Multipurpose Controller Board

User's Manual

Reference 3100998 FDE Issue E

February 98

AXIOHM , 1-9 Rue d'Arcueil
BP 675, 92542 Montrouge Cedex, France
Tel : (33) (0) 1 47 46 78 00 Fax : (33) (0) 1 46 55 13 44

1. PREFACE

The AXIOHM controller board has been designed to drive most AXIOHM printers and related accessories (integrated paper cutter, take-up spool, paper presenter...) from the 60 mm to the 115 mm paper width printers. Our single family of controller boards allows the user a single development environment for a variety of printhead resolution and mechanisms. The following is a list of mechanisms that can be used with the controller board.

Mechanism	Paper width	Printer resolution	Number of dots	Voltage required
CLAA	60 mm	2.9 dots/mm	128	24 V
CLBI	60	3.8	192	24
CLBM	60	3.8	192	12
CLDF	60	7.6	384	24
CLDK	60	7.6	384	12
CECC	82.5	4	320	24

Mechanism	Stand by current (mA)	Peak current 100% (A) *	Mean current 25% (A) *	Peak current 25% (A) *	Corresponding speed (cm/s)
CLAA	44	5.12	1.2	1.28	7.2
CLBI	44	8.16	1.4	2.04	7.2
CLBM	85	9.6	2	2.4	3
CLDF	44	13.96	1.2	3.49	6
CLDK	84	24.6	2.3	6.15	5.8
CECC	63	10.38	1.95	2.6	7.2

* at nominal voltage value

Note 1 : 25% can be considered as the necessary duty to print text line.

Note 2 :Graphic speed for all mechanism is 1.7 cm/s

2. GENERAL FEATURES OF THE CONTROLLER BOARD

SUMMARY OF PRINTER SPECIFICATIONS

ITEM	VALUE			UNIT
	min.	tip.	max.	
Operating temperature range standard extended	 0 -40		 +70 +85	 ºC ºC
Operating Voltage range	10	12 or 24	30	V
Printing voltage (12V head)	10			V
Printing voltage (24V head)	19			V
Internal logic voltage		5		V
Current Consumption (24V) : Idle Without head		 50	 0.9	 mA A
Dimensions (without connectors) Width Depth Height		 135 (5.32) 92 (3.62) 30 (1.18)		 mm (inch) mm (inch) mm (inch)
Weight		150		g

This electronic controller board is designed for use with all Axiohm printers. It is available either with Centronics or RS232C interface. It includes :

Paper feed control
Regulation of thermal dot heating time as a function of:
- Temperature of thermal printhead
- Power supply fluctuations

"End of paper" management
Integrated paper cutter control
Control of all options available on Axiohm printers
Logic current (5 V) regulation
Downloadable character set
Various bar-code generators (EAN 8,13, Interleaved 2/5, Monarch...)
Dynamic adjustment of printing speed as a function of power supply.
Printer and paper advance motor pre-heating.

3. CONNECTIONS

Printhead :
Connector J2.1 for 2.9, 3.2, 3.8, 4 dots/mm printheads
Connector J2.2 for 7.6 dots/mm printheads
Only one connector implemented in production depending on the printhead used.
HE10 (see pinout in your printer manual)
Use a flat ribbon cable to connect printer to the controller.

Power:
Connector J8
Molex serial 41 671-4 (female serial 6442 (or 41695 without looking ramp which is UL 94V-0))
Pin 1,2 : Ground
Pin 3,4 : V ch

Centronics Interface:
Connector J15
D Sub 25

RS232 Interface:
Connector J6
D Sub 9

Printer Paper feed motor :
Connector J7
Molex series 6410-4 (female series 6471 (or 2695 without looking ramp which is UL 94V-0))

Printer End of paper detector :
Connector J9
Molex series 6410-3 (female series 6471 (or 2695))

Cutter motor :
Connector J1
Molex series 6410-2 (female series 6471(or 2695))

Cutter position detector :
Connector J10
Molex series 6410-3 (female series 6471(or 2695))

Paper feed/self test connector :
Connector J3
Molex series 6410-2 (female series 6471(or 2695))

Reset connector :
Connector J5
Molex series 6410-2 (female series 6471(or 2695))

Ticket out :
Connector J13
Molex series 6410-3 (female series 6471(or 2695))

Cutter exit (Jam) :
Connector J12
Molex series 6410-3 (female series 6471(or 2695))
Note: Axiohm Inc. recommends using the Honeywell HOA 1404-003 reflective opto

Low Paper :
Connector J11
Molex series 6410-3 (female series 6471(or 2695))
Note: A momentary switch or reflective opto can be used

Door open :
Connector J14
Molex series 6410-3 (female series 6471(or 2695))
Note: A momentary switch or reflective opto can be used

Auxiliary motor :
Connector J4
Molex series 6410-2 (female series 6471(or 2695))
pin 1 : +
pin 2 : Ground

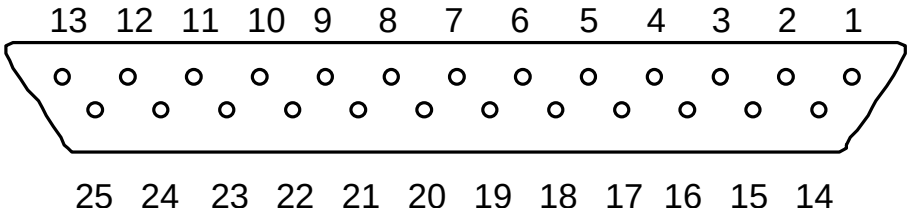
	Reflective opto pin-out		Momentary switch pin-out	
	Pin 1	Collector	Pin 1	first terminal
	Pin 2	Anode	Pin 2	
	Pin 3	Cathode & Emitter	Pin 3	Second terminal

4. CENTRONICS INTERFACE

When using the Centronics interface the connector **J15** (Sub D 25) must be used and all the switches on "Off" position.

