DRIVER BOARD PDB1754-MKL
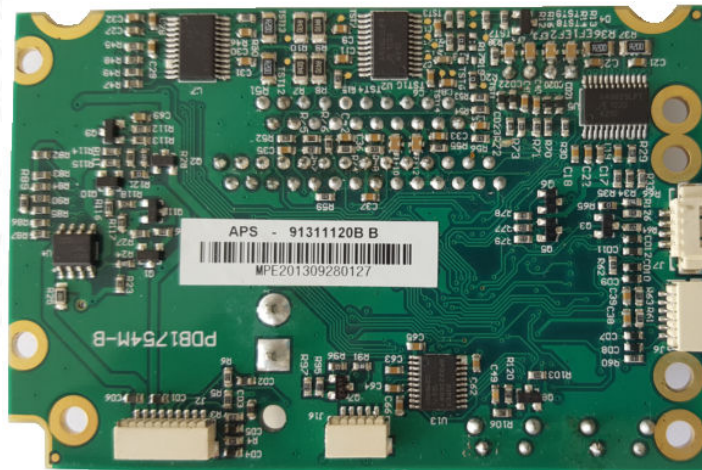
Technical manual

CONTENTS

APS FRANCE - 14 RUE OLIVIER DE SERRES, 49070 BEAUCOUZÉ
SAS au capital de 20 000,00 € - SIRET 85289421100022 – TVA : FR58852894211 – RCS ANGERS

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1. INTRODUCTION

The PDB1754-M(KL) control board is a stand-alone control board primarily targeted at HSP Family and corresponding MKL kiosk mechanisms.

The PDB1754-M control board is able to drive a printer mechanism as well as a presenter mechanism at the same time. RS232 and USB communication interfaces are available in standard.

Additionally, the PDB1754-M control board functionality can be extended thanks to the A.P.S standard extension port, enabling customers to directly drive simple sensors and actuators with little to zero extra electronics.
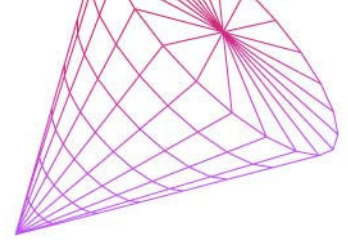
2. GENERAL FEATURES

2.1 CONTROL BOARD FEATURES

- **High printing speed**
- **High resolution printing**
- **Windows, Linux and Android drivers**
- **Wide operating temperature range (-20 to +70°C)**

2.2 CONTROL BOARD INTERCONNECTIONS

- **RS232 communication interface**
    Hardware or software flow control
- **USB communication interface**
    Complies with the *Universal Serial Bus specification Rev. 2.0 (full speed)*
    Self-powered device
    Standard USB Mini-B
- **Near end-of-paper and week-end sensors interface**
    Near end-of-paper sensor indicates when paper roll is nearly empty
    Week-end sensor ensures there is enough paper to work during the whole week-end
- **Chinese font chip**
- **External SPI memory**
- **Standard A.P.S keyboard interface**
    Online/offline switch, paper feed switch and status LED
- **Standard A.P.S extension port**
    24V power
    3.3V power
    User I2C interface or 2 digital IO
    User general purpose IO (2 digital or analog)
- **Exit mouth LED port**
    Can drive up to 8 LED

- **Presenter control interface.**
    Stepper motor control
    Two opto-sensors
- **Printer mechanism interface**
    Compatible with HSP Family
    Automatic detection at power-up, no user configuration required
- **Mechanical chassis closure interface**
    Switch indicates that chassis is securely closed

2.3 Control board software features

- **APS control code compatible**
- **Full control over printing quality/speed**
    User-definable maximum speed
    User-definable printing intensity
    Dynamic division enables user to control maximum current consumption
- **Powerful text printing modes**
    Double, quadruple width and height
    Underlined, inverse video
    90 and 180° rotated printing
    ...
- **Powerful graphic modes**
    Double, quadruple height
    Raster graphics printing
- **Barcode support**
    Support for UPC-A, UPC-E, EAN13, EAN8, CODE39, ITF, CODABAR, CODE128, PDF417
- **QR barcode printing**
- **Print preloaded ticket**
- **Easy firmware upgrades**
- **Easy font upgrades**
- **Easy ticket upgrades**
- **Low-power consumption mode available**
- **Windows driver available**
- **Linux driver available**
- **Android driver available**

3. REVISION HISTORY

Revision	Date	Page	Revision item	Author
Preliminary	23/02/2017		First released	PS
A	29/05/2020		Official issue	PS

Table 1

4. GENERAL SPECIFICATIONS

Item	Specification
Voltage range (V)	From 11V to 27V
Current consumption (A) (*)	From 1 to 7, 3.5 typical
Operating temperature (°C) (**)	From −20 to +70
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

(*) Dynamic current consumption can be programmed through the use of firmware commands.

