HSA SYSTEMS

A UNIQUE IMPRINT

CB6e Installation manual

For PACKAGING

About this document

Users of this manual

This manual is designed to help the reader to install and operate the HSAJET Controller Board CB6e (hereafter: CB6). It assumes that the reader has a fundamental understanding of basic computer knowledge.

Related documents

In addition to this manual, you are also suggested to read the following manuals:

Reference about I/O connections for soldering of encoder / start cables	CB6e io manual	1.0
INKdraw reference manual: complete guide to INKdraw.	CB Inkdraw manual	2012-03-27
CB Board communication reference: network commands for remote control	obj inkdraw network commands	2012

Warning

The CB6 uses RJ45 connectors and sockets. Do NOT confuse these with standard network connectors for the PC. You will possibly destroy the controller if you connect networking equipment to CB6 outputs.

Do NOT connect or disconnect ANY cables on the CB6 controller with power on the system. Always disconnect power completely before you connect any cables.

Version information and change log

Change log for this documentation:

Sep 2014	Initial document, installation manual for CBF4
June 2015	Change for CB6e
July 1, 2015	Initial version
July 2, 2015	Corrected technical terms. First final version.

Version overview

For printing using the CB6e, you should verify that all versions are up to date and matching.

Part	**Version information**
CB6e controller board (FPGA type T100)	FPGA 3.1.46 Micro Processor 2.6.7 Hardware version : CB6e V2.0 Comps V1.2
Premium Print heads	Hardware version 4.0 PCB FPGA 4.14 Micro Processor 2.11
Inkdraw	1.13.136

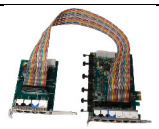
Product Introduction

Product description

- Controller for HP thermal inkjet heads
- Up to 203 (8”) x 2700 mm print area
- Network control
- Real-time print of variable data

The HSAjet CB6 is a PCI-Express based controller board for HP PREMIUM printers

Parts and Order codes

Image	Description	Order Code
	CB6e controller board for PCI-Express	CB6e
	Plug board (illustrated next to, and connected to, CB6)	CB6ePlug
	Premium Distributor box	HPHPreDis
	Premium Print head Illustrated with optional WHEEL and SENSOR	HPHPre*X* Available in 1,2,3,4,6 and 8 pen versions
	Crypto Key	CB6eCr8 CB6eCr12 CB6eCr16 For unlocking 8,12 og 16 pens on controller board.

Prescribed use

The CB6 is designed to control up to 8 HP pens, and additionally 8 pens from the plug board, in any configuration of heads.

It should be installed in a PC with PCI Express bus in a 32 bit Windows operating system.

One slot is required for the CB6, an additional slot space (but not actually a slot) is required plug board and connectors.

Installation procedure

For a successful installation you should carry out the following steps, each step is detailed in the following pages

- Install CB6 board and plug board if needed in the computer.
  [Page 10]
- Install device driver and software packages.
  [Page 14]
- Setup and install print heads on conveyor. Mechanical installation is not covered here.
  [Page 17]
- Connect cables to printers.
  [Page 18]
- In the software, number the heads according to the needs.
  [Page 22]
- Verify installation
  [Page 28]
- Adjust parameters to get a perfect print.
  [Page 29]

When you have successfully purged your print head from the software, you are ready to create your first message.

Safety instructions

This product, like all microcontroller products, uses semiconductors that can be damaged by electrostatic discharge (ESD). When handling, care must be taken so that the devices are not damaged.

Damage due to inappropriate handling is not covered by the warranty.

The following precautions must be taken:

- Do not open the protective conductive packaging until you have read the following, and are at an approved anti-static work station.
- Use a conductive wrist strap attached to a good earth ground.
- Always discharge yourself by touching a grounded bare metal surface or approved anti-static mat before picking up an ESD - sensitive electronic component.
- Use an approved anti-static mat to cover your work surface.
- **DO NOT EVER MIX PREMIUM CONNECTORS AND OTHER NETWORK EQUIPMENT**

External devices:

This product interfaces with external devices like encoders, sensors, lamps and power supply's. Make sure that the voltage and power requirements of the external equipment is within specifications of the product. Damage due to connections of faulty or wrong external equipment is not covered by the warranty.