4.1. Pin assignment :

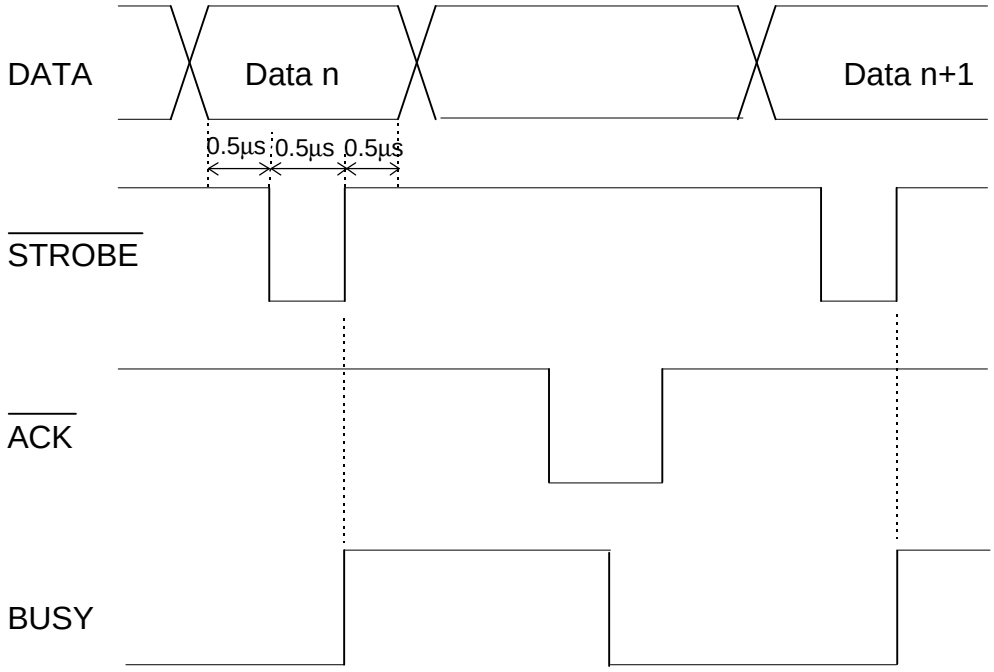
CONNECTOR VIEW



PINOUT

1	Strobe'	10	Ack'	18	Gnd
2	Data bit 0	11	Busv	19	Gnd
3	Data bit 1	12	Paper Out'	20	Gnd
4	Data bit 2	13	Pulled to Vcc	21	Gnd
5	Data bit 3	14	n/c	22	Gnd
6	Data bit 4	15	Pulled to Vcc	23	Gnd
7	Data bit 5	16	Reset'	24	Gnd
8	Data bit 6	17	n/c	25	Gnd
9	Data bit 7				

4.2. Timing diagram



BUSY	This signal sent by the printer controller at high level (1 TTL) indicates the printer is busy and cannot receive characters (either processing character in progress or interruption with the same priority at reception or preheating in progress, or end of paper).
$\overline{\text{STROBE}}$	When this signal goes from 0 to 1, it allows the reading of the data (the data must be stable when this occurs).
END OF PAPER	This signal is high (1 TTL) when the printer is out of paper (no paper present beneath thermal head). Note: Additional information about the status of the printer will be provided along this line. See status
PRIME	Signal to reset the printer. If kept at level 0 for at least 100 µs, initializes printer and resets the buffer to 0.
$\overline{\text{ACK}}$	This signal, sent by the printer controller, from level 1 to 0, indicates the printer has processed the data (or has sent a status on end of paper line).

5. RS 232C INTERFACE

5.1. Dip Switch block for RS232C configuration

SWITCH 1,2,3 : SPEED

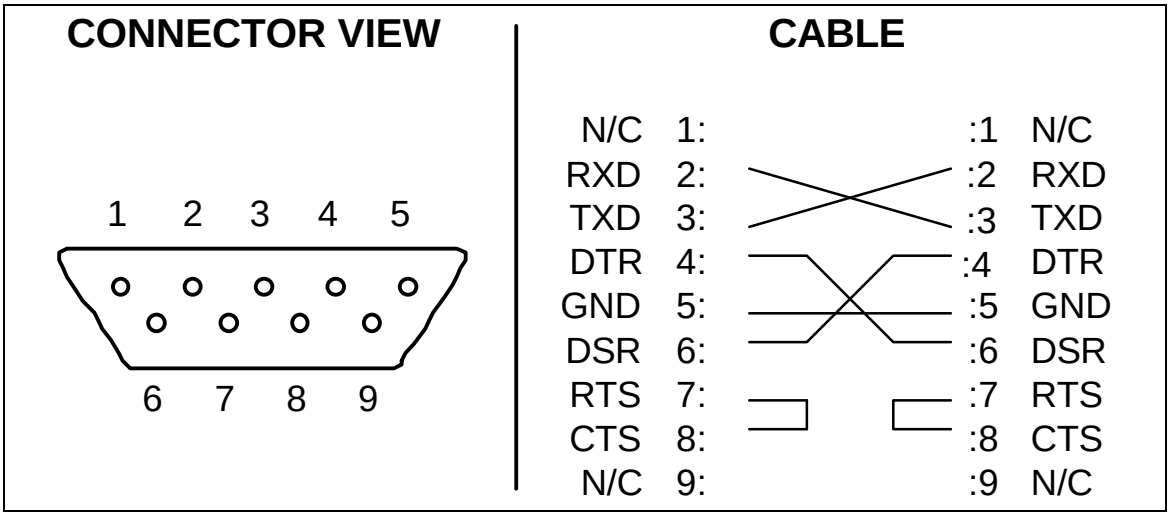
O : Switch ON
F : Switch OFF

SWITCH 1	SWITCH 2	SWITCH 3	SPEED (bauds)
F	O	O	38400
O	F	O	19200
F	F	O	9600
O	O	F	4800
F	O	F	2400
O	F	F	1200
F	F	F	600

SWITCH number	Signification	ON	OFF
4	PARITY	No parity	Parity
5	PARITY TYPE	odd	even
6	STOP BIT	1 stop bit	2 stop bit
7	DATA LENGTH	7 bits	8 bits
8	INTERFACE TYPE	RS232	CENTRONICS

