

HQ-Box2 User Manual



HQ-Box2 Storage-M6

Rev 1.2 20250702

Table of Contents

1. Introduction.....	3
2. Safety instructions.....	4
2.1. Caution – Hot surface.....	5
2.2. Recycling and battery replacement.....	5
2.3. Electrostatic Sensitive device.....	5
3. Electromagnetic Compatibility.....	5
4. Safety compliance.....	6
5. Operating and storage conditions.....	6
6. Product description.....	7
6.1. Motherboard (HB-ILD).....	8
6.2. External Connectors and sockets.....	8
6.3. LED display.....	11
7. Assembly instructions.....	12
7.1. Needed equipment.....	12
1.1. DRAM Assembly.....	13
1.2. M.2-M NVMe SSD assembly.....	14
1.3. M.2-B Assembly (SATA and mobile COMM).....	16
1.4. M.2-E Assembly.....	17
8. Thermal considerations.....	18
2. Mounting options.....	19
2.1. Desktop mount (DMT).....	19
2.2. Din Mount Assembly.....	22
2.3. Wall mount Assembly (WMT).....	23
9. Revision Notes.....	25
10. Copyright Notice.....	25

1. Introduction

Heptagon Systems HQ-Box2 is a series of rugged fanless servers in a state-of-the-art compact Box-PC enclosure. Based on the Intel® Xeon® D-1700 / D-1800 LCC SOC, 4..10-core, the HQ-Box2 offers 384GB DDR4-ECC memory and an integrated 10/25/50Gb Ethernet controller with up to 8 ports. Built for Networking and Edge computing, the Intel SOC offers scalability and a rich feature set to address key requirements, while providing a new level of compute power to support any Edge/Network application.

With flexibility and customization in mind, the HQ-Box2 offers multiple configuration options to accommodate for a variety of use cases. Additional custom-configured modifications can be easily created with a short turnaround time. The HQ-Box2 feature set is optimized towards dense compute and connectivity resources using integrated accelerators such as Intel® QuickAssist Technology (QAT) and Inline IPSec. Real-Time Features TSN (Time Sensitive Networking) and Intel® TCC (Time Coordinated Computing) are supported.

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.
- Mounting options.

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.

Note: This manual covers all product variations and therefore does not include mechanical dimensions. For this information, please choose one of the following options:

- Visit the product page of each specific model to download its dedicated mechanical drawing.
- Download the comprehensive "HQ-Box2 Mechanical Dimensions" file, which contains all models' dimensions, from our website.

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 HQ-Box2.
- 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 heat sink (ribbed structure) on the right side of the HQ-Box2 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 HQ-Box2 EMC compliance was done with cables of 3 meter maximum length. HQ-Box2 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:

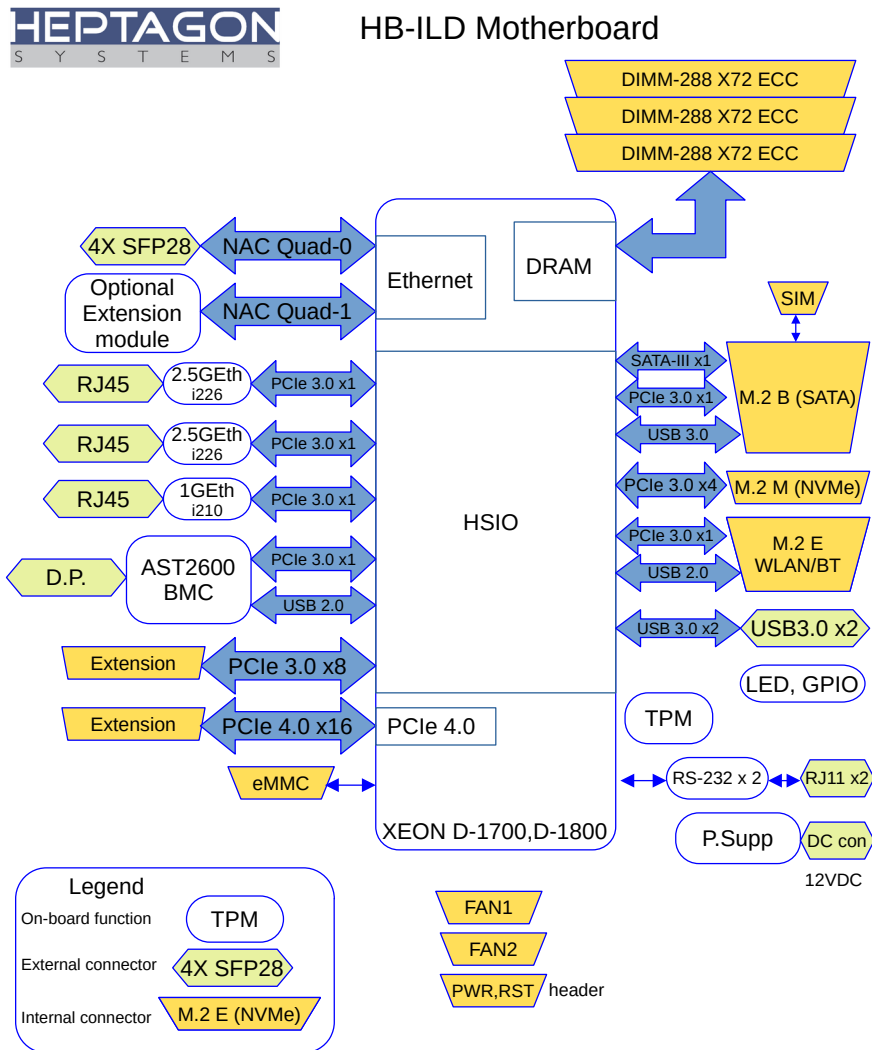
Europe (EU): EN 62368-1:14+A11:17

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

5. Operating and storage conditions

Operating condition		Range
Operating Temperature	Standard	0°C to 50°C
	Extended	20°C to 60°C
	Industrial	-40°C to 72°C / 75°C (on selected configurations)
Storage temperature		-40°C to +85°C
Supply voltage		+12VDC +/- 10%
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 HQ-Box2 Motherboard block diagram