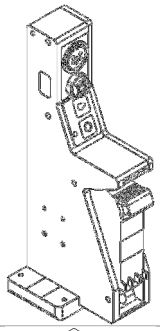
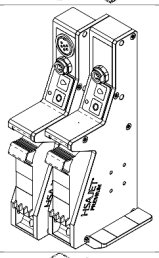
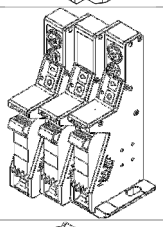
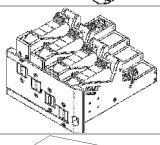
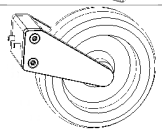
Make absolutely sure that everything you connect has been wired correctly according to specifications. Please see and understand wiring diagrams before you solder any connectors. Failure to wire connectors correctly may result in damages to the product.

Installation environment

Environment	Condition
Installation area	Indoors
Ambient temperature	10 - 40 degrees C
Humidity	95% RH or less, no condensation
Surrounding Area	Install in an area free from • Oil mist and dust • metal shavings or other foreign materials • radioactive materials • combustible materials • hamful gases and liquids • chlorides • direct sunlight • open flames

Terminologies used

This manual uses the following terminlogies

	HP Premium printhead 1 pen
	HP Premium print head 2 pen
	HP Premium print head 4 pen
	HP Premium distributor box
	Wheel for print head

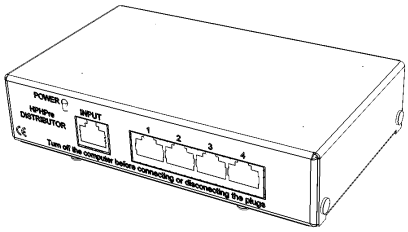
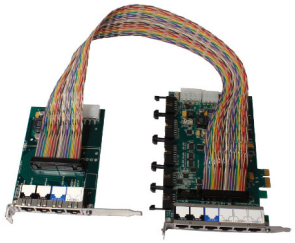
Unpacking

Unpack the CB6e board with care. Carefully compare the content against the items covered by the packing list.

The following components are always included:

	Controller board
	CD with manuals, software and driver On the CD you will find INKdraw — Design software for printed images Driver — For Windows to talk to the PCI board Support SW — Various software to support the installation Mount kit (connectors for wiring of sensors)

The following parts are optional and included if ordered:

	Distributor box Used to connect more than one physical head.
	OPT-mntkit-I/O-ENC Bracket with encoder and sensor connector.
	CB6e Plug Board
	USB Dongle Kit (Crypto Key and USB key)

Installation Guides

General Rules

In general, you must follow these rules when installing CB6 systems

Rule	Explanation
Use “Head” connectors ONLY	It is VERY important that you **DO NOT** connect head connector cables to “CAMERA” outputs or “LVDS” outputs. Typically these will be blocked off already. See illustration page 11
You need a dongle for more heads	Standard version has support for 4 pens only. To allow for more, you need a Crypto Key connected to a USB connector.
4 pens per output	You can connect maximum 4 pens to any of the 4 outputs. (2 on CB6e, 2 on plug board)
Distributor box for multiple heads	If you want to connect multiple heads to one output, example 2 x 1 pen, you need a distributor box. You need a distributor box for EVERY output unless you have just ONE head in the output.
Cable length observation	Maximum cable length is 10 meter in total from PC to print head(s)
Observe versions	You should make sure that version numbers between controller and heads are correct. See version number table.

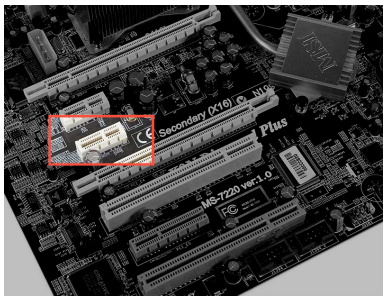
Physically install boards

To install the CB6 boards, you need to have

- A motherboard equipped with PCI-Express x1 connector. You may also use x4, x8 or x16 connectors. They are backwards compatible.
- A free slot for the plug board, if desired (does not connect to slot, just needs a space)

It has been found that Intel-based motherboards work better than AMD-based boards.

An example of the correct connector is illustrated below, with connector highlighted.



Caution: Only ONE CB6 board will fit per computer. Unlike CBF4 which would allow multiple boards. Do NOT connect multiple boards to one computer.

To install the board, carefully insert it completely and mount the bracket firmly.

Make sure you connect 5 / 12V power connector at the back.

The CB6 needs power supply in form of a standard internal PATA power connecter (Molex connector)

If necessary, use a Y-split cable from a hard drive.

Make sure that your PC has sufficient power to drive the print heads.

