

# YB3x User Manual



**Rev 1.1 20210405**

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## 1. Introduction

The YB3x is a fanless, highly flexible vCPE / embedded server.

The YB3x has two slots for communication modules that can accommodate modules of 10G SFP+, 10G Base-T, 1GbE Base-T and 1GbE SFP.

An enclosure extension has a PCIe 3.0, 8-Lane extension slot for a PCIe Add-in card (AIC), allowing Full Height / Half Length cards (FHHL). It may accommodate additional communication ports, FPGA for AI and data acquisition, and more.

The enclosure extension may also accommodate dual NVMe SSD (M.2 or U.2), enabling fast and large storage capacities.

The manual is divided into the following sections:

- Safety and standards – please read carefully.
- Product description – technical details and the architecture of the product.
- Assembly instructions for adding and removing optional parts.
- Mechanical drawing.

Heptagon systems is constantly improving its products and adding new features. The user is advised to check our [website](#) for the latest revision of this document.

## 2. Safety instructions

Safety is of the utmost importance. Please invest the time to read the chapter below, compiled for your own safety.

**Disclaimer:** Failure to follow the safety instructions can lead to injuries and/or damage of property. Heptagon Systems is not liable should safety instructions not be followed. Please refer to the Heptagon Systems Sales and Warranty Terms and Conditions for further information.

This product was designed and built in accordance with the safety requirements of low voltage equipment.

This product was built and tested prior to shipment for operational and safe use.

In order to preserve this product as operational and safe, the following guidelines must be kept:

- The product must always operate within the operation and storage conditions described in this manual. Conditions include:
  - Supply voltage
  - Temperature
  - Humidity
  - Shock and vibration
- Installation and mounting instructions must be followed to ensure appropriate air circulation.
- Power supply to the product must meet local safety regulations for electrical installation. Electricity infrastructure should be prepared by people who are qualified for the task by the local authority. Proper grounding for an AC power supply is crucial. Use only safety approved PS according to IEC/EN 60950-1 with the designated rated voltage and power for the YB3x.
- Exercise caution when moving and installing. Failure to properly mount can cause incidental falls and subsequent injuries.
- Before servicing the product, ensure it has been disconnected from all power sources. Power it off safely, then disconnect the power cable.
- Use anti-static equipment before opening and while servicing the product. Electrostatic discharge can destroy or damage electronic equipment. Take extra caution when using add-on cards to prevent damage.
- All add-on cards should comply with add-on card specifications. The total amount of add-on cards and disks used should not pass the power budget prescribed for them or exceed the maximum supply current of the product.
- Extensions or add-ons that require a service such as a filter or fan should be maintained in accordance with their maintenance requirements.
- If the product is malfunctioning or showing signs of damage, stop using the product and disconnect it from its power source. The product should be marked as faulty to prevent others from using it.
- Service to the product should be made by a Heptagon Systems qualified service. Opening of the product should be restricted for the purpose of replacing an add-on card, a storage device or a backup battery.
- This unit may contain SFP sockets for SFP transceivers of Class I laser. The SFP transceiver should be safety approved to IEC60825 and CDRH registered. Please consult the safety instructions of the SFP transceiver.

## 2.1. Caution – Hot surface

The top side of the YB3x is a hot surface.



## 2.2. Recycling and battery replacement

If the product contains a battery:

- Replace only with the correct type of battery as advised in the product manual. Failure to do so may result in a fire and/or explosion.
- Please recycle the battery as instructed by local authorities. Do not dispose in an ordinary rubbish bin.

Recycling:

All Heptagon Systems packaging materials are made from recyclable products.

Please consult your local Heptagon Systems representative for recycling of the product.

## 2.3. Electrostatic Sensitive device



The internals of this product may contain static sensitive devices.

Appropriate anti-static handling procedures should be used when transporting and maintaining this product. The following should be noted:

- Make sure to be in an electrostatic safe environment when opening the product for service.
  - Use a personal electrostatic strap before starting the service procedure.
- All electronic boards should be stored in ESD protective shields.

## 3. Electromagnetic Compatibility

This product is made for industrial use as classified by EMC directive (Type B device).