(**) Extended temperature and humidity ranges information is available from APS upon request.
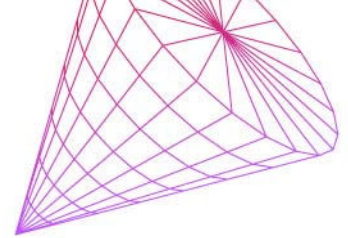
5. PRINTER DEVICE INTERCONNECTIONS
5.1 INTERCONNECTIONS SUMMARY

APS FRANCE - 14 RUE OLIVIER DE SERRES, 49070 BEAUCOUZÉ
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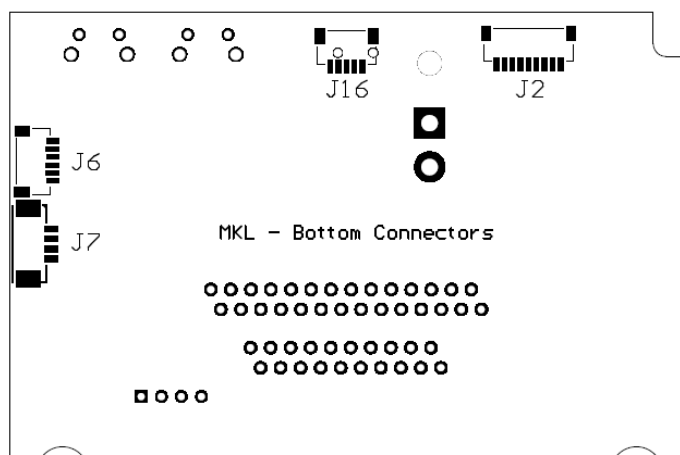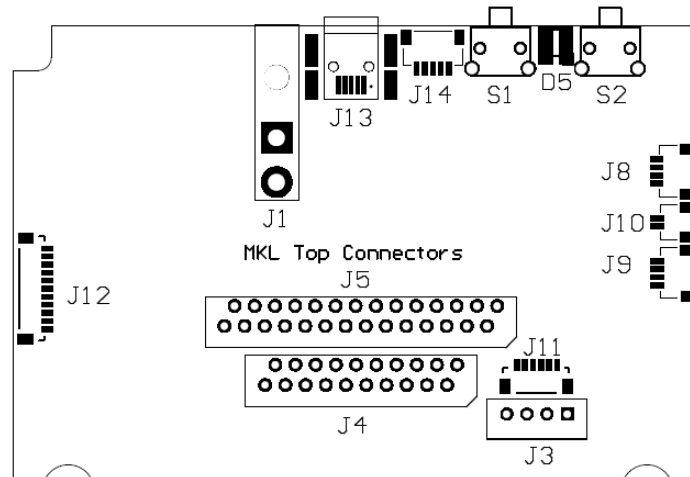
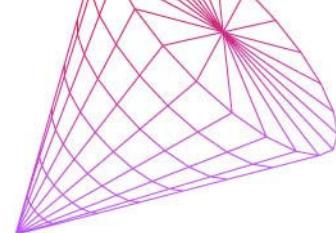| Reference	Location	Type	Description	Page
J2	Bottom	CHYAOSHIUNN JS-1254R-09	APS Extension port	11
J1	Top	CHYAOSHIUNN JS-1153-02 Or MOLEX 0039300020	Power supply	6
J16	Bottom	CHYAOSHIUNN JS-1254R-05	USB interface 1	7
J14	Top	CHYAOSHIUNN JS-1254R-05	RS232 interface	7
J3	Top	CHYAOSHIUNN JS-1135-04	Presenter motor	15
J11	Top	CHYAOSHIUNN JS-1254R-06	Presenter sensors	15
J8	Top	CHYAOSHIUNN JS-1254R-04	APS Keyboard port 1	8
J4	Top	FPC connector	Printer signals and motors	14
J5	Top	FPC connector	Printer TPH	13
J7	Bottom	CHYAOSHIUNN JS-1147H-04	Exit mouth LED	16
J9	Top	CHYAOSHIUNN JS-1254R-04	APS Keyboard port 2	8
J6	Bottom	CHYAOSHIUNN JS-1254R-06	Near-end and week-end opto-sensors	10
J10	Top	CHYAOSHIUNN JS-1254R-02	Mechanical chassis switch	17
J13	Top	Mini USB	USB interface 2	7
J12	Top	CHYAOSHIUNN JS-1254R-11	JTAG connector (production use only)	

5.2 INTERCONNECTIONS DETAILS

5.2.1 POWER SUPPLY CONNECTOR

The PDB1754 control board runs on a single 24V power supply input.
Current consumption while printing is configurable *via* software escape commands.

