EPM203-MRS

Technical reference

Preface

- This manual provides a complete technical information for the **EPM203-MRS** "Easy Loading Printing Module".
- For customized mechanisms, **A.P.S.** supplies documentation in addition to the present specification.
- The present specification is valid also for customized types, where the different condition has not effects for common data (e.g.: different colour of case parts).

- **A.P.S.** reserves the right to make changes to the product, without notice, to improve reliability, functions or design.
- **A.P.S.** does not assume any liability arising out of the application or use of the product or circuits described within.
- The warranty terms of the product are described in a separate document, ask **A.P.S.** to obtain this document.

Revision history

Rev. Index	Date	Page/Sec.	Description	Author
Prelim. 1	22-Jan-2003	-	-	GP/EV
Prelim. 2	09-Apr-2003	Attached 2	Overall dimensions drawing added. Previous rev. date corrected (it was Jan-2002)	AF
Prelim. 3	20-May-2003	Attached 4	Updated overall dimensions drawing and printer photo	MR
A	17-JUL-2003	- - Attached Page 36-42 Sec. 3 Sec. 5.6	• Issued. • 5.54 Firmware Revision. • Suggested panel dimension in overall dimension drawing added. • Instructions for fixing points, mounting precautions and EPM handling added. • Connectors name/type indication corrected. • Hole/black mark detect section updated.	AF/EV
B	04-June-2004	Sec. 5.1	GS B n (Serial communication and mode settings)	FC
C	05-Nov-2004	-	Updated dynamic division parameter saving.	FC
D	06-April-2005	24, 26 and 28	Saving of mark length parameter (ESC s). Height change restriction (ESC ! n). Denmark character set (ESC R n).	FC
E	28-July-2005	32	UPC-E barcode enhancement.	FC
F	10-Oct-2005		Minor enhancements.	FC
G	22/Mar/06	30	Text mode : a last character is possible even if next character spacing does not hold in the line. Minor enhancements.	FC

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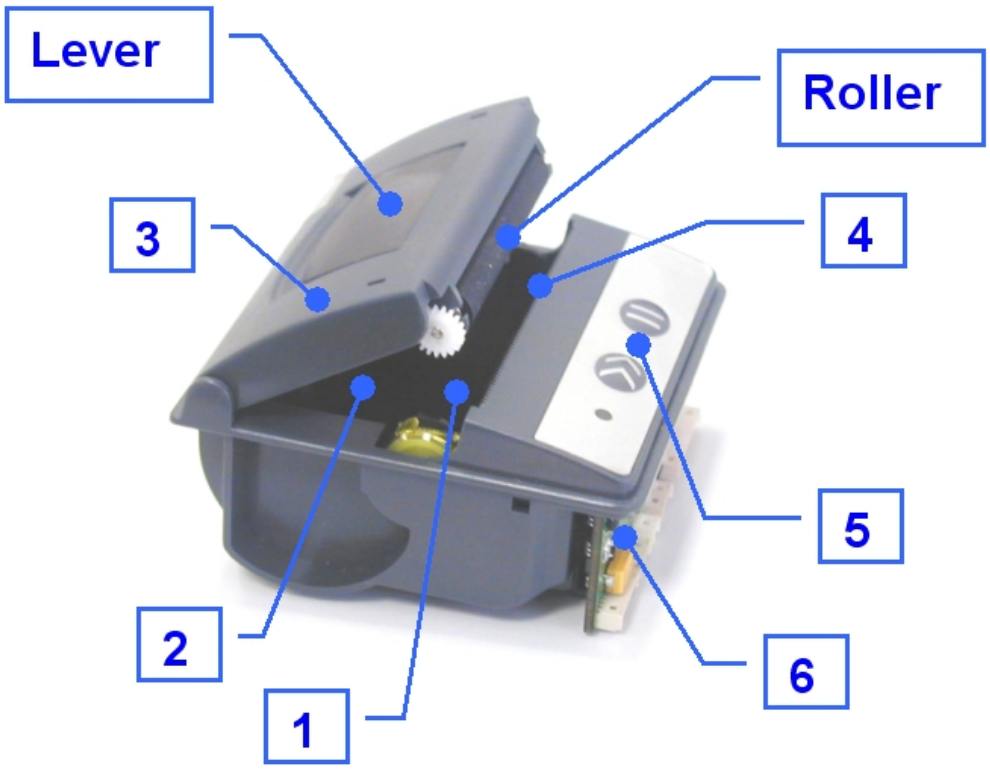
1. INTRODUCTION

The **EPM203-MRS** is a 2 inches, 3V, Easy Loading Printing Module with an integrated control board using serial and parallel communication protocols.
The EPM module consists of a set of mechanical and electronic parts.
These parts have been designed to have a high grade of integration and to perform many different functions.

The sections that form the EPM module are described in the following image.

1. Printer mechanism, easy loading type
2. Paper roll housing
3. Cover group, with Lever (for easy opening) and Roller
4. Tear Bar, for paper cutting
5. Control panel with two push button and one LED
6. Electronic Control Board



1.1 EPM203-MRS main features

- **Fully hot plug printer**
- **Single power supply**
  From 3 Volts to 7.2 Volts
- **3 Communication ports**
  Serial : RS232 (speed up to 57600 Bds),
  TTL (speed up to 57600 Bds).
  Centronics.
- **Software programmable consumption**
  Dynamic division, and high speed (up to 45 mm/s)
- **Full control over printing quality/speed**
  Speed clamping, acceleration smoothing… via control codes
- **Sleep mode**
  Current consumption <10nA
  Wake-up on Serial-RS232, Serial-TTL, Parallel port or Keyboard
- **Integrated keyboard with Paper Feed and ON-OFF Line push buttons and LED**
- **Three internal fonts**
  Easy font updating
- **Powerful Text Printing Modes**
  Horizontal
  180 degree
  Double and Quadruple width and height printing
  Inverse video
- **Powerful Graphic Modes**
  Variable width and offset
  Double and Quadruple width and height
- **Hole / Mark Detection**
- **10 Barcodes**
  Normal and 90 degree
- **Printer Setup parameters can be saved in flash**
- **Windows® drivers available**
- **Easy firmware upgrades (**please contact A.P.S**)**

2. GENERAL SPECIFICATIONS

Item	Specification
Dimension W x D x H (mm)	76.8 x 77.4 x 43.5
Paper width	58 +0/-1 mm
Paper roll size	Max. Ø32 mm (outside diameter)
Print method	Thermal dot-line printing
Number of dots	384
Dot density	8 dots/mm
Print width	48 mm (centred on paper)
Heat element pitch	0.125 mm
Paper feed pitch	0.125 mm
Paper feed tension	50gf or more
Paper hold tension	80gf or more
Recommended Paper	JUJO-AF50KS-E (standard grade) JUJO-AF50KS-E3 (high sensitivity) Equivalent types can be used
Voltage range	From 3V to 7.2V
Current consumption	From 1.5A to 5A at 5V (peak for 3ms) ≤10nA (in OFF mode)
Operating temperature	From 0°C to +50°C
Operating humidity (RH%)	20-85 (no condensation)
Storage temperature (°C)	From -40°C to +90°C
Storage humidity (RH%)	10-90 (no condensation)
EMC standard	Designed to comply with Level B – FCC - CE

Mechanism life

	Durability	Basic conditions	Maximum variations
Thermal head pulse resistance	100 million pulses	- Room temp.: 20 ÷ 25 °C	Max. 15% in resistance value (Ω) of any dot, from its initial value
Abrasion/wear resistance	50 km of paper		
Cover Group, Opening/closing cycle	2000 operations or more	-	-

3. PRINTER DEVICE INTERCONNECTION

This device is fully hot-plug : any connector hereafter can be connected or disconnected without damaging the printer.
Refer to the attached drawing for location and pin 1 identification of each connector.

3.1 Power supply connector

EPM device connector J5	User side matching connector
Molex, 53047 Series 9 contacts (male)	Molex 51021 Series (female) Contacts: 50079/50058.

Pin number	Signal name
1	GND
2	GND
3	GND
4	GND
5	GND
6	V bat
7	V bat
8	V bat
9	V bat

IMPORTANT NOTE:
Wires AWG28 must be used in order to avoid current losses

3.2 Serial communication connector

The EPM203-MRS printer integrates 2 serial communication connectors.
The RS232 connector is specially dedicated to the full RS232 protocol (+/-12V levels), when the TTL connector is designed to handle TTL levels (0/5V levels).

Logic Signal	Voltage Level on RS232 Connector	Voltage Level on TTL Connector
0	From +3V to +12V	From 0V to 0.2V
1	From -3V to –12V	From 2 to 5V

3.2.1 RS232 connector

EPM device connector J4	User side matching connector
Molex, 53047 Series 5 contacts (male)	Molex 51021 Series (female) Contacts: 50079/50058.

