255. When rotated bar code, printed height will be rounded up to mm. When PDF417, it sets basically the height of each line (cf. example above; n=8 (i.e. 1mm) is advised).

Default: 128 (16mm).

GS w n

Description: Set bar code magnification.

Format: <1Dh> <77h> <n>

Comments: Set bar code module width as multiple of 1/8mm. Module is the elementary bar/space on which bar code symbol is based. n should range from 2 to 6.

Default: 3.

Notes: - **bar code ratio** between thick and thin line is **2:1**.
 - bar code printing is always **centred**.
 - when magnification is too important, bar code width may exceed printing width. Therefore, bar code will be printed out from left paper side and truncated.

GS H n

Description: Set bar code text position.

Format: <1Dh> <48h> <n>

Comments: Set position where HRI text (Human Readable Interpretation) of next barcodes will be printed out.

n	TEXT POSITION
0	Not printed
1	Above bar code
2	Under bar code
3	Above and under bar code

Default: HRI is not printed.

Notes: - HRI is printed out with the latest text features (font, width, height ...) and always centred.
 - when PDF417, HRI text is never printed out. Before PDF417 printing, this feature is set automatically to "Not printed" and it is not restored after printing !

GS R n

Description: Set normal/rotated bar code.

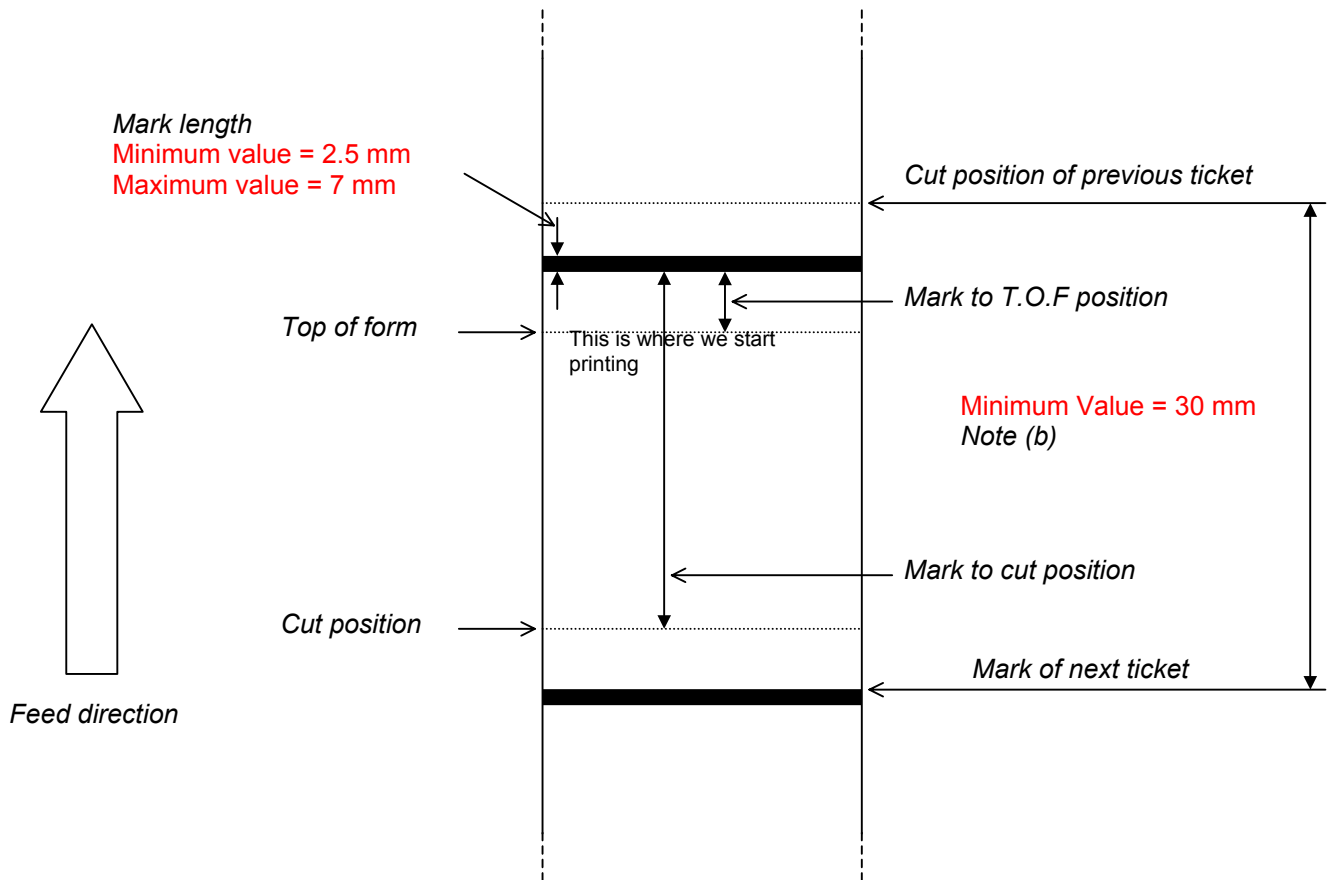
Format: <1Dh> <52h> <n>

Comments: n = 0: bar code printing is normal (horizontally),
 n = 1: bar code printing is rotated of 90° (vertically).

Default: normal.