5.2. Connector J6 Pinout (Type D Sub 9 pin)

Pin		Signal	Pin		Signal
1		Not connected	2	In	RXD (Receive data)
3	Out	TXD (Transmit data)	4	Out	DTR
5		Ground	6	In	DSR
7		Not connected	8		Not connected
9		Not connected			



Note : Pins 7 and 8 (RTS, CTS) are not used and not connected on the printer controller board. But they are used on the PC side. Be sure the your cable has a short between pins 7 and 8 on the PC side.

6. SOFTWARE CONTROL CODES

Control codes are non-printable characters or sequences of characters which affect the subsequent operation of the printer.
For your convenience, these are grouped below in logical sets of commands.

Throughout the following descriptions of the commands you will note that two special codes are used to cause the printer to interpret the following byte or bytes as part of a command and not as printable characters. These codes are:

Code	Name	Dec. value	Hex. value	
ESC	Escape	27	1B	General “escape sequence” commands
GS	Graphic Sequence	29	1D	Often used for special graphic commands

The general command syntax is as follows:

Command

(Description)	Name and description of the command.
(Format)	The code sequence to be sent to the printer. <nn> is used to represent the decimal value used for the command. <nnH> is used to represent the hexadecimal value used for the command. <ndata> is the raw data used to create graphics and bar codes.
(Comments)	Additional information such as range allowed for the numbers or default values.

6.1. Print Features

CODE

<09H> Horizontal Tab (HT) : Advances the cursor to the next horizontal tab position (every 8 characters). Ex :

```
12345678901234567890123456789012345678901234567890
        T       T       T       T
abcd›   ef›     ghijklmnopqrs›  tuv
```

<0AH> Call us if you have to use it.

<0BH><nline> Vertical tabulation : Feed <nline> lines and goes to the beginning of the line.

<0DH> Carriage return.

<0EH> Double Width : Selects double width character printing.

<0FH> End of double width.

<10H>	General Font Reset. (clears all the font attributes and download font)

Note 1: after sending <10H>, please wait 1 second before sending new data

Note 2: It is recommended not to use 10H to return the Command Codes to the default values, but instead use the corresponding control codes.
Example: <0FH> to cancel <0EH>.

<12H>	Double Height : Selects double height character printing.
<13H>	End of double height.
<15H>	Underlining : Selects underlined character printing.
<18H>	End of underlined printing.
<1EH>	Inverse Video : Selects white on black printing.
<1FH>	End of Inverse Video.

6.2. Cut Command

<16H>	The reception of "16H" (the paper cut control character) initiates a paper advance (corresponding to the distance between the printed line and the actual paper cut) and then actuates the paper cutter.
ESC'm'	The reception of ESC 'm' command will not initiate a paper advance before the cut operation, and does not back step the paper to the top-of-form after the cut.

Note: not available in side writing mode or immediately after a vertical tab.

6.3. Print Directions

GS'I'<n>	Normal printing if n=0, 180 deg. printing if n=1.
ESC't'<nchar>	Number of characters per side-writing lines. 1<nchar≤45 (default value is 45). The number of lines allowed in side-writing depends on the printer (see appendix 2).
ESC'V'<0>	Side writing mode.

To leave the side writing mode you have to complete the window, meaning, that if the number of lines in the window is 26 and you want to print only two, you will have to send 25 <0DH> commands. It is not possible to print barcodes within a side-writing window, for this you have to use the barcode orientation command.

6.4. Bar Code

GS'A'<n1><n2> — Selects X position of bar code (X>0) :
X=n1*256+n2 (Default value = 64)

GS'w' <mag> — Select horizontal size (magnification) of bar-code
mag = number of dots per thin bar. The ratio between thin and thick bar is 2.
If you need a different ratio use **GS'W'** code.

GS'W' <nthin> <nthick> — Select the width of the thin and thick bar in dots.
(Default value = 1,3)

GS'h'<nheight> — Selects height of bar-code.
height = height in dot lines. 1<N<255. (Default value = 120).

GS't'<under> — Write text under the bar code if under = 1 (available only with vertical bar code).
Do not write if under = 0 (default value).

Note: Command not available in code 128

GS'O'<or> — Bar code orientation.
or = 0 : Vertical bar code (default value).
or = 1 : Side printed bar code (ladder bar code).

GS'k'<type><X><data 1>...<dataN> — Selects a bar-code generator and prints the bar-code.
X = number of characters to be printed.

type	bar-code
<02H>	EAN 13
<03H>	EAN 8
<04H>	Code 39
<06H>	Codabar / Monarch
<07H>	Interleaved 2/5
<08H>	Code 128 A
<09H>	Code 128 B
<0AH>	Code 128 C

You can print any bar-code vertically or horizontally by using the **GS'O'**<or> command. It is not possible to print any information at the end of the bars when you are in ladder bar-code mode.

The printer will only print the character sent, therefore, when using a barcode with check-sum, this information is sent by the user and not calculated by the printer.

6.5. Graphic Printing

<11H> <data1>,....,<data n> — Graphic mode. The following 1 to n^{th} data are 8 bit bitmap data to be printed on a line (n depends on the printhead; n = number of dots of printhead used/8) (See appendix 2).

Note: A file converter is supplied with the Axiohm Inc. Demo Disk that converts from BMP to printable data.