The HQ-Box2 offers a flexible and modular architecture, enabling full utilization of the Xeon D-1700 / D-1800 SOC . The HQ-Box2 modularity enables flexibility in all major implementation junctions, accurately tailoring the HQ-Box2 to the exact needs of the client. The SOC Ethernet controller is divided into two groups: Quad-0 and Quad-1. Quad-0 has 4x SFP28 on board. Quad-1 can be utilized with an optional extension.

The HQ-Box2 has dual 2.5GbE plus a GbE port which is shared with the AST2600 BMC.

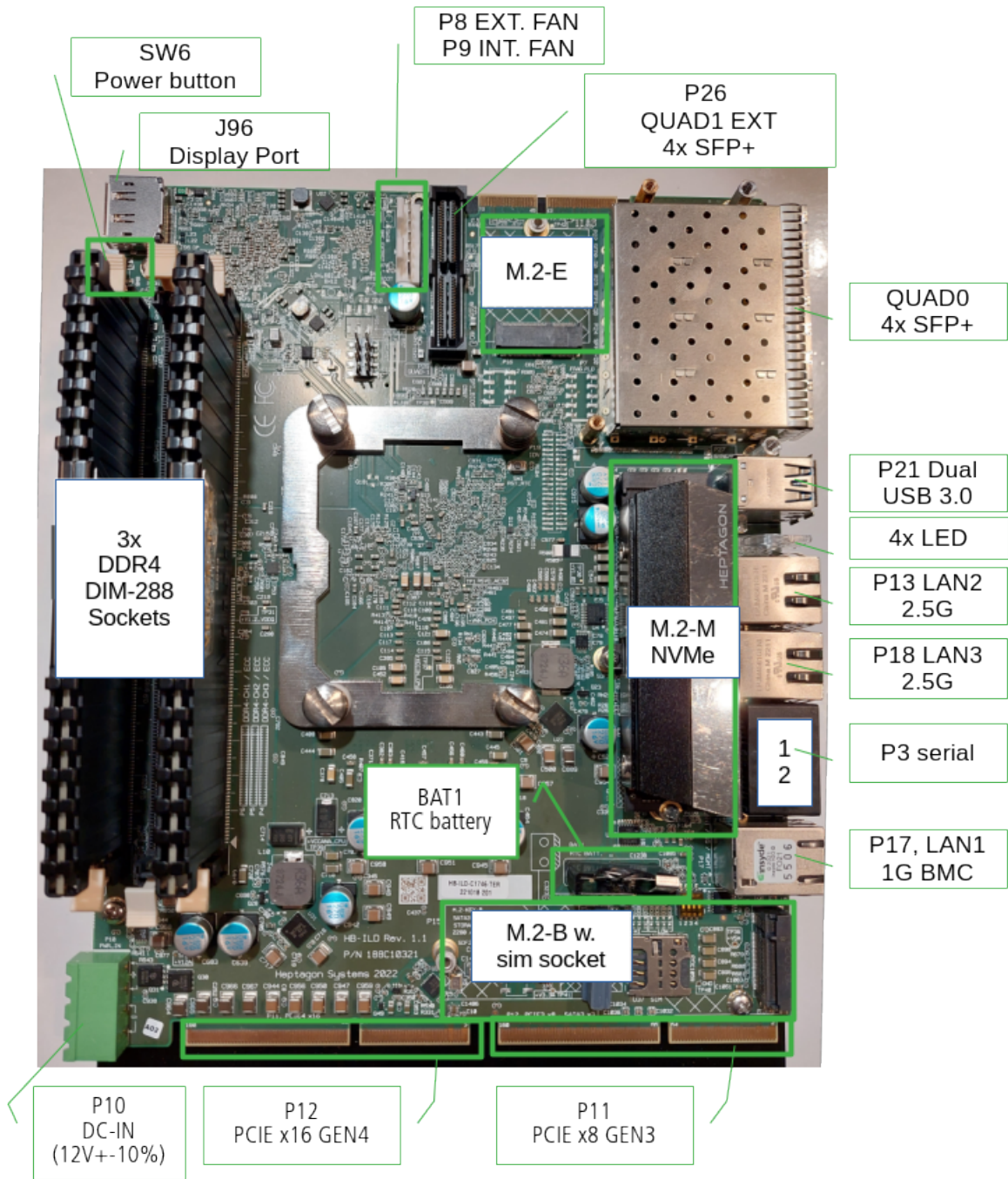
The HQ-Box2 has 24 lanes of PCIe for extension. 16 Lanes are PCIe Gen-4 and 8 lanes are PCIe Gen-3. All lanes can be bifurcated in to 16/8/4 lanes.

The memory sub system has 3x DDR4-ECC DIMM-288 with total capacity of 384GB.