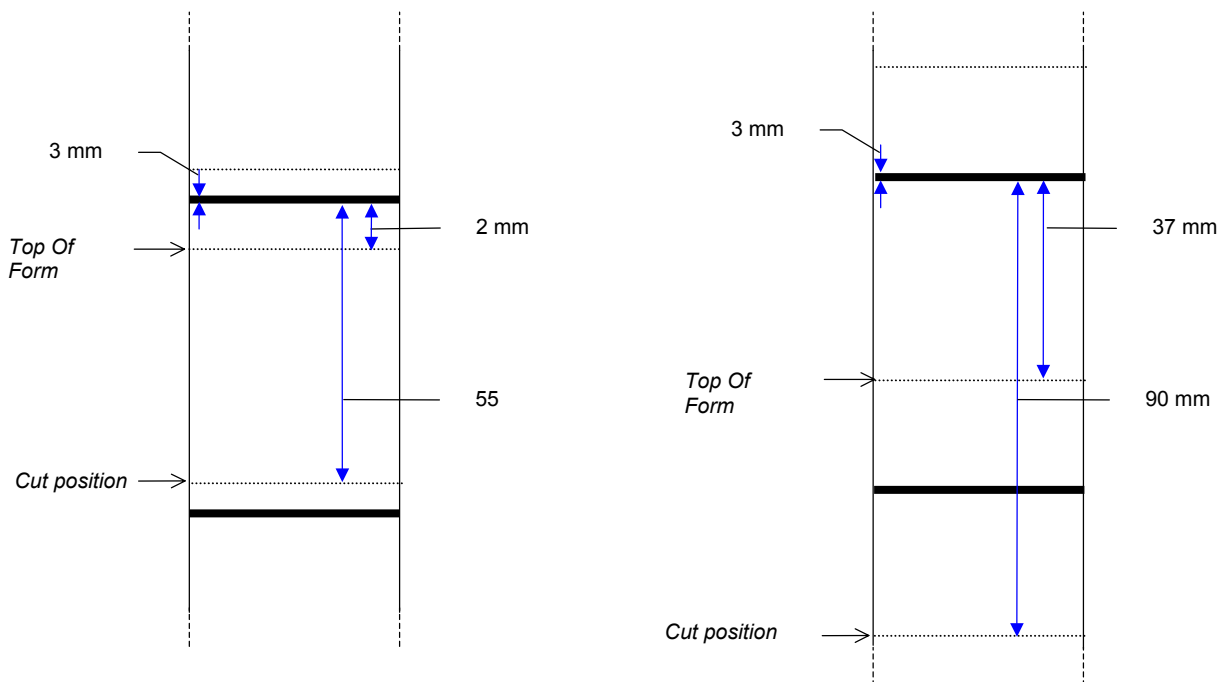
Note: when PDF417, printing is always horizontal. Before PDF417 printing, this feature is set automatically to "Normal" and it is not restored after printing !

9.7 Hole / black mark detection control codes



Remark : hole/black mark is detected by “End of Paper” optosensor.

EXAMPLES:



GS L n

Description: Set mark length, switch continuous/mark mode.

Format: <1Dh> <4Ch> <n>

Comments: Set mark length and switch from continuous paper feed to mark detection mode. n specifies mark length as multiple of 1/8 mm. n should range from 20 to 56 (=> mark length should range from 2.5 mm to 7 mm).

Default: 0 (continuous paper feed mode).

Example: mark length = 3mm => n = 24 should be transmitted and printer enters immediately in mark detection mode.

Notes: - n = 0 : printer switches into continuous paper feed mode.

- this command clears also the hole/black mark detection error bit of printer status.
- when switching in mark detection mode, paper error bit of printer status is cleared too.
- mark length is a parameter which can be saved in flash in order to recover directly the right continuous/mark detection mode at each power-on/reset.
- when mark detection mode becomes active at power-on/reset or via this command and no paper has been inserted, "End of Paper" status is not set because printer cannot make difference between "End of Paper" and a "Mark" while enough paper has not been fed. So, at power-on/reset, an automatic forward paper feeding of 2cm is performed so as to be able to detect possible "End of paper". If paper is well detected, an automatic backward paper feeding is then performed so as to return to initial position (TOF for example) and enables immediate start of printing. If no paper is detected, an "End of Paper" status is then set which enables an automatic paper loading. In the other case (mark detection mode activation via this command), "End of Paper" status stays cleared until first "Move to TOF" command which will make paper feeding until actual "End of Paper" detection. At this moment, automatic paper loading becomes available again.
- when green lever is turned to head-down position while mark detection mode is active, the same automatic "forward/backward" paper feeding is performed so as to detect possible "End of paper" and to make automatic paper loading available too.

GS E

Description: Move to "Top Of Form" (TOF) position.

Format: <1Dh> <45h>

Comments: Paper is fed until next TOF position is under head dot line.

Note : hole/black mark detection error bit of printer status is set if no mark has been found during this operation after 50cm of paper feeding. Moving to TOF position is then stopped and printing operations are disabled. To remove this error and enable again printing operations, a "GS L n" command is required.

GS T n1 n2

Description: Set "Mark" to TOF position length.

Format: <1Dh> <54h> <n1> <n2>

Comments: Set length L between end of mark and first printable line (TOF) as multiple of 1/8 mm.
 $L = (256 * n1) + n2$.

Default: 0 mm.

