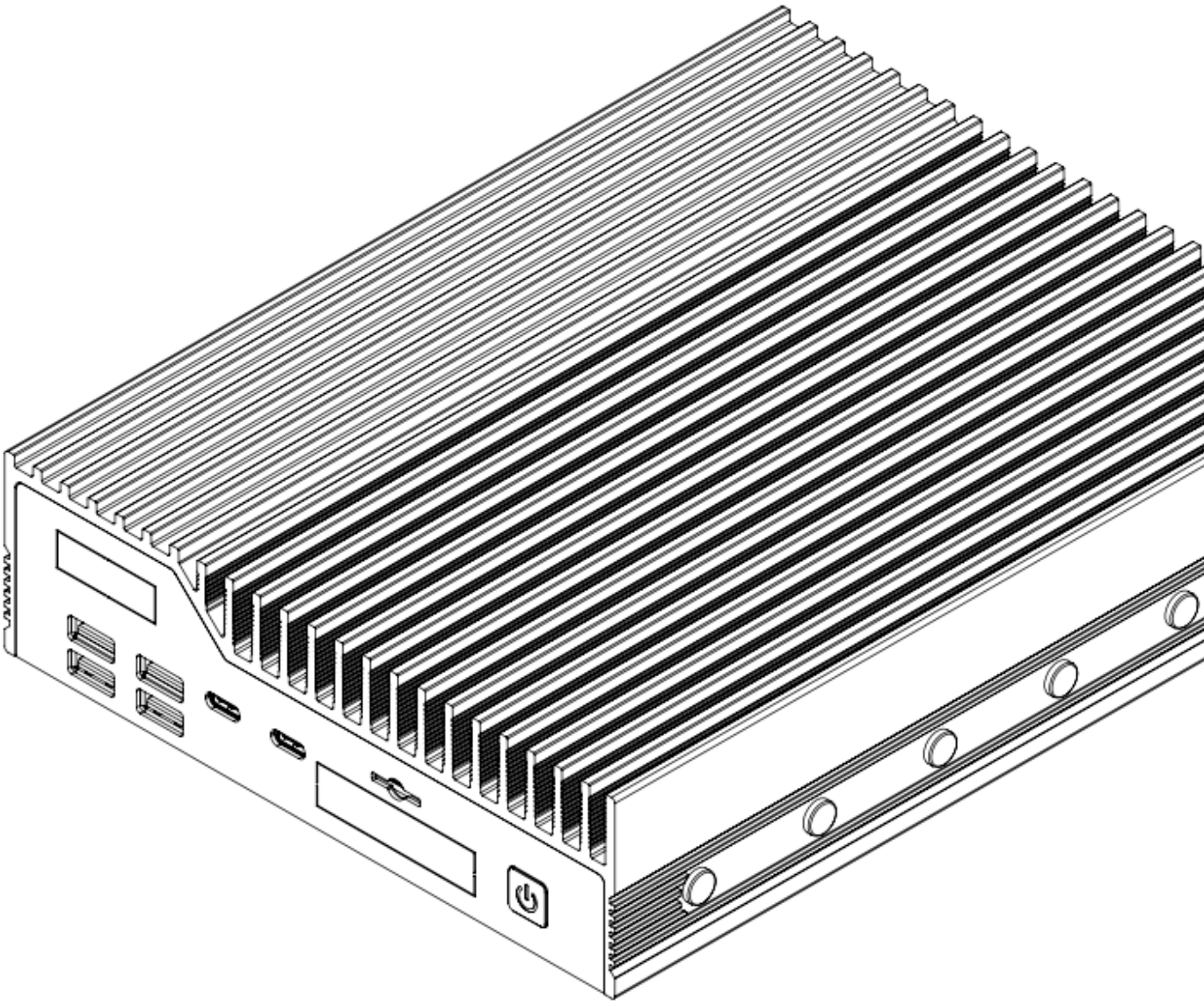
HX511 Product Manual



Revision History

Revision History	Date
First release of HX11 manual	06/06/2023
Updated Errata and feature list	06/12/2023

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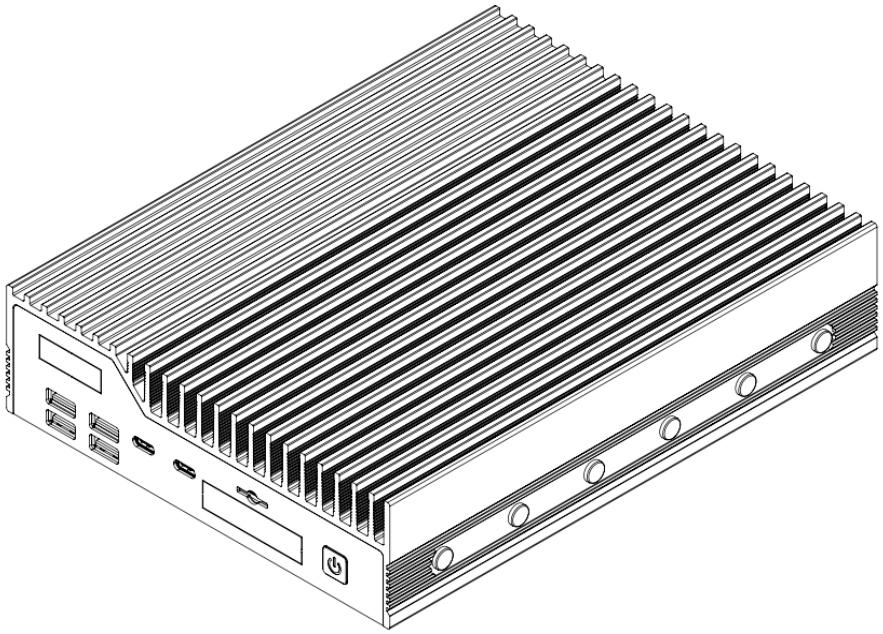
1 - System Overview

1.1 System Introduction

The OnLogic HX511 expands on the Helix product range, and leverages Intel® 12th generation Alder Lake PS processing into a powerful fanless system.



The HX511 offers increased compute power and visual processing capabilities, encased in Hardshell™ Fanless Technology. Additionally, it offers optional expansion options via reliable, cableless add-on cards. With quad video output, a wide power range, and high processing power, the HX511 is equipped to handle a wide variety of applications.

1.2- In-box Accessories

- 4x Rubber Feet

If you purchased additional items such as mounting brackets, power supplies or terminal block connectors, they will be located in the system box or within the outer shipping carton.

All drivers and product guides can be found on the corresponding product page. For more information on accessories and additional features, visit the HX511 product page at https://www.onlogic.com/hx511/.

1.3 - Product Specifications

Model	HX511
System Dimensions	8.86" x 2" x 6.97" 225 x 50.8 x 177 mm
System Weight	4.94 lbs 2.24 kgs
Board Dimensions	8.7" x 6.1" 221 x 156 mm
CPU (on solder side of board)	Socket LGA 1700 - Alder Lake PS
PCH	PS Integrated
Memory	2 x SO-DIMM DDR5 (2 x 32GB max Dual Channel) 64 GB Total
LAN Controller	1x Intel i225-LM -with AMT 1x Intel I225-IT
Expansion	1x M.2 2280/3042/3052 B-Key (PCIe x2, USB 3.2 5Gb/s, SATA III) 1x M.2 2230 E-key (Wi-Fi) (PCIe / USB 2.0) 1x M.2 2280 M-key (PCIe x 4, SATA III)
Back I/O	2x Full size DisplayPort 1.4 2x Gb LAN (2 x Intel) 2x USB 3.2 10 Gb/s 4-pin Terminal Block (12 ~ 24 V input) Optional dual CAN card Optional single COM (RS-232/422/485) card
Front I/O	1x Power button with LED indicator 1x 3FF-Sim slot (Mapped to the B-Key) 4x USB 3.2 10Gb/s Optional 3 COM (RS-232/422/485) add-in card Optional DIO add-in card 2x Thunderbolt 4 (40 Gb/s) USB Type C
Onboard Headers & Connectors	1x Battery on a cable 1x internal power header (5V, 12V)
Voltage Input	12~24V
Power Input	4-pin Terminal Block (supports remote switch)
BIOS	Insyde
Operating Systems	Windows 10 IOT 2021 LTSC, Ubuntu 22.04 LTS, Yocto, Window 11
Special Features	Watchdog timer RTC PTT in BIOS On-board TPM 2.0 Support for Vision Processing Units Support for 4G LTE and GPS expansion cards