On-board storage has M.2-M (NVMe) and M.2-B (SATA) slots. Supporting GSM connection, the M.2-B slot is connected to an on-board uSIM socket. For WLAN / BT expansion, the HQ-Box2 offers M.2-E slot.

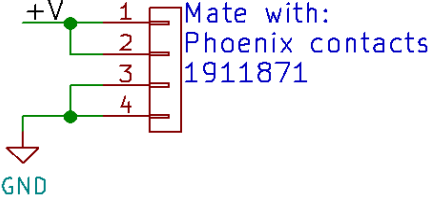
Optional eMMC storage is offered for large volumes.

6.1. Motherboard (HB-ILD)

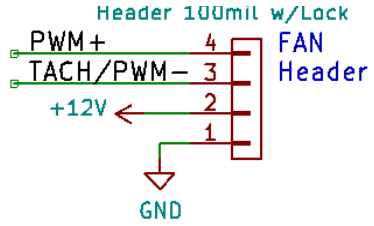


6.2. External Connectors and sockets

Panel connectors		
Function	Connector	Description
SFP+	QUAD0 QUAD1	QUAD0 is assembled on the motherboard. QUAD1 is an add-on card which connects to P26 extension connector.
USB	P21	USB 3.0, Standard Dual A-type

Panel connectors																
Function	Connector	Description														
2.5Gbe ETH	P13 - LAN2 P18 - LAN3	2.5G Ethernet, Intel i226.														
1GbE ETH	P17 - LAN1	1G Ethernet. Intel i210.														
Power connector	P10	DC 12V, Mate with Phoenix Contact 1911871  <p>Mate with: Phoenix contacts 1911871</p> <p>Supply cable should be 16AWG stranded wire for 1m supply cable. Note that two wires are required on each side.</p>														
RS-232	P3	P3 is a dual RJ11-6 connector. It is a basic RS-232 port (Tx/Rx). The connection diagram of each of the ports is as below: <table border="1" data-bbox="577 851 997 1187"> <thead> <tr> <th>Pin</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>N.C.</td> </tr> <tr> <td>2</td> <td>N.C.</td> </tr> <tr> <td>3</td> <td>GND</td> </tr> <tr> <td>4</td> <td>RX</td> </tr> <tr> <td>5</td> <td>TX</td> </tr> <tr> <td>6</td> <td>N.C.</td> </tr> </tbody> </table>	Pin	Function	1	N.C.	2	N.C.	3	GND	4	RX	5	TX	6	N.C.
Pin	Function															
1	N.C.															
2	N.C.															
3	GND															
4	RX															
5	TX															
6	N.C.															
Power button	SW6	Push button. Press for 5 seconds to turn off.														

Motherboard connectors and sockets

Function	Connector	Description
DRAM	P4-6	3 x DIM288 sockets for DDR4, DIMM-288 with ECC.
PCIe 3.0 extension	P11	PCIe 3.0 x 8 Lane, 0.8mm high speed edge connector.
PCIe 4.0 extension	P12	PCIe 4.0 x 16 Lane, 0.8mm high speed edge connector.
M.2 Sockets	P14	M-Key, PCIe 4.0 x4, for NVMe. 2280.
	P15	B-Key, SATA, USB3.0, uSim (U37), up to 2280.
	P16	E-Key, USB2.0, PCIe 2.0x1 for wireless LAN and BT. 3042/3030.
eMMC	P19	eMMC card with 32GB and 64GB options.
Display Port	J96	The BMC Display Port output.
Fan	P8, P9	<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>Mating connector: * Molex 22-01-2047 (housing) * Molex 08-50-0114 or 08-50-0113 (crimp terminals)</p> </div>  <p>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. P8 has a built in 1A fuse.</p>
CMOS Battery	BAT1	CR2032 battery holder.

6.3. LED display.

The HQ-Box2 front panel utilizes Four LEDs:

LED (top to bottom)	Function
PWR (DS22)	Green when on. Blinks when the memory sub system is initializing.
SSD	Blinks with SSD activity (from all ports).
GP1,GP2	The GP LEDs are general purpose LED, connected to programmable pins of the CPU.

7. Assembly instructions

The following describe update options of the HQ-Box2.

7.1. Needed equipment

1. An anti-static clean surface.
2. Anti-static strap
3. Screwdriver Torx T10 drive tip.
4. Screwdriver Philips PH1 drive tip.
5. For QUAD1 SFP upgrade only: 5mm hex socket (long - 50mm length):



1.1. DRAM Assembly



The HQ-Box2 has three DDR4 sockets matching the CPU 3 memory channels.

Recommended DRAM population table

Total Capacity GB	DIMM size GB			Option	
	P6 / CH1	P5 / CH2	P4 / CH3	Commercial	Industrial
8	8	-	-	D8	D8I
16	8	-	8	D16	D16I
24	8	8	8	D24	D24I
32	16	-	16	D32	D32I
48	16	16	16	D48	D48I
64	32	-	32	D64	D64I
96	32	32	32	D96	D96I
128	64	-	64	D128	D128I
192	64	64	64	D192	D192I
256	128	-	128	D256	D256I
384	128	128	128	D384	D384I

Notes:

1. The 3 memory channels are independent. Mix of different DRAM per socket is possible. We do however suggest to use the same size/manufacturer/model on all assembled DRAM.
2. Required DRAM specification: DIMM-288 Registered DDR4 (RDIMM), DDR4-2933, 1.2V with ECC.
3. When assembling your own DRAM please make sure it has a proper heat spreader. All Heptagon Systems supplied DRAM have a dedicated heat spreader (PN 206B10010).
4. In case of assembling two DRAM modules, it is recommended to leave P5 vacant for better air convection.
5. The best DRAM performance is attained when all slots are populated.