Pin number	Signal name
1	Gnd
2	Transmit data (Txd, printer output)
3	Receive data (Rxd, printer input)
4	CTS/DSR (printer input)
5	RTS/DTR (printer output)

3.2.2 TTL connector

EPM device connector J3	User side matching connector
Molex, 53047 Series 5 contacts (male)	Molex 51021 Series (female) Contacts: 50079/50058.

Pin number	Signal name
1	Gnd
2	Transmit data (Txd, printer output)
3	Receive data (Rxd, printer input)
4	CTS/DSR (printer input)
5	RTS/DTR (printer output)

3.3 Parallel communication connector

EPM device connector J2	User side matching connector
Molex, 53047 Series 15 contacts (male)	Molex 51021 Series (female) Contacts: 50079/50058.

Pin number	Signal name
1	\AUTOFEED
2	BUSY
3	D7
4	D6
5	D5
6	D4
7	D3
8	D2
9	D1
10	D0
11	PE
12	\INIT
13	GND
14	\STB
15	\ACK

3.4 Sleep mode disable connector

EPM device connector J1	User side matching connector
Molex, 53047 Series 2 contacts (male)	Molex 51021 Series (female) Contacts: 50079/50058.

The EPM is supplied with sleep mode enabled at power up, thus the contacts on this connector are not wired together. If pin 1 and 2 are wired together, the sleep mode feature is disabled.
See "**ESC S**" control code for more details about the sleep mode.

4. EPM DEVICE OPERATIONS

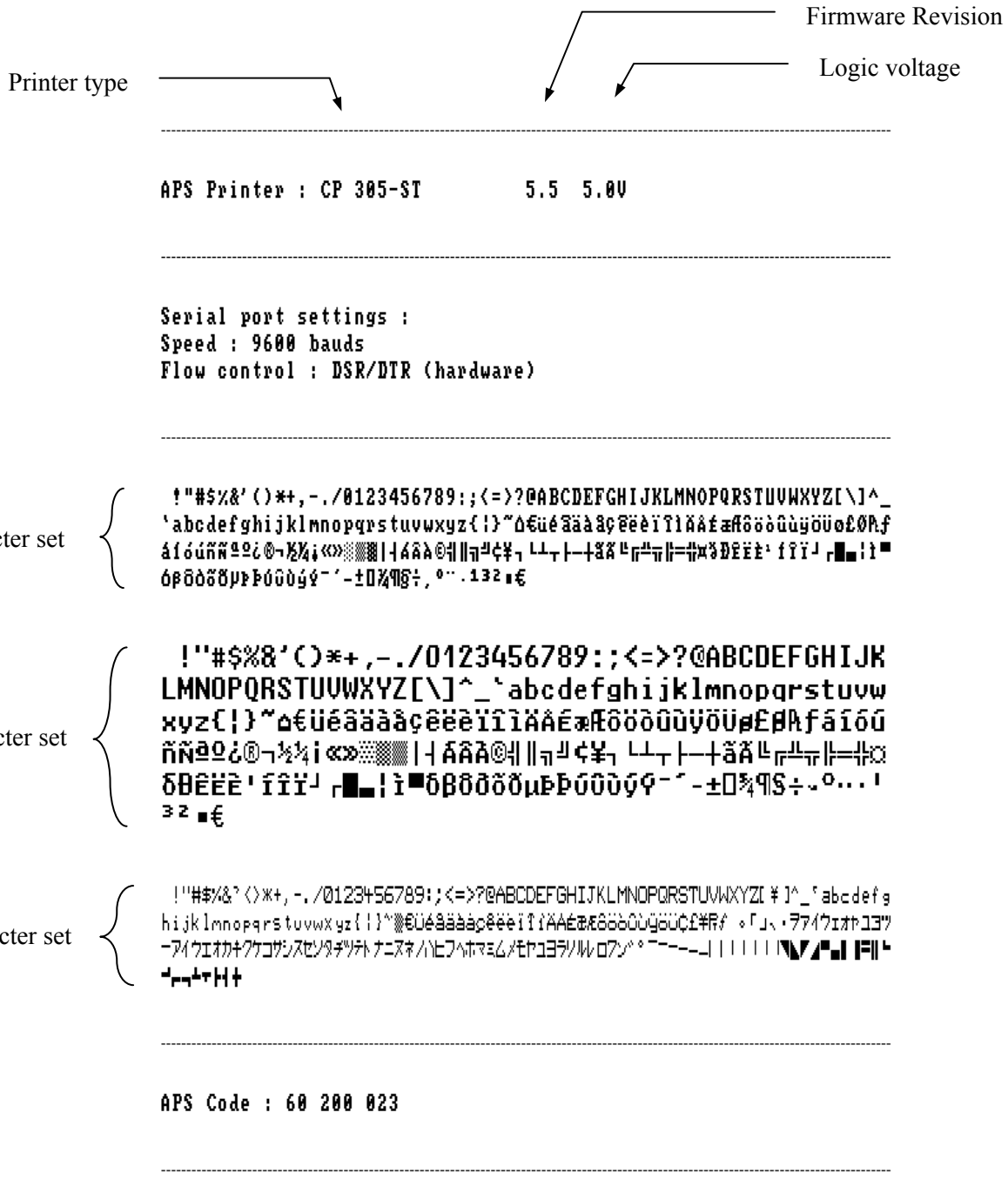
4.1 Integrated Keyboard functions

The two push buttons and LED functions are described in the following table:

Printer Status ⇨	**OFF**	**OFF Line**	**On Line**	**End of Paper**	**Over/Under Voltage or Temperature**
Push Button #1	Execute **self-test** if pressed during Power-On	On Line	Off Line	N/A	
		Switch OFF the printer if pressed more than 2.5 seconds			
Push Button #2	Switch On the Printer	Feeds Paper	Feeds Paper if not already printing	N/A	
LED	OFF	1 Flash "ON"	Always "ON"	3 Flash "ON"	4 Flash "ON"

4.2 Self test Mode

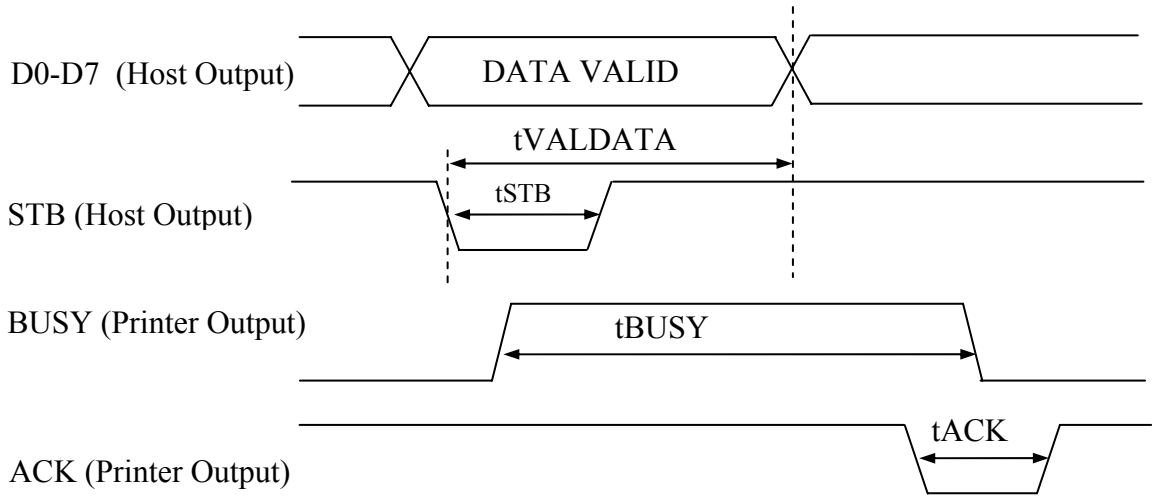
This mode is done by pressing simultaneously the 2 push buttons of the keyboard. It prints the printer type, the revision of the printer firmware, the logic voltage, the serial port settings, all internal character sets, and product code



4.3 Timing for parallel communication

The communication protocol is Centronics compatible, and has the ability to handle the "Compatibility Mode" (Write from the Host to the Printer), and also the "Byte Mode", for the host to read internal data from the printer. The "Byte Mode" is used to receive printer status back from the printer.