Europe (EU): It was tested and complies with

EN 55032: 15 EN

EN55035:17

EN 61000-3-2: 19

EN 61000-3-3: 13

USA: It was tested and complies with FCC 47CFR part 15: 2015, sub part B.

Canada: It was tested and complies with ICES-003;

Australia and New Zealand (AU and NZ): It was tested and complies with AS/NZS CISPR 32: 15.

The YB3x EMC compliance was done with cables of 3 meter maximum length. YB3x is not intended to connect to cables longer than 3 m.

## 4. Safety compliance

The device was tested and passed the following EU and AS/NZS directive safety tests:

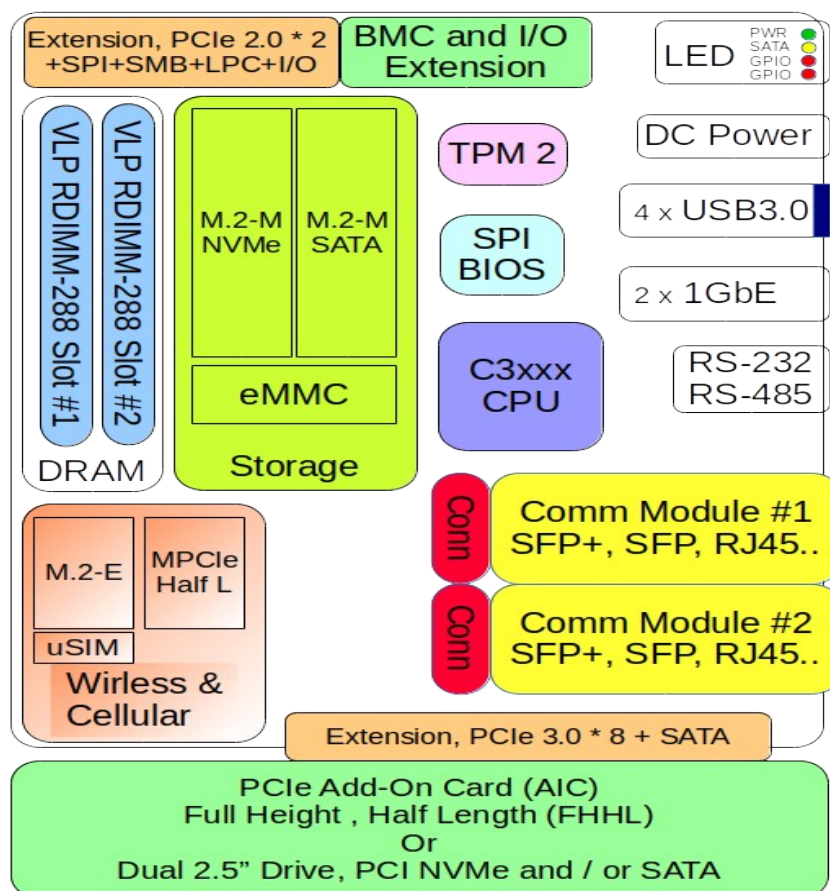
Europe (EU): EN 62368-1:14+A11:17

Australia and New Zealand (AU and NZ): 62368.1:18

## 5. Operating and storage conditions

Operating condition	Range	
Operating Temperature	-40°C to +72°C	
Storage temperature	-40°C to +85°C	
Supply voltage	+12VDC +/- 10%	AC Adapter 90 to 260VAC, 127 to 370VDC
Operating Humidity	5% to 85% RH, Non-condensing	
Storage Humidity	5% to 95% at 40°C, Non-condensing	
Operating Vibration	TBA	
Operating Shock / Storage Shock	TBA	

## 6. Product description



*Drawing 1: The YB3x block diagram*

The YB3x offers a flexible and modular architecture, enabling full utilization of the C3xxx (Denver) . The YB3x modularity enables flexibility in all major implementation junctions, accurately tailoring the YB3x to the exact needs of the client.