DRAM part numbers:

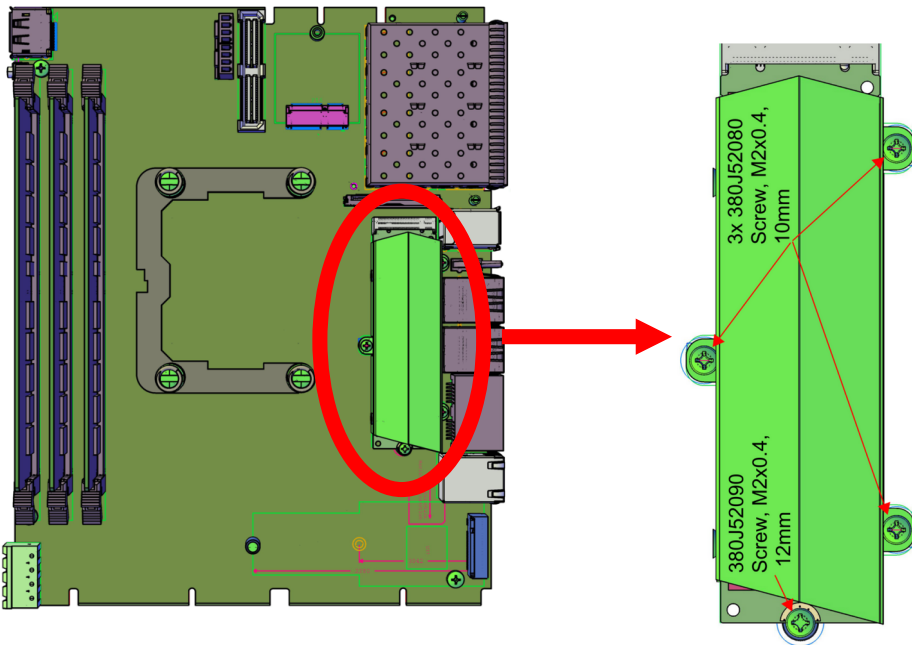
Commercial temperature P/N	Industrial temperature P/N	Description, size	Ref
603R08010	603R0801I	DRAM Module, RDIMM-DDR4, 8GB, ECC, PC4-2933, 1.2V	
603R16010	603R1601I	DRAM Module, RDIMM-DDR4, 16GB, ECC, PC4-2933, 1.2V	
603R32010	603R3201I	DRAM Module, RDIMM-DDR4, 32GB, ECC, PC4-2933, 1.2V	
603R64000	603R6400I	DRAM Module, RDIMM-DDR4, 64GB, ECC, PC4-2933, 1.2V	
603R13100	TBA	DRAM Module, RDIMM-DDR4, 128GB, ECC, PC4-2933, 1.2V	
206B10010		DDR4 heat spreader (two parts, to mount on each side of the DRAM).	HW2 -1x HW2,HW3 - 2x HW2,HW3,HW4

		-3x
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1.2. M.2-M NVMe SSD assembly

P/N	Description, size	Qty	Ref
604Nxxxxx	M.2 M-type 2280 SSD, PCIe Gen 3, 4 Lane	1	SM1
206B10050	Heat sink for M.2-2280 with 3 mounting ears	1	HS3
380J52090	Screw, M2x0.4 12mm, DIN7985, Pan head, Philips, Stainless Steel, A2 grade	1	SCR27
380J52080	Screw, M2x0.4 10mm, DIN7985, Pan head, Philips, Stainless Steel, A2 grade	3	SCR28..30

- Assemble the M.2 SSD into the 206B10050 Heat sink.
- Insert the M.2 SSD+Heat sink into P14 M.2 slot and fasten the heat sink mounting holes with 3x 380J52080 M2x0.4, 10mm screws.
- Fasten the M.2 PCB with 380J52090 M2x0.4, 12mm screw.



Do not over fasten!

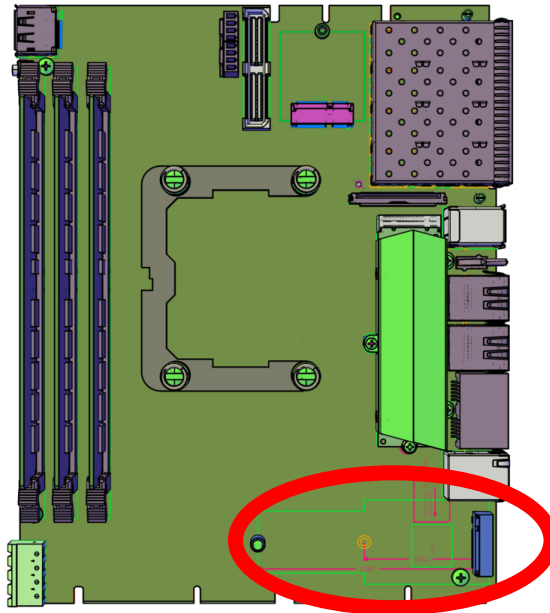
- M.2-2280 NVMe Gen3 SSD part numbers. The **W-Type** column defines the write intensive type of the SSD.
 - Consumer
 - DC - Data centre