Pin	Signal	Direction	Description
1	VIN	Power	24V supply input
2	GND	Ground	Supply ground

Parameter	Symbol	Min.	Typ.	Max.	Unit
Power supply input voltage	VIN	11	24	27	V
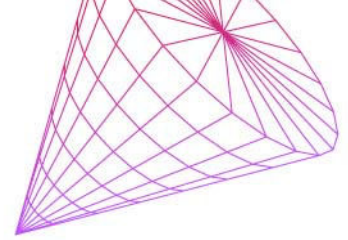
5.2.2. USB INTERFACE

The PDB1754-M control board offers a standard USB communication interface.
Additionally, one LED is provided to visually monitor the USB interface.

USB Mini-B

Pin	Signal	Direction	Description
1	VBUS	Power	USB bus 5V power
2	D-	I/O	Differential data signal
3	D+	I/O	Differential data signal
4	ID		Unconnected
5	GND	Ground	USB bus ground

USB Molex

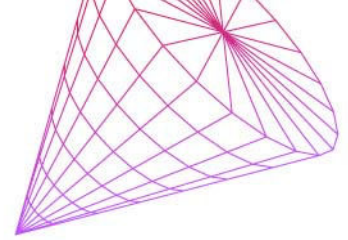| Pin	Signal	Direction	Description
1	VBUS	Power	USB bus 5V power
2	D-	I/O	Differential data signal
3	D+	I/O	Differential data signal
4	GND	Ground	USB bus ground
5	GND	Ground	USB bus ground

The USB LED indicates the state of the USB communication interface:

- LED is off when no cable is plugged and/or the HOST is not alive.
- LED quickly blinks when a cable is plugged in (during enumeration phase), then remains on.
- LED blinks when there is activity on the USB communication link.

5.2.3 RS232 INTERFACE

The PDB1754 control board offers a standard RS232 serial communication interface.
This interface uses RS232 signal levels (+/- 12V).

Pin	Signal	Direction	Description
1	GND	Ground	Serial ground
2	TXD	Output	Serial transmit data
3	RXD	Input	Serial receive data
4	CTS / DSR	Input	Clear to send handshaking signal
5	RTS / DTR	Output	Ready to send handshaking signal

Parameter	Symbol	Min.	Typ.	Max.	Unit
HIGH level input threshold	V_{IH}(RS232)		1.5	2.4	V
LOW level input threshold	V_{IL}(RS232)	0.6	1.2		V
HIGH level output voltage	V_{OH}(RS232)	5	5.4		V
LOW level output voltage	V_{OL}(RS232)		-5.4	-5	V

5.2.4 EXTERNAL FLASH MEMORY

The PDB1754-M is fitted with a 4 Mbit flash memory chip that is available for storing user defined graphic images such as graphical logos.

5.2.5 GB2312 CHARACTER SET SUPPORT

The PDB1754-M provides support for printing the characters defined by the GB2312 standard.

5.2.6 QR BARCODE SUPPORT

Provided is support for level encodings L, M, Q, H. Maximum encoded data length is 250 bytes.

5.2.7 A.P.S KEYBOARD PORTS

The standard A.P.S keyboard gathers user buttons and status LED.
Two standard A.P.S keyboard ports are provided on the PDB1754 control board. Ports are available on opposite sides of the board for convenience. The two ports are wired in parallel and have the same pinout.

Switches are normally open, and connect signal to ground when closed.
Internal pull-up resistors are provided on the PDB1754 control board.
During normal board operation, pressing paper feed switch triggers a paper feed sequence.
During normal board operation, pressing ON/OFF line switch continuously during more 3s triggers a hardware reset.
During power up, pressing paper feed switch triggers a self-test sequence.

The PDB1754 control board integrates a current limiting resistor for status LED to minimize external components count.