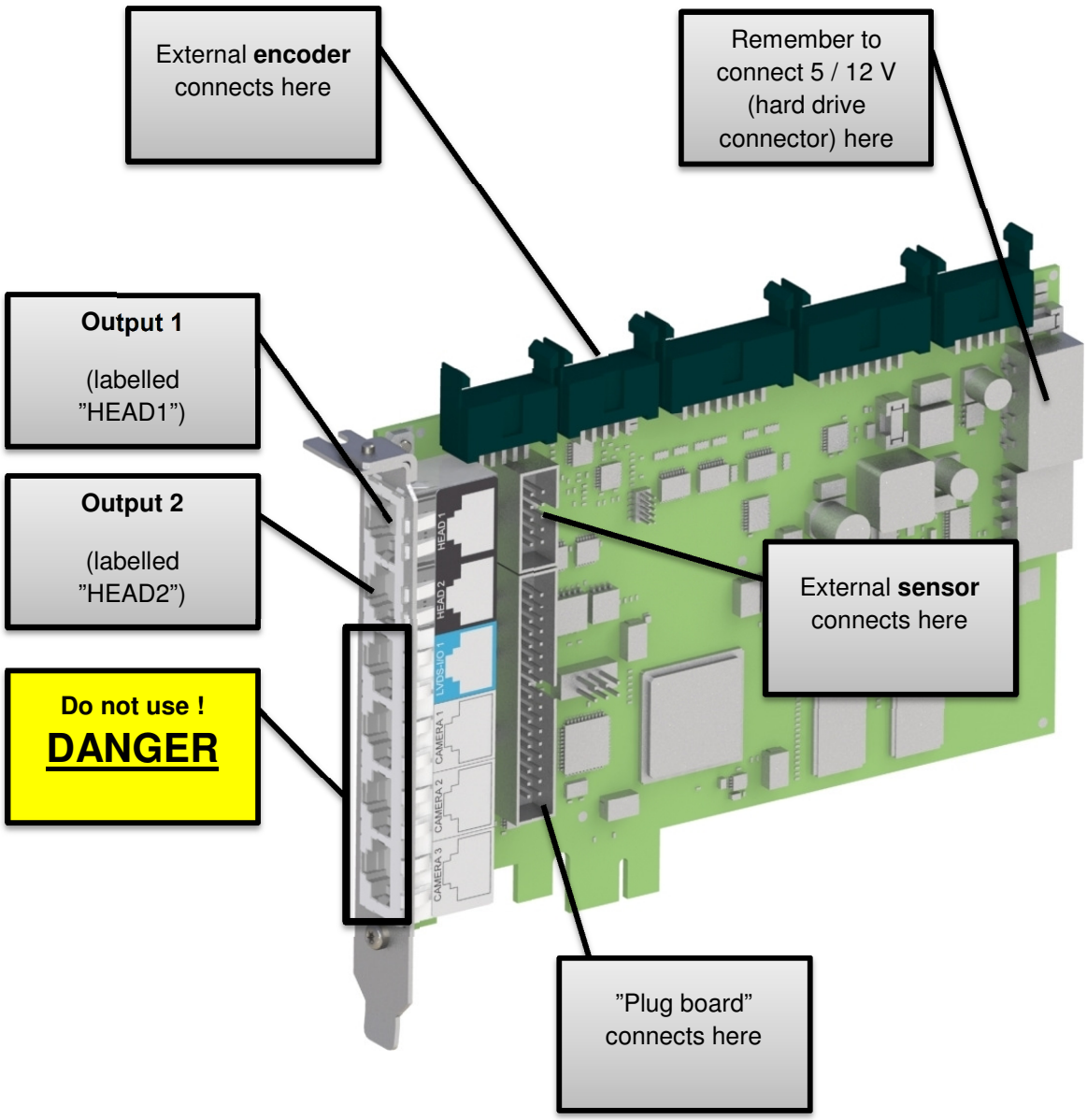
At least 10A (in 12V) should be available from the power supply.

Power requirements are:

CB6e: 12V / 15A / 180 W
Each pen max 30 W

Plug board :12V / 12.5 A / 150 W
Each pen max 30 W

Around the CB6 card



In this documentation, the term “Output 1” (to Output 4) is used for the head connections in the controller board, labeled “HEAD 1” etc. This is to avoid confusion between physical heads and this connector.