Size	Commercial temperature P/N	Industrial temperature P/N	W-Type	Option	
				Commercial	Industrial
128GB	604N12830	T.B.D.	Consumer	N128	N128I
256GB	604N25630	604N25631	Consumer	N256	N256I
1TB	604N1004C	604N10041	Consumer	N1T	N1TI
1TB	604N10040	N/A	DC	N1TD	--
2TB	604N2004C	604N20041	Consumer	N2T	N2TI
4TB	604N40040C	T.B.D.		N4T	N4TI

1.3. M.2-B Assembly (SATA and mobile COMM)

P/N	Description, size	Qty	Ref
604Mxxxxx	M.2 M-type 2280 SSD SATA	1	SM2
380J52090	Screw, M2x0.4 12mm, DIN7985, Pan head, Philips, Stainless Steel, A2 grade	1	SCR27
383A52560	Standoff for 8.5mm M2, 6.6mmH, M2 not threaded To be used only with 2242 cards.	(Optional) 1	SDF30

- 2280 size: Assemble the 604Mxxxxx M.2-M card and secure it with 380J52090 M2, 12mm screw.
- 2242 size: Place the 383A52560 standoff in the mounting hole, assemble the 604Mxxxxx M.2-M card and secure it with 380J52090 M2, 12mm screw.

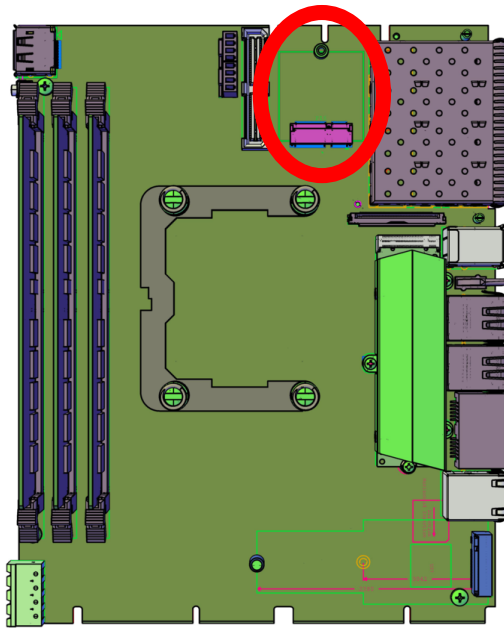


Notes:

- The HQ-Box2 M.2-B socket allows for 2280 and 2242 length devices.
- 2230 and 2260 lengths are not supported.

1.4. M.2-E Assembly

P/N	Description, size	Qty	Ref
605Bxxxxx	M.2-E Add-on card	1	P16
380J52090	Screw, M2x0.4 12mm, DIN7985, Pan head, Philips, Stainless Steel, A2 grade	1	



1. Insert the 605Bxxxxx M.2-E card and secure it with 380J52090 M.2 12mm screw.

Notes:

- The HQ-Box2 M.2-E socket allows for 2230 and 3030 devices.

8. Thermal considerations

Mounting of the HQ-Box2 should take into account the fact that the HQ-Box2 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 HQ-Box2 within it's specified temperature range:

- Keep a minimal air gap of 45mm above the HQ-Box2.
- Keep a minimal air gap of 20mm below the HQ-Box2.
- Add on cards (AOC) should have similar operating temperature range to that of the HQ-Box2. If the AOC operating temperature does not match the requirements, Please consider using a perforate cover to allow air flow. In more extreme cases, a fan may be required to guarantee the AOC will function properly.

2. Mounting options

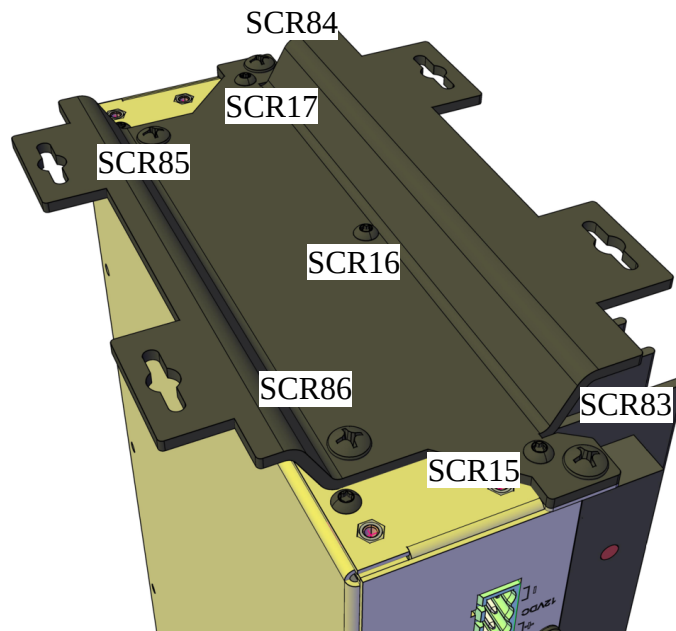
2.1. Desktop mount (DMT)