	TPM (Infineon SLB9672)
Thermal Standards (Subject to change through RFI and RFQ steps)	System Operating Temperature: 0-50C Storage Temperature: -10-85C Operating Humidity: 0% - 90% (non-condensing)
Extra Chassis Features	6 Antenna holes Wall Mount DIN Rail Mount VESA Mount
Regulatory Certifications	 FCC 47 CFR Part 15 Subpart B (Class A)  EN 60950-1 & EN 63268-1 CISPR 32/EN 55032 CISPR 35/EN 55035 Radio Equipment Directive (2014/53/EU)  WEEE Directive (2012/19/EU)  RoHS 3 (2015/863/EU)  IEC 60601-1-2, 4th ed. - EMC Ready  EN 60945, 4th ed.  IEC/UL/EN 62368-1

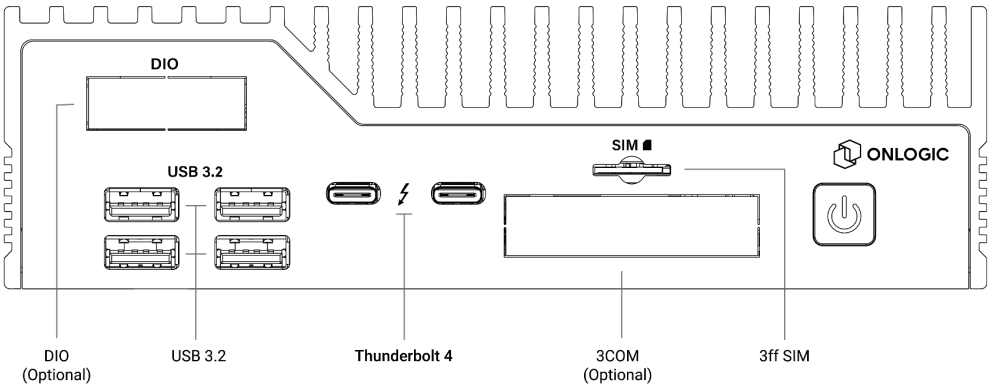
Radio Specifications when equipped with Intel AC 9260 Wi-Fi (device for indoor use)	
Frequency Bands	2.4 GHz and 5 GHz bands
Operating Frequency	2400 - 2485 MHz 5150 - 5250 MHz, 5250 - 5350 MHz 5470 - 5725 MHz, 5725 - 5878 MHz
Channel spacing / Bandwidth	2.4GHz: 802.11b/g/n; 5 MHz / BT: 1MHz Bandwidth: 20 MHz / 40 MHz 5 GHz: 802.11a/n/ac: 20, 40, 80, 160 MHz
RF output power	20 dBm (2400-2485 MHz) IEEE 802.11b/g/n & BT 10 dBm (2400-2485 MHz) BLE 23 dBm (5150-5725 MHz) IEEE 802.11a/n/ac 13.98 dBm (5725-5875 MHz) IEEE 802.11a/n/ac
Type of Modulation	2.4 GHz: DSSS/OFDM/FHSS 5 GHz: OFDM

Type of Antenna	Reference antenna is PIFA type (2 dBi/2 dBi gain)
Modes of operation	Duplex (Tx/Rx)
Duty cycle (access protocol)	As In: IEEE 802.11a/b/g/n/ac

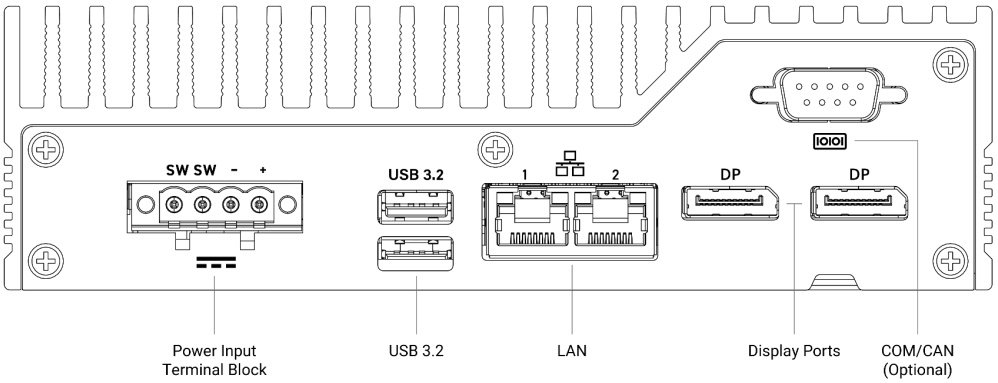
Radio Specifications when equipped with Amit MDG100 (EU)	
GPS Receiver	Operating frequency range: 1559 - 1610 MHz
GLONASS Receiver	Operating frequency range: 1559 - 1610 MHz
BDS Receiver	Operating frequency range: 1559 - 1610 MHz
Galileao Receiver	Operating frequency range: 1559 - 1610 MHz
QZSS Receiver	Operating frequency range: 1559 - 1610 MHz
GSM 900	Operating frequency range: 880 - 915 MHz, 925 - 960 MHz Maximum output power: 33dBm rated
GSM 1800	Operating frequency range: 1710 - 1785 MHz, 1805 - 1880 MHz Maximum output power: 30dBm rated
WCDMA Band 1	Operating frequency range: 1920 - 1980 MHz, 2110 - 2170 MHz Maximum output power: 24dBm rated
WCDMA Band 8	Operating frequency range: 880 - 915 MHz, 925 - 960 MHz Maximum output power: 24dBm rated
LTE FDD Band 1	Operating frequency range: 1920 - 1980 MHz, 2110 - 2170 MHz Maximum output power: 23dBm rated
LTE FDD Band 3	Operating frequency range: 1710 - 1785 MHz, 1805 - 1880 MHz Maximum output power: 23dBm rated
LTE FDD Band 7	Operating frequency range: 2500 - 2570 MHz, 2620 - 2690 MHz Maximum output power: 23dBm rated
LTE FDD Band 8	Operating frequency range: 880 - 915 MHz, 925 - 960 MHz Maximum output power: 23dBm rated
LTE FDD Band 20	Operating frequency range: 832 - 862 MHz, 791 - 821 MHz Maximum output power: 23dBm rated
LTE FDD Band 28A	Operating frequency range: 703 - 733 MHz, 758 - 788 MHz Maximum output power: 23dBm rated
LTE FDD Band 38	Operating frequency range: 2570 - 2620 MHz Maximum output power: 23dBm rated
LTE FDD Band 40	Operating frequency range: 2300 - 2400 MHz Maximum output power: 23dBm rated
E-GSM	Operating frequency range: 880 - 915 MHz Maximum output power: 33dBm rated
DCS	Operating frequency range: 1710 - 1785 MHz Maximum output power: 30dBm rated