Comm Module #1 and #2 utilize the CPU quad 10G communication channels. Each communication module has two 10G communication channels which can be configured as dual 10G SFP+, 10G Base-T, 1G SFP and 1G base-T. Additional routing of PCIe lanes into the Communication module enable more options such as the COM-4P4S module, which has four channels of SFP+ (of the CPU) and four channels of SFP, using a PCIe Ethernet controller.

PCIe 3.0 x 8 Add-In-Card (AIC) can be added for additional flexibility. The card form factor is Full Height Half Length (FHHL), allowing cards such as 8x Ethernet, frame grabbing, GPU, fast I/O and more.

For storage applications, the AIC extension may be replaced with the storage extension, having dual U.2 (2.5", 15mmH) SSD with NVMe or SATA interface. A BMC or additional I/O function can be added with the BMC extension connector.

The fanless design of the YB3x allows even the most demanding CPUs of the C3000 series, including the 2.4GHz, 32W C3955 and its embedded sibling, the 2.0GHz, 31W C3958.

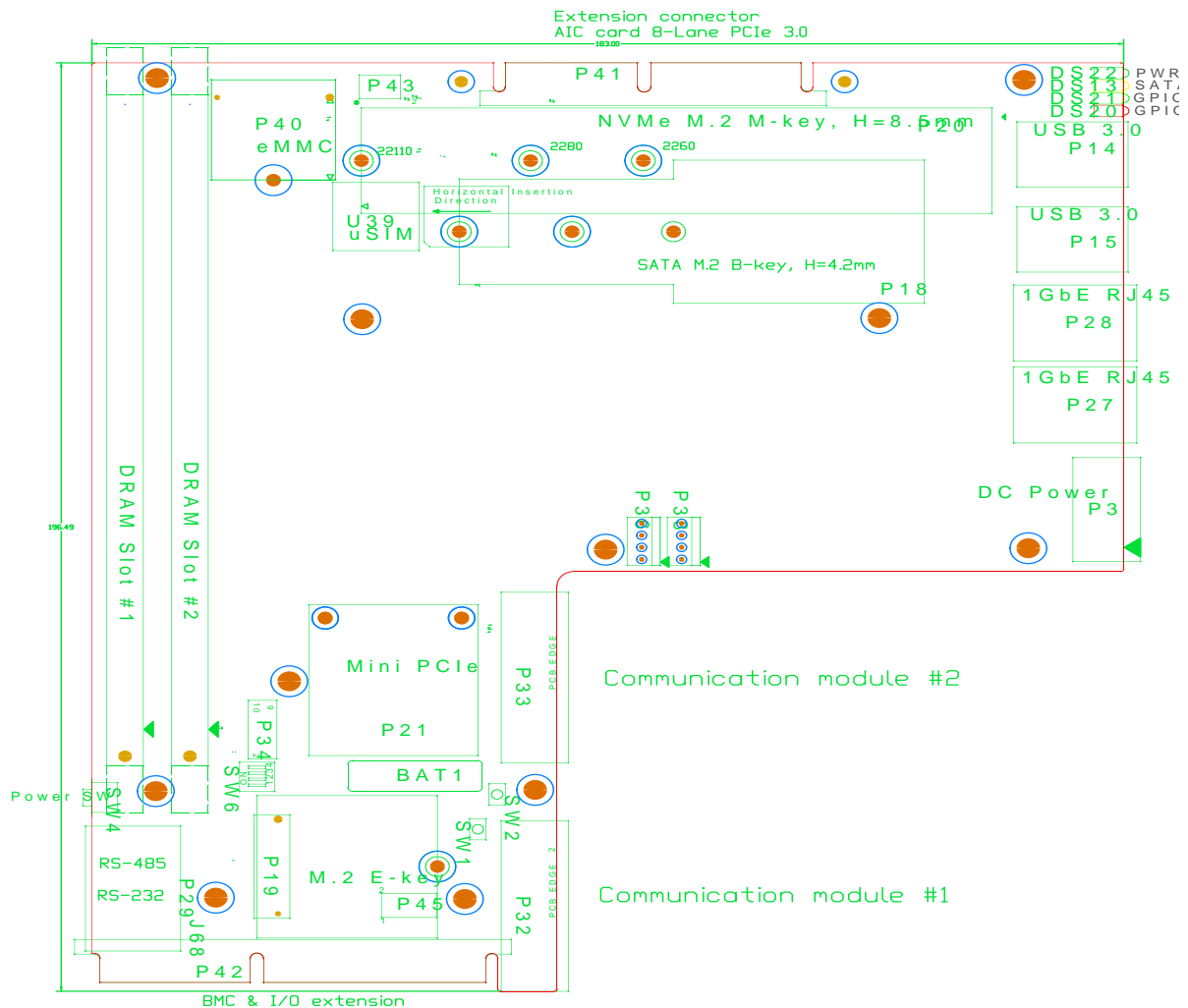
The memory sub system enables up to 64GB of ECC DDR4-2666 with two slots of VLP-