Note: negative length is allowed. Negative value is represented with the two's complement of absolute value. For example, to set a "-5 mm" length :

$$L = -40 = 65536 - 40 = 65496 \quad \Rightarrow \quad n1 = 255, n2 = 216.$$

GS Y n1 n2

Description: Set "Optosensor" to "Head dot line" length.

Format: <1Dh> <59h> <n1> <n2>

Comments: Set paper path length L between optosensor position and head dot line as multiple of 1/8 mm.

$L = (256 * n1) + n2$. This data is required to be able to move with accuracy to TOF and cut positions from end of mark detection.

Default: 104 (13mm, whatever mounting configuration of optosensor (front or bottom)).

Notes:- this control code should be used only if optosensor position is different from default.

- no negative length is allowed; maximum value is 32767.

GS X n1 n2

Description: Set "Mark" to "Cut" position length.

Format: <1Dh> <58h> <n1> <n2>

Comments: Set length L between end of mark and cut position as multiple of 1/8 mm. $L = (256 * n1) + n2$.

Default: 0 mm.

Note: no negative length is allowed; maximum value is 32767.

GS x n1 n2

Description: Set "Head dot line" to "Cut" position length.

Format: <1Dh> <78h> <n1> <n2>

Comments: Set paper path length L between head dot line and cut position as multiple of 1/8 mm.
 $L = (256 * n1) + n2$. This data is required to be able to move with accuracy to cut position from end of mark detection.

Default: 88 (11 mm).

Notes:- this control code should be used only if cutter's blade position is different from default.

- no negative length is allowed; maximum value is 32767.

NOTES:

(a) Make sure that hole/black mark fully covers optosensor window, according to selected paper path (front or bottom).

(b) Distance between cut position of previous ticket and mark of next ticket should be higher than distance (in terms of paper path) between cutter and optosensor (default : 24.75mm). A minimum distance of 30mm should provide reasonable margin.

(c) To get optimum performance, paper should be guided, and in particular, distance between paper and optosensor should be kept as constant as possible so as to make hole/black mark detection the most accurate as possible. In addition, it is advised to perform a calibration of "End of Paper" optosensor with paper used (calibration should be performed in continuous paper feed mode).

(d) During automatic paper loading, if insertion of paper failed just at the end of this automatic step, it might not be possible to make a new attempt because failure might not be detected (if not enough feeding without paper, it might be a mark too) and so, automatic paper loading will stay disabled. The only way to make this step robust is to set good conditions of paper loading (long paper loading length with "GS P n1 n2", pause before starting paper loading with "GS p n"). Otherwise, if this kind of failure occurs, only a paper feeding operation could make automatic paper loading enabled again ("Move to TOF" of a test ticket for example, ...).

9.8 Real time control codes

2 requests are processed in real time: “Send printer status” and “Reset printer”. However, the suitable way to send these requests depends of communication line and context.

9.8.1 RS232

Bytes are received one after one directly by UART of microcontroller. So they can be processed whatever printer state (printer error or full buffer). In the case of full buffer (handshaking was set OFF by printer with “RTS or DTR” or Xoff), host should disable its own handshaking control before sending its real time request. Otherwise this control will prevent request to be sent.

- “ESC v” will be used to send a “Send printer status” request. Note that during graphic printing, it is possible that printer interprets graphic data as a “Send printer status” request (edge effect of real time processing implementation). Then printer will return its status. So when host needs to get some data from printer, it is advised to reset its receiving buffer before sending its request (in the case when this noisy answer has been received previously).
- “ESC @” will be used to send a “Reset printer” request. Note that this one will be processed in real time only if printer is in error so as to prevent the same edge effect explained above (fatal consequence this time !).

9.8.2 USB

Bytes are received by packets not directly by microcontroller but an external USB hardware interface driver. This USB driver handles 3 communication channels: “DATA_IN”, “DATA_OUT” and “CONTROL_IN_OUT”. Host will use mainly “DATA_IN” channel to send its printing data and its control requests (printer control codes). However, this channel is not a real time channel unlike “CONTROL_IN_OUT”. Therefore, when firmware buffer is full, packets stay in this external component which becomes full too. This component manages itself handshaking with host. So communication is “suspended” until enough space is free to stock new packet. So when printer is in error and buffer is full, it is impossible for host to send its real time request with using this “DATA_IN” channel. “CONTROL_IN_OUT” has to be used in place because this is really a real time channel. However, allowable requests in this channel are regulated by USB standard (cf. “*USB Device Class Definition for Printing Devices*”, version 1.1.). 3 kinds of requests are defined: “Standard Requests”, “Class Specific Requests” and “Vendor Requests”. The 2 first kinds are already defined by USB standard; only last kind is intended to specific user needs. Therefore, available status provided by “GET_PORT_STATUS Class Specific Request” is too limited. So, in order to retrieve extended printer status (the one returned with printer control code “ESC v”), a specific “Vendor Request” has been added to the set of standard USB printer requests: APS_GET_HRS_KIOSK_STATUS. In addition, available reset operation provided by “SOFT_RESET Class Specific Request” is not suitable because only communication buffer would be reset. So, in order to provide a full reset operation (as a hardware reset during a power cycle), a specific “Vendor Request” has been added too: APS_HARD_RESET.