ESC'&'<0><ascii><0><0><data1>...<data N> Download

The resident character set is available to the user for customised graphic printing. This information is stored in RAM, but will be lost with a power failure. This command will download a logo into the location of <ascii> (ascii must be ≥20h) with data 1 to data N graphic bytes. N depends of the resolution of the printhead and the matrix of character used (See appendix 4).

Format :	data k	data k+1	
Most significant bit is 7	00000000,	00000000	
	...		
	00000000,	00000000	(data N)

6.6. Paper Management

ESC 'L' <x> After a one minute time-out, the printer will advance the paper approximately 25 mm to reduce the possibility of a paper jam.
To disable the feature:
<x> = 0 OFF
<x> = 1 ON (default)

Note: The paper can conform to the platen if the printer has been sitting idle for an extended amount of time, thus creating the possibility for a paper jam.

ESC'A' <m> Paper loading management
<m> = 1 Automatically (default)
<m> = 0 Use paper feed connection J3 only
This value will be stored in EEPROM until being replaced.

ESC'J' <nsubline> Forward feeds n sublines (0<n<255) and goes to the beginning of the line.

ESC'B' <nsubline> Backward feeds n sublines 0<n<255.

6.7. Additional and Optional Features

<14H> Reset firmware/board, executed in real time (only during JAM).

Note : after sending <14H>, please wait 1 second before sending new data

ESC'W' Only for RS232 communication. The printer send four digit for firmware version: One number, one dot and two numbers: '2.10'. executed in real time.

ESC'I' Reset buffer, executed in real time.

ESC'Z' Print a self test ticket

GS'%'<p> Set maximum current consumption of printer.
Max Consumption = Imax . (p/100)
Imax = Current needed if all dots on
Ex: CLDF printer : Imax = 14 A
If p = 10 then Max consumption will be 1.4 A
0<p<100
This value will be stored in the EEPROM until being replaced.

GS'!'<heat>

Set the pre-heating of printhead and motor if heat =
1. The pre-heating will start under 10°C.
2. To disable pre-heating.
This value will be stored in the EEPROM until being replaced.

GS'R'<paper>

Set paper sensitivity. This value will be stored in EEPROM until being replaced.
paper = <01H> : High sensitivity
paper = <02H> : Medium sensitivity (default value)
paper = <03H> : Low sensitivity

ESC'R'<nset>

Select the character set of the country. (default value : 0)

nset	Country	nset	Country
<00H>	USA	<06H>	Italy
<01H>	France	<07H>	Spain
<02H>	Germany	<08H>	Japan
<03H>	UK	<09H>	Norway
<04H>	Denmark I	<0AH>	Denmark II
<05H>	Sweden		

GS'K'

Presenter motor advance. The motor will be actioned for 1/3 second each time this code is sent.

Note: Command available only with a presenter.

ESC'C'

Auxiliary motor ON/OFF. The command will first turn the motor ON. The command sent again will turn it OFF.

ESC'D' <set>

set=1 : set the auxiliary motor ON
set=0 : set the auxiliary motor OFF

GS'T'

Unlimited tickets and or ticket size when using the paper presenter (disables ticket out sensor).

GS'S' <sensor> <type>

Warning : Use this code only if you understand it and really need it. This code changes the basic configuration of the board.
SENSORS CONFIGURATION SAVED IN EEPROM
This code allows the user to configure and use the sensors plugs not used by an Axiohm device (not programmed by factory settings). The sensor you add can be checked by the sensor status commands, but does not affect the interpretation status. It means that if you add a cutter exit sensor on J12, you will be able to ask for the sensor status with ESC'v'<3> (RS232) or ESC'p'<11> (Centronics) but the state of the sensor will not change the 'fatal jam' status (ESC'P'<0> for RS232 and ESC'p'<1> for Centronics).

<type> = 1 for a reflective optosensor
<type> = 3 for a switch.

<Sensor>	Sensor plug	description	factory default
<02H>	J10	Cutter Position	3 switch
<03H>	J11	Low paper	1 reflective opto
<04H>	J12	Cutter exit	1 reflective opto
<05H>	J14	Door open	3 switch
<06H>	J13	Presenter exit	1 reflective opto

GS's' <opto> <threshold>

Warning : Use this code only if you understand it and really need it. This code changes the basic configuration of the board.
SENSORS THRESHOLD SAVED IN EEPROM
This code allows the user to configure the threshold of all optos on the board.
More the threshold is up more the distance have to be short between opto and paper.
If you use 255 for threshold the opto threshold will be the factory default.

<Opto>	opto plug	description	<threshold>
<00H>	J14	Door open	0...254
<01H>	J13	Presenter Exit	0...254
<02H>	J12	Cutter exit	0...254
<03H>	J11	Low Paper	0...254
<04H>	J10	Cutter Position	0...254
<05H>	J9	Paper Out	0...254

6.8. Status

The printer status is returned after the reception of the ESC sequence, but it is recommended to delay the polling of the printer as noted below.
Note that you can ask for a sensor status even if the board is not factory programmed for it. (Ex : if the board is not programmed (factory setting) for a door sensor, you can plug a switch on J14 and ask for the sensor status.). You need to program the type of sensor used before plugging it, see **GS'S'** code on previous page.

6.8.1.RS232

Two different types of status are available :

- With Esc'v', the printer returns the status of each sensor. Note that it takes some time for the printer to send the answer (time to poll all the sensors).
- With Esc'P' it returns the interpretation of this status (for instance if the cutter sensor is position low at the end of the cut it will respond “jam”).

In addition Esc 'p' allows the printer to automatically return the status in case of a change on any of the sensors.