Pin	Signal	Direction	Description
1	GND	Ground	Ground
2	OFFLINE_SW	Input	ON/OFF line switch
3	FEED_SW	Input	Paper feed switch
4	SYS_LED	Output	Status LED
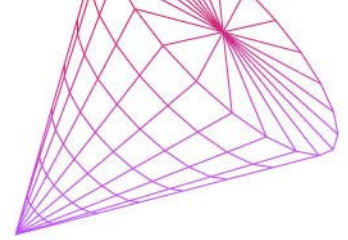
Parameter	Symbol	Min.	Typ.	Max.	Unit
Status LED current (V_F=2V)	I_{LED}		10		mA
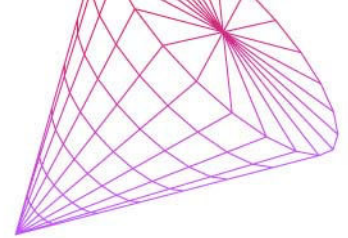
These connectors enable the user to design a remote interface including paper feed, online/offline buttons and status LED.

External circuitry is as follows.

Pin 1 - GND

Pin 2 - ON/OFF Line

Pin 3 - Paper Feed
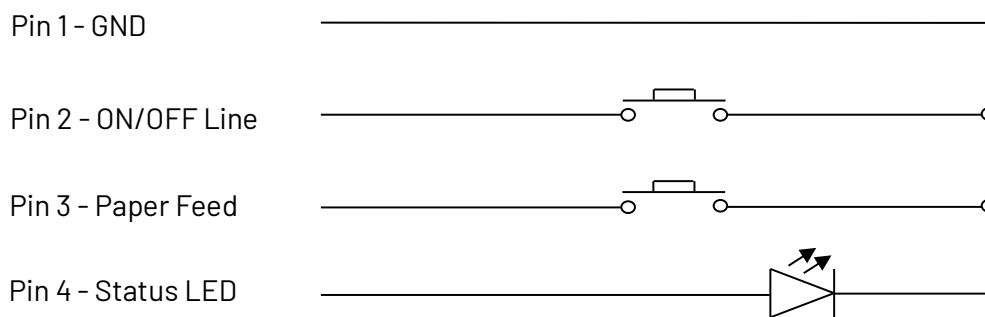
Pin 4 - Status LED

Status LED indicates the current state of the board.

Board state	LED blink pattern
Online	Always ON
Offline or self-test mode	One flash
Paper stop – printer head up or cover is open	Two flashes
Paper stop – end of paper	Three flashes
Error condition detected	Continuous blinking
Monitor mode	Fast blinking

5.2.8 NEAR END-OF-PAPER AND WEEK-END SENSORS

The PDB1754-M control board provides an interface for near end-of-paper and week-end sensors.

Both sensors are used to monitor current stock of paper in printer.
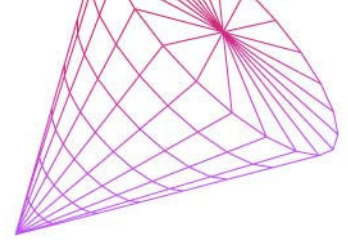Near end-of-paper triggers when paper roll is nearly empty.
Week-end operates in the same way; however physical position of the sensor is set so as to guarantee maintenance-free operation during a whole week-end.

Week-end sensor should be placed farther from the paper roll axis than the near end-of-paper sensor.

The PDB1754-M control board integrates a 10K resistor pull-up on opto-sensor collector signals.
The PDB1754-M control board integrates a current limiting resistor for opto-sensor LED to minimize external components count.

Pin	Signal	Direction	Description
1	NEOP_LED	Output	NEOP opto-sensor LED anode
2	NEOP_OPTO	Input	NEOP opto-sensor collector output
3	GND	Ground	Ground
4	GND	Ground	Ground
5	WEOP_OPTO	Input	Week-end opto-sensor collector output
6	WEOP_LED	Output	Week-end opto-sensor LED anode

Parameter	Symbol	Min.	Typ.	Max.	Unit
Sensor LED current (V_F=1.2V)	I_{LED}		10		mA
Sensor HIGH level input voltage	V_{IH}	2.31		3.3	V
Sensor LOW level input voltage	V_{IL}	0		1.15	V

Here is a simplified schematic of the electronics driving the NEOP sensor on the PDB1754-M control board:
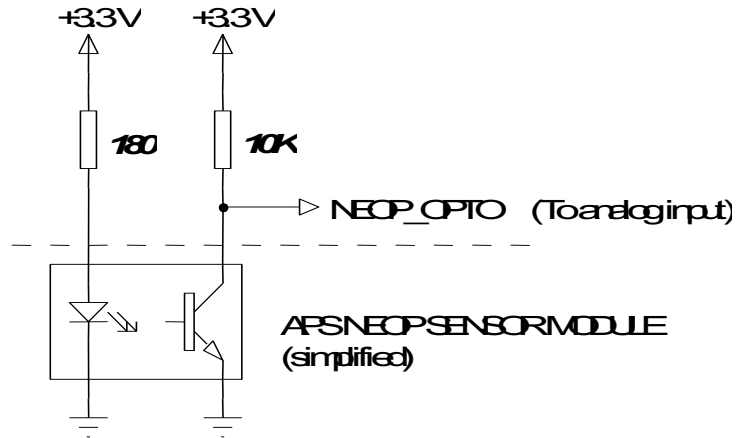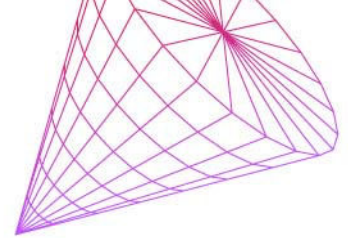