For **each** printer output you can attach the following :

Number of pens	Notice
1, 2, 3 or 4 pens in a single head	Connects directly to back of CB6e
1+1 **1+1+1** **1+1+1+1** **2+1** **2+2** **3+1**	Connects using a CB6e distributor box connected via a Ethernet cable. **Make sure that you order a properly shielded Ethernet cable with the distributor box.**

The installation requires one or two free slots in your PC.

Install Plug Board (optional)

If the installation requires more than 8 pens in total, you must use the auxiliary CB6e Plug board. This connects to the CB6e board using the supplied multi-color cable.

Fasten the Plug Board in an empty slot. This board does NOT need any motherboard sockets.

Remember to connect 12V molex connector to this board as well.

Optional steps:

- Connect the cable from the encoder / sensor bracket to the appropriate connector labeled "Encoder". Connector fits one way only. Make sure it is all the way in.
  Encoder bracket is mounted with a FEMALE SUBD 9 connector. Label the external connector.

- Connect the cable from the encoder / sensor bracket to the appropriate connector labeled “SENSOR”. This connector is on the face of the board. Make sure it is all the way in. Label the external connector.

Check list CB6e installation

Before you move on, please check and confirm

	CB6e Board is firmly inserted and SECURED with a screw in the slot
	CB6e Board has an active PATA power connector firmly attached (like a hard drive). Similar for the plug board
	All connectors apart from “Head1”..”Head4” are safely blocked off to prevent being used by customer – by blind connectors or labels.
	Encoder connector is mounted correctly if used, and firmly secured
	External sensor connector is mounted correctly if used, and firmly secured
	All connectors are labelled according to use. This will prevent incorrect connections

Software installation

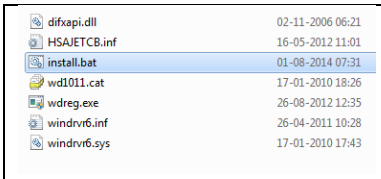
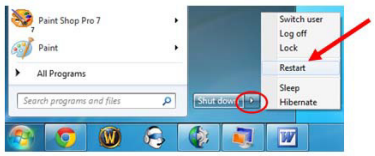
Before you can use your system you have to install driver and software.

Driver installation

First time you start your Windows machine after installing the CB6e, Windows may report that a new PCI device has been found. Just select "Cancel" to this.

The driver comes in a zip file, supplied on the CD.

To install, follow these steps:

	Unzip the driver files to a temporary directory – example c:\cbdriver You can delete this directory after installation. Next run the “install.bat” file. You may have to run as administrator.
	Shutdown (power off) and reboot, restart may leave the CB6e board in an uncontrolled state.

Software installation

Once you have installed the driver, you should install **INKdraw.**

The installation file will be in the format **inkinstall_{version}_{subversion}**

From there, follow the prompts on screen. Default installation path is c:\{program files}\obj inkdraw

Notice: Windows 7 and Windows 8 activate UAC per default. This effectively prevents a software installed under “Program Files” from writing in its own installation directory. Windows will then write Inkdraw Files in a virtual directory, transparent to the user.

You are recommended to follow one of these recommendations:

1) **Disable UAC completely. Ask your computer administrator how.**

2) **Install Inkdraw in a place NOT under Program Files. Example: C:\Inkdraw**

3) **Assign user account “full control” of inkdraw installation directory**

USB Dongle installation

It is necessary to install a USB dongle if you need to print with more than 4 pens, OR if you need special features enabled, such as mailing objects.

Your dongle comes as two USB keys:

- A regular USB key containing driver and a REG key.
- A silver cryptobox key. This is the dongle.

To install do this:

	Insert the regular USB key. Install the driver.
	Double-click the REG key. Confirm import.
	Insert Cryptobox Windows should report that a new device is installed.

Check list software installation

	Software starts without error messages
	Creating a new layout (File->New) in Inkdraw shows “1 CB” installed.
	If you have USB dongle installed, you can add as many pens as your dongle allows. (up to 8,12 or 16).
	Print mode can be started (F10) and stopped (ESC)
	You can save a file, and this file is also visible using Windows Explorer.

Install heads on conveyor

The physical installation of print heads is generally not covered in this installation.

However some general rules should be observed for best results:

- Place the heads at 90 degrees exactly to product movement
- Heads must be parallel to product surface, and not tip in either direction
- Distance to print ideally 0,5 to 1 mm. Not more than 4mm, even at slow speeds.
- Encoder should be used if any way possible, and should read directly on the product for best accuracy.
- For best accuracy, use a steady and controlled transport of products. As example, rollers do not provide a good steady transport.