1.4 - Exterior Features and Dimensions

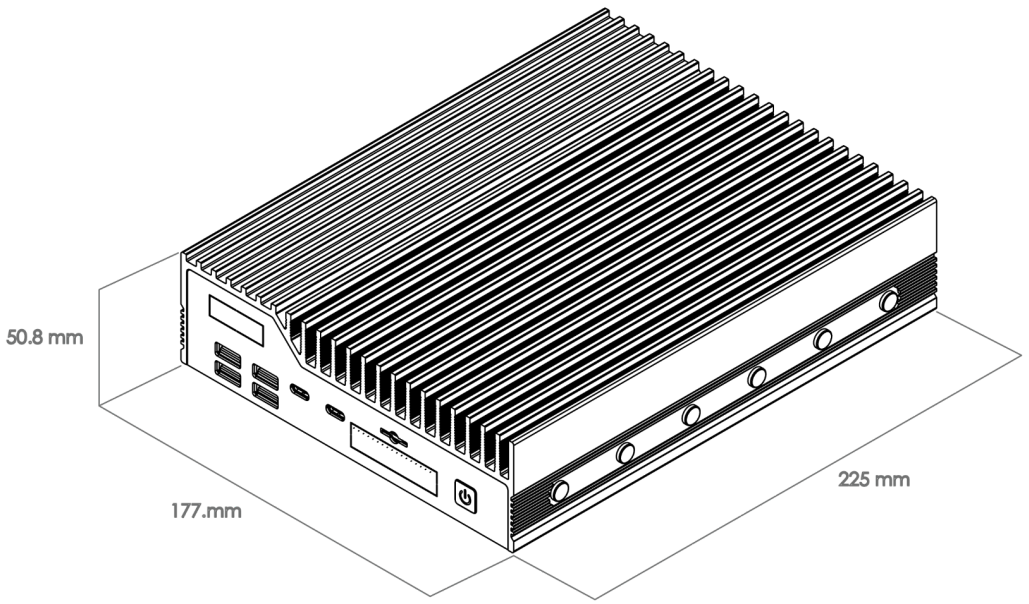
1.4.1 - Front I/O



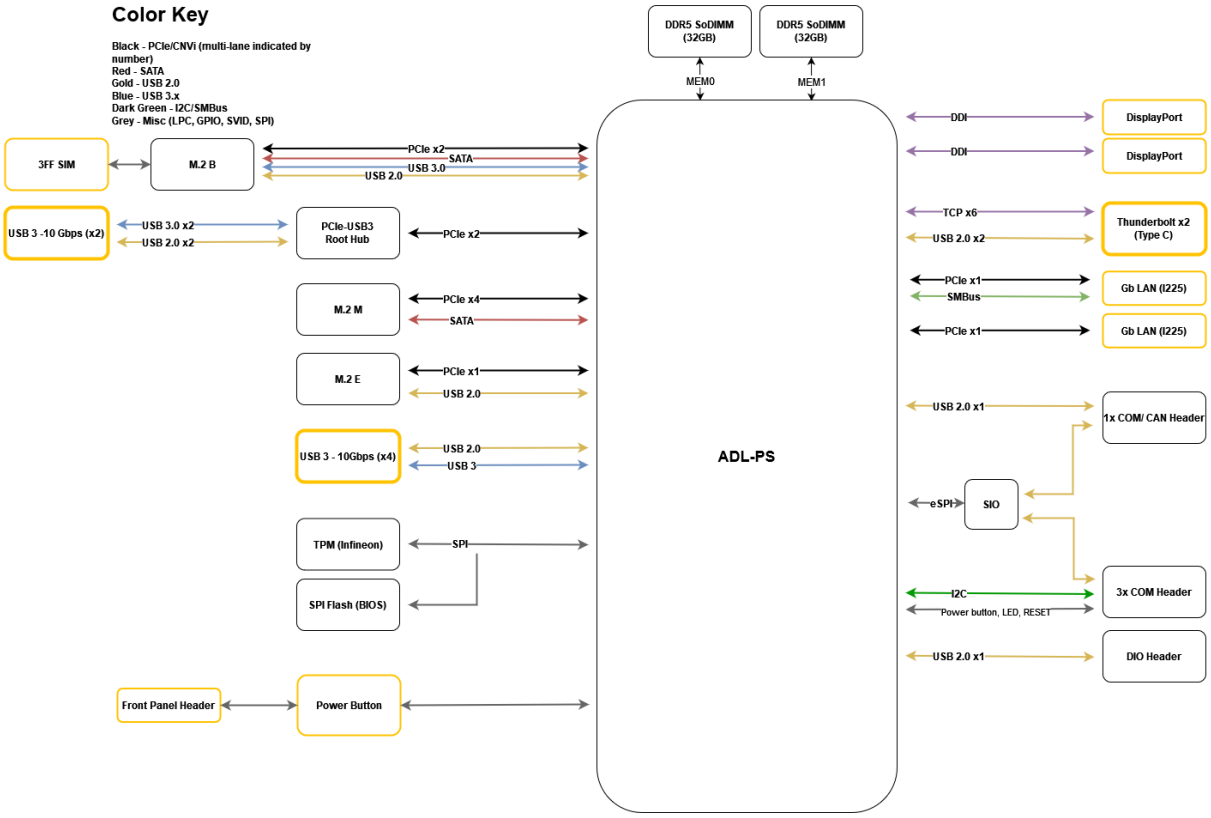
1.4.2 - Back I/O



1.4.3 - Helix 511 Dimensions (HX511)



1.5 - System Block Diagram



1.6 - Additional Features

1.6.1 Intel Active Management Technology

Intel AMT is supported on select processor SKUs that meet requirements for vPro support:

- i7-12800HL
- i5-12600HL
- i3-12300HL

AMT Configuration is managed from outside the BIOS setup menu by pressing DELETE at the system boot screen and selecting “MEBx Configuration”

For detailed configuration options, see the HX511 BIOS manual.

1.6.1 Intel Volume Management Device

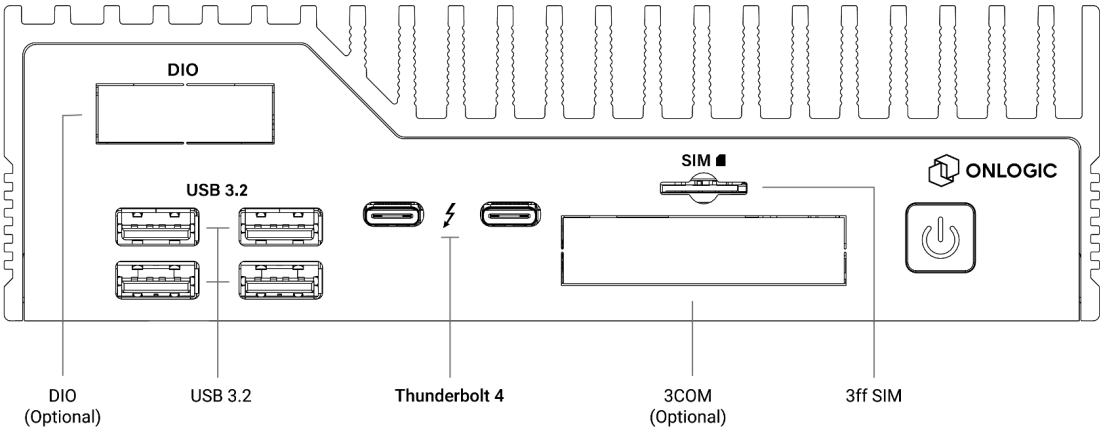
Intel VMD may be used to configure software RAID for supported Windows operating systems.

VMD is supported on all processor SKUs. VMD must be enabled from the BIOS setup menu, and then may be configured from the RST setup menu by pressing DELETE at the system boot screen and choosing “Device Management.”

For detailed configuration options, see the HX511 BIOS manual.

2 - I/O Definitions

2.1 - Front I/O definition



Power button / Power LED

The front power button can be used to turn on and off the Helix system. The power button is a momentary contact button with a blue LED backlight used to display the status of the system. A single press while the system is on will initiate a graceful shutdown operation from the OS. Pressing and holding the button for 4 seconds while the system is running will cause a hard reset of the system. The system can be woken by a single press of the power button from any state.

The LED backlight will indicate the system status. A solid blue light indicates that the system is powered in the S0 state. A flashing blue light indicates the system is in the sleep state. The LED is off in S5 and deep sleep states.

SIM card

A 3FF Subscriber Identity Module (SIM) card slot is present on the front panel of the Helix platform allowing native support for OnLogic 4G LTE modules. The SIM signals are connected to the M.2 B-Key internal expansion slot.

The SIM slot is a Push-Push type receptacle. To insert the SIM card into the front panel of the Helix platform, please use a small implement to push the card into the slot until it clicks. To remove the card, push with a small implement until the card clicks, then pull on the free end of the card to remove it.

USB 3.2

There are four USB 3.2 Gen 2 ports on the front panel of the Helix platform. These ports are capable of linking at 10Gb/s transfer rates.

Thunderbolt™ 4

There are two Thunderbolt 4 ports on the front panel of the HX511. These ports are capable of linking at up to 40Gb/s transfer rates.