A similar schematic is used to drive the week-end sensor (WEOP).

5.2.9 A.P.S EXTENSION PORT

The standard A.P.S extension connector makes it easy to customize the printer. It enables user to monitor external digital or analog sensors and to drive simple actuators.

The PDB1754-M integrates 4K7 pull-up resistors on SCL and SDA I2C signals.

Pin	Signal	Direction	Description
1	VIN	Power	24V supply
2	VIN	Power	24V supply
3	VL	Power	3.3V supply
4	GND	Ground	Supply ground
5	GND	Ground	Supply ground
6	SCL/GPIO3	I/O	I2C SCL signal or user digital GPIO (internal 4K7 pull-up)
7	SDA/GPIO2	I/O	I2C SDA signal or user digital GPIO (internal 4K7 pull-up)
8	GPIO1	I/O	User digital GPIO or analog input
9	GPIO0	I/O	User digital GPIO or analog input

Parameter	Symbol	Min.	Typ.	Max.	Unit
HIGH level input voltage	V_{IH}	2.31		3.3	V
LOW level input voltage	V_{IL}	0		1.15	V
HIGH level output voltage	V_{OH}	2.8		3.3	V
LOW level output voltage	V_{OL}	0		0.5	V
Analog input voltage	V_{ANA}	0	-	3.3	V
Maximum total current for all GPIO pins	I_{OT}			20	mA
Maximum current per 24V power pin	I_{IN}			1	A
Maximum current per 3.3V power pin	I_L			100	mA

Application notes are available from A.P.S for expansion and integration examples.

Additionally A.P.S can be contacted for specific firmware developments to tune the extension port to specific customer applications.
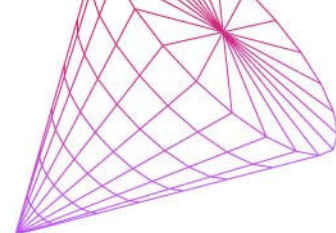
5.2.10 PRINTER TPH

The printer TPH connector is compatible with HSP Family mechanisms.

Pin	Signal	Direction	Description
28	VH	Power	Head power voltage
27	VH	Power	Head power voltage
26	VH	Power	Head power voltage
25	VH	Power	Head power voltage
24	DO1	Output	TPH shift register 1 data out (dots 385 to 640)
23	DI1	Input	TPH shift register 1 data in (dots 385 to 640)
22	GND	Ground	Power/logic ground
21	GND	Ground	Power/logic ground
20	GND	Ground	Power/logic ground
19	GND	Ground	Power/logic ground
18	GND	Ground	Power/logic ground
17	STB1	Input	TPH strobe (dots 385 to 640)
16	CLK	Input	TPH shift registers clock
15	/LA	Input	TPH shift registers latch
14	VDD	Power	Logic power voltage
13	TM	N/A	Thermistor pole
12	TM	N/A	Thermistor pole
11	STB2	Input	TPH strobe (dots 1 to 384)
10	GND	Ground	Power/logic ground
9	GND	Ground	Power/logic ground
8	GND	Ground	Power/logic ground
7	GND	Ground	Power/logic ground
6	DO2	Output	TPH shift register 2 data out (dots 1 to 384)
5	DI2	Input	TPH shift register 2 data in (dots 1 to 384)
4	VH	Power	Head power voltage
3	VH	Power	Head power voltage
2	VH	Power	Head power voltage
1	VH	Power	Head power voltage

Note: Pinout of this connector is reversed compared to pinout of the mechanism connector.

Supporting tapes of both ends of the FFC should be placed on the same side of the cable.
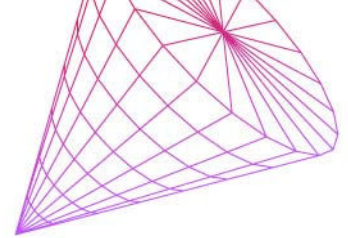
5.2.11 PRINTER SIGNALS AND MOTORS

The printer signals and motors connector is compatible with HSP Family mechanisms.