DIMM288.

On-board storage has eMMC, M.2-NVMe and M.2-SATA slots. All slots can be populated. On-board I/O extensions can use a half-length mPCIe slot and an M.2 Type-E slot with an on-board uSIM socket.

The YB3x supplies by default four USB 3.0 ports, dual 1GbE Ethernet and RS-232/RS-485 ports.

## 6.1. Motherboard (HB-DV)

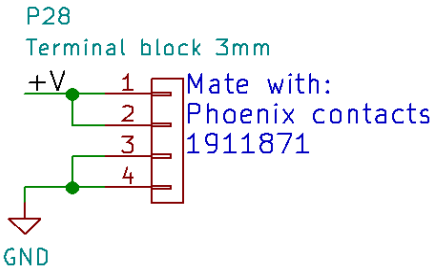


*Drawing 2: The YB3x Motherboard (HB-DV)*

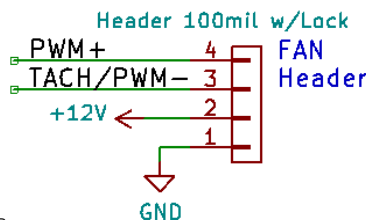
The above motherboard drawing is viewed when the YB3x is open and turned upside down. Large green/brown circles denote the mounting holes locations.



## 6.2. External Connectors and sockets

Panel connectors		
Function	Connector	Description
USB	P14, P15	USB 3.0, Standard A-type
1GbE ETH	P27,P28	P28 – ETH1, P27 – ETH2 Dual 1GbE RJ45 with Green/Yellow LEDs. Green – Link, Yellow – Activity
Comm-Module	P32,P33	P33 – Comm Module #1, P32 – Comm Module #2 (The Communication modules have a separate manual)
Power connector	P3	<p>DC 12V, Mate with Phoenix Contact 1911871</p>  <p>Supply cable should be 16AWG stranded wire for 1m supply cable. Note that two wires are required on each side.</p> <p>There is an option for wide supply voltage of 9..28VDC. It is an assembly option of the HB-DV motherboard and should be specifically ordered.</p>
RS-232/485	P29	P29 is a dual RJ11-6 connector. Left side (A) is an RS-232 port (Tx/Rx). The right side (B) can be switched between RS-232 and RS-485. The connection diagram is found in the “Motherboard connectors and sockets” section.
Power button	SW4	Push button. Press for 5 seconds to turn off.
Antenna holes		Two antenna holes are located on each side of the YB3x. The holes match SMA or RP-SMA pigtail connectors.