USB Type-C connector (Thunderbolt 4)

– Power output up to 5V/3A for the first port and 5V/1.5A for the second port. Power will be allocated on a first-come first-serve basis between the first and second ports.

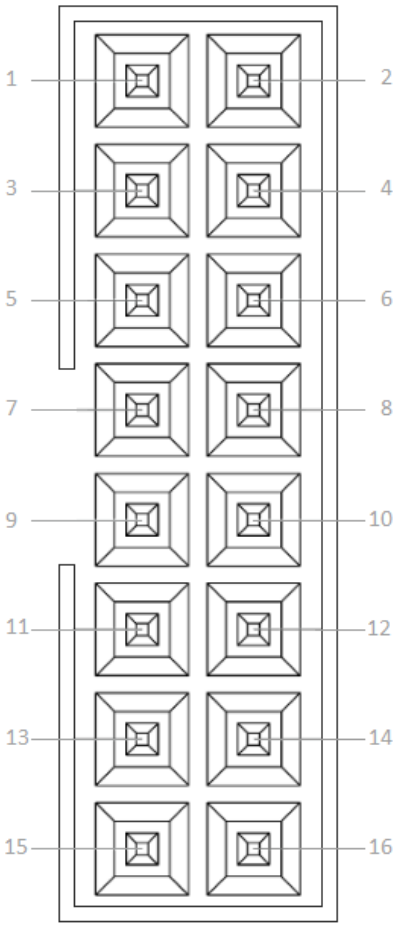
– Up to 40 Gb/s data transfer rate in Thunderbolt Alt Mode

– DisplayPort 1.4 compliant in DisplayPort Alt Mode

– Supports SuperSpeed USB 10 Gbps; backwards compatible with SuperSpeed USB 5 Gbps and USB 2.0.

Note: Type-C power sink mode is not supported on Helix 511.

DIO option



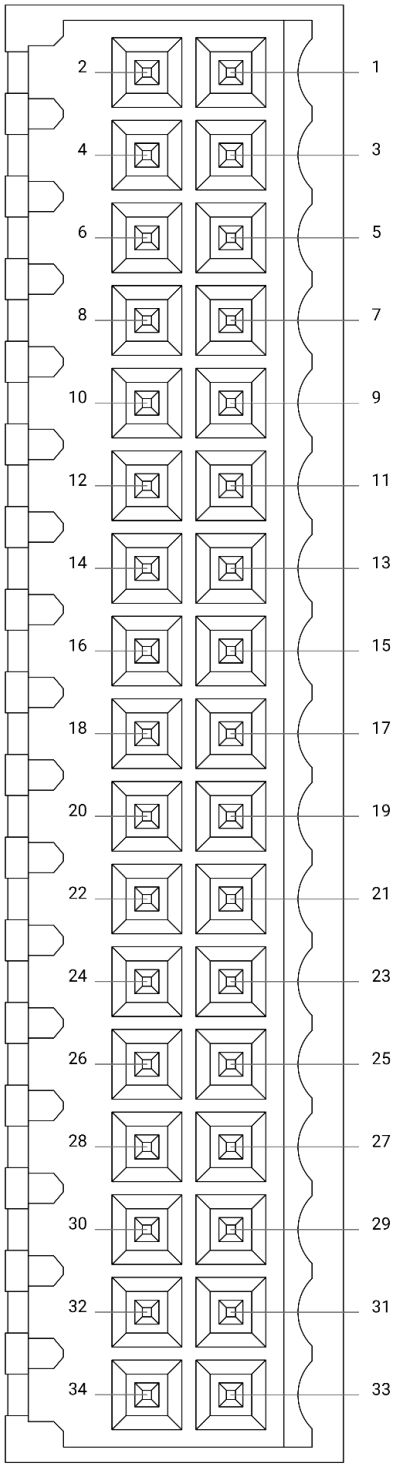
Pin	Function
1	DI 3
2	DIO VCC
3	DI 2
4	NC
5	DI 1
6	NC
7	DI 0
8	NC
9	DO 3
10	GND
11	DO 2
12	GND
13	DO 1
14	GND
15	DO 0
16	GND

The Helix 511 platform supports an optional Isolated Digital I/O add-in card (OnLogic HX511-DIO). This option allows for interfacing of the Helix 511 with existing PLC integrations or other digital logic applications. For a complete explanation of features, operating voltages, and safety information, please refer to the DIO expansion manual on the OnLogic support site.

https://support.onlogic.com/documentation/helix-511-technical-resources/#dio-card

3X COM Option

Rotated Clockwise: 90 Degrees



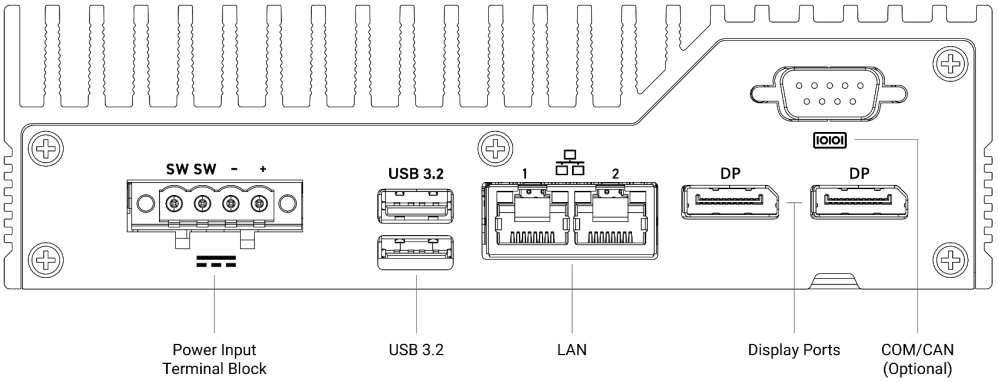
Pin	RS-232	RS-422	RS-485
1	COM2 DCD	COM2 TX-	COM2 TX+/RX+
2	COM2 RX	COM2 TX+	COM2 TX-/RX-
3	COM2 RTS		
4	COM2 DSR		
5	COM2 CTS		
6	COM2 TX	COM2 RX+	
7	COM2 DTR	COM2 RX-	
8	COM2 RI / 12V / 5V	COM2 12V / 5V	COM2 12V / 5V
9	GND	GND	GND
10	GND	GND	GND
11	COM3 DCD	COM3 TX-	COM3 TX+/RX+
12	COM3 RX	COM3 TX+	COM3 TX-/RX-
13	COM3 RTS		
14	COM3 DSR		
15	COM3 CTS		
16	COM3 TX	COM3 RX+	
17	COM3 DTR	COM3 RX-	
18	COM3 RI / 12V / 5V	COM3 12V / 5V	COM3 12V / 5V
19	COM4 DCD	COM4 TX-	COM4 TX+/RX+
20	GND	GND	GND
21	COM4 RTS		

	22	COM4 RX	COM4 TX+	COM4 TX-/RX-
	23	COM4 CTS		
	24	COM4 DSR		
	25	COM4 DTR	COM4 RX-	
	26	COM4 TX	COM4 RX+	
	27	SHIELD	SHIELD	SHIELD
	28	COM4 RI / 12V / 5V	COM4 12V / 5V	COM4 12V / 5V
	29	GND	GND	GND
	30	RESET SWITCH	RESET SWITCH	RESET SWITCH
	31	GND	GND	GND
	32	POWER LED	POWER LED	POWER LED
	33	POWER BUTTON	POWER BUTTON	POWER BUTTON
	34	DISK ACT. LED	DISK ACT. LED	DISK ACT. LED

Each port's serial mode and voltage between Off/5V/12V on Pin "9" is individually selected in the BIOS configuration. The serial ports support RS-232, RS-422, and RS-485 configurations. Refer to the BIOS manual in Appendix C for configuration instructions.

Power and Reset switch connectors are provided for use with momentary-contact switches making a connection between each signal and ground. Power and disk activity LED connections are provided to directly or indirectly drive indicator LEDs. Both provided signals are 5V sourced through a 330Ω resistor.