Pin	Signal	Direction	Description
20	CUT4	N/A	Cutter stepper motor phase 4
19	CUT3	N/A	Cutter stepper motor phase 3
18	CUT2	N/A	Cutter stepper motor phase 2
17	CUT1	N/A	Cutter stepper motor phase 1
16	GND	Ground	Signals ground
15	GND	Ground	Signals ground
14	CUT_SW	Output	Cutter home switch (other pole tied to ground)
13	HUP_SW	Output	Head-up switch (other pole tied to ground)
12	GND	Ground	Signals ground
11	GND	Ground	Signals ground
10	SM1	N/A	Roller stepper motor phase 1
9	SM2	N/A	Roller stepper motor phase 2
8	SM3	N/A	Roller stepper motor phase 3
7	SM4	N/A	Roller stepper motor phase 4
6	GND	Ground	Signals ground
5	GND	Ground	Signals ground
4	EOP_VF	Input	End-of-paper opto LED anode
3	EOP_CO	Output	End-of-paper opto collector output
2	MRK_VF	Input	Mark detection opto LED anode
1	MRK_CO	Output	Mark detection opto collector output

Note: Pinout of this connector is reversed compared to pinout of the mechanism connector.

Supporting tapes of both ends of the FFC should be placed on the same side of the cable.
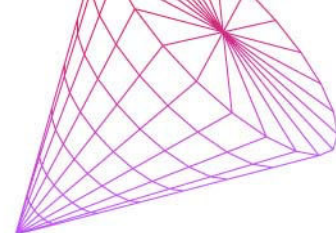
5.2.12 PRESENTER MOTOR AND SENSORS

The PDB1754 board is able to directly drive a presenter mechanism.
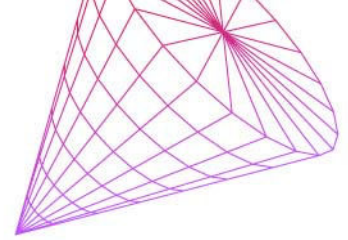The presenter mechanism is made of a stepper motor and up to two exit sensors (opto-sensors).

Below is the pinout of the presenter stepper motor connector.

Pin	Signal	Direction	Description
1	PRE1	N/A	Presenter stepper motor phase 1
2	PRE2	N/A	Presenter stepper motor phase 2
3	PRE3	N/A	Presenter stepper motor phase 3
4	PRE4	N/A	Presenter stepper motor phase 4

Below is the pinout of the presenter sensors connector.

Pin	Signal	Direction	Description
1	PRE_LED1	Output	Presenter exit 1 opto-sensor LED anode
2	PRE_OPTO1	Input	Presenter exit 1 opto-sensor collector output
3	GND	Ground	Ground
4	GND	Ground	Ground
5	PRE_OPTO2	Input	Presenter exit 2 opto-sensor collector output
6	PRE_LED2	Output	Presenter exit 2 opto-sensor LED anode

Parameter	Symbol	Min.	Typ.	Max.	Unit
Sensor LED current (V_F=1.2V)	I_{LED}		10		mA
Sensor HIGH level input voltage	V_{IH}	*TBD*		3.3	V
Sensor LOW level input voltage	V_{IL}	0		*TBD*	V

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5.2.13 EXIT MOUTH LED

The PDB1754 board can be connected to a series of LED placed at the exit of the presenter mechanism.

The exit mouth LED interface is able to drive up to 8 LED in series.
Current is internally limited on the PDB1754 control board using a 470R resistor.

Pin	Signal	Direction	Description
1	VIN	Power	24V supply power
2	LEDSW	N/A	LED cathode input, switched to ground
3	MOUTH_LED	Output	Optional opportunity to drive additional LED
4	GND	Ground	Ground

| Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	VIN	21.6	24	26.4	V
LED switch current [*]	I_{LEDSW}			50	mA
Output	MOUTH_LED		3.3		V

[*] LED switch current depends on the number of LED connected in series to the exit mouth connector.
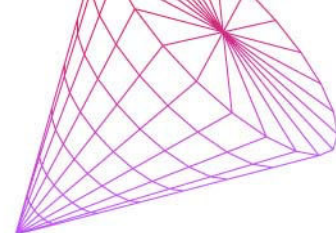
Use the following equation to compute the typical current I_{LEDSW} with *n* LED connected in series (forward voltage of each LED is V_F).

$$I_{LEDSW} = \frac{VIN - n \cdot V_F}{470R}$$

With a typical V_F of 2.0V (green color LED), I_{LEDSW} is about 17mA for 8 LED in series at VIN=24V.
The connector to drive these LED must be placed on PIN1 and PIN2 of J7, PIN3 and PIN4 are only to drive additional LED whose schematic is shown below.