ESC'P' Ask for printer status (MSB bit 7, LSB bit 0)

bit number	description	high = 1	low = 0
0	Fatal Jam	jam, printing disabled	OK
1	Presenter output	jam, override with GS'T'	OK
2	End of paper	no paper, printing disabled	OK (switch closed or opto reflection)
3	Low paper	low paper	OK (switch closed or opto reflection)
4	Door open	door is open, printing disabled	door is closed (same as above)
5	Power Failure	power failure/reset	OK
6	Buffer	empty	contains data
7	Not implemented		

Warning : **ESC'P'** and **ESC'v'** do not work the same way. (ex. when low paper is low ESC'P'/bit 3 will be 1 and ESC'v'/bit 2 will be 0)

ESC'v' Ask for sensors status (MSB bit 7, LSB bit 0)
Use a momentary switch, default OPEN.
When using a switch, 1 is sent when the switch is closed **(ESC'v'** only).
When using a opto-sensor, 1 is sent when there is a reflection **(ESC'v'** only).

bit number	sensor type	switch = 1	switch = 0	opto = 1	opto = 0
0	End of paper	paper present	no paper	paper present	no paper
1	Cutter sensor	cut complete	problem	cut complete	problem
2	Low paper	OK	low paper	OK	low paper
3	Cutter exit/ jam	not available		paper present	paper not present
4	Door sensor	door is closed	door is open	door is open	door is closed
5	Presenter output	not available		ticket present	ticket not present
6	Pre-heating	active at 1	disabled	active at 1	disabled
7	Power failure	failure at 1	no failure	failure at 1	no failure

GS’v’ **Same as ESC’v’ but it is not a real time response. If you send many characters and GS’v’, the characters are printed then the printer sends the sensors status.**

ESC'p',<n> Automatic printer status
- n = 0 Default mode. Normal status handling.
- n = 9 The status is return automatically as soon as any changes is detected on the printer status (see ESC'P')
Bits 0 to 5 only.

6.8.2.Centronics

With a standard Centronics line you can only have one status from the printer : 'Paper Out'. With the Axiohm controller board you can have a more detailed status.
The concept is to ask one question to the printer and the answer will be 1 or 0. We have defined a set of questions and answers (see ESC'P' or ESC'p'<n> table below). To answer these questions we use the “Paper Out” line. The line is set to a logic "high" in a positive response to the question asked. After reception of the next byte, (answer acknowledged by the host), the line returns to a logic “low” unless the status is a true “Out of paper”.

The return of the status can be set to :

- Standard mode (default). The 'paper out' line is a standard Centronics line. It will be high only if there is no paper in the printer or if you ask for the status and there is an error. Take a look at the C routine in the toolkit disk to have more information.
- Automatic mode. The line will be activated if any change is detected on the printer status. (Information from ESC'p'<1> to ESC'p'<6> only).
  To activate this mode send ESC 'p' <9>. To disable this mode send ESC 'p' <0>.
  Note that in this mode the 'paper out' signal can be a representation of a true paper out or an error of a sensor. This mode should be activated only if you have a specific software to drive it.

A first “global” request can be sent with ESC'P' (Is the printer OK?). Then, individual questions about the printer can be asked. An 10 µs ACK is generated 1ms after ESC 'P'.

Esc'p' <n> returns the interpretation of this status by asking the response of a particular bit, shown in the table below. (Example, if the Presenter Exit sensor is a logic "low", there is a ticket present at the exit).

ESC'P' Global status request.

ESC'p', <n> Status request.
When using a switch, 1 is sent when the switch is closed.
When using a opto-sensor, 1 is sent when there is a reflection.

n	information	high = 1	low = 0
00H	normal	change to standard status return	
01H	Fatal Jam	jam, printing disabled	OK
02H	Presenter output	jam, override with GS'T'	OK
03H	No paper	no paper, printing disabled	OK
04H	Low paper	low paper	OK
05H	Door open	door is open, printing disabled	door is closed
06H	Power Failure	power failure	OK
07H	Buffer	empty	OK
09H	Automatic	Change to automatic status return	
0AH	Cutter sensor	switch : blades closed	switch : blades open
0BH	Cutter Exit	Ticket present	OK
0CH	Presenter Exit	Ticket present	OK

How to handle the status request under a DOS environment ?
In standard mode (see below), if you just send characters and don't ask for status the printer is fully compatible with Centronics. The “Paper Out” line Is high only when there is no paper. When you ask for the status, the printer will change the “Paper Out” line and during this period, the printer is not fully compatible with Centronics. Usually the DOS layer will not allow you to send a character while the “Paper Out” line is high. To avoid this problem send the characters with BIOS functions and not DOS functions. You can look at the example of this procedure in the toolkit disk.
Note that this is valid only to ask for the status and you can send normal characters with the standard DOS functions. We recommend you to use our 'CHECK STATUS' C function to ask for status.

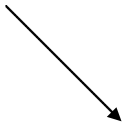
7. SELF TEST ROUTINE

A self-test is invoked by pressing the paper feed button during a reset or power up. On entering the self-test mode, the printer checks its internal hardware and prints a report which will include the following information : (ESC'Z' code can also be used)

7.1. Description and example

- product reference
  (head density, voltage, number of dots per line)
- software version
- character set
  (size of the font, printout a the char set)