2.2 Rear I/O definition



DisplayPort 1 & 2

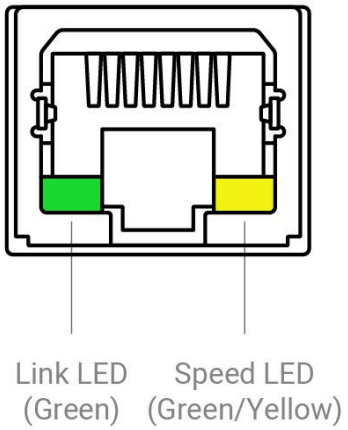
Helix utilizes Intel® Integrated processor graphics that power the onboard DisplayPorts. This means resolutions up to 4096x2304 @ 60Hz are supported on both outputs simultaneously. All ports support Multi-Stream Transport (MST).

LAN1 - Intel I225-LM

The Intel I225 LAN Port on Helix supports up to 2.5Gbps link speeds over standard shielded CAT5e or CAT6 cables. The connector is the industry standard RJ45 connector. This port also features Intel's vPro® technology enabling remote out-of-band management and security features (requires Intel Core™ i5 or higher). The LAN link state is shown by the two LEDs enclosed in the port. The description is included below.

LAN2 - Intel I225-IT

The second LAN Port on Helix 511 supports up to 2.5Gbps link speeds over standard shielded CAT5e or CAT6 cables. The connector is the industry standard RJ45 connector. The LAN link state is shown by the two LEDs enclosed in the port. The description is included below.



LED	Color	State	Function
Link	-	Off	LAN link is not established
	Green	On	LAN link is established
		Blinking	LAN activity occurring
Speed	-	Off	10 Mb/s data rate
	Green	On	100 Mb/s data rate
	Yellow	On	1000 Mb/s data rate

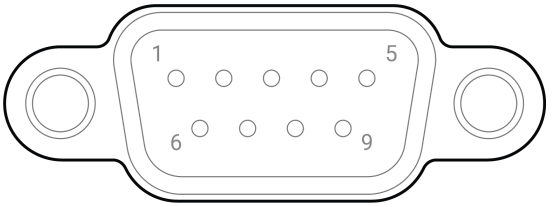
LAN activity light description

USB 3.2

The dual stack USB 3.2 ports on the rear panel are USB 3.2 Gen 2 ports, capable of linking at 10Gb/s transfer rates.

COM DB9 option

The serial port mode and voltage between Off/5V/12V on Pin 9 on Helix can be selected in the BIOS configuration. The serial ports support RS-232, RS-422, and RS-485 configurations. Refer to the BIOS manual in Appendix C for configuration instructions.

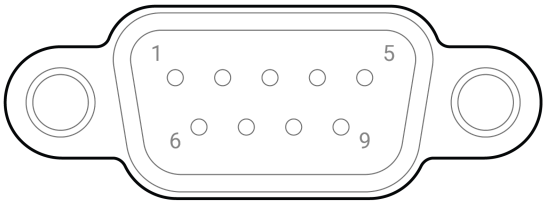


Pin	RS-232	RS-422	RS-485
1	DCD	TX-	TX-/RX-
2	RX	TX+	TX+/RX+
3	TX	RX+	NC
4	DTR	RX-	NC
5	GND	NC	NC
6	DSR	NC	NC
7	RTS	NC	NC
8	CTS	NC	NC
9	RI/PWR	NC/PWR	NC/PWR

COM DB9 pinout

CAN DB9 option

The CAN port on Helix 511 supports CAN2.0 A/B at baud rates from 100-1000 kbaud. The system CAN port is not internally terminated, and a properly terminated (*120 Ohms, typical*) cable should be used. CAN messages may be sent and received via a virtual serial port over USB. Windows and Linux drivers are in-box for this interface.



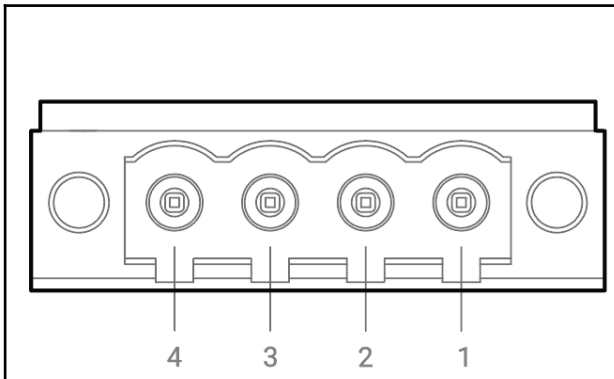
Pin	Signal
1	CAN_2_L
2	CAN_1_L
3	GND
4	NC
5	NC
6	GND
7	CAN_1_H
8	CAN_2_H
9	NC

Terminal block power option

Mainboard power is applied to the Helix 511 through a 4-pin terminal block connector (Mating part: Dinkle 2ESDAM-04P or equivalent).

The system is operational from 12V~24V. [see section 4.3 for input voltage qualifications]. The maximum rated current of the connector is 15A per pin. Use a wire gauge that is rated for the operational current. Cables should be properly terminated with wire ferrules. Do not use the terminal block with tinned wire ends or solid core wire. See below for connector pinout.

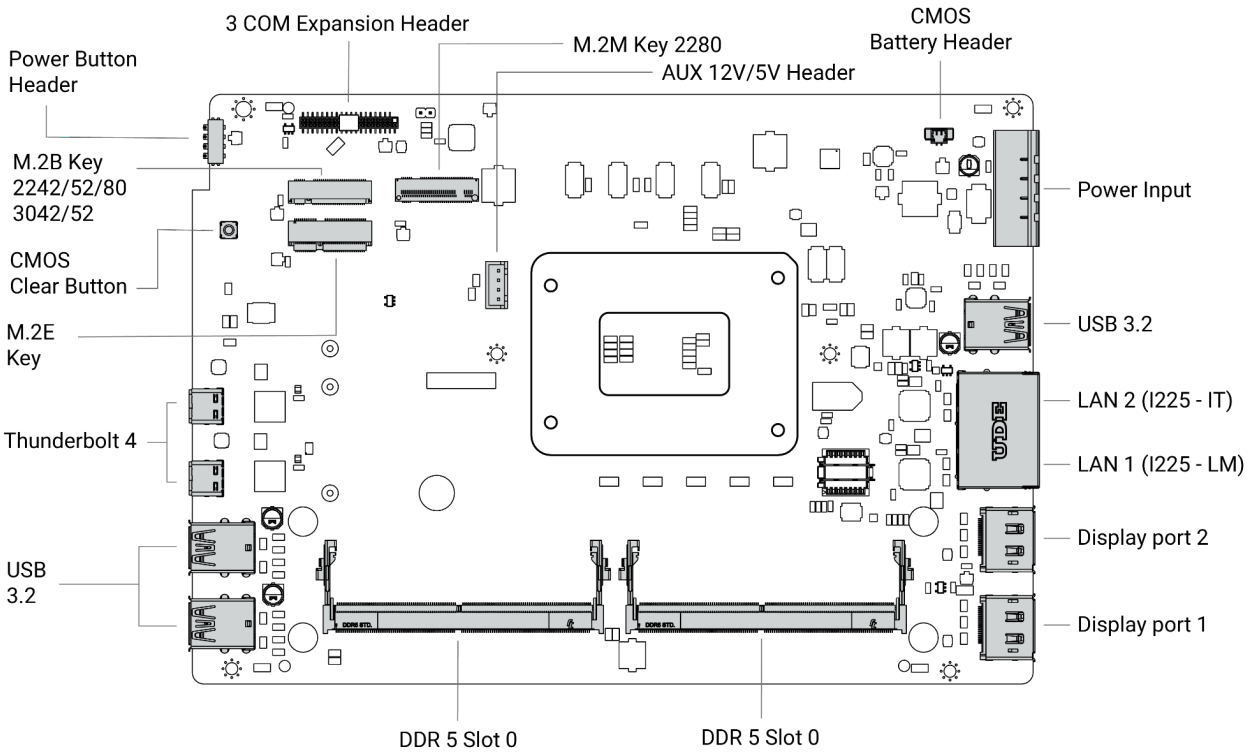
When using the remote switch connections with the terminal block option, mating power switch cables should be a twisted-pair wire with floating shield to assure proper immunity to EMI/RFI. It is recommended to keep wires at less than 3 meters in length. Switches should be momentary contact type only.