Connect cables

DO NOT connect any cables to the controller board(s) while the PC is turned on. You risk damaging your PC and/or controller board(s).

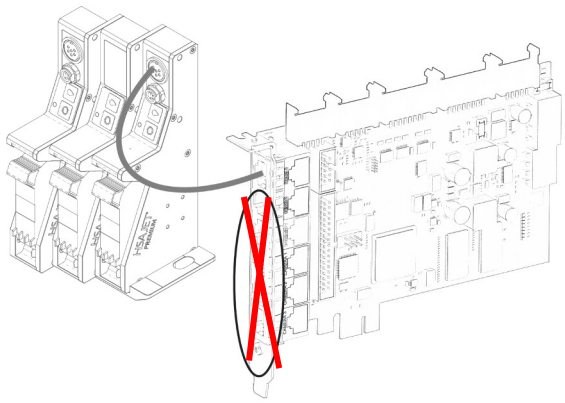
When connecting cables for the CB6e, you should follow some general rules:

- Use the connectors in order: Head1, Head 2, Head 3 and Head 4. (where 3 and 4 are on plug board)
- Fill the connectors as much as possible – 4 pens in each. See below for explanation why.
- Use a distributor box if you have more than one physical head per output. One output can handle maximum 4 pens (50,8mm/2"). You need a distributor box for each output. See examples below
- Maximum cable length generally 10 m
- EVERY pen on EACH output must have a UNIQUE number assigned by software. See below.

The following pages will provide some examples of connections. Extrapolate from these to your own installation:

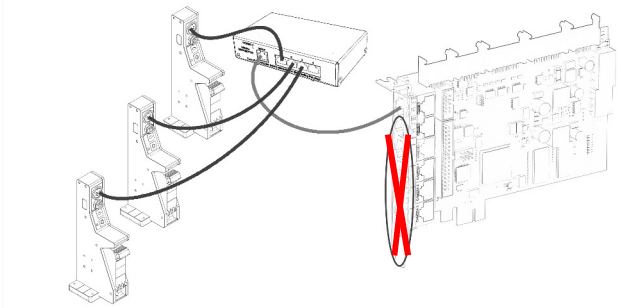
Single head to 1 output

This is the simplest version: 1 head of maximum 4 pens connected to a single output.

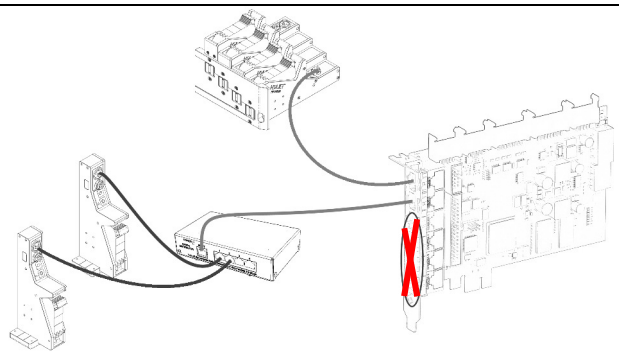
	Do not connect anything in the oval. Connect one Premium cable in HEAD1, to the print head. You can work normally using this head.

Multiple heads, maximum 4 pens total

If you have Multiple heads, but still no more than 4 pens total, you need to use a distributor box.

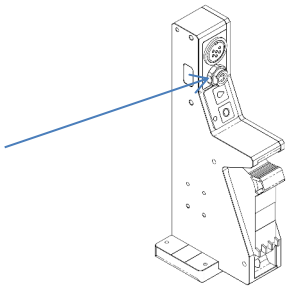
	Do not connect anything in the oval. Connect one standard cable from HEAD1 to distributor box, and from there premium cables to each head. It is not important which outputs you use in the distributor box, even if outputs are numbered. Total cable length from computer to head 10 meter / 30 feet.

Multiple heads, more than 4 pens

	Do not connect anything in the oval. The first output (HEAD 1) is filled using a 4-pen head. The second output is used to connect 2 x 1 pen, via distributor box.

Print head sensor

If you have purchased print head(s) with sensor, you should connect the sensor to the round connector in the pen it mounts to.



To actually use the sensor, select that pen as sensor in Parameter Menu, CB6 section. Default is “External”.

> You can only have ONE global sensor for the entire print system. You cannot split the print into multiple virtual systems even if you connect multiple sensors.

The sensor is adjusted using the small screws located on the sensor.