Ticket sample



- whether a cutter is fitted or not
- whether a presenter is fitted or not
- out of paper sensor (switch, optosensor or off)
- cutter sensor (switch, optosensor or off)
- door sensor (switch, optosensor or off)
- low paper sensor (switch, optosensor or off)
- optos threshold
  (Do=Door, Ja=presenter exit, Ou=Cutter exit, Np=Paper low, Ct=Cutter position, Ep=End of paper)
- what type of interface is fitted
  (RS232 or Centronics)
- switch settings (only RS 232)
- current setting (set via software)
- pre-heat on or off
- paper sensitivity setting (set via software)

```
-----------------------
PRINTER AXIOHM: 7.6 24V
dots/line           384
-----------------------
Version 2.0


Char set: FONT  16x24
          USA

 !"#$%&'()*+,-./01234567
89:;<=>?@ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]^_`abcdefg
hijklmnopqrstuvwxyz{|}~
ÇüéâäàåçêëèïîìÄÅÉæÆôöòûù
ÿÖÜ¢£¥Pƒáíóúñ№ª º¿ ¬½¼¡«»


 ß    µ          ±    ÷
°•· n²
Ready.


CONFIGURATION

Cutter    : on
Presenter : off
Eop sensor: refl opto
Cut sensor: switch
Door open : off
Nep sensor: off
Opto threshold (hex):
  Do/Ja/Ou/Np/Ct/Ep
  38/28/14/37/64/3C

interface : serial
  9600 n 8 1

I max     : 100 %
Pre heat  : off
Paper temp: normal
```

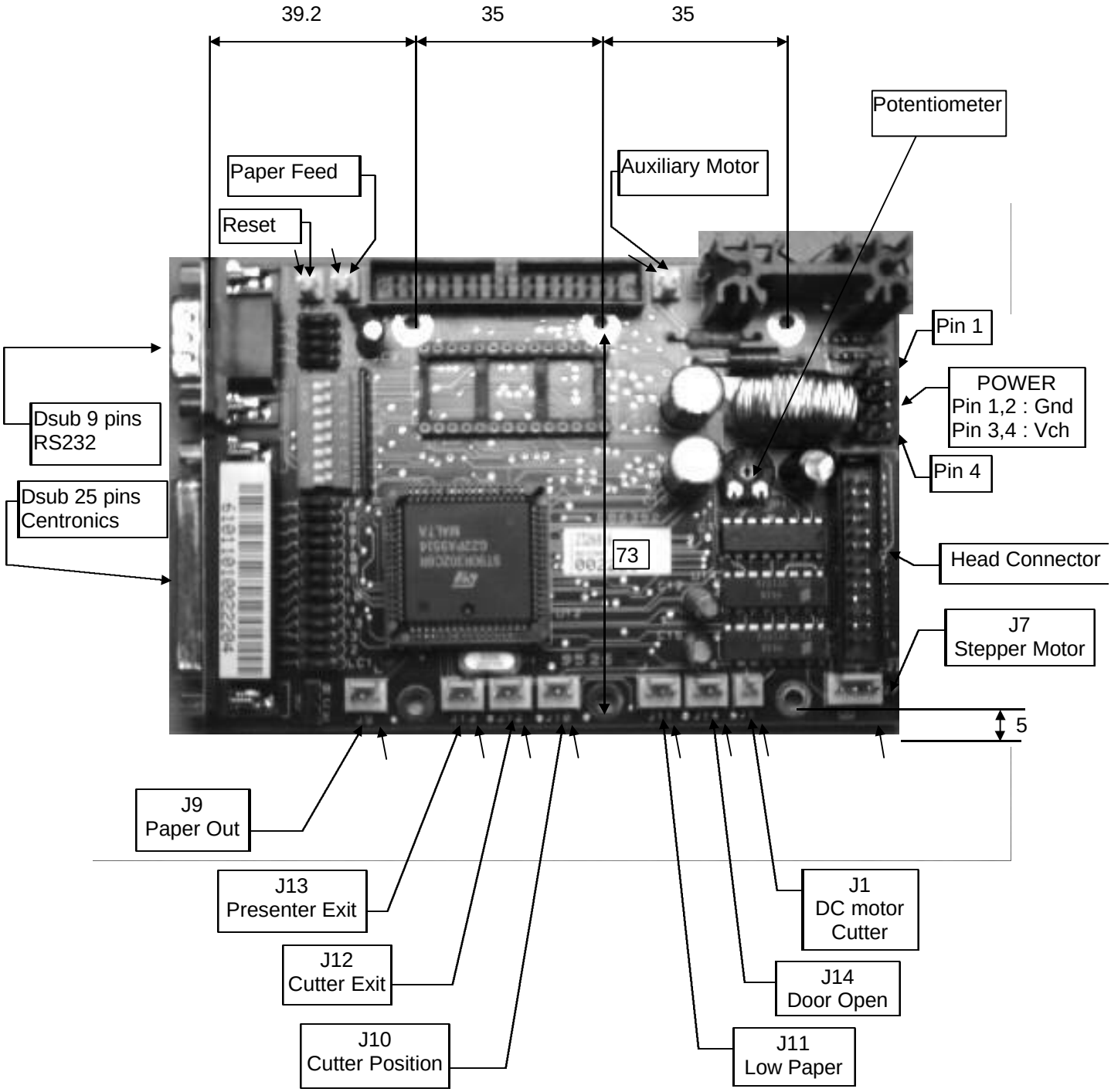
7.2. Print contrast control

The print contrast can be controlled by hardware or software. A potentiometer (r37) is used for hardware control of the heating time or print contrast. To increase the print contrast, rotate the potentiometer anti-clockwise.