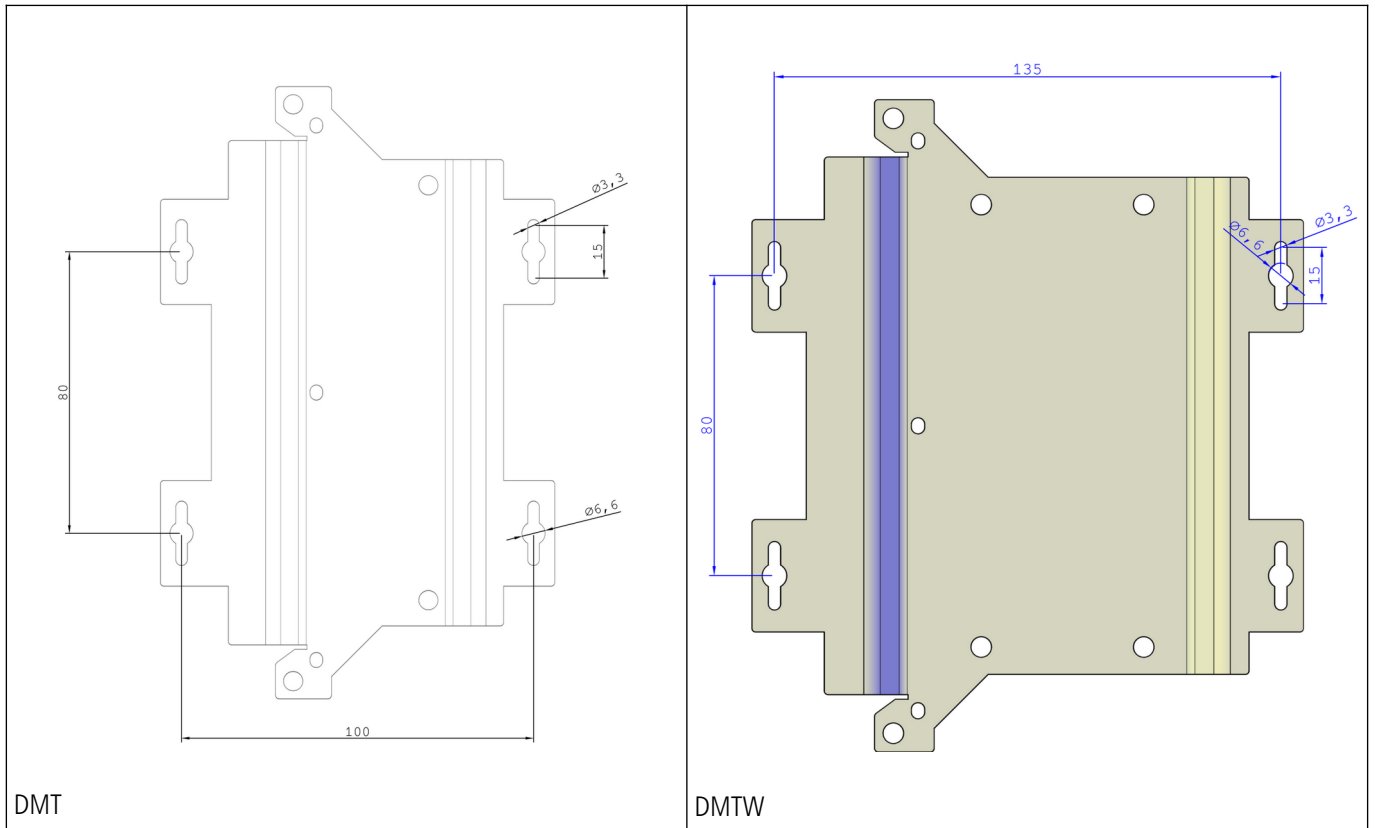
DMT is a vertical mounting of the HQ-Box2. It has two part numbers, one for the narrow enclosures (Bare, Storage-M/M6) and will be referred to as DMT. The other part number is for the wide enclosures which will be referred to as DMTW.

P/N	Description, size	Qty	Ref	Option
-----	-------------------	-----	-----	--------

	Assembled HQ-Box2	1		
291A10931BK	HQB2 Foot Stand narrow, Black, Rev 1.1	1	MP17	DMT
291A11100BK	HQB2, Foot Stand Wide (DMT), Rev 1.0	1		DMTW
380C5405B	Screw, M3x0.5, 6mmL, Torx, Button head (ISO 7380), Black	3	SCR15..17	
380J5607B	Screw_M5x0,8 8mm_pan-head black	4 6	SCR83..86 SCR83..86, SCR95..96	DMT DMTW

1. Unscrew the existing M3 screws from SCR 15..17 locations. The original screws are 4mm long and are too short.
2. Foot stand selection
 1. DMT: For use with HQ-Box2 Bare and HQ-Box2 Storage-M/M6: Place and align the 291A10931BK foot stand over the HQ-Box2 Bottom. Use 4x 380J5607B M5,8MM screws to tighten the mount to the enclosure.
 2. DMTW: For use with all other models of HQ-Box2: Place and align the 291A11100BK foot stand over the HQ-Box2 bottom. Use 6x 380J5607B M5,8MM screws to tighten the mount to the enclosure.
3. Optionally use 3x 380C5405B M3,6mm screws for additional strength.