Advanced Printing Systems

Table below gathers all USB requests (standard and specific) and gives for each one their handling status:

REQUEST TYPE	LABEL	SUPPORTED	DETAILS
Standard	GET_STATUS	Yes	Cf. USB standard
	CLEAR_FEATURE	Yes	Cf. USB standard
	SET_FEATURE	No	
	SET_ADDRESS	Yes	Cf. USB standard
	GET_DESCRIPTOR	Yes	Cf. USB standard
	SET_DESCRIPTOR	No	
	GET_CONFIGURATION	Yes	Cf. USB standard
	SET_CONFIGURATION	Yes	Cf. USB standard
	GET_INTERFACE	No	
	SET_INTERFACE	No	
	SYNCH_FRAME	No	
Class Specific	GET_DEVICE_ID	Yes	Cf. USB standard
	GET_PORT_STATUS	Yes	Cf. USB standard
	SOFT_RESET	No	
Vendor	APS_GET_HSP_STATUS	No	
	APS_GET_HRS_KIOSK_STATUS	Yes	Cf. below
	APS_HARD_RESET	Yes	Cf. below
	APS_ACK_ERROR	No	

Table below specifies the 2 “Vendor Requests” available on our CPxxx-HRS printers:

Label	bmRequestType	bRequest	wValue	wIndex	wLength	Data
APS_GET_HRS_KIOSK_STATUS	11000001b (read dir vendor req i/f recipient)	0x01	0x0000	0x0000 (interface)	0x0001	1 byte received (see answer format below)
APS_HARD_RESET	01000001b (write dir vendor req i/f recipient)	0x02	0x0000	0x0000 (interface)	0x0000	[None]

APS_GET_HRS_KIOSK_STATUS:

Printer answers with a 1 byte data buffer containing below extended status information:

BIT	FUNCTION	BIT = 0	BIT = 1
0	Head temperature	OK	Too high or too low
1	Head-up	No	Yes
2	End of Paper	No	Yes
3	Power supply	OK	Too high or too low
4	Printer in use	Ready	Action in progress
5	ON/OFF line	OFF	ON
6	Hole/mark detection error	No	Hole/mark not found
7	Cutter error	Yes	No

APS_HARD_RESET:

Printer performs a self-reset (“hardware” reset as a power cycle). Therefore, printer restarts by a whole initialization (all parameters set to their default values, internal buffers cleared, ...) and host will view an USB disconnection/reconnection without prior acknowledgement of its request.

To sum up, when USB is currently used, host should send its real time requests via “CONTROL_IN_OUT” channel :

- “**APS_GET_HRS_KIOSK_STATUS**” will be used to send a “Send printer status” request.
- “**APS_HARD_RESET**” will be used to send a “Reset printer” request.

Note that these 2 requests are fully real time (no restricted conditions).

However, it is also possible to get status with “**ESC v**” via “DATA_IN” channel but real time and well-execution are not guarantee; idem with “**ESC @**” via “DATA_IN” when printer reset is required.

10. ADDITIONAL INFORMATION

10.1 USB

APS VENDOR ID	0x1AD4
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TYPE OF HRS / MODE	PRODUCT ID
MONITOR MODE	0x0001
KM324HRS-V2	0x000F

10.2 Firmware updating

Software embedded in controller board flash is made up of several items :

ITEM	ALWAYS PRESENT	DOWNLOADABLE	COMMENTS
Monitor	Yes	No	<i>It is always the revision flashed in factory. Useful to download the other items.</i>
Firmware	No/Yes	Yes	<i>If not present, printer stays in monitor mode.</i>
Font	No	Yes	<i>If not present, no text can be printed out.</i>
PDF417 data	No	Yes	<i>If not present, PDF417 barcode cannot be printed out.</i>
Parameters	No	Yes	<i>If no present, default values are used.</i>

Each item can be downloaded alone (except monitor) and this structure enables very powerful and easy way to customize or update your printer. Therefore you can only upgrade the firmware while keeping your parameters settings. You can also remove PDF417 data so as to get enough space for another font if PDF417 is not used ...

A package is a group made up of some of these items above.

An APS PC tool is available to perform flash management : "**Flashing Utility**".

This tool accepts only “.APS_Package” working file (APS specific format which contains a group of items to be downloaded).

Unfortunately, flash cannot be fully managed for the moment. Current limitations are :

- “.APS_Package” file can only be built by APS,
- update requires a “complete” package (with at least a firmware even if you just want to add a font for example) because during updating, all flash is firstly erased except monitor and parameters.

A “full features” revision should be available very soon. Please contact APS for further details.

IMPORTANT NOTE :

Firmware can be updated either via USB or RS232.

Regarding RS232, flux control of communication is only managed by hardware and is bidirectional. So, all RS232 handshaking signals should be absolutely wired.

10.3 Font management

The controller board is provided with 3 resident fonts : 8x16, 12x20 and 7x16.

However, it is possible to remove them and add your own fonts. For the moment, no APS tool enables to perform the full process “creation/conversion/download”. Procedure should be only as following :

- Creation of customized font with the APS PC tool “**Font Editor**” : a bitmap font file is built (“.fna”).
- Conversion of this “.fna” file into an “.APS_Package” file : only APS can perform this task for the moment.
- Downloading of this “.APS_Package” file into printer with the APS PC tool “**Flashing Utility**” (cf. 10.2 Firmware updating).