APPENDICES

APPENDIX 1

EXTERNAL DIMENSIONS AND MOUNTING HOLES
height = 30mm maximum

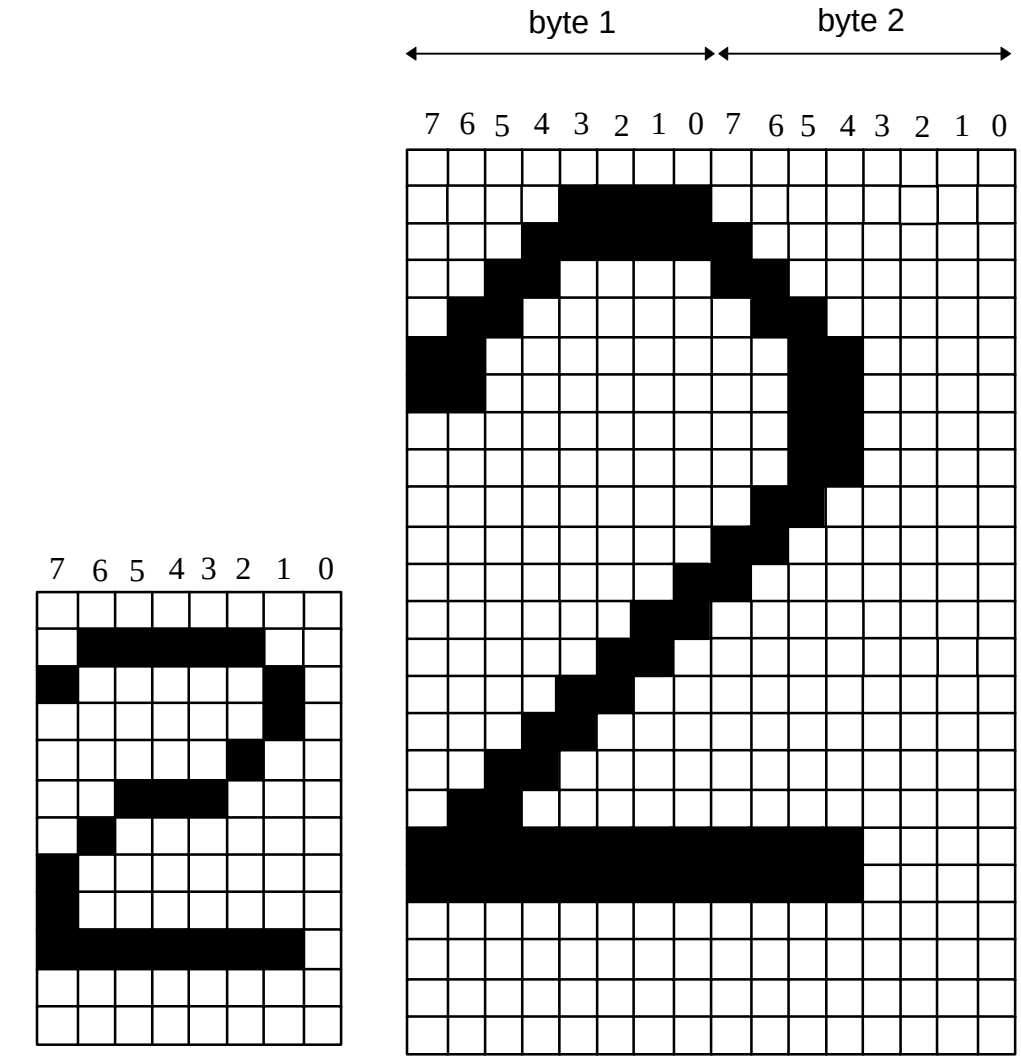


APPENDIX 2

Character matrix used

Mechanism	Printer resolution	Size of character including space width X height	Number of lines allowed in side printing	Value of n when using <11H>	Value of N when using ESC'&'
CLAA	2.9 dots/mm	6x12	10	16	12
CL0B-CLOH	3.2	6x12	13	20	12
CLBI-CLBM	3.8	8x12	16	24	12
CLDF-CLDK	7.6	16x24	16	48	48
CECC	4	8x12	26	40	12
CPEE	6	16x24	26	80	48

Example of character matrices



8 dots x 12 dots matrix 16 dots x 24 dots matrix

Any character of the standard font you used takes place within a matrix 'a' x 'b' which includes the character by itself and the spaces between the lines and characters. Each sublines of character is coded on 1 byte (if a≤8) or 2 bytes (if 8<a≤16). Note that when 'a' is not a multiple of 8 some bits are not considered as a part of the character (this will be important for the downloading function).
EX : in the 6x12 matrix bits 1,0 are not a part of the character matrix.

APPENDIX 3
Character set

Dec	Char	Dec	Char	Dec	Char	Dec	Char	Dec	Char	Dec	Char	Dec	Char
32		64	@	96	`	128	Ç	160	á	192		224	
33	!	65	A	97	a	129	ü	161	í	193		225	ß
34	"	66	B	98	b	130	é	162	ó	194		226	
35	#	67	C	99	c	131	â	163	ú	195		227	
36	$	68	D	100	d	132	ä	164	ñ	196		228	
37	%	69	E	101	e	133	à	165	Ñ	197		229	
38	&	70	F	102	f	134	å	166	ª	198		230	µ
39	'	71	G	103	g	135	ç	167	º	199		231	
40	(	72	H	104	h	136	ê	168	¿	200		232	
41	)	73	I	105	i	137	ë	169		201		233	
42	*	74	j	106	j	138	è	170	¬	202		234	
43	+	75	K	107	k	139	ï	171	½	203		235	
44	,	76	L	108	l	140	î	172	¼	204		236	
45	-	77	M	109	m	141	ì	173	¡	205		237	
46	.	78	N	110	n	142	Ä	174	«	206		238	
47	/	79	O	111	o	143	Å	175	»	207		239	
48	0	80	P	112	p	144	É	176		208		240	
49	1	81	Q	113	q	145	æ	177		209		241	±
50	2	82	R	114	r	146	Æ	178		210		242	
51	3	83	S	115	s	147	ô	179		211		243	
52	4	84	T	116	t	148	ö	180		212		244	
53	5	85	U	117	u	149	ò	181		213		245	
54	6	86	V	118	v	150	û	182		214		246	÷
55	7	87	W	119	w	151	ù	183		215		247	
56	8	88	X	120	x	152	ÿ	184		216		248	°
57	9	89	Y	121	y	153	Ö	185		217		249	·
58	:	90	Z	122	z	154	Ü	186		218		250	·
59	;	91	[	123	{	155	¢	187		219		251	
60	<	92	\	124	|	156	£	188		220		252	
61	=	93	]	125	}	157	¥	189		221		253	²
62	>	94	^	126	~	158		190		222		254	
63	?	95	_	127	•	159	ƒ	191		223		255	