Check list physical installation and cabling

	Heads are placed accurately related to product movement
	CB6 outputs are used from 1 to last, in that order
	All heads are filled as much as possible – if not possible, use dummy heads in layout
	No cables longer than 10 meter
	No cables in any other connector apart from head connectors

Number the print engines

In order to print correctly the print engines must be numbered uniquely within each output.

Before detailing the process, a short explanation why and how.

Understanding pen numbering

The signals in each CB6e output is sent and received in a common cable, digitally. This can in simple terms be compared to a common telegraph line where each pen can listen – and respond.

However it is important that only one pen on each communication line responds, or the communication will be mixed up.

Each communication line (head output) has 4 channels. This should correspond to a channel to each pen.

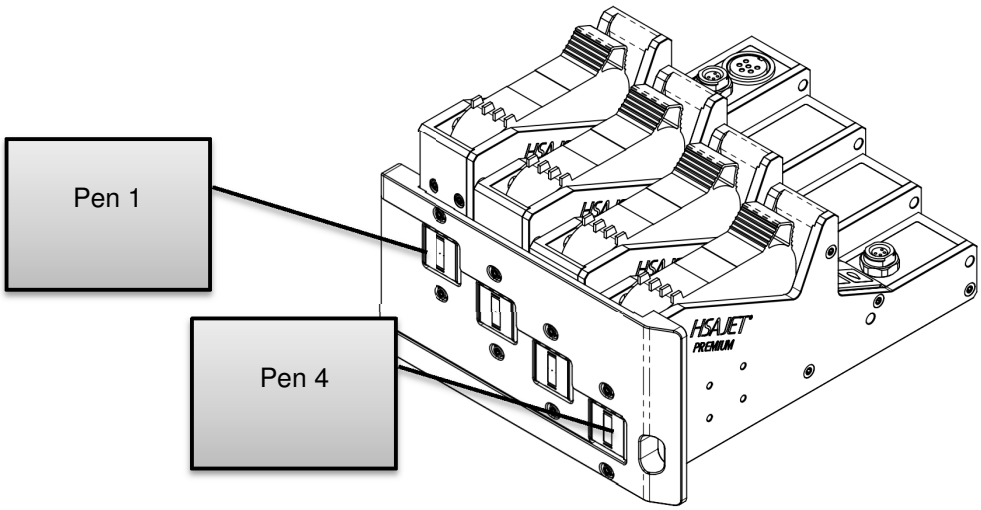
Once assigned a channel, the information will be stored in the pen's memory and remembered even at power off.

Default numbering of pens

When you buy a print head, the pens are already numbered for you.

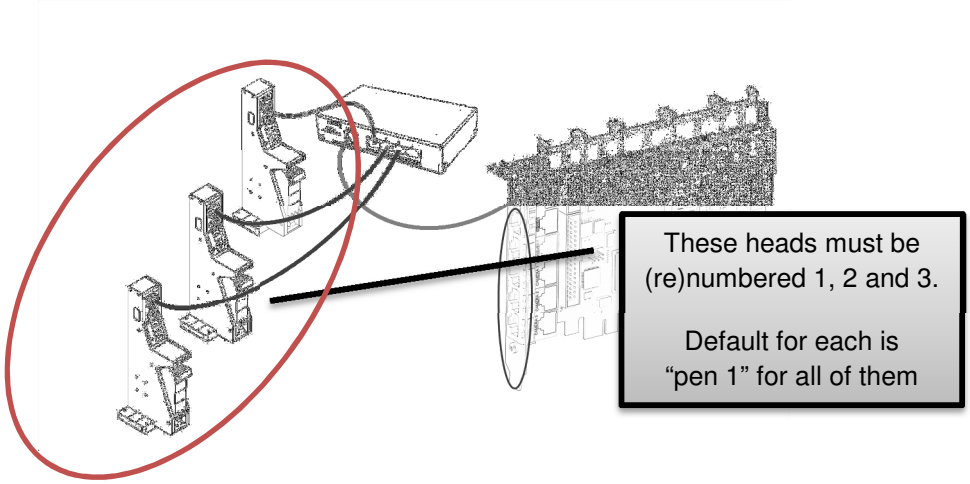
If you only connect one head to a CB6e output, you do NOT need to change the numbering of pens. You also do NOT need to change anything if you connect a head to output 1, and another to output 2, as the numbers will NOT collide across outputs.

By default, the pens are numbered from top, when placed in lying position:



When to change pen numbering

You only need to change pen numbering when more than one head is connected to the same output via a distributor box.