A “3-in-1” tool should be available very soon. Please contact APS for further details.

11. WINDOWS AND LINUX DRIVERS

Windows XP / 2000 and Linux drivers are downloadable from A.P.S. website.

<http://www.aps-printers.com/>

12. PRINTER INSTALLATION

12.1 Paper roll setting

The KM324-HRS-V2 is provided with a movable roll holder, there are five possible positions available (A, B, C, D, E).

The printer is delivered in standard configuration according to Figure 14 (posit. B), (factory setup). It is possible to move the roll holder in the other four positions according to Fig. 13,15,16 or 17.

The suggested roll diameter is max. 140mm for positions A and E.

Due to ergonomic questions, when using positions B,C and D, the suggested roll diameter is max. 120mm (for easy paper insertion).

Fig.13

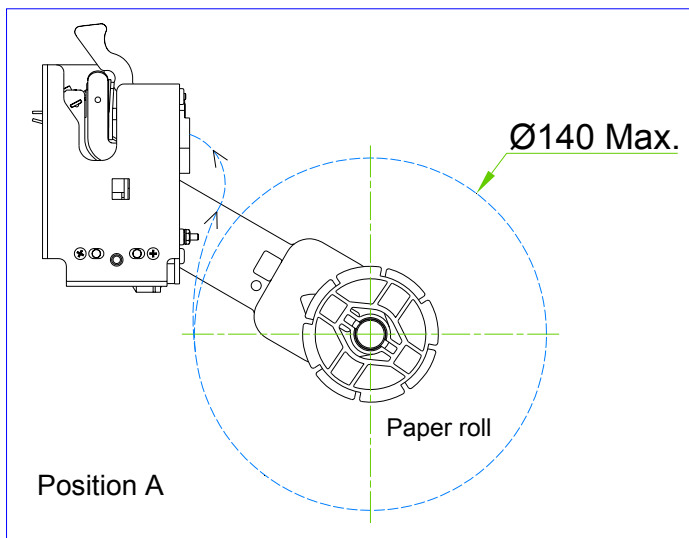


Fig.14

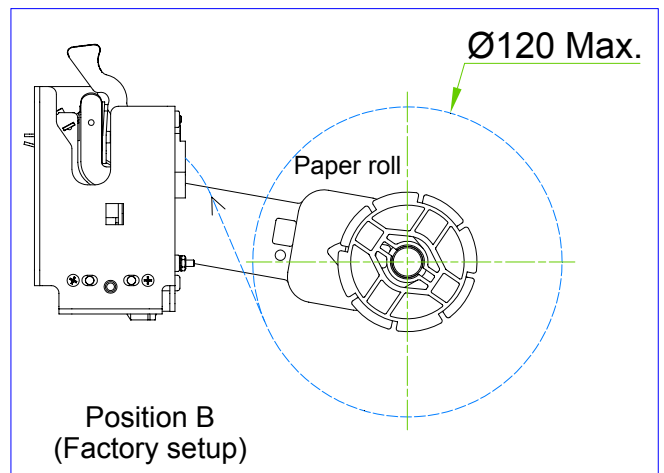


Fig.15

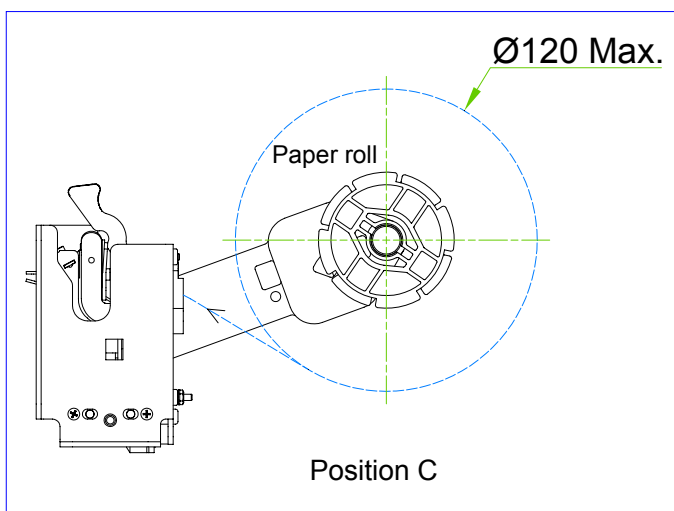
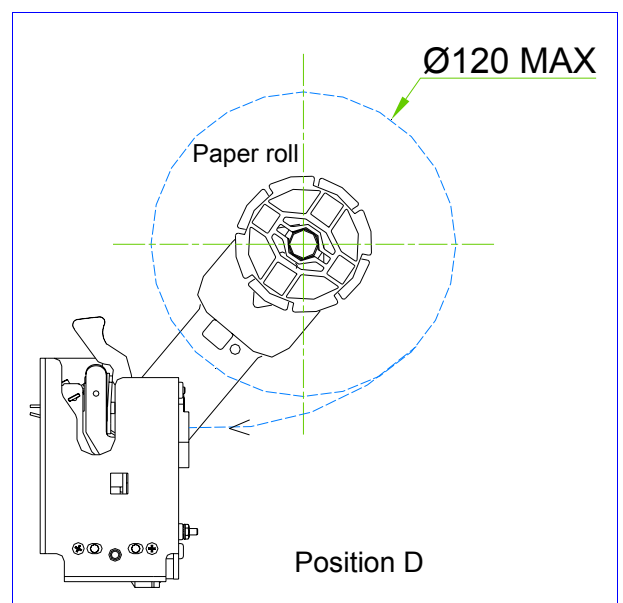
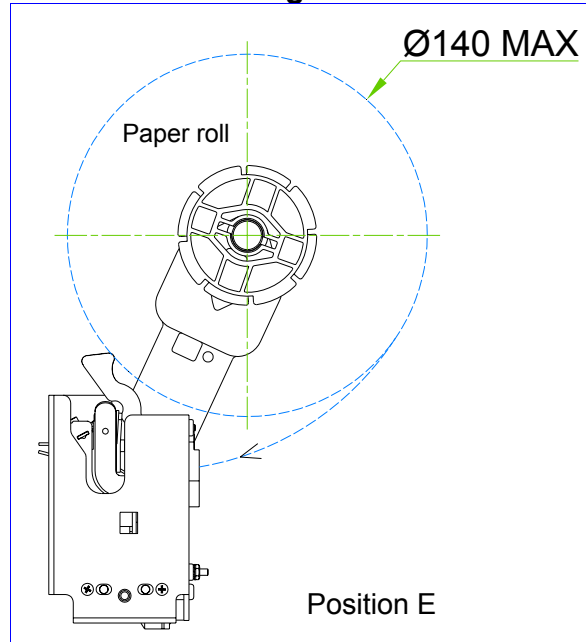