APPENDIX 4

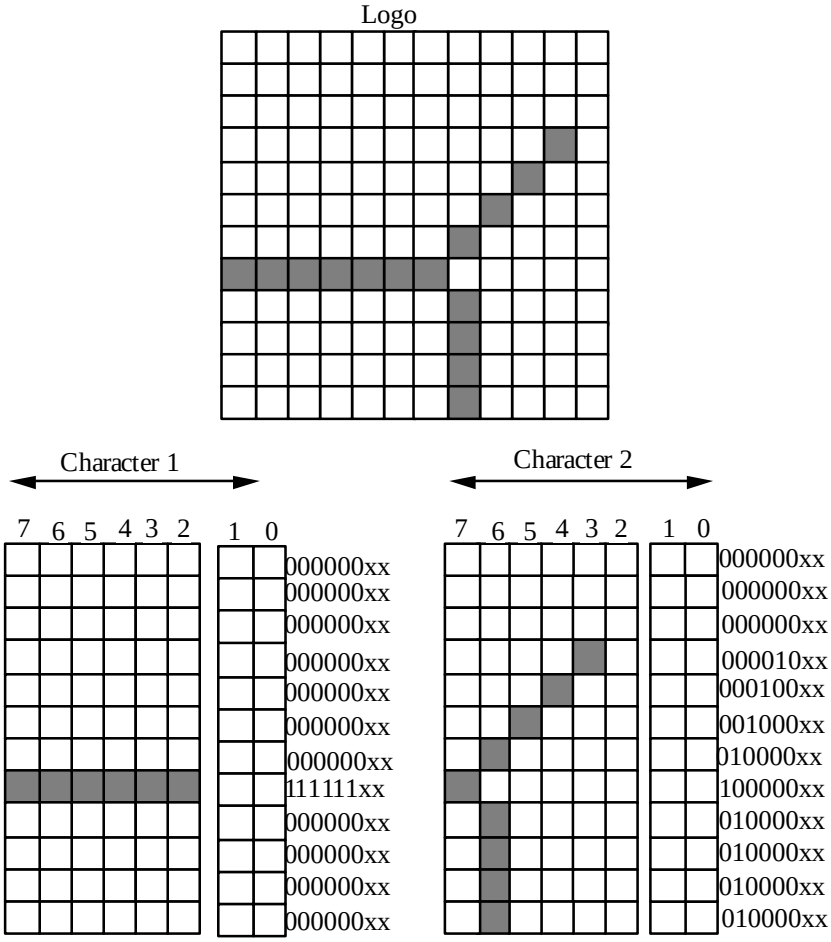
Additional information on control codes

<10H>

This code sets the initial standard character set and the normal printing mode. It clears all downloaded characters or logo.

ESC'&'<0><ascii><0><0><data1>...<data N>

When a character is down loaded, the resident ASCII character is not available until a reset (code <10H>) or a power off.
Make sure to send the appropriate number of data after the downloading code (see Appendix 2).
The full space of the character matrix is available to download your character.
Note: the width of the character matrix is not a multiple of 8 some bits will not be considered.
Example :



To download the above logo with a CLAA printer you have to split the logo in two different characters (because it is greater than the matrix used). Bit 0 and 1 of the byte will not be considered because the matrix used is a 6x12. Download and print each of them separately.

APPENDIX 5

Quick Reference of Control Codes

Hex.	Dec.	Parameter	default value	Description
09	9			Horizontal tab
0B	11	<nline>		Vertical tab of nlines
0D	13			Carriage return
0E	14			Double width
0F	15			End double width
10	16			Reset Buffer
11	17	<data>		Graphic printing
12	18			Double height
13	19			End double height
14	20			Reset Firmware
15	21			Underline
16	22			Paper cut
18	24			End underline
1E	30			Inverse video
1F	31			End inverse video
ESC A		**<m>**	**1 (auto)**	**Paper loading management**
ESC B		<nsublines>		Feeds <nsublines> of paper backwards
ESC C				Auxiliary motor toggle
ESC D		<x>		Auxiliary motor ON(x=1)/OFF(x=0)
ESC I				Reset buffer
ESC J		<nsublines>		Feeds <nsublines> of paper forwards
ESC L		<x>	1	Paper management
ESC m				Special cut operation
ESC p		**<n>**	**0 (default)**	**Detailed printer status (Centronics)**
ESC P				Printer status
ESC R		<nset>	0 (USA)	Select country
ESC s		**<o><t>**		**Change threshold (t=0..255) of opto (0..5)**
ESC t		<nchar>		Number of side writing characters
ESC v				RS232 status
ESC V				Side writing mode
ESC W				Return 4 digits for version (ex :'2.10')
ESC &		...		Download custom fonts
ESC Z				Print a self test ticket
GS A		<n1> <n2>	0 64	Bar code position
GS h		<nheight>	120	Select bar code height
GS I		<n>	0 (normal)	Print orientation
GS k		<type><x> ...		Bar code generator
GS K				Auxiliary motor advance
GS O		<or>	0 (vertical)	Bar code orientation
GS R		**<paper>**	**2 (normal)**	**Select paper sensitivity**
GS S		**<s> <t>**		**Add new sensor**
GS t		<t>	0 (no text)	Select text under bar code
GS T				Unlimited ticket printing
GS v				Same of ESC 'v' but not in real time.
GS w		<nthickness>		Bar code thickness ratio
GS W		<nthin><ntick>	1 3	Barcode thin and thick bar setting
GS %		**<p>**	**100 (100%)**	**Select maximum current consumption**
GS !		**<heat>**	**2 (no)**	**Select pre-heat function**

note : Control codes with parameters stored in EEPROM are in bold.