How to change pen numbering

Changing pen numbering is made from the Inkdraw software.

	Identify which numbers the pens should have, and label them. **Remember that each head of 2 and 3 pens MUST be numbered as illustrated above, from top. Otherwise data will be incorrect once printed.**
	Open parameter menu (F9) and select "CB6" section
	Press the number on screen, and confirm with the ROUND button on the pen. The color of the pen diode will change.
	Confirm numbering anytime by pressing the round button on the pen. The corresponding number in software will be active

Notice: the numbers in the software will display as a 4 x 4 grid of buttons numbered 1 .. 16. You can only number a pen that exists on the output related to row, as illustrated below. The table shows the relation between pen position in software and pen numbering.

1	2	3	4	Pen numbering
1	2	3	4	Output 1
5	6	7	8	Output 2
9	10	11	12	Output 3
13	14	15	16	Output 4

As the pens keep the numbering internally, you can see from the table above that a pen numbered as “2” will become “pen 2” when connected to Output 1, but will be “Pen 6” when connected to Output 2, etc.

Understanding this is very important when understanding what is printed where.

What data is printed where

In Inkdraw for CB6, the data is always sent from the TOP of the layout, to outputs 1,2,3 and 4 in that order. Each output contains 4 pens of data, or 2” print data.

The table below illustrates height of job related to output.

To and INCLUDING			Data is sent to
1200 pixel	2”	50.8 mm	Output 1
2400 pixel	4”	101.6 mm	Output 2
3600 pixel	6”	152.4 mm	Output 3
4800 pixel	8”	203.2 mm	Output 4

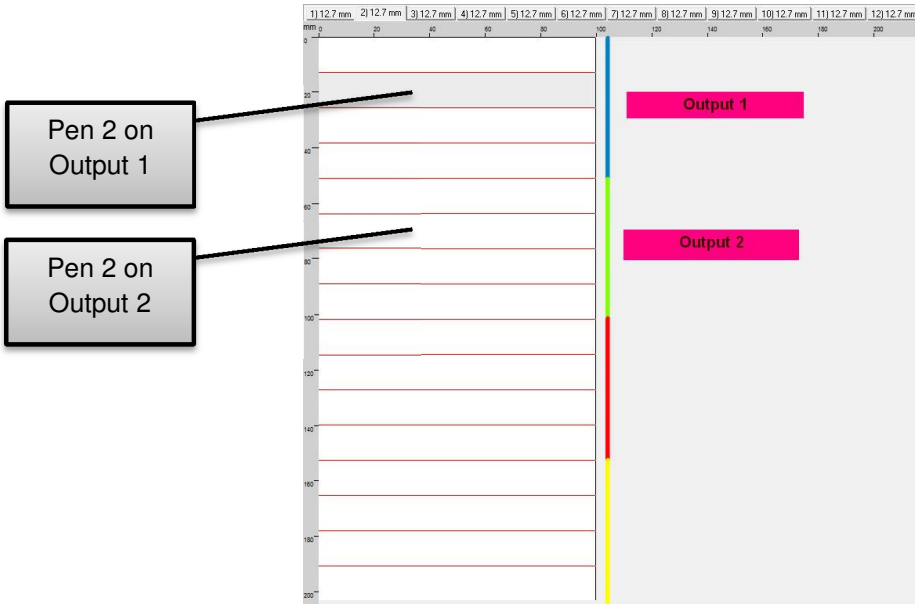
As an example, given that a pen is numbered “2”, this pen would print the following data:

Connected to Output 1	301 .. 600 pixel	12.7 mm .. 25.4 mm
Connected to Output 2	1501 .. 1800 pixel	63.5 mm .. 76.2 mm

The full table of output related to vertical position:

Output	Pen no.	Starting at pixel	Ending at pixel	Height (mm)
O1	1	1	300	12,7
O1	2	301	600	25,4
O1	3	601	900	38,1
O1	4	901	1200	50,8
O2	5	1201	1500	63,5
O2	6	1501	1800	76,2
O2	7	1801	2100	88,9
O2	8	2101	2400	101,6
O3	9	2401	2700	114,3
O3	10	2701	3000	127
O3	11	3001	3300	139,7
O3	12	3301	3600	152,4
O4	13	3601	3900	165,1
O4	14	3901	4200	177,8
O4	15	4201	4500	190,5
O4	16	4501	4800	203,2