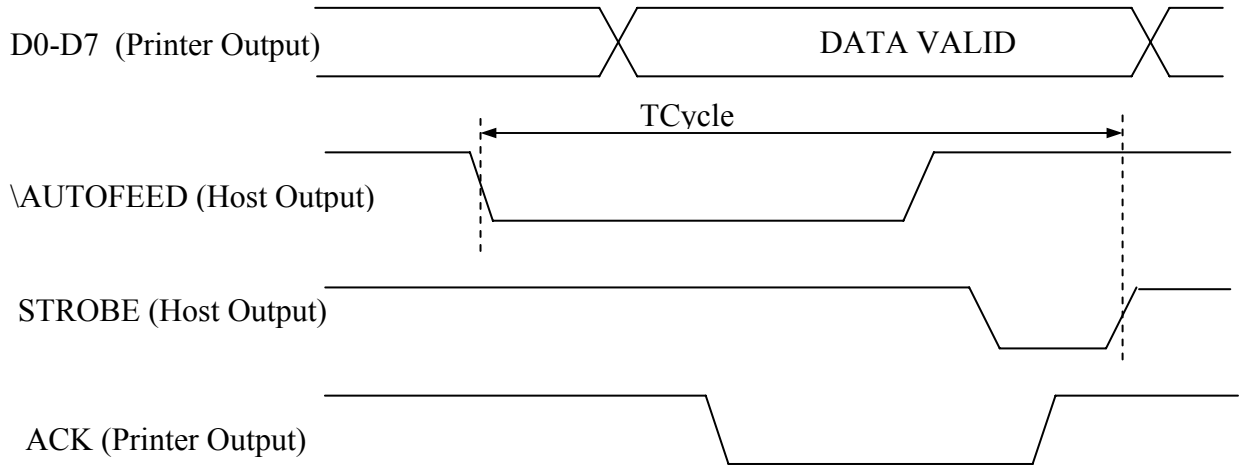
4.3.1 Compatibility mode timing (host writes to the printer)



Parameter	Min.	Typ.	Max.	Comments
Time STB (tSTB)	5 µs	-	-	This time is given by the host
Time BUSY (tBUSY)	25 µs	90 µs	250 µs	This hold time is controlled by GS b control code
Time tVALDATA	25 µs	-	-	Time in while the data must be stable. This time is fixed by the host.
Time ACK (tACK)	-	3µs	-	

IMPORTANT NOTE:
The data (D0-D7) must be stable for tVALDATA. If not, please contact APS for additional cabling.

4.3.2 Byte Mode timing (host reads data from printer)



In this mode, the data transfer controlled is given by the host, but tCycle must not exceed 0.5 seconds

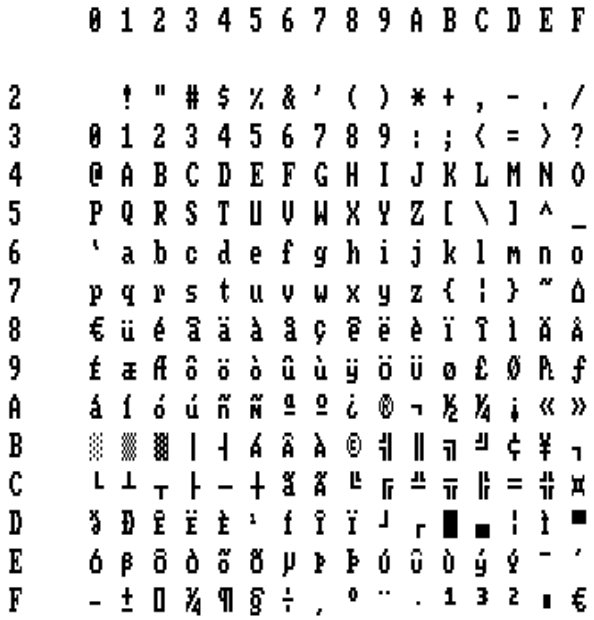
4.4 Serial / Parallel mode selection

Serial or Parallel mode will be chosen via software automatically after the first character is received. At power-up, both serial and parallel communications are active. If the first character is received on the serial port, the communication will be serial, and vice versa for parallel. This first character will be interpreted like any other incoming byte into the printer.

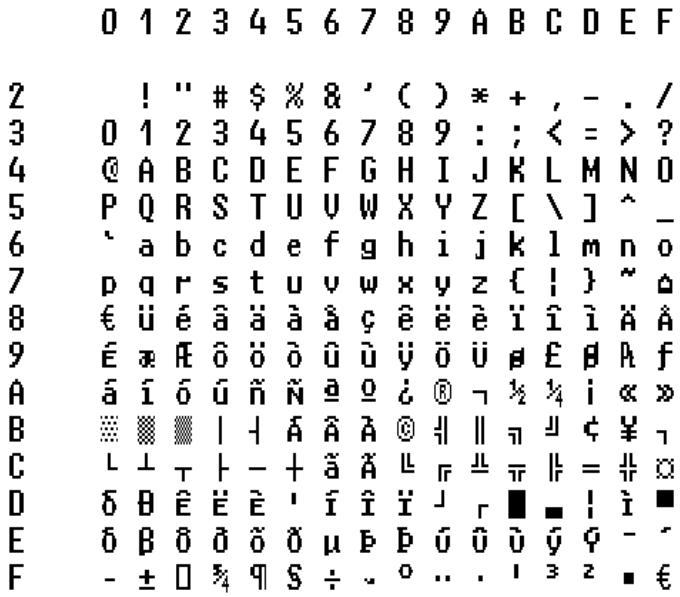
4.5 Text Printing Format

The controller board has three resident sets of 224 characters: 8x16, 12x20, and 7x16.
The 8x16 and 12x10 fonts include the *Euro currency symbol (Position 128, 80h)*.
12 characters are selectable from the international character set: refer to ESC "R" command for more information.
All character bitmaps will be shown with their hexadecimal code (row being the most significant nibble, and column the least significant nibble). Example: ASCII code for 'A' is 41 hex (or 65 decimal).

- **8x16 Character set**: Character size is 9 pixels (8 "active dots" plus one inter-character) x 20 pixels (16 "active" dots plus 4 interlines including underline), or 1.125mm x 2.5mm.
  With double and quadruple height and width, maximum character size can go up to 4.5mm width x 10mm height.
  Horizontal character spacing and line spacing may be adjusted via the software. Character per line is up to 64 in standard text, 32 in double width, and 16 in quadruple width.



- **12x20 Character set**: Character size is 13 pixels (12 “active dots” plus one inter-character) x 24 pixels (20 “active” dots plus 4 interlines including underline), or 1.625 mm x 3 mm.
  With double and quadruple height and width, maximum character size can go up to 6.5mm width x 12mm height.
  Horizontal character spacing and line spacing may be adjusted via the software. Character per line is up to 44 in standard text, 22 in double width, and 11 in quadruple width.



- **7x16 Character set:** Character size is 8 pixels (7 “active dots” plus one intercharacter) x 20 pixels (16 “active” dots plus 4 interlines including underline), 1 mm by 2,5mm.
  With double and quadruple height and width, maximum character size can go up to 4 mm width by 10mm height.
  Horizontal character spacing and line spacing may be adjusted via the software. Character per line is up to 48 in standard text, 24 in double width, and 12 in quadruple width.
  This font includes the Katakana characters set.

5. 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 as part of a command and not as a printable character.

5.1 Control codes cross reference

Setup and Hardware control

COMMAND	DESCRIPTION
GS / n	Set printing speed / maximum peak current
GS s n1 n2	Set maximum print out speed
GS a n	Set acceleration smoothing
GS D n	Set print intensity
ESC @	Reset printer
ESC v	Send printer status
ESC I	Send printer identity
ESC S	Put the printer in sleep mode
ESC A n	Set autosleep time
GS B n	Serial communication settings
GS b n	Set parallel port busy line hold time
ESC o n	Set optocoupler type
GS O n1 n2	Start optocoupler calibration
ESC O	Send optocoupler parameters
GS o	Send optocoupler level
ESC s	Save setup parameters
ESC d	Default setup parameters
GS p n	Set paper loading pause
GS P n1 n2	Sets paper loading length
GS e n	Ejects paper
GS d n	Sets eject direction
GS M n1 n2	Sets paper loading speed

Text and General commands

Command	Description
ESC % n	Select internal Character Set
ESC R n	Select international character Set
ESC 2 n	Set line pre-spacing
ESC 3 n	Set line spacing
ESC SP n	Set character spacing
ESC b n	Set inverse video printing
ESC c n	Set maximum number of columns
ESC C n	Set text justification
ESC ! n	Set print mode
ESC { n	Set/reset Rotated character
LF	Line feed
CR	Carriage return
ESC J n	Feed paper (n dot lines) forward
ESC j n	Feed paper (n dot lines) backward
CAN	Cancel print data buffer (text mode)

Graphics commands

Command	Description
ESC * n1 n2 n3 n4 n5 n6 data	Print graphics
ESC $ n1 n2	Horizontal dot positioning
ESC V n1 n2 n3 data	Horizontal bit image

Bar code commands

Command	Description
GS k n [Start] <data> NUL	Print bar code
GS h n	Barcode Height
GS w n	Barcode magnification
GS H n	Text position in Barcode
GS R n	Set/reset rotated barcode

Hole and black mark detection commands

Command	Description
GS L n	Set Mark length
GS T n1 n2	Set TOF position
GS E	TOF feed paper

5.2 Setup and Hardware control commands

GS / n

Description:	Set printing speed / Maximum peak current / Dynamic division
Format:	<1Dh> <2Fh> <n>
Comments:	n = 1 to 32: (Default n = 5) Software programmable consumption (Dynamic division). The maximum number of black dots which are simultaneously heated is (n+1) x 8. In default mode, n = 5.
Example:	n = 5 Maximum black dots heated: (5+1)*8 = 48. Printer Peak consumption @5V: (0.3A (Stepper Motor) + 5*48/160) = 1.8A 160 Ohms is the dot resistance.