Fig.16



Paper roll setting (continued)

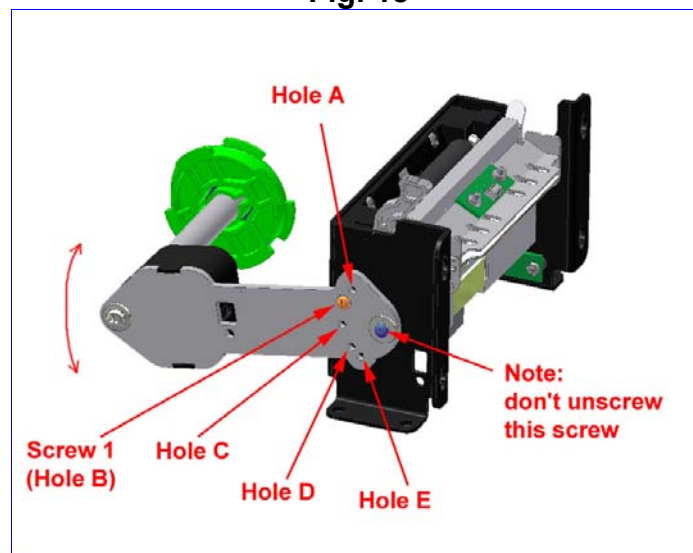
Fig.17



12.2 How to move the paper roll holder

- Remove screw 1.
- Rotate the roll holder in the desired new position, align hole A,B,C,D or E with the matched hole on the Printer frame.
- Re-mount screw 1 and tighten it with a driving torque of 50-60 Ncm. Refer to Fig. 18.