Pin	Function
1	DC +
2	DC -
3	SW1
4	SW2

Terminal block power pinout

2.3 - Motherboard Connectors



M.2 B-Key

An M.2 B-Key port is present on the Helix 511 motherboard to allow support for B-Key form-factor expansion cards. Supported cards include 3042, 3052, 2280 form-factors. The B-Key connector supports PCIe Gen 4 x2, USB 3.2 10Gb/s, USB 2.0, SATA Gen I (1.5Gbps), SATA Gen II (3.0Gbps), and SATA Gen III (6.0Gbps) devices.

The 3FF Micro SIM card slot is connected to the M.2 B-Key.

A full pinout table for this expansion slot is provided in **Appendix E**.

M.2 E-Key

An M.2 E-Key port is present on the Helix 511 motherboard to allow support for E-Key form-factor wireless expansion cards. Only 2230 form-factor cards are supported. The E-Key connector supports PCIe Gen 3 x1 and USB 2.0. A full pinout table for this expansion slot is provided in **Appendix E.**

M.2 M-Key

An M.2 M-Key port is present on the Helix 511 motherboard to allow support for M-Key form-factor expansion cards. Only 2280 form-factor cards are supported. The M-Key connector includes support

for PCIe Gen 3 x4, PCIe Gen 3 x2, PCIe Gen 4 x4, SATA Gen I (1.5Gbps), SATA Gen II (3.0Gbps), and SATA Gen III (6.0Gbps) devices.

A full pinout table for this expansion slot is provided in **Appendix E**

SO-DIMM1 & SO-DIMM2

The Helix 511 has two onboard DDR5 SO-DIMM slots with the following specifications:

- Maximum Capacity: DDR5-4800 64GB with two 32GB SO-DIMM Modules
- Channel configuration: 1 DIMM Per Channel (DPC) - 2 Channels
- No ECC Support

BIOS EEPROM

If the BIOS needs to be updated, please refer to **Appendix C** for reflashing instructions.

CMOS Clear Button

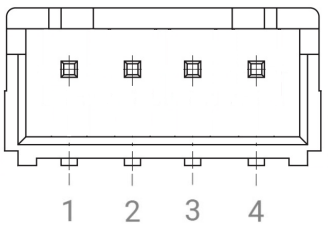
A board mounted button is used to clear the BIOS settings of the Helix 511.

RTC battery header

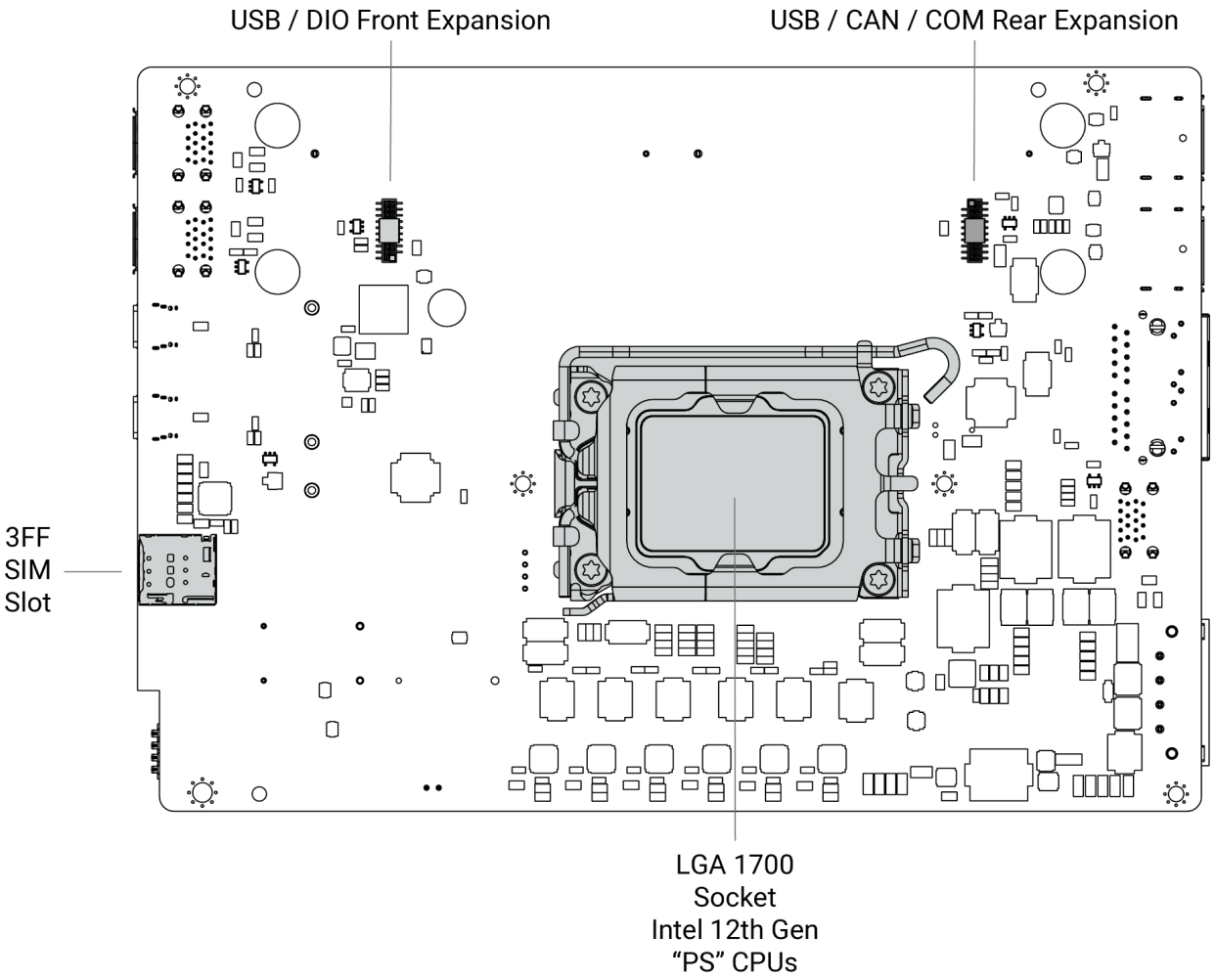
The RTC (Real Time Clock) battery on the Helix 511 is used to retain BIOS CMOS settings and maintain the real-time clock for the system. If the RTC battery is low, BIOS settings will not be retained and you may receive an alert in the operating system. The cabled RTC battery should be replaced with a Maxell CR2032-WK11 (or UL listed equivalent). An equivalent battery shall use a Hirose DF13-2S-1.25c connector to mate with the on-board connector.

Aux 12V/5V Header

The Helix 511 has a power header that can support up to 2A of 5V and 12V power. This header is designed for internal expansion cards that require additional power above what is provided by the expansion slots. This header is a 2.5mm Pitch 4-pin JST XH Connector, with the pinout shown below.



Pin	Definition
1	5V DC
2	GND
3	GND
4	12V DC



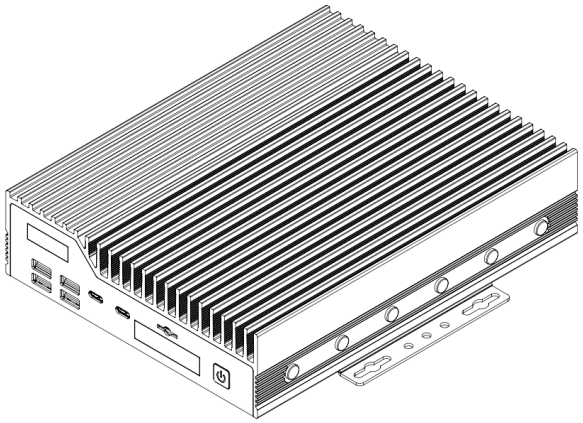
Motherboard bottom view (Heatsink side)

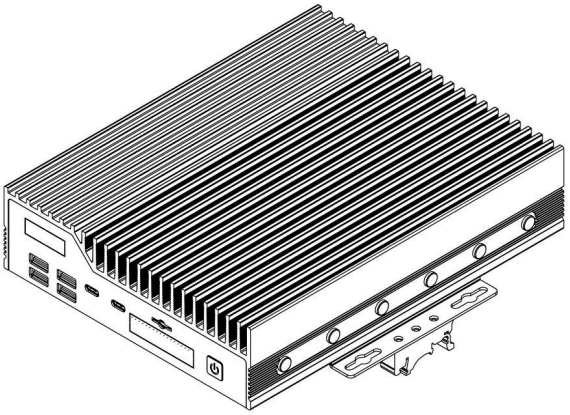
CPU socket

The LGA1700 CPU socket on the Helix 511 supports all 12th Gen Intel PS-series processors up to 45W TDP.