Schematic model to drive additional LED.
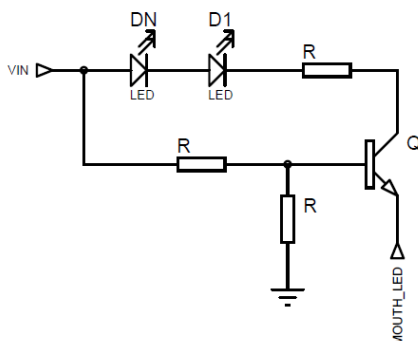
5.2.14 MECHANICAL CHASSIS SWITCH

The mechanical chassis switch is used to check that the chassis of kiosk mechanisms is securely closed and that printing operation can safely take place.

Switch is normally open, and connect signal to ground when closed.
Internal pull-up resistor is provided on the PDB1754 control board.

Pin	Signal	Direction	Description
1	GND	Ground	Ground
2	CHASSIS_SW	Input	Mechanical chassis switch
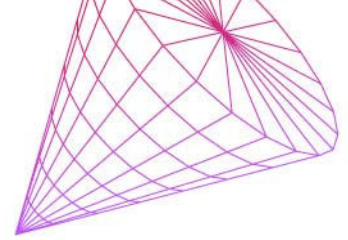
6. CONTROL BOARD OPERATIONS
6.1 SELF-TEST MODE

As soon as printer is powered on, a self-test can be run at any time by making following switches sequence (in less of 5s):

Push on "ON/OFF Line" button and stay pressed on it

then

Push twice on "Paper Feed" button

In this mode, the board prints a ticket containing board name and main features, A.P.S code, firmware revision, communication settings and finally all internal character sets (2 character sets by default).

The board reverts to default state once self-test printing is over.
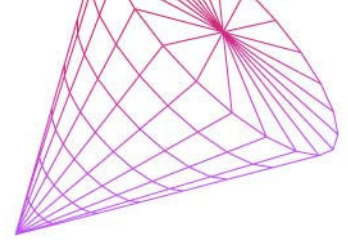
6.2 OPERATING CONTROL CODES

The PDB1754-M control board is APS code compatible and understands most commands of the APS commands set.