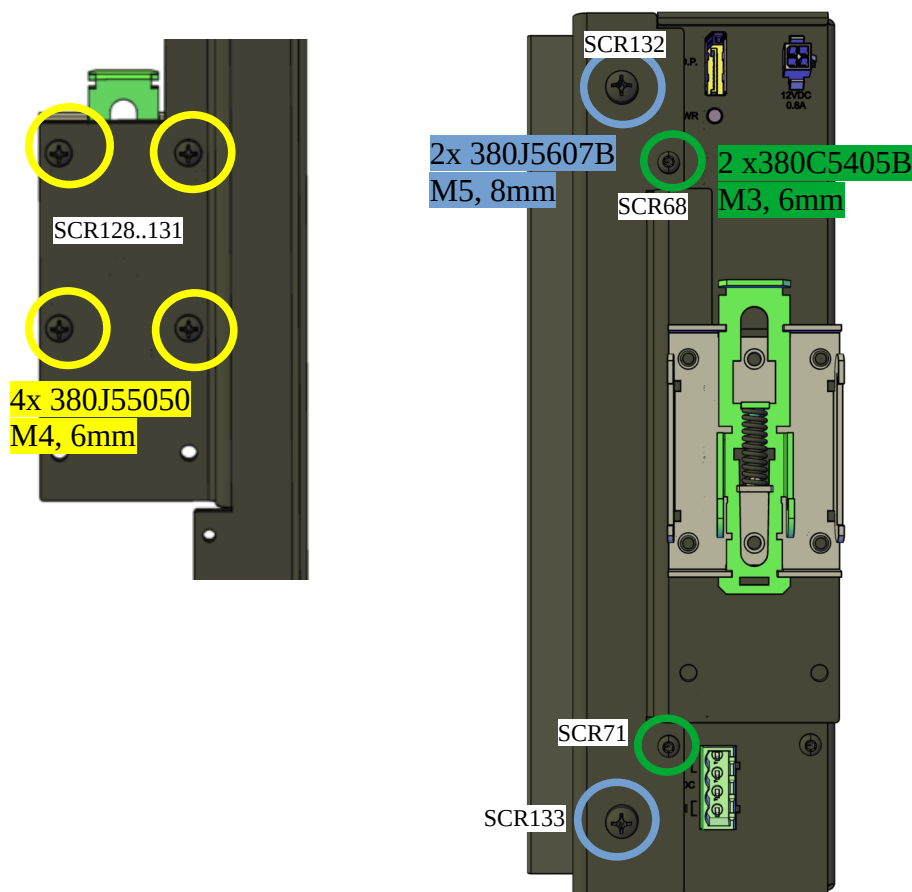




2.2. Din Mount Assembly

P/N	Description, size	Qty	Ref
291A11110BK	HQB2 Din Mount, Slim, Black , Rev 1.0	1	MP19
206F10060	Mounting, 35mm DIN Rail Mounting Clip, Steel, 44.2mm width	1	HW13
380J55050	Screw, M4x0.7, 6mmL, Din7985, Pan head, Philips, Stainless Steel	4	SCR128..131
380J5607B	Screw_M5x0,8 8mm_pan-head black	2	SCR132..133
380C5405B	Screw M3x0.5, 6mm Torx black	2	SCR68,SCR71

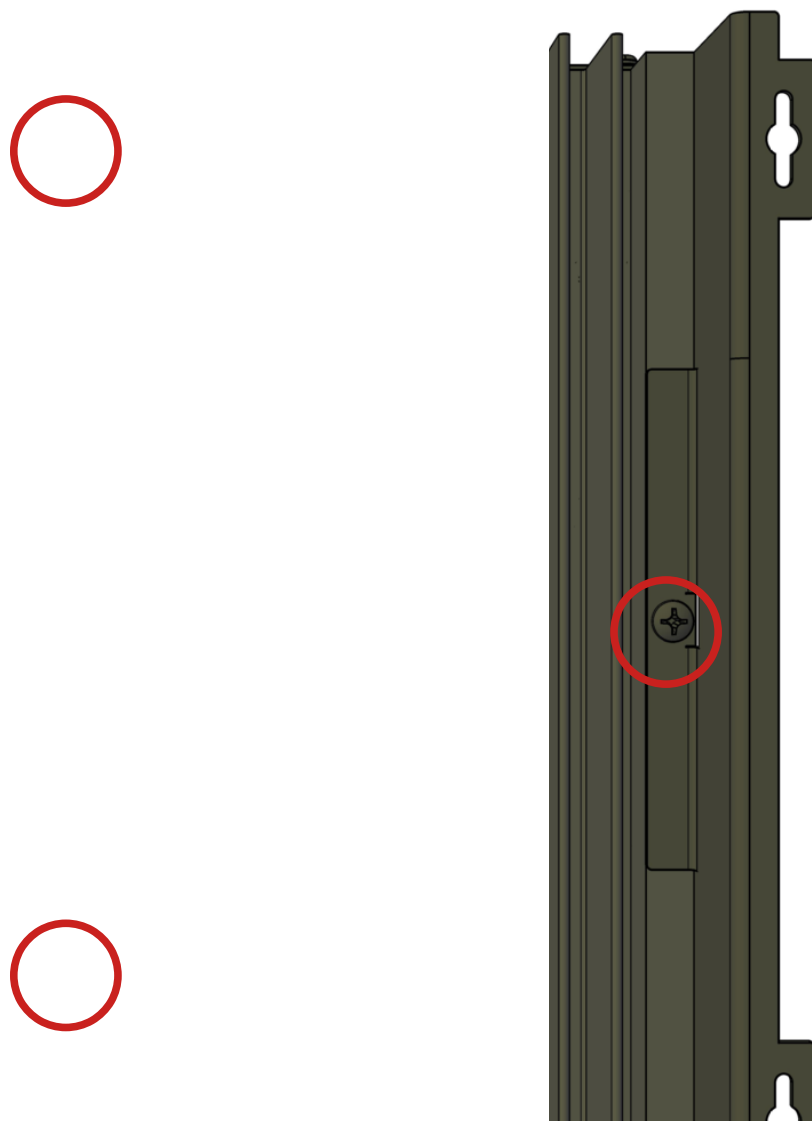
1. Remove 2x M3 screws which fasten the back panel to the Heat sink (we shall replace them with 6mm screws).
2. Assemble 206F10060 Din mount clip onto the 291A11110BK Din mount with 4x 380J55050 M4 6mm screws.
3. Assemble the 291A11110BK din mount to the HQ-Box with 2x 380J5607B M5 8mm screws + 2x 380C5405B M3 6mm screws.