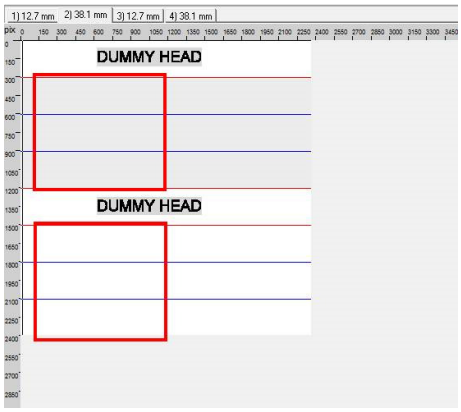
Illustrated in an inkdraw layout:



Special case: 3 pen heads

For 3 pen heads, there is a special case, because the rules of “maximum 4 pens in a distributor box” and “fill each output completely” are conflicting.

When the installation needs 2 x 3 pen heads, you must assign dummy heads of 1 pen to the layout, as illustrated:



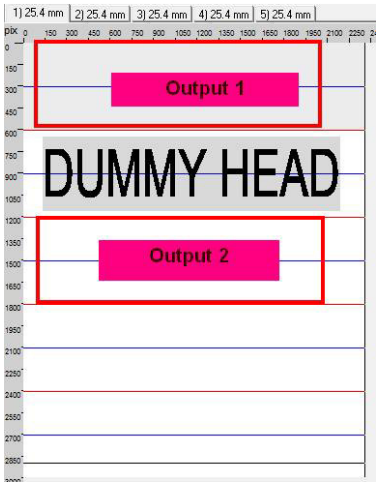
Where you place the dummy (above or below 3 pen head) is not important. As illustrated, the 3 pen head must be numbered 2,3,4 – if the dummy is below, the 3 pen head must be numbered 1,2,3.

Special case: multiple smaller heads, and no distributor box

Sometimes it may be desired not to use a distributor box, even with heads less than 4 pen. This is possible, but will again have influence on the job design.

Notice that such combination is only possible with crypto key, since logically you would be using more than 4 pens.

Example: connecting 2 x 2pen heads, one in Output 1, one in Output 2. The first head will print in first 2”, the next head in next 2”.



Again, it's not important if you place the dummy head above or below the head to print. This just depends on how you number the 2-pen heads.

Check list head numbering

	All pens are numbered with a unique number in each output
	Heads with more than 1 pen are numbered from TOP, as illustrated. This is regardless of position during print.
	All pens are responding when the round button is activated

Verify installation

In order to finish the installation, you should now verify that all parts are working.

If you cannot check off every single of the below items, you should go back and check your installation:

	You can enter and exit print mode. This must not take more than 0.8 seconds.
	When creating a new layout, you see “Zone 1: 1 CB” in dropdown
	Bottom-left of Inkdraw, you see pen status. Holding mouse over, this must update
	In F9 (parameter) menu, Test I/O is working for both sensor and encoder
	In F9 (parameter) menu, you can see all attached pens and status in CB6 menu
	A printout in fixed speed mode prints on all pens containing data

Adjust for perfect print

Final step is to adjust parameters for a perfect print. This is not covered in detail in this documentation. In general though, the recommended steps are as follows below.

> You should only adjust as much as it makes sense. A job requiring a single line with 1 pen anywhere in any size requires almost no adjustment. On the other hand, a perfectly stitched multiple-pen job needs much more accuracy and adjustment.

Start with the encoder

If the encoder is inaccurate, everything else will be, and adjustments will make no sense. Start by making sure the encoder is absolutely accurate.

Make a test print with a grid pattern (available from HSA), or a box of known length.

The ratio between desired length of print and actual print is the same as the ratio between current encoder setting and ideal encoder setting.

Smaller encoder values will give longer printouts, and vice-versa.

> Even very small inaccuracies of the encoder parameter or wheel roundness can be seen in the printout. It is recommended to have the encoder wheel run directly on the printed product.

Adjust head offsets

The heads longest away from sensor in print direction should have the most offset. Head offset is measured in selected unit, but internally stored in pixel (1/600 inch).

Adjust pen offsets

In print heads of multiple pens, adjust the pen offset. The pen that is furthest away from sensor should have the most offset.

Default offset between pens in a premium head is 700 pixel (7/6 = 1.17 inch or 29.63 mm).

Adjust start distance

Finally adjust the start distance, which is the distance from sensor to printout starts. Remember that depending on the direction, layout may print from left or right hand side – and that the “White” area in the canvas counts equally to the black.

SUPPORT

For product support, please contact HSA SYSTEMS Customer Service department

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