## Motherboard connectors and sockets

Function	Connector	Description																																						
DRAM	Slot 1,2	DIM288 sockets for VLP DDR4, ECC.																																						
PCIe 3.0 extension	P41	Supports PCIe 3.0 x 8 Lane with an edge connector.																																						
SATA III ports	P41	SATA III over the extension.																																						
	P18	SATA-III, M.2 B-key.																																						
Mini PCIe socket	P21	Can accommodate Half-Length mPCIe card.																																						
M.2 Socket	P20	M-Key, PCIe 3.0 x4, for NVMe. 2280/22110																																						
	P18	B-Key, SATA, USB3.0, uSim (U39), up to 2280. <b>Note:</b> If M.2 NVMe, P20 is mounted, you have to remove it temporarily in order to access the P18 M.2 card.																																						
	P40	E-Key, USB2.0, PCIe2,0x1 for wireless lan and BT. 3042/3030.																																						
eMMC	P19	eMMC card with 32GB and 64GB options.																																						
10Gb ETH	P32,P33	Comm-Module connectors provide a dual 10Gb Ethernet expansion slot each.																																						
BMC expansion	P42	Edge connector for mounting of BMC board or an additional I/O expansion.																																						
Serial ports RS-232 / RS-485	P29 A,B	Dual RJ11-6 connector. The left side has RS-232. The right side may be switched between RS-232 and RS-485. The below table matches standard RJ11 wire color code to the RJ11 pinout functions.																																						
		<table><tr><th rowspan="2">Pin</th><th rowspan="2">Color</th><th>P29A Left</th><th colspan="2">P29B Right</th></tr><tr><th>RS-232</th><th>RS-485</th><th>RS-232</th></tr><tr><td>1</td><td>White</td><td>N.C.</td><td>RX+</td><td>N.C.</td></tr><tr><td>2</td><td>Black</td><td>N.C.</td><td>RX-</td><td>N.C.</td></tr><tr><td>3</td><td>Red</td><td>GND</td><td>GND</td><td>GND</td></tr><tr><td>4</td><td>Green</td><td>RX</td><td>N.C.</td><td>RX</td></tr><tr><td>5</td><td>Yellow</td><td>TX</td><td>TX+</td><td>TX</td></tr><tr><td>6</td><td>Blue</td><td>N.C.</td><td>TX-</td><td>N.C.</td></tr></table>	Pin	Color	P29A Left	P29B Right		RS-232	RS-485	RS-232	1	White	N.C.	RX+	N.C.	2	Black	N.C.	RX-	N.C.	3	Red	GND	GND	GND	4	Green	RX	N.C.	RX	5	Yellow	TX	TX+	TX	6	Blue	N.C.	TX-	N.C.
		Pin			Color	P29A Left	P29B Right																																	
			RS-232	RS-485		RS-232																																		
		1	White	N.C.	RX+	N.C.																																		
		2	Black	N.C.	RX-	N.C.																																		
		3	Red	GND	GND	GND																																		
		4	Green	RX	N.C.	RX																																		
		5	Yellow	TX	TX+	TX																																		
6	Blue	N.C.	TX-	N.C.																																				
Fan	P36, P38	<div>Mating connector: * Molex 22-01-2047 (housing) * Molex 08-50-0114 or 08-50-0113 (crimp terminals)</div> <div></div>																																						
		Fan Connector for AIC which has an on-board fan. Supply is +12VDC with PWM functionality. The logic levels of the PWM is 3.3V. P36 <b>has a built in fuse</b> . P38 is not populated and is for custom orders only.																																						

## Motherboard connectors and sockets

Function	Connector	Description
CMOS Battery	BAT1	CR2032 battery holder.

### 6.3. LED display.

The YB3x front panel utilizes Four LEDs:

<b>LED (top to bottom)</b>	<b>Color</b>	<b>Function</b>
PWR (DS22)	Green	Green when on. Blinks when the memory sub system is initializing.
SATA (DS13)	Yellow	Blinks with SATA activity (form all ports).
GPIO (D21, DS20)	Red	The GPIO LEDs are connected to programmable pins of the CPU: DS20 is connected to the CPU PCIE_CLKREQ_N1 (BGA ball BA58) DS21 is connected to the CPU PCIE_CLKREQ_N2 (BGA ball BH71)

### 6.4. DRAM Memory

The YB3x has two RDIMM-288 sockets for VLP DDR4-2666 with ECC. Maximum memory capacity is 64GB.