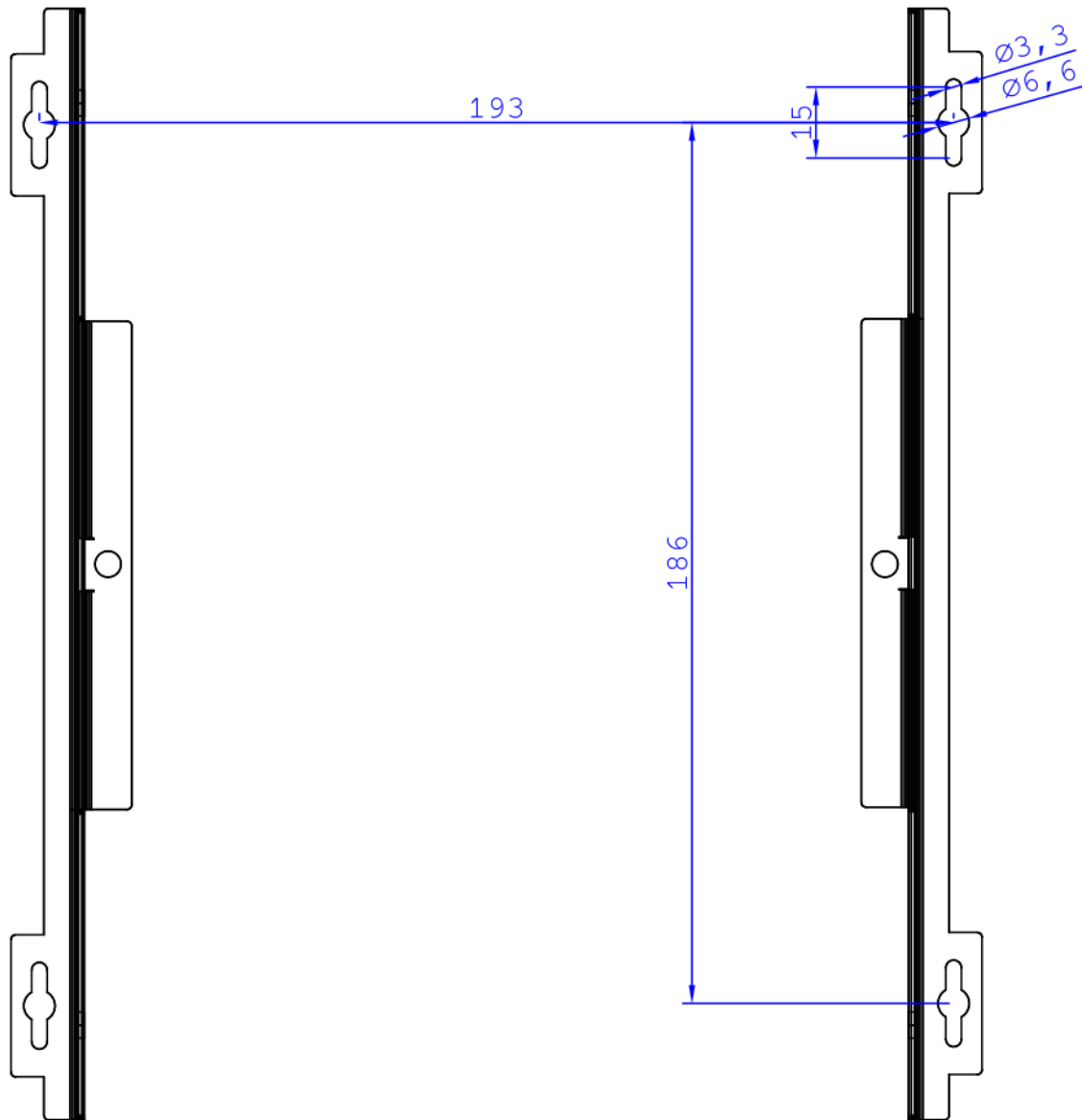
2.3. Wall mount Assembly (WMT)

P/N	Description, size	Qty	Ref
291A10960BK	HQB2 Wall mount, Black, Rev 1.0	2	MP20..21
380J5607B	Screw_M5x0,8 8mm_pan-head black	6	SCR132..137

1. The 291A10960BK wall mount is composed of two identical parts. They are assembled at the same plane as the front and back panels. Attach each part with 3x 380J5607B M5,8mm screw to the Heat sink as the below drawing:



Mounting holes dimension:



9. Revision Notes

Revision	Date	Revision notes
0.5	2022 - FEB - 11	Draft version
0.8	2022 - AUG - 20	Mounting section added
1	2024 - MAY -12	DRAM / M.2 sections re-written
1.1	2025 - MAR -05	Minor corrections
1.2	2025 – JUL – 02	Clarify operating temperature, Insert Xeon D-1800 support. Add DRAM options up to 384GB. Correct physical dimensions.

10. Copyright Notice

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