Additional commands are provided for a better control of final printing quality (for example, printing intensity setting or programming of max. current consumption). These commands are specific to A.P.S printers.
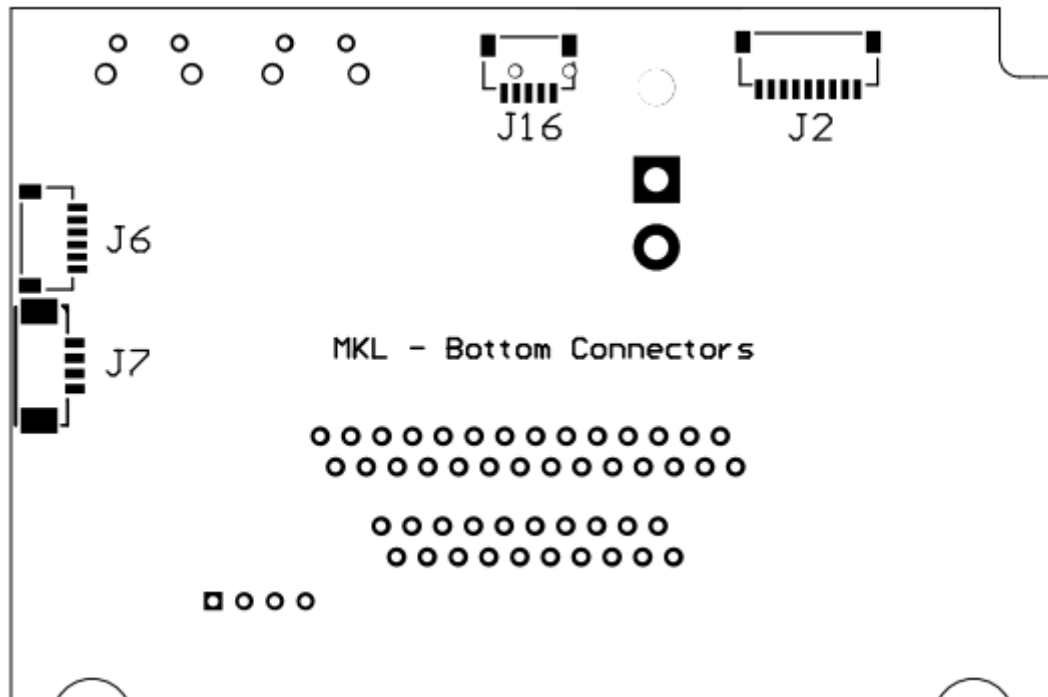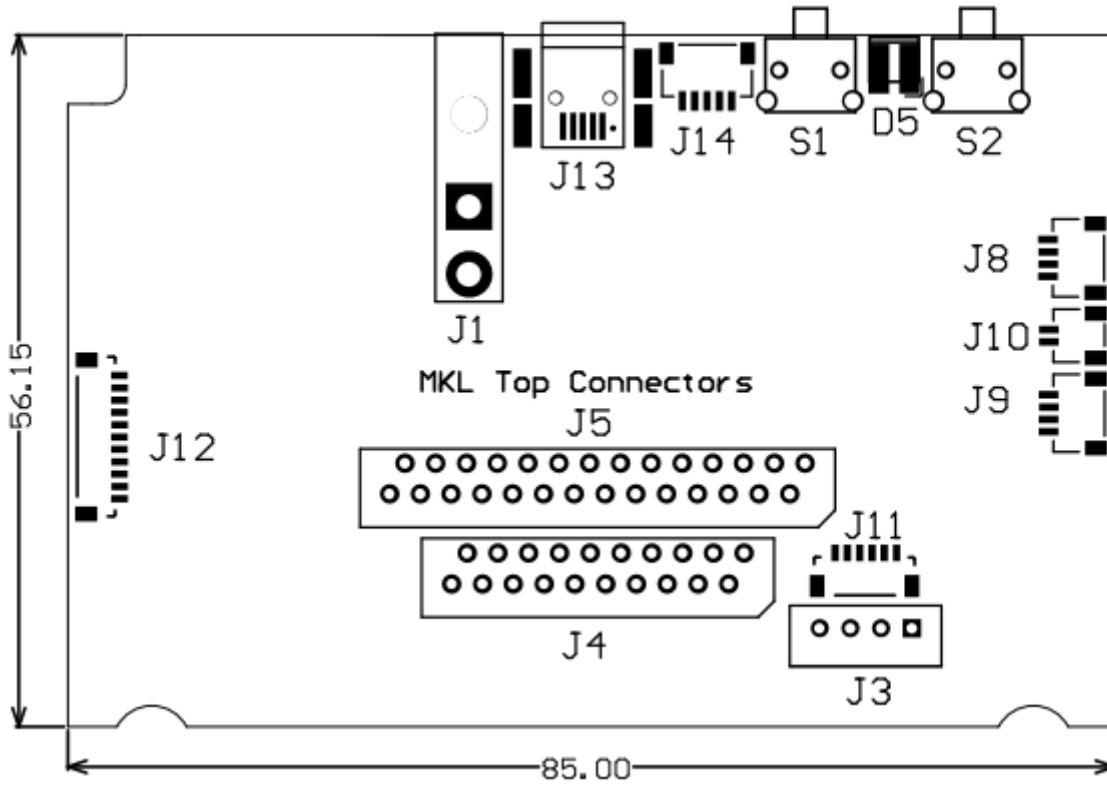
Please refer to the **PDB1754-MKL printers programming manual** for more information.
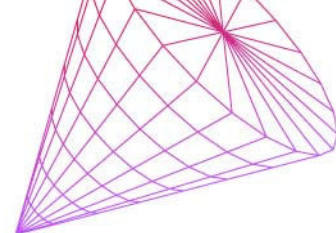
7. OPERATING PRECAUTIONS

1) Do not touch the connector pins with naked hands.
2) Do not excessively bend the control board during assembly.

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8. MECHANICAL DRAWING

MKL Top Connectors

MKL – Bottom Connectors

10. ORDERING CODE

PRODUCT NAME	ORDERING CODE
DRIVER BOARD PDB1754MKL 12-24 V	**91 311 120**

11. ADDITIONAL ACCESSORIES

PRODUCT NAME	ORDERING CODE	DESCRIPTION
FFC 20 pins 150mm x HSP	**20410114**	FFC CABLE
FFC 28 pins 170mm x HSP	**20410115**	FFC CABLE
CABLE USB	**91301317**	USB-A(PC) to USB-MINI interface cable
CABLE RS232	**91301334**	Cable RS232 Serial interface cable (L=200 mm JST 5 pins 1mm pitch only on one side)
POWER CABLE	**91301320**	POWER SUPPLY CABLE