6.4.1. Single slot DRAM: Either DRAM slot can be used.

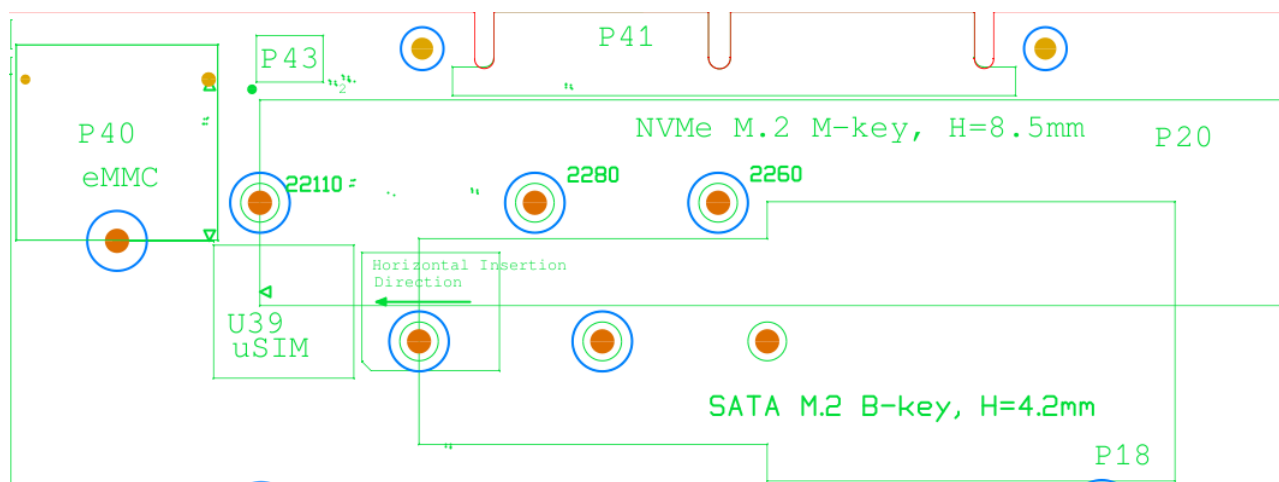
6.4.2. Pair matching. When inserting two DRAM DIMM into both slots, it is important that both will use the same DRAM chip bit width. DRAM chips come in x1,x4,x8 and x16 bit width. The bit width is specified in the manufacturer data sheet.

6.4.3. Size matching – each slot can have different size DRAM DIMM, as long as the bit-width rule is kept.

6.4.4. Supported DRAM sizes: 4GB, 8GB, 16GB,32GB.

6.4.5. Qualified DRAM modules: Please consult our support as the list is dynamic and constantly updated.

## 6.5. On board storage and I/O expansion



**Drawing 3: M.2 and eMMC slots of the HB-DV Motherboard**

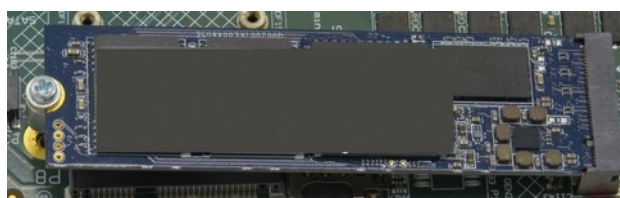
- 6.5.1. Insertion order: M.2 B-Key (SATA and USB, P18) must be inserted before M.2 M-Key (NVMe, P20).
- 6.5.2. If a SIM is needed, the uSIM must be inserted (U39) before the assembly of the M.2.
- 6.5.3. Spacer (a.k.a standoff):
- 6.5.4. Spacers and screws come pre-assembled for all slots.
- 6.5.5. In case a spacer or a screw is lost, the following part numbers should be ordered:

Mate with	P/N	Description
P20	383A52560	Standoff for 8.5mm M2, 6.6mmH, M2 not threaded
	380J52090	Screw, M2x0.4, 12mmL, Din 7985, Stainless Steel
P18, P40	383A52510	Standoff for 4.2mm M2, 2.45mmH, M2 not threaded
	380J52070	Screw, M2x0.4, 8mmL, Din 7985, Stainless Steel