GS s n1 n2

Description:	Set maximum print speed
Format:	<1Dh> <73h> <n1> <n2>
Comments:	This control code may be used to reduce the print speed. Maximum print speed may be reduced in case of paper roll diameter above 60mm and/or if rewinding mechanism is connected to the printer. It can also help to reduce noise. Bytes n1, n2, set the time T (in µs) between each step: T = (256*n1) + n2. 1000 < T < 25000. Default: T = 2000 : n1 = 7, n2 = 208.
Example:	T = 2000 µs Maximum print out speed: (1/(8 * 2000e-6)) = 62.5 mm/s 8 dots/mm is the dot density.

GS a n

Description:	Set acceleration smoothing
Format:	<1Dh> <61h> <n>
Comments:	n = 0 to 255: (Default n = 180) Software programmable acceleration smoothing. The print cycle time is limited to the cycle time of the previous cycle multiplied by the acceleration coefficient (coefficient = n/256). This improves print quality and reduces noise.
Example:	n = 180: Cycle time can't be smaller than 70% of previous cycle time.

GS D n

Description:	Set print Intensity
Format:	<1Dh> <44h> <n>
Comments:	n=80h (128d) : (Default). Nominal print intensity n>80h (128d) : Printout becomes darker n<80h (128d) : Printout becomes lighter (n from 0 to 255 (FFh)).

ESC @

Description: Resets printer
Format: <1Bh> <40h>
Comments: Resets the printer device. This command is executed immediately after being received, even in case of a full buffer (DTR/RTS or Xoff active). Host must disable the handshaking controls to send the ESC @ command.

ESC v

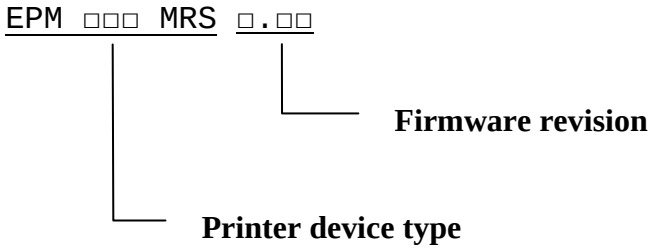
Description: Send printer status
Format: <1Bh> <76h>
Comments: The printer returns a single byte that reflects the status of the printer in accordance with the following table:

Bit	Function	Bit = 0	Bit = 1
0	Head temperature	OK	Too high or too low
1	Head-up	No	Yes
2	Paper out	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	Too short, too long or not found
7	Not Used	-	Always set to 1

This command is executed immediately after being received, even in case of a full buffer (DTR/RTS, Xoff or Busy active). Host must disable the handshaking controls to send the ESC v command.
When using the parallel port, PE signal is continuously updated by the software. To read the status byte, use the Byte Mode (Parallel communication), after having sent the ESC v command.

ESC I

Description: Send printer identity
Format: <1Bh> <49h>
Comments: The printer returns a string ended by zero (00h) that reflects the printer identity.
The string is formed by the combination of the following:



ESC S

Description: Puts the printer in sleep mode
Format: <1Bh> <53h>
Comments: This command puts the printer in sleep mode giving the major benefit of zero power consumption. Before going into sleep mode, the printer will relay back the same code (ESC S) to the serial or parallel port (depending of which interface selected), and then it shuts down. The serial and parallel communication voltage levels must be turned to zero to reduce any leakage current inside the printer (except INIT on the parallel port that must remain at level 1).

There are 3 ways of waking the printer up:

- Through the parallel port by activating the \INIT signal (resets the printer)
- Through the serial port by sending the character “00 hex” (wake-up character)
- Press the paper feed button

Note:

1. During sleep mode, all signals except \INIT must be turned to logic 0. If they are not, unexpected results may occur on the sleep mode function.
2. Wait 500 ms before sending the next character for the printer to execute the power-up sequence.
3. When waking-up through the serial port, the wake-up character will be ignored.

ESC A n

Description: Set the autosleep time
Format: <1Bh> <41h> <n>
Comments: n = 0 to 255: (Default n = 0: feature disabled). This command puts the printer in sleep mode when no print activity has occurred after a certain. Timeout is n * 5 seconds.
For more information, please contact A.P.S.

GS B n

Description: Serial communication and mode settings
Format: <1Dh> <42h> <n>
Comments: Sets serial communication speed and mode
Bit 7: B7=0: Xon/Xoff mode (software control),
B7=1: RTS/DTR mode (hardware control)
Bit 6: Not used
Bit 5: Not used
Bit 4: Not used
Bit 3: Not used
Bit 2, 1, 0: Speed: (note: the speeds are not totally identical due to hardware limitations)

n	Communication speed (Bauds)
0	1 200
1	2 400
2	4 800
3	9 600
4	19 200
5	28 800
6	57 600

Default : n = 83h: RTS/DTR; Normal mode, 1 Stopbit, 9600 Bds, No Parity
(unused bits should be set to zero)

GS b n

Description: Parallel port busy line hold time setting
Format: <1Dh> <62h> <n>
Comments: Sets the minimum tBUSY hold time on the parallel busy line. See "Compatibility mode timing" (refer to section 4.3.1) for an example of the waveform.

The 'n' value may be changed to avoid erratic character reception from the host's automatic character repeat feature. This command repeats sending the latest byte sent when the printer hold time tBUSY is too short (from 20µs to 100µs depending on the host's parallel port firmware). To avoid the repeating, the minimum time of tBUSY must be increased. Please note that increasing the tBUSY hold time will reduce the communication speed.

If the host firmware correctly controls the timing per the waveforms given in "Compatibility mode timing" (see section 4.3.1) and has no automatic repeat feature, n can equal 0, thereby minimizing time of tBUSY (around 25µs) and maximizing communication speed.

By default n = 50 which gives 80µs for the minimum duration of tBUSY.
The time is given by the formula: (n * 1µs) + 30µs. (n from 00h to FFh).

ESC o n

Description: Sets the optocoupler type.
Format: <1Bh> <6Fh> <n>
Comments: n = 0: support for reflective optocoupler activated (default).
n = 1: support for transmissive optocoupler activated.

If the default optocoupler is replaced by the user, the distance between the opto and the printing line can be adjusted by a control code – see "Hole / Black mark detection commands" section.

Note: Transmissive optocouplers are generally used in applications requiring hole or black mark detection.

GS O n1 n2

Description: Starts the optocoupler calibration procedure.
Format: <1Dh> <4Fh> <n1> <n2>
Comments: n1 specifies the length of paper loading before the actual calibration is done.
n2 specifies the length of paper used to calibrate the opto.
Length is in centimeters.
For details, please contact A.P.S for opto calibration application note.

ESC O

Description: Sends optocoupler parameters.
Format: <1Bh> <4Fh>
Comments: The printer responds by sending 6 bytes :

- opto type (0 for reflective, 1 for transmissive)
- black level
- mark/backing level
- paper level
- paper presence threshold
- mark detection threshold

All these parameters are determined automatically by the opto calibration procedure and should provide correct operation for most applications. This command is intended for test purposes.

GS o

Description: Sends the current level of the opto.
Format: <1Dh> <6Fh>
Comments: The printer responds with a byte representing the opto level.

ESC s

Description: Save the setup parameters. (Applies to version 5.2 and higher)
Format: <1Bh> <73h>
Comments: The setup parameters are saved in the internal flash memory of the controller. They are not lost when power is removed or printer reset, and are recalled when power is applied again. At the end of the saving sequence, the printer returns a byte with value zero.

The following parameters are saved by this command:

- internal font
- pre line spacing
- line spacing
- character spacing
- print mode
- rotated
- maximum number of columns
- text justification
- maximum peak current
- intensity
- serial mode
- busy hold time
- barcode height
- barcode magnification
- barcode text position
- barcode orientation
- paper loading length
- paper loading speed
- paper loading pause
- speed limitation
- mark length
- top of form position
- mark to cut position
- head to cut length
- opto to head length
- acceleration smoothing
- international character set
- autosleep time

ESC d

Description: Default setup parameters. (Applies to version 5.2 and higher)
Format: <1Bh> <64h>
Comments: Revert all parameters of the 'Save setup parameters' command to their factory default values. This action is temporary. If the printer is reset or power is cycled, the parameters will be initialized with the last set saved by the 'ESC s' command. If you want to permanently set the parameters to the factory defaults, you must send an 'ESC d' 'ESC s' sequence. Combining the use of these command and the 'reset printer' command enables you to compare the effects of the default and saved values without altering the saved values.