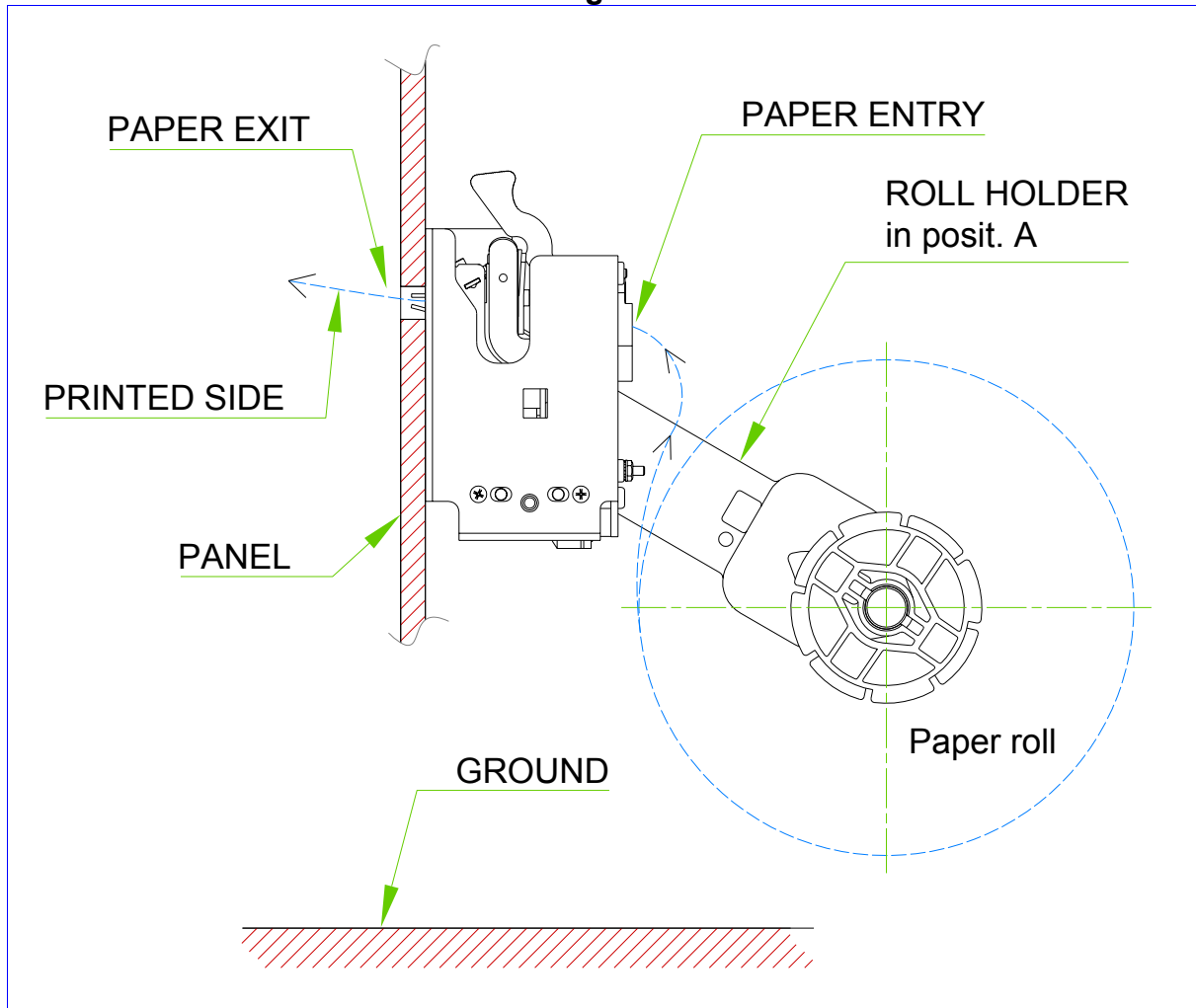
Fig. 18



12.3 Printer orientation

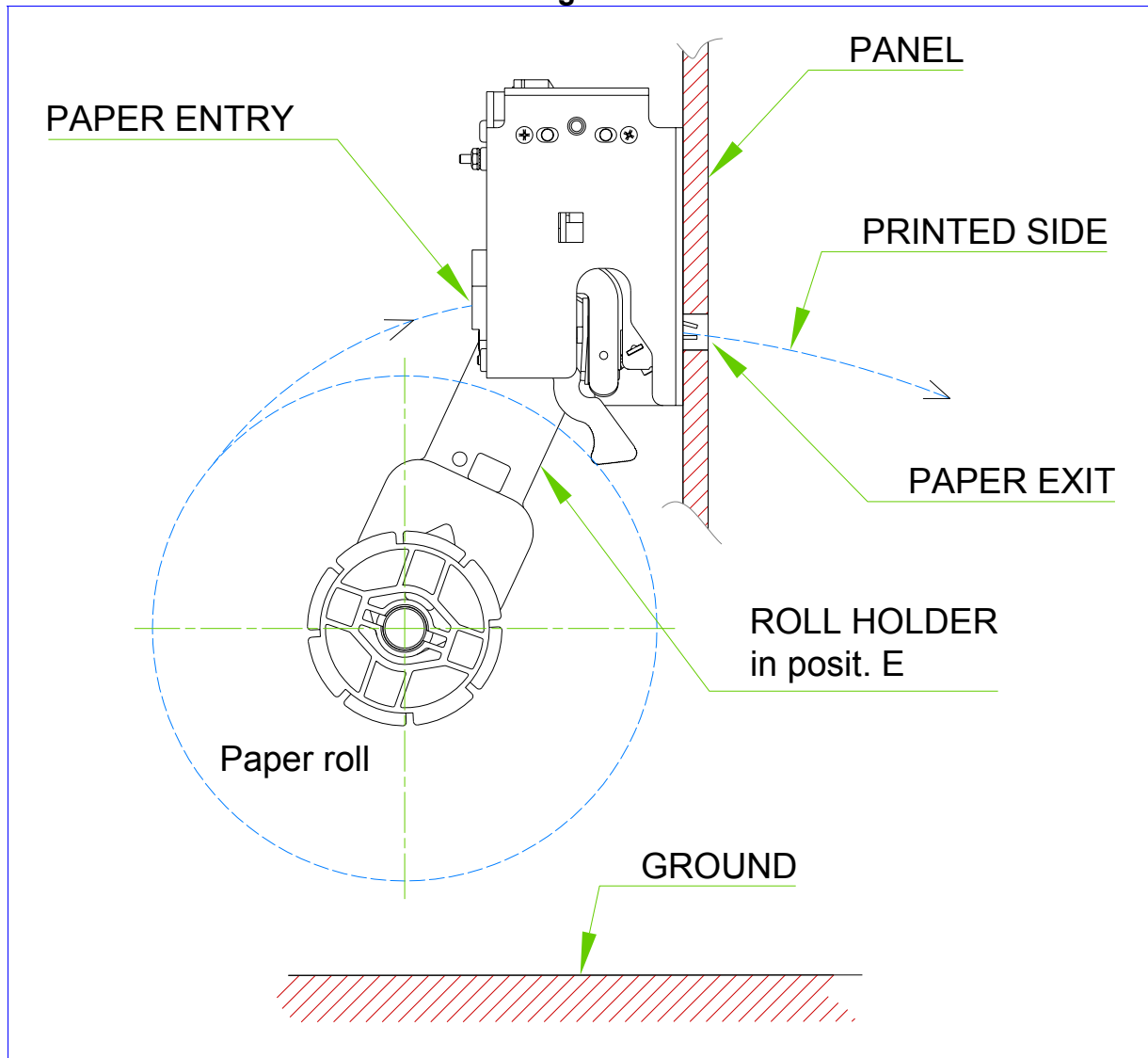
Fix the printer according to Fig. 19 or 20, any paper roll setting can be used for both configurations.