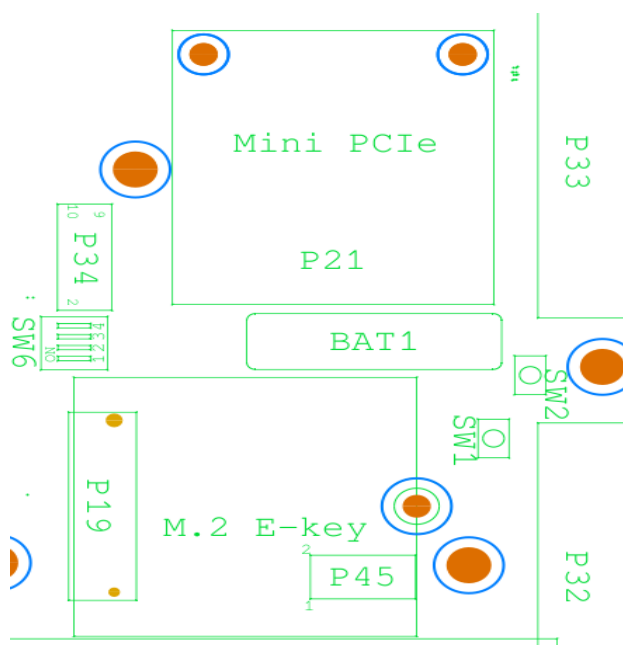
6.5.6. The standoff are custom parts and can be purchased as kits of 10 units.

6.5.7. M.2 and eMMC Assembly instructions:

6.5.8. Remove from the motherboard and lightly attach the spacer with a screw to the M.2 card (left image).



6.5.9. Gently insert the M.2 card to the slot, without dropping the spacer (right image).



*Drawing 4: Mini PCIe and M.2-E slots of the HB-DV*

6.5.10. mPCIe assembly: Standoffs for the mini PCIe card are pre-soldered to the motherboard. Use two 4mm length M2x0.4 pan head DIN7985 screws to secure the mPCIe to its socket.

6.5.11. In case a spacer or a screw is lost, the following part numbers should be ordered:

Mate with	P/N	Description
P21	380J52020	Screw, M2x0.4, 3mmL, Din7985, Pan head, Philips, Stainless Steel
P19	383A52510	Standoff for 4.2mm M2, 2.45mmH, M2 not threaded
	380J52070	Screw, M2x0.4, 8mmL, Din 7985, Stainless Steel

## 7. Thermal considerations

Mounting of the YB3x should take into account the fact that the YB3x has no internal fan and thus requires free flow of air in order to cool itself. The following guidelines will ensure proper operation of the YB3x within it's specified temperature range:

- Rack 19" installation:
  - **The 1U slot above the YB3x must be vacant.**
  - If the ambient temperature is expected to be above 35C, consider making the 1U slot below the YB3x vacant.
  - Consider the total heat generated in slots below the YB3x.
- None Rack 19" installations:
  - **Keep a minimal air gap of 45mm above the YB3x.**
  - Horizontal mounting (Wall mount): The YB3x may be positioned horizontally provided its heat sink ribs direction is vertical. The air gap between the YB3x heatsink and the nearest wall (or object) should be at least 45mm.

[illegible]