GS p n

Description: Sets paper loading pause
Format: <1Dh> <70h> <n>
Comments: n = 0 to 255. Software programmable pause between the moment the printer detects the insertion of paper and the moment the roller starts turning. This allows accurate manual positionning of the paper. The value n is in 125 milliseconds units.
Default: n = 0.
Example: n = 16. The printer waits 2 seconds.

GS P n1 n2

Description: Sets paper feeding length in automatic paper loading
Format: <1Dh> <50h> <n1> <n2>
Comments: Sets the length of the paper fed during the automatic paper loading.
Bytes n1, n2, set the length L (in dot lines) of the feeding.
L = (256*n1) + n2
Default : L = 40 mm : n1 = 1, n2 = 64.

GS e n

Description: Ejects paper
Format: <1Dh> <65h> <n>
Comments: n = 0 to 255. The printer will feed the paper until an end of paper condition is detected. It will then feed an extra n millimeters, useful for ejecting sheets totally.

GS d n

Description: Sets eject direction
Format: <1Dh> <64h> <n>
Comments: n = 0 : the eject direction is the forward feed direction (default)
n = 1 : the eject direction is the reverse feed direction
If n is not either 0 or 1, the command is ignored.

GS M n1 n2

Description:	Sets paper loading speed
Format:	<1Dh> <4Dh> <n1> <n2>
Comments:	This control code may be used to adapt the loading speed to various conditions. Bytes n1, n2, set the time T (in µs) between each step: T = (256*n1) + n2. 1500 < T < 32000. Default: T = 11520: n1 = 45, n2 = 0. Speed: (1/(8 * 11520e-6)) = 10.8 mm/s.

5.3 Text and General commands

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.
For custom fonts support, please contact A.P.S

ESC R n

Description: Select international character set
Format: <1Bh> <52h> <n>
Comments: Modify the set of printable characters in accordance with the table below:

n	COUNTRY	23	24	40	5B	5C	5D	5E	60	7B	7C	7D	7E
0	USA	#	$	@	[	\	]	^	‘	{	|	}	~
1	France	#	$	à	°	ç	§	^	‘	é	ù	è	“
2	Germany	#	$	§	Ä	Ö	Ü	^	‘	å	ö	ü	ß
3	UK	£	$	@	[	\	]	^	‘	{	|	}	~
4	Denmark 1	#	$	@	Æ	Ø	Å	^	‘	æ	ø	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	$	@	¡	Ñ	¿	^	'	"	ñ	}	~
8	Japan	#	$	@	[	¥	]	^	‘	{	□	}	~
9	Norway	#	¤	É	Æ	□	Å	Ü	é	æ	□	å	ü
10	Denmark 2	#	$	É	Æ	Ø	Å	Ü	é	æ	ø	å	ü
11	Spain 2	#	$	à	¡	Ñ	¿	é	'	í	ñ	ó	ú
12	Latin Amer.	#	$	à	¡	Ñ	¿	é	û	í	ñ	ó	ú

ESC 2 n

Description: Set line pre-spacing
Format: <1Bh> <32h> <n>
Comments: Sets the line pre-spacing. (Default n = 0). n may vary from 0 to 15. The line spacing pitch is 1/8mm. Note: This is usefull when printing in inverse video if some character pixels are on the first dotline.

ESC 3 n

Description: Set line spacing
Format: <1Bh> <33h> <n>
Comments: Sets the line spacing. (Default n = 3). n may vary from 3 to 15. The line spacing pitch is 1/8mm.

ESC SP n

Description: Set character spacing
Format: <1Bh> <20h> <n>
Comments: Sets the character spacing. (Default n = 2). n may vary from 1 to 16. The character spacing pitch is 1/8mm. This spacing is proportional to double width (nx2) and quadruple width (nx4) commands.
Note: A last character is possible even if next character spacing does not hold in the line.

ESC b n

Description: Set inverse video printing
Format: <1Bh> <62h> <n>
Comments: The value of n (default 0) can be 1 (inverse video) or 0 (normal video). This setting is valid for the whole printing line. Spaces at the beginning of a line will be printed as a dark rectangle. In order to shift the black printing from the left margin, one can send the TAB (ascii 9) instead. This enables one accurate control of the placement of the edges of the inverted portion.

ESC c n

Description: Set maximum number of columns
Format: <1Bh> <63h> <n>
Comments: The value of n (default 255) is the maximum number of printable characters the printer accepts before automatically going to the next line.

ESC C n

Description: Set text justification
Format: <1Bh> <43h> <n>
Comments: The value of n specifies how text will be justified.
n = 0: text will be centered.
n = 1: text will be right justified.
n = 2: text will be left justified.
Default is left justification.

ESC ! n

Description: Set print mode
Format: <1Bh> <21h> <n>
Comments: The value of n (default 0) selects the various modes of printing as described in the table on the next page:

Bit	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

Note: Different print widths can be mixed on the same line (8 changes per line maximum). Only one print height is enabled per line. If height change request during a line already started, change will be taken into account only on the next line.

ESC { n

Description: Set/Cancel Rotated characters
Format: <1Bh> <7Bh> <n>
Comments: This command rotates text by 180°
n = 0 (default): Printout is normal
n = 1: Printout is rotated 180°

LF

Description: Line feed
Format: <0Ah>
Comments: Move the print position to the beginning of the next line.

CR

Description: Carriage return
Format: <0Dh>
Comments: Move the print position to the beginning of the next line. Note: if CR is followed by LF, the printer will ignore the LF after CR. So, CR = LF = CR+LF.

ESC J n

Description: Feed paper (n dot lines) forward
Format: <1Bh> <4Ah> <n>
Comments: Paper is fed for n (n<256) dot lines (n times 0.125 mm). The print position is at the beginning of the next line.

ESC j n

Description: Feed paper (n dot lines) backward
Format: <1Bh> <6Ah> <n>
Comments: Paper is fed for n (n<256) dot lines (n times 0.125 mm) backward. The print position is at the beginning of the next line.

CAN

Description: Cancel print data buffer (text mode)
Format: <18h>
Comments: The print buffer is cancelled and the print position is set to the beginning of the next line.

5.4 Graphic commands

ESC * n1 n2 n3 n4 n5 n6 <data>

Description: Print graphics
Format: <1Bh><2Ah><n1><n2><n3><n4><n5><n6><data>
Comments: Bytes n1, n2 and n3 sets the number of byte N to be printed out:

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

Byte n4 sets graphic operators on data byte and has the following meaning:

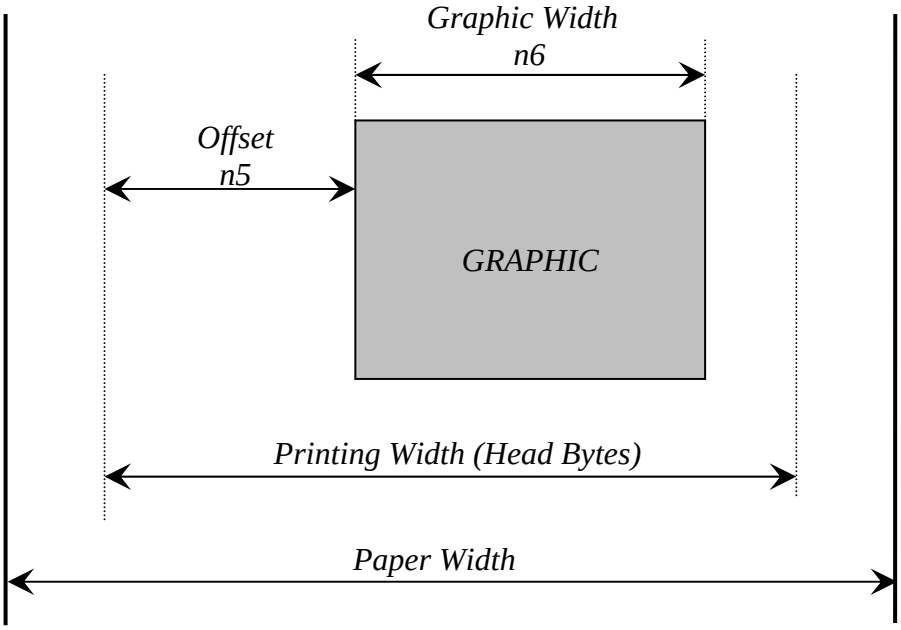
- n4=0 : print normal size data byte (full printer resolution)
- n4=1 : double width
- n4=2 : double height
- n4=3 : expanded (double width, double height)

Byte n5 sets the number of byte to be skipped before printing out the first graphic bit:

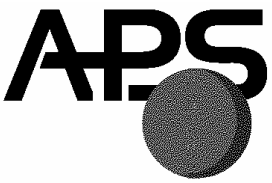
- 00 H : first graphic bit to be printed out is dot one on the head
- 01 to FF H : 1 to 255 bytes skipped (to be less than total number of head's bytes)

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

- 01 to FF H : width is 1 to 255 bytes (to be less than total number of head's 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 centered,
Size = 368*242 / 8 = 11 132 bytes :

n1 = 124d, n2 = 43d, n3 = 0d, n4 = 0d, n5 = 1d, n6 = 46d
or n1 = 7Ch, n2 = 2Bh, n3 = 0h, n4 = 0h, n5 = 1h, n6 = 2Eh

ESC $ n1 n2

Description: Horizontal dot positioning
Format: <1Bh><24h><n1><n2>
Comments: Dot positioning command in bytes (to be used with ESC V). Dot position equals (n1 + 256*n2). n1 must be less than the total number of the head bytes, given by the total number of dots divided by 8 (for instance EPM203-MRS is 384/8 = 48), and n2 is always 0.