3 - Mounting Instructions

3.1 - Wall Mount & DIN Rail Mounting





The Helix 511 has optional Wall Mount brackets (SKU : MTW101) and DIN Rail mounting brackets (SKU : MTW101-K) available for purchase.

For Wall Mounting, follow steps below :
Step 1: Align the four screw holes on the bottom of the system with the respective holes on the mounting brackets.

Step 2: Attach wall mounting brackets (MTW101) to the system using the supplied M3 screws (M3X0.5 Flathead Screw, 4mm Long).

Step 3 : Install system to surface using keyhole slots on wall mount brackets and appropriate hardware for the surface (not provided).

For DIN Rail Mounting, follow the below steps:
Step 1: Follow steps 1-2 from the Wall Mounting section.

Step 2: Align the mounting holes of the din clip bracket to the three mounting holes on the wall mount bracket.

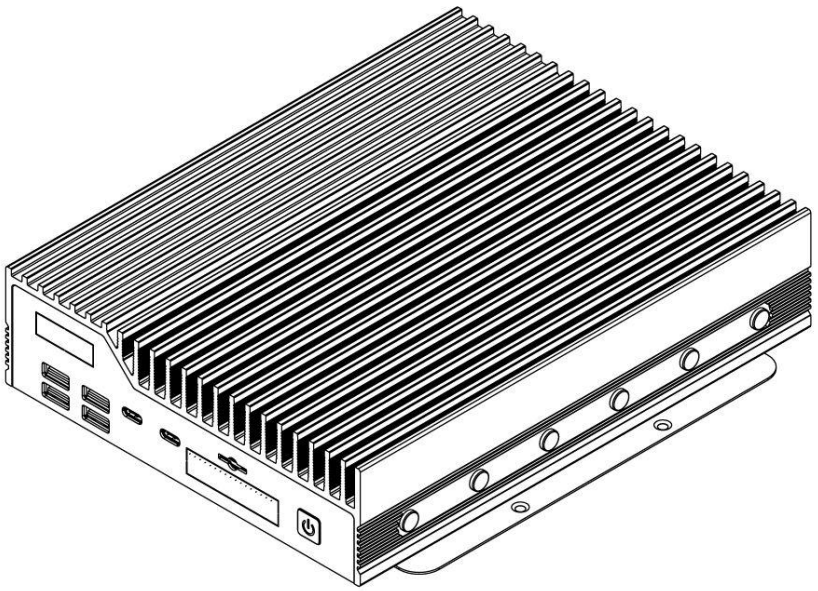
Step 3: Install the din clips to the wall mount brackets using supplied screws and a Phillips head screwdriver.

Step 6: Mount system onto the DIN rail.

Note: The mounting brackets are required to support 3x the hanging weight of the system (14.82lbs / 6.72 kgs). The mating surface and hardware must be capable of supporting the same load.

3.2 - VESA Mounting

The Helix 511 has an optional VESA mounting bracket (SKU : VMPL-2022-K) available for purchase. Follow the steps below for mounting.



Step 1: Align the four screw holes on the bottom of the system with the respective holes on the mounting bracket.

Step 2: Attach VESA Mount Plate, to the system using the supplied M3 screws (M3X0.5 Flathead Screw, 4mm Long)

Step 3: Install the system to VESA 75 or VESA 100 mounting pattern using provided VESA Mount screws.

The mounting bracket systems are required to secure 3x the hanging weight of the computer system (14.82lbs / 6.72 kgs). The mating substrate must be capable of maintaining the same rating.

4 - Power Management

4.1 - Wake-Up Events

The Helix platform supports multiple power states. The wake-up events can be configured in the BIOS. This section describes the supported power management functions and gives information on protection circuitry for power adapters.

Wake-Up Event	From ACPI State	Comments
Power Button	Deep S5, S5, S3	
LAN	S5, S3	Must be enabled in BIOS
USB	S3	
RTC Wake set by BIOS	Deep S5, S5, S3	Must be enabled in BIOS
RTC Wake set by OS	S3	

4.2 - Protection Circuitry

Parameter	Value
Nominal operating voltage (Rated DC value of input)	12~24V
Undervoltage protection trip DC level (system turns off)	6.5V
Maximum safe DC voltage (system not damaged)	28.4V

These DC levels specified are the absolute max values for the pins for function and safety of the system. The protection circuitry allows for brief transient voltages above these levels without the system turning off or being damaged. A transient voltage suppressor on the power input allows momentary excursions above stated limits. For input power consumption and current see **Appendix A.**

5. Appendices

5.1 - Appendix A: Power consumption

The power consumption of the Helix 511 was measured for various system configurations, workloads, and power states at both 12V and 24V system input voltages. Tests were performed using Prime 95, Furmark, and Burnintest v9.0 build 1012 to stress system components. These tests were performed with Intel Turbo Boost Enabled. The build configurations and power consumption are listed in the tables below. The power consumption listed below is the average power draw over a 5 minute window from the test starting. This includes a brief period of PL2 power consumption (previously Intel turbo Boost) where the power consumption is much larger than the listed average. The highest power consumption seen during the period of turbo PL2 is shown at the bottom of each table.

*The configurations below are using representative samples of internal devices, the specific components mentioned below may vary from the devices provided by OnLogic.

System Component	Config 1 Low	Config 3 Medium	Config 4 High
CPU	Intel Core i7-1265UL Processor	Intel Core i5-12600HL Processor	Intel Core i7-12800HL Processor
Memory	1 x 8GB DDR5 SO-DIMM 4800MT/S Transcend TS1GSA64V8G	2 x 16GB DDR5 SO-DIMM 4800MT/S Transcent TS2GSA64V8E	2 x 32GB DDR5 SO-DIMM 4800MT/S Transcend TS4GSA64V8E
LAN	[1 port linked at full speed]	[1 port linked at full speed]	[2 port linked at full speed]
Storage #1 M.2 M-Key	Samsung 980 Pro 1000GB Gen4 NVMe SSD	Samsung 980 Pro 1000GB Gen4 NVMe SSD	Samsung 980 Pro 1000GB Gen4 NVMe SSD
M.2 B-Key			Transcend TS512GMTS952T2 500GB SATA Gen3 SSD
M.2 E key	Intel 9260NGW	Intel 9260NGW	Intel 9260NGW
Serial port			3xCOM
Expansion Port 1		DIO	DIO
Expansion Port 2		COM	COM
USB	Port 1: N/A Port 2 : N/A Port 3 : N/A Port 4: Mouse & Keyboard	Port 1: N/A Port 2 : N/A Port 3 : N/A Port 4: Wireless Mouse & Keyboard	Port 1: N/A Port 2 : N/A Port 3 : N/A Port 4: Wireless Mouse & Keyboard
Thunderbolt	Port 1: N/A Port 2: N/A	Port 1: N/A Port 2: N/A	Port 1: TBT 4 dock connected (idle) Port 2: N/A
Display	One Monitor	One Monitor	One Monitor
OS	WIndows 11 Pro 64 Bit	WIndows 11 Pro 64 Bit	WIndows 11 Pro 64 Bit

OS Power Plan	Balanced	Balanced	Balanced
BIOS Version	1.18	1.18	1.18

The power consumption for each system configuration is recorded below.