Fig.19



Printer orientation (continued)

Fig. 20

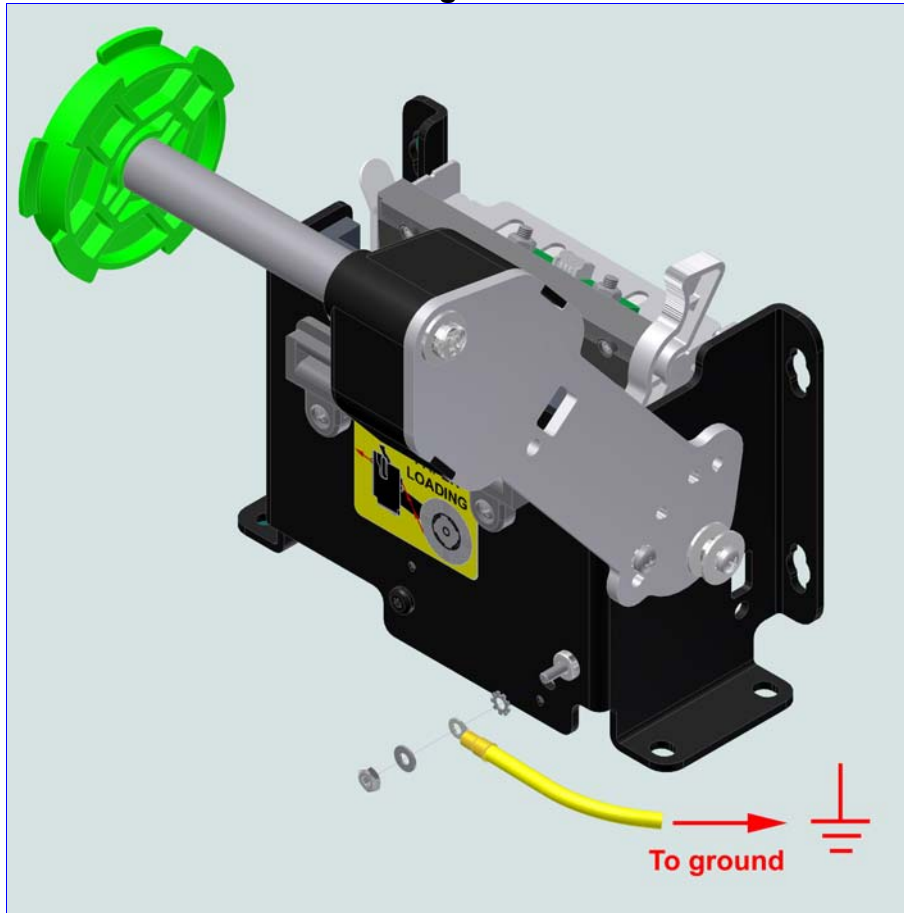


12.4 Connection to ground

It is recommended to connect the main frame of the KM324-HRS to ground by means of electrical connection. Use the appropriate connection point located in the back side of the printer (Fig. 21)

Once you have installed the printer, verify if your connection to ground is correct.

Fig. 21



12.5 Printer fixation

Fix the printer in a stable surface, design your case in order to protect the printer from humidity, water and dust.

The printer is provided with 4+4 holes for fixing, use 4 screws Ø4mm to ensure a correct fixation.

See Overall dimensions drawing on attachment.

CAD 3D file are available upon request.

13. ENVIRONMENTAL PROTECTION

The Product described in the present specification is conform to directive 2002/95-EC (RoHS) and following amendments issued by the European Council, the product doesn't contain the hazardous substances prohibited by the directive.

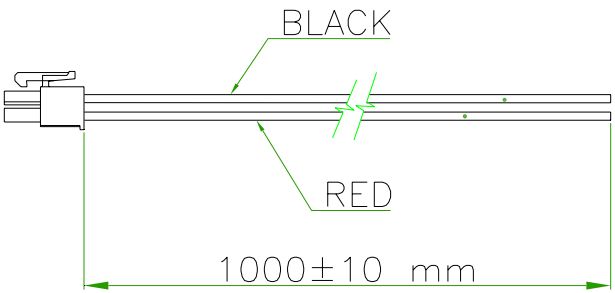
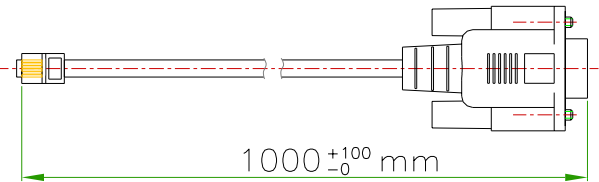
Declaration of RoHS compliance is available upon request.

14. ORDERING CODES

PRINTER

MODEL	ORDERING CODE	RoHS COMPLIANT
KM324-HRS-V2	002 90 740 107	Yes

OPTIONALS

ITEM	ORDERING CODE	RoHS COMPLIANT	DRAWING
Power cable	002 91 301 320	Yes	
RS232 cable	002 91 301 314	Yes	
USB cable	002 91 301 317	Yes	