ESC V n1 n2 n3 <data>

Description: Horizontal bit image
Format: <1Bh><56h><n1><n2><n3><data>
Comments: The number of bytes to be printed is equal to (n2+256*n3). n2 must be less than the total number of the head bytes, given by the total number of dots divided by 8 (for instance EPM203-MRS is 384/8 = 48), and n3 is always 0. n1 is the resolution: 0 is standard size,1 is double width, 2 double height, 3 is expanded.

IMPORTANT NOTES FOR GRAPHICS:

- Please note that n5 (offset) + n6 (graphic width) needs to be less than the number of head's bytes (printing width). If it is greater, control code will be ignored.
- One dot line must be performed in less than 500ms. If not, the current into stepper motor will be removed resulting in poor print quality.
- It is recommended for all graphics sequences to set up the communication speed at the maximum value.

5.5 Bar code commands

GS k n [Start] <data> NUL

Description: Print bar code
Format: <1Dh> <6Bh> <n> [Start] <data> <00h>
Comments: n is barcode standard selection, as described in the following table. [Start] is an optional byte used only by Code 128.

n	START BYTE	BAR CODE TYPE
0	No Start	UPC-A
1	No Start	UPC-E
2	No Start	EAN 13
3	No Start	EAN 8
4	No Start	Code 39
5	No Start	Interleaved 2/5 (ITF)
6	No Start	Codabar
7	135	Code 128A
	136	Code 128B
	137	Code 128C

Note: <data> should be absolutely correct and suitable to bar code type. No checking is performed by printer before starting printing. So, if number of data bytes or checksum byte is wrong, printed bar code will be wrong. However, if checksum byte misses, printer will calculate it and add to data.
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).

GS h n

Description: Select vertical height of bar code
Format: <1Dh> <68h> <n>
Comments: n, from 1 to 255 in multiple of 1/8 mm (default is 128)

GS w n

Description: Select horizontal magnification of bar code
Format: <1Dh> <77h> <n>
Comments: n, defines the number of 0.125mm units are used to define the module of each barcode symbol. The thick lines are set to twice n value. (n from 2 to 6, default is 3)

GS H n

Description: Select printing position of bar code text
Format: <1Dh> <48h> <n>
Comments: n is used to define the position of the characters which are printed with the bar code :

n	PRINTING POSITION
0	Not printed (Default)
1	Above bar code
2	Under bar code
3	Above and under bar code

Note: If the barcode width exceeds the printing width, it will be ignored.
The barcode text is printed out with the latest selected font (ESC %)

GS R n

Description: Set/reset rotated barcode
Format: <1Dh> <52h> <n>
n = 0: barcode is printed horizontally.
n = 1: barcode is printed vertically.

5.6 Hole / Black mark detection commands

Due to the EPM203-MRS compactness and depending on the customer application, the label printing is not available. If printing positioning is required, APS suggests using paper roller with black mark.

GS L n

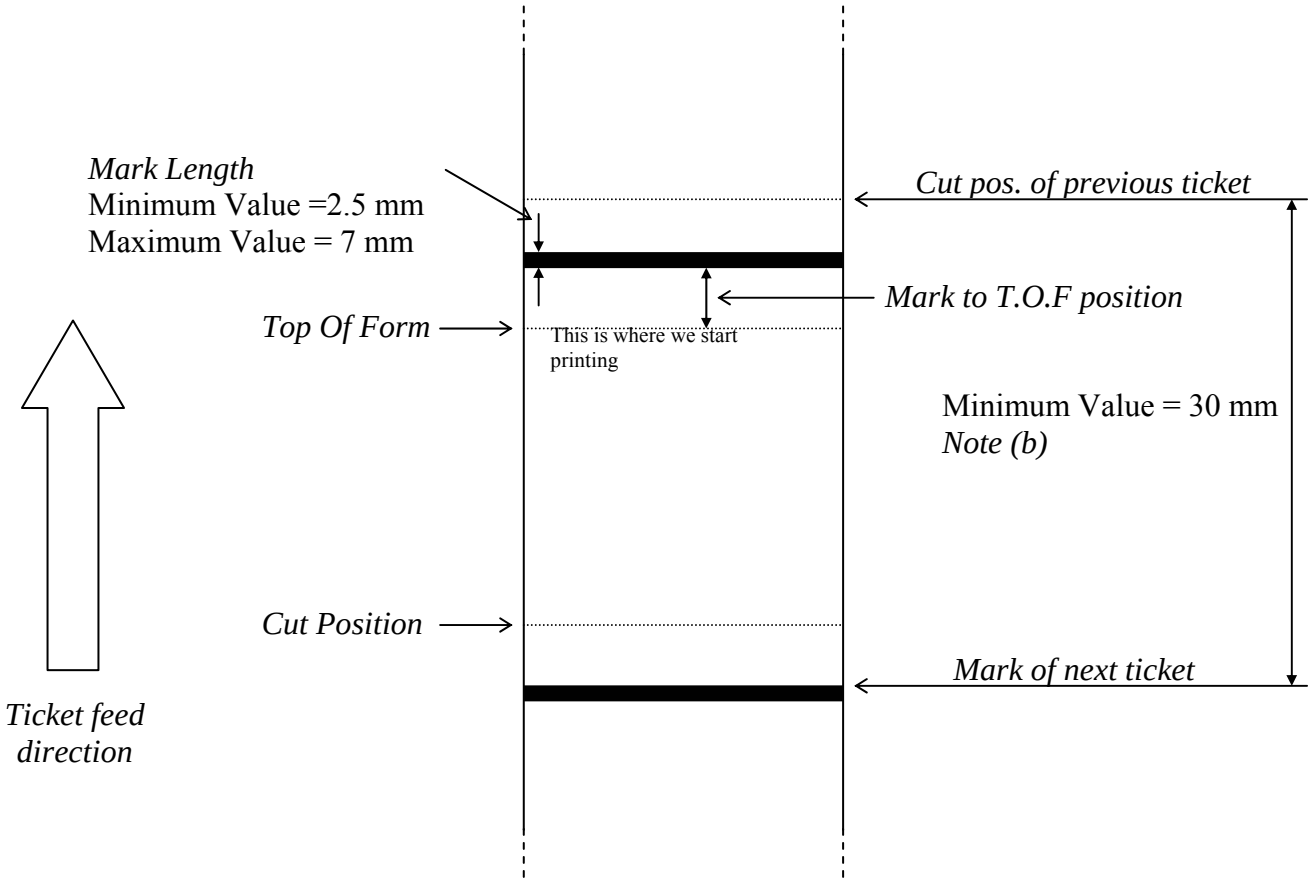
Description:	Set Mark length
Format:	<1Dh> <4Ch> <n>
Comments:	Set Mark length and switch from continuous paper feed to mark detection. n specifies the length of the mark in dot lines at 0.125mm. If n = 0 (Default) then the printer switches into continuous paper feed mode. Example: If n = 24 the length of the mark is equal to 3mm, and the printer enters the mark detection mode. The minimum mark length is 2.5 mm and the maximum is 7 mm.
Note:	Sending this command clears the hole/mark detection error bit in the printer status.

GS T n1 n2

Description:	Sets top of form (TOF) position
Format:	<1Dh> <54h> <n1> <n2>
Comments:	Defines the number of dot lines N between the end of the mark and the first printable line (TOF). N = (256*n1) + n2. By default, N = 0 dot lines.
Note:	It is possible to define a negative top of form distance. The value is represented with the two's complement of the absolute value of the distance.
Example:	To specify a – 5 mm distance, N = - 40 = 65536 – 40 = 65496. n1 = 255, n2 = 216.

GS E

Description:	TOF feed paper
Format:	<1Dh> <45h>
Comments:	Makes paper feed to the next TOF position. The hole/mark detection error bit in the printer status is automatically cleared when the black mark is found.