Heptagon S Y S T E M S

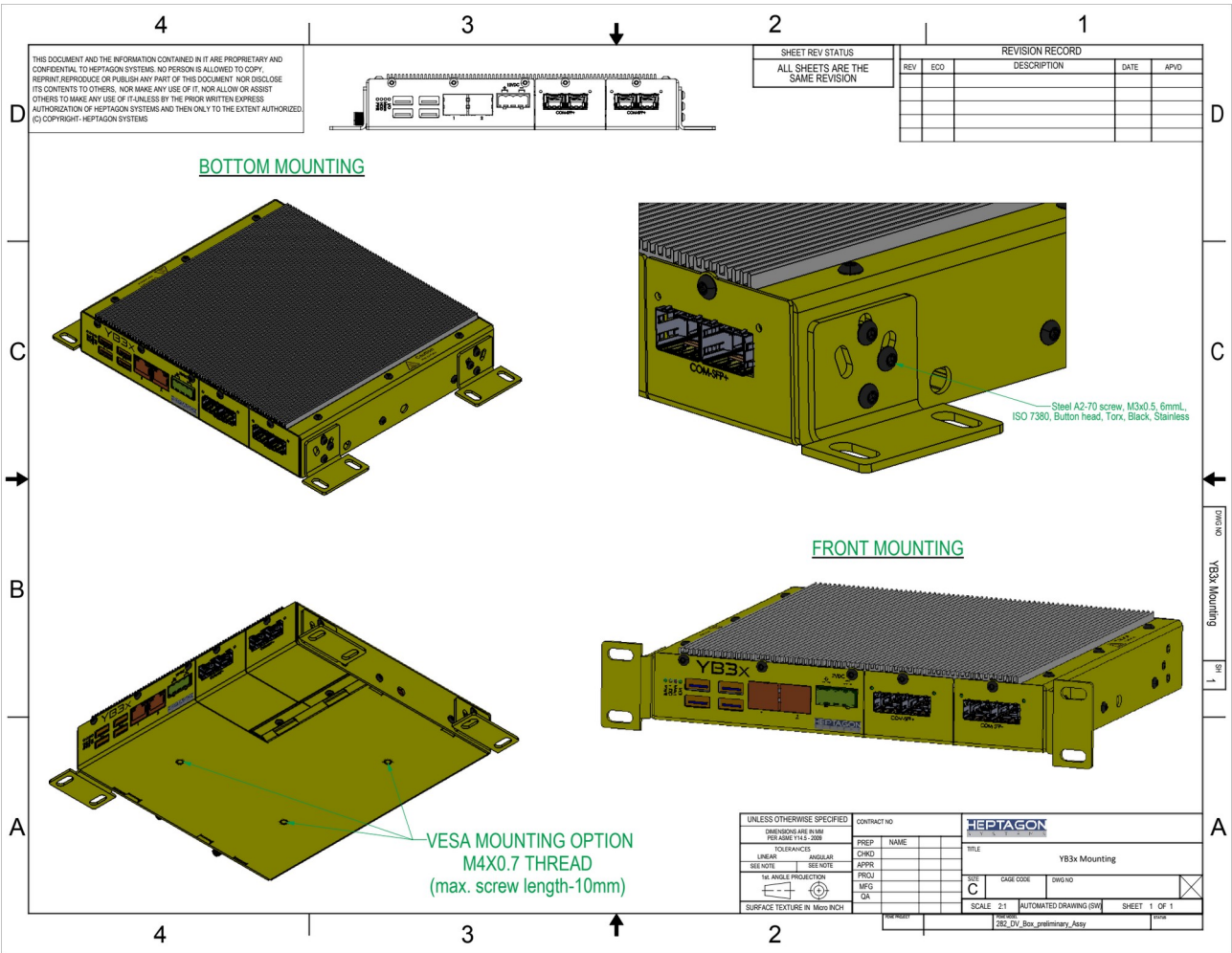




# 9. YB3x Mounting options

The YB3x has 3 mounting options:

- Front, using mounting ears to the 19" rack. The unit must be fixed to the rack, not for slide mounting.
- Shelf, rotating the mounting ears 90°
- VESA (at the enclosure bottom, 3 screws),



Drawing 7: YB3x mounting options

The below table summarizes the parts for each mounting option.

<b>Front</b>		
<b>Quantity</b>	<b>PN</b>	<b>Description</b>
2	291A10370	YB3x Mounting ear
6	380J54050	Screw, M3*0.5, 6=6mm, Pan head, Philips A2-70
<b>Shelf</b>		
3	291A10370	YB3x Mounting ear
9	380J54050	Screw, M3*0.5, 6=6mm, Pan head, Philips A2-70
<b>VESA</b>		
3	---	Screw, M4*0.7, - warning: Do not let the screw penetrate the YB3x enclosure more than 10mm. More than this measure will damage the motherboard.

## 10. Revision Notes

Revision	Date	Revision notes
0.5	2019-Apr-06	Draft version
0.8	2019-Jul-17	
0.9	2020-Jan-12	Update EMC and safety standards
1.0	2020-Nov-05	Enhance the safety section, added op. Conditions, clarify mounting.
1.1	2021-APR-05	Replace HB-DV Top, M.2 SSD, eMMC, Mini PCIe and M.2-E assembly drawings, update the description.

## 11. Copyright Notice

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