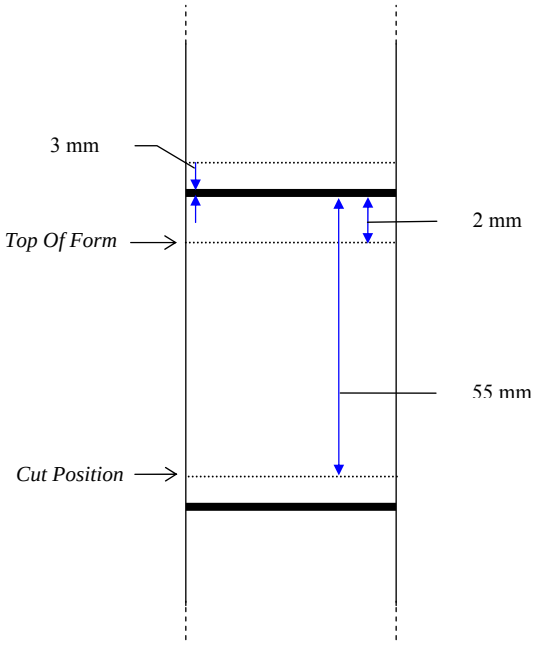
NOTES:

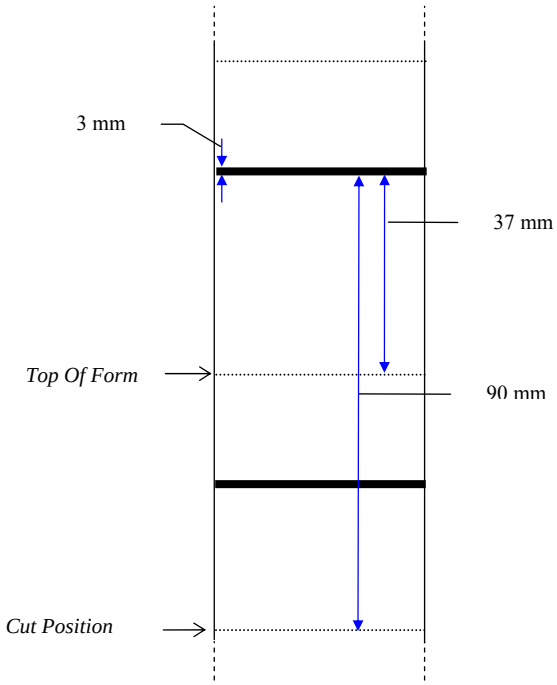
(a) Make sure that Hole/Black mark fully covers the opto sensor window.

(b) The distance between the cut position of the previous ticket and the mark of the next ticket should be superior to the distance (in terms of paper path) between the tear bar and the opto (default: 24.5mm). A minimum distance of 30mm should provide reasonable margin.

(c) For optimum performance, the paper should be guided, and in particular, the distance between the paper and the opto should be kept as constant as possible.

5.6.1 Hole / Black mark detection examples





6. MECHANICAL AND HOUSING

6.1 Overall dimensions and fixing points

See attached drawings at the end of this technical reference for overall dimensions and recommended screws.
3D-IGES files, for mechanical details, are available upon request, ask APS for more information.

The mechanism has to be fixed using the fixing points provided for this purpose.

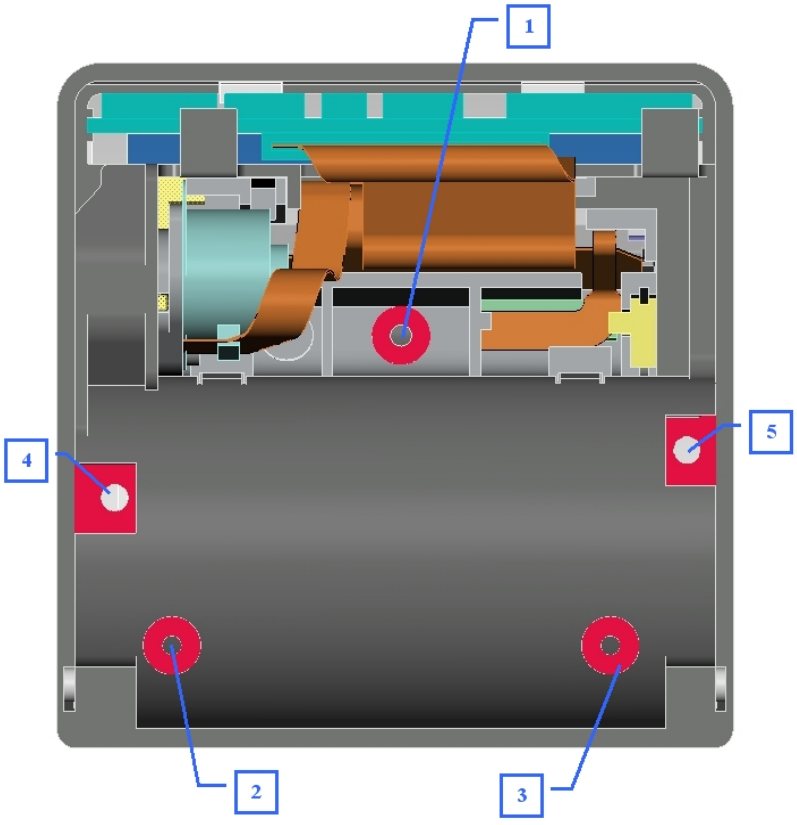
- Using points 1-2-3 (all of them simultaneously).
- Or using points 4-5 (mounting on panel, see overall dimensions drawing for panel dimensions).

To avoid any kind of deformation or distortion, a flat surface for contact areas is required, if not, the print quality and printer's life will be drastically reduced.

- Point 1 is on the top of the mounting base and has a distance of 21.9mm from points 2-3 (see also the attached drawings).
- Points 2-3 are all on the same plane, at the mounting base of the EPM.
- Points 4-5 are all on the same plane.

The image below shows the matching areas to be used for fixing (red coloured).

Bottom view of EPM203



6.2 *Mounting precautions*

Orientation according to figure A-B is to be preferred; reliability and life tests have been based only according to this orientation.
Alternatively, it is possible to choose different orientation angles as shown in figures C-D-E.

FIGURE A

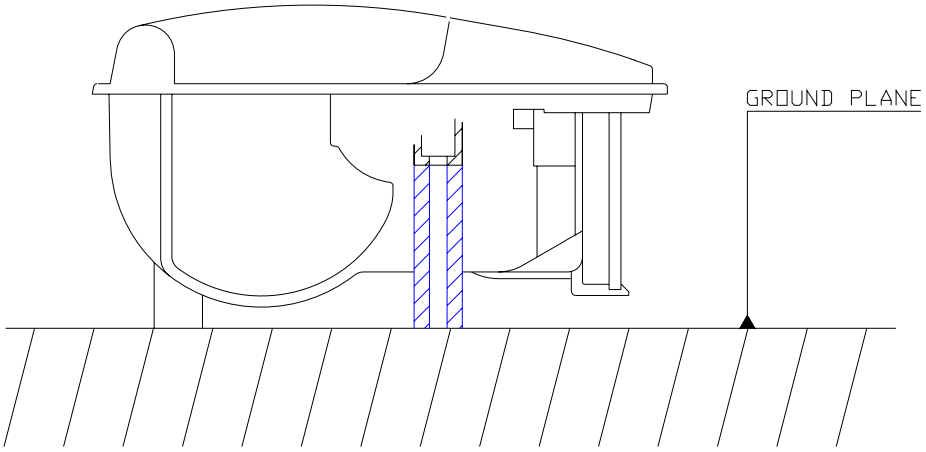
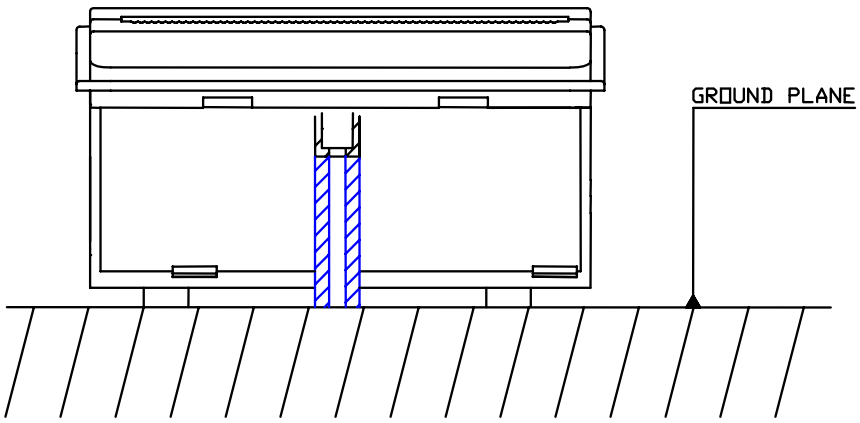
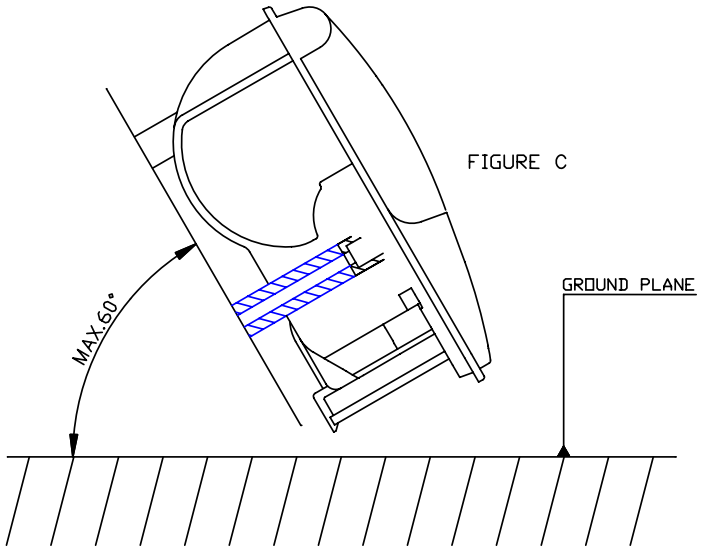
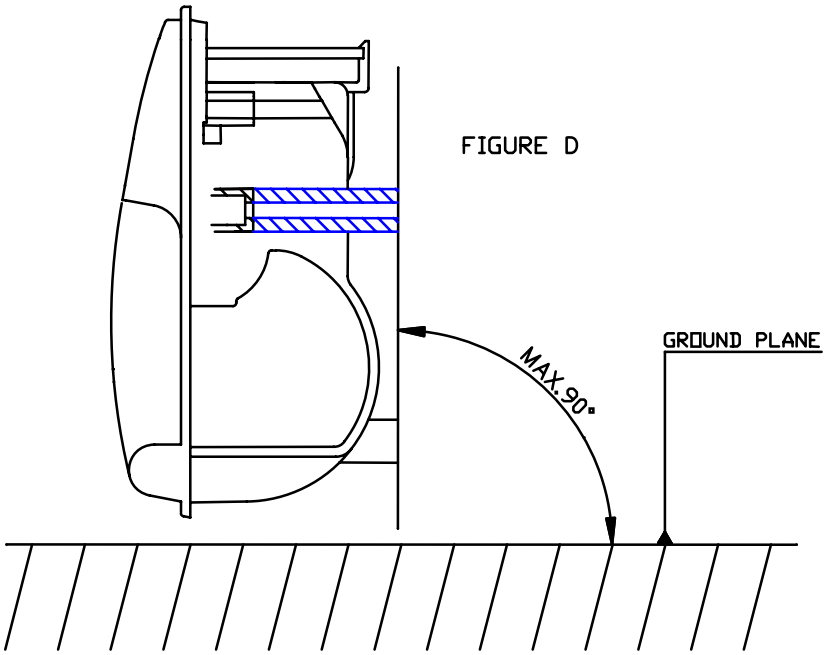


FIGURE B



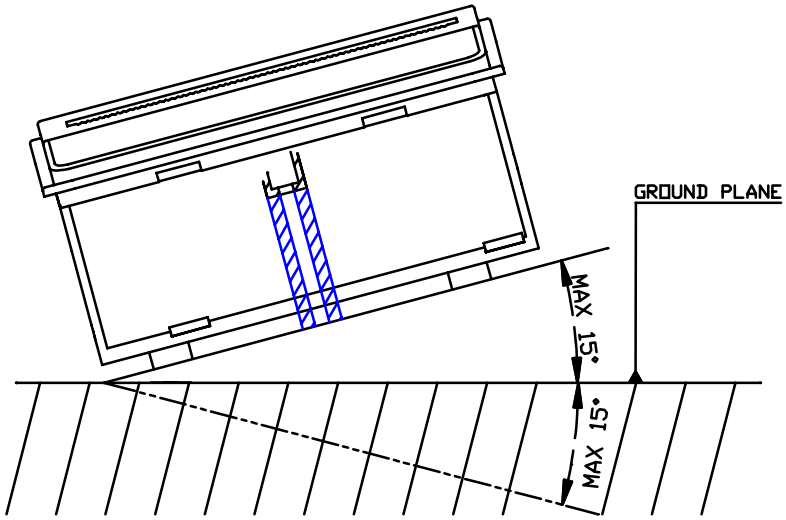
Mounting precautions (continued)





Mounting precautions (continued)

FIGURE E



7. HANDLING THE EPM

7.1 How to open the cover group

Pull the lever until the Cover Group is released from its locking position.
To avoid damages to the lever do not use excessive force.

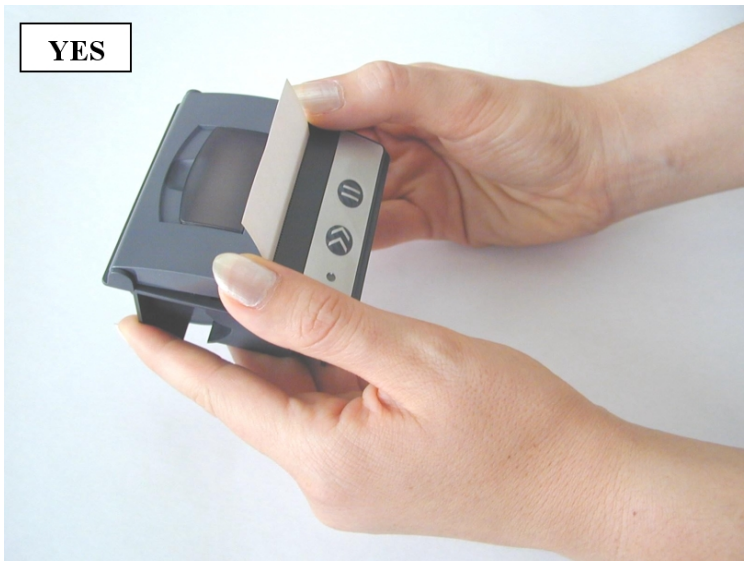
7.2 How to load paper rolls

STEP 1

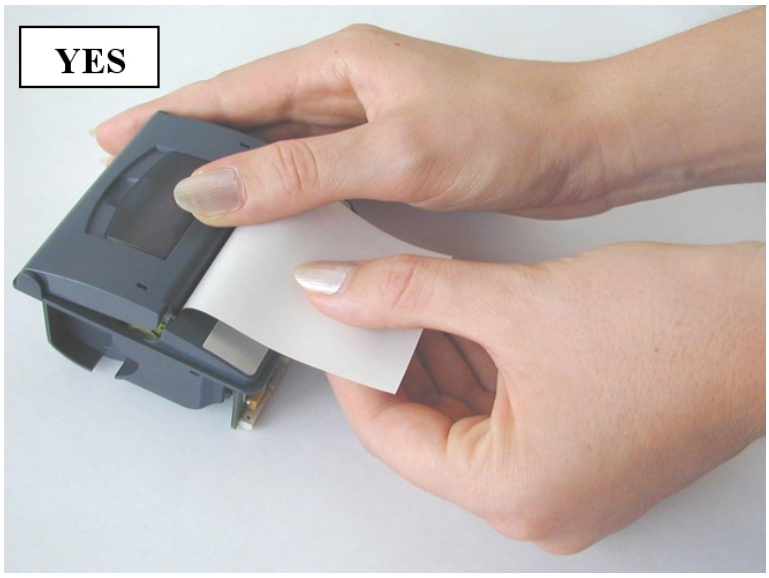
STEP 2

7.3 How to close the Cover Group correctly

Press on both sides of the Cover Group simultaneously.

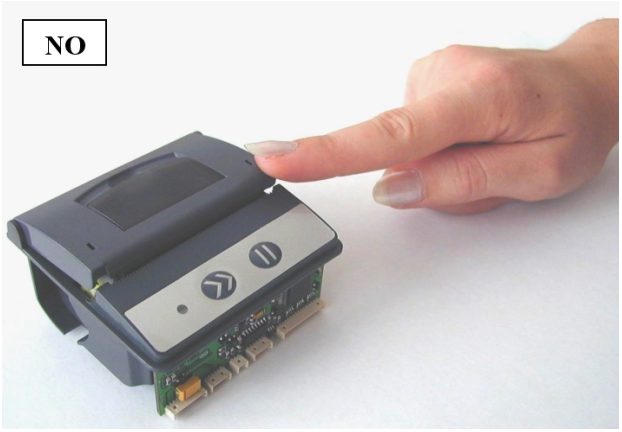


Alternatively:
Press on the middle area of Cover Group, near the paper exit.



How to close the Cover Group (Continued)

Do not close the Cover Group pressing only on one side.



7.4 How to cut the paper correctly

Pull the paper towards the Tear Bar from one side to the other.

8. ORDERING CODE

Type	Ordering code
Standard	**EPM203-MRS**