Low Config Measurements		
Power Consumption	**12V Avg [W]**	**24V Avg [W]**
Pseudo G3	0.05	0.135
Deep S5	0.11	0.26
S5	1.6	2
S3	2.7	3.1
OS Idle	6.7	8.7
CPU / System stress	27.3	28
CPU + GPU / System stress	27.8	29.9
Max turbo draw	79.7	85.7

Medium Config Measurements		
Power Consumption	**12V Avg [W]**	**24V Avg [W]**
Pseudo G3	0.05	0.135
Deep S5	0.11	0.26
S5	1.6	2
S3	3.2	3.6
OS Idle	7.9	10.2
CPU / System stress	65.7	70.7
CPU + GPU / System stress	66.1	67.8
Max turbo draw	123	121

High Config Measurements		
Power Consumption	**12V Avg [W]**	**24V Avg [W]**
Pseudo G3	0.05	0.135
Deep S5	0.11	0.26
S5	2.4	2.9
S3	4.2	4.5
OS Idle	12.4	12.9
CPU / System stress	70	74
CPU + GPU / System stress	68.6	72
Max turbo draw	139.7	140

5.3 - Appendix B: BIOS manual and Drivers

For a detailed overview of the BIOS screens and individual settings, as well as instructions for updating the BIOS, please refer to the OnLogic support site at the link below.

https://support.onlogic.com/documentation/helix-511-technical-resources/

5.4 - Appendix C: System Thermal Results

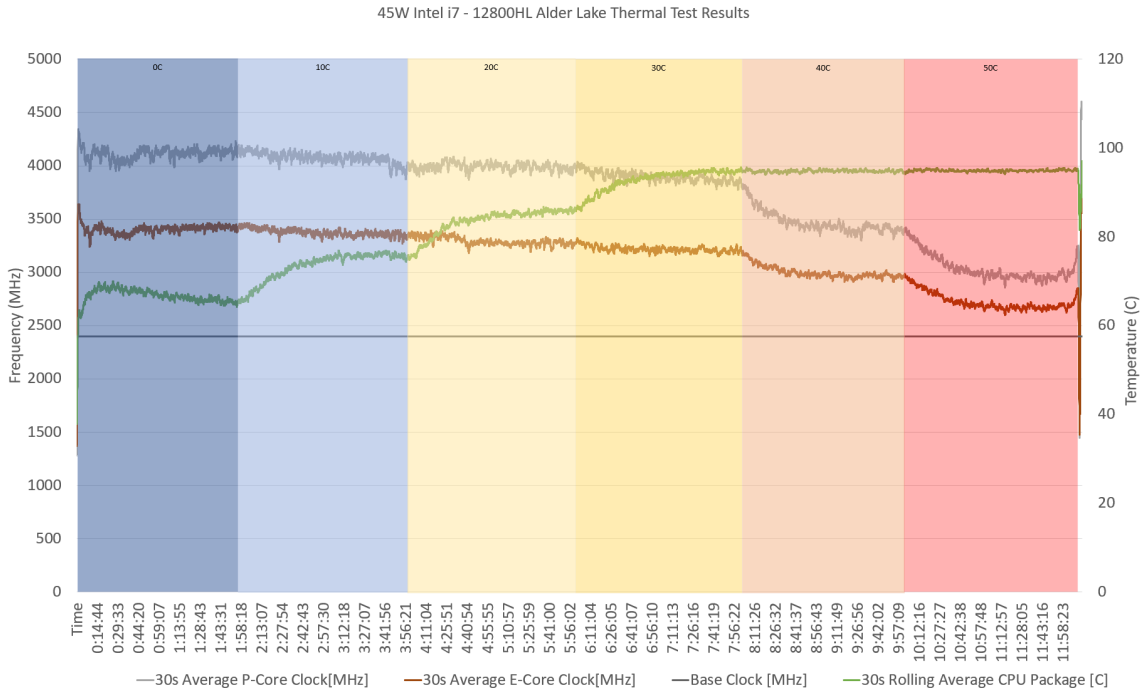
5.4.1 Test Conditions

- Temperature Range: 0ºC to 50°C
- Step size: 10°C
- i7 Processor loaded @80% PTAT, 1TB SSD, and 64GB DDR5 RAM loaded @ 80% with BurnInTest 9.2

5.4.2 Test Methodology

Thermal testing of the Helix 511 was completed using a thermal chamber to control ambient environmental temperature across the rated temperature range of the system. Throughout testing, the system and its components were being stressed by various softwares to simulate a rigorous constant workload. Stress testing occurred for two hours in each temperature range. Components were monitored during testing via their internal sensors. Some components were monitored externally via thermocouples.

5.4.3 Test Results



5.4.4 Test Result Summary

The Helix 511 with i7-12800HL processor saturated upwards of its rated base clock speeds on performance and efficiency cores while sustaining significant processor, memory and storage stress loads through an ambient temperature range of 0-50C.

5.5 - Appendix D: Expansion port pinout

5.5.1 - M.2 B-Key

Pin	Function	Function	Pin
1	CONFIG_3	3.3V	2
3	GND	3.3V	4
5	GND	FULL_CARD_POWER_OFF#	6
7	USB 2.0 D+	W_DISABLE1#	8
9	USB 2.0 D-	NC	10
11	GND	KEY	
	KEY	KEY	
	KEY	KEY	

	KEY	KEY	
	KEY	NC	20
21	CONFIG_0	NC	22
23	NC	NC	24
25	NC	GPIO_10/W_DISABLE2#	26
27	GND	NC	28
29	PERn1/USB3.1-Rx-	UIM-RESET	30
31	PERp1/USB3.1-Rx+	UIM_CLK	32
33	GND	UIM_DATA	34
35	PETn1/USB3.1-Tx-	UIM_PWR	36
37	PETp1/USB3.1-Tx+	NC	38
39	GND	NC	40
41	PERn0/SATA-B+	NC	42
43	PERp0/SATA-B-	NC	44
45	GND	NC	46
47	PETn0/SATA-A-	NC	48
49	PETp0/SATA-A+	PERST#	50
51	GND	CLKREQ#	52
53	REFCLKn	PEWAKE#	54
55	REFCLKp	NC	56
57	GND	NC	58
59	NC	NC	60
61	NC	NC	62
63	NC	NC	64
65	NC	SIM_DETECT	66
67	RESET_N	SUSCLK	68
69	CONFIG_1	3.3V	70
71	GND	3.3V	72
73	GND	3.3V	74
75	CONFIG_2		

5.5.2 - M.2 E-Key

Pin	Function	Function	Pin
1	GND	3.3 V	2
3	USB_D+	3.3 V	4

5	USB_D-	NC	6
7	GND	PCM_CLK	8
9	RESERVED	CNV_RF_RESET#_R	10
11	RESERVED	BT_PCMIN	12
13	GND	BT_PCMOUT	14
15	RESERVED	NC	16
17	RESERVED	GND	18
19	GND	NC	20
21	RESERVED	RESERVED	22
23	RESERVED	KEY	
	KEY	KEY	
	KEY	KEY	
	KEY	KEY	
	KEY	RESERVED	32
33	GND	RESERVED	34
35	PETp0	RESERVED	36
37	PETn0	RESERVED	38
39	GND	RESERVED	40
41	PERp0	RESERVED	42
43	PERn0	RESERVED	44
45	GND	RESERVED	46
47	REFCLKp0	RESERVED	48
49	REFCLKn0	SUSCLK(32kHz)	50
51	GND	PERST0#	52
53	CLKREQ0#	W_DISABLE2#	54
55	PEWAKE0#	W_DISABLE1#	56
57	GND	NC	58
59	RESERVED	NC	60
61	RESERVED	NC	62
63	GND	RESERVED	64
65	RESERVED	NC	66
67	RESERVED	NC	68
69	GND	NC	70
71	RESERVED	3.3V	72
73	RESERVED	3.3V	74
75	GND		

5.5.3 - M.2 M-Key

Pin	Function	Function	Pin
1	GND	3.3 V	2
3	GND	3.3 V	4
5	PERn3	NC	6
7	PERp3	NC	8
9	GND	DAS/DSS (I/O)/LED_1# (I)(0/3.3V)	10
11	PETn3	3.3 V	12
13	PETp3	3.3 V	14
15	GND	3.3 V	16
17	PERn2	3.3 V	18
19	PERp2	NC	20
21	GND	NC	22
23	PETn2	NC	24
25	PETp2	NC	26
27	GND	NC	28
29	PERn1	NC	30
31	PERp1	NC	32
33	GND	NC	34
35	PETn1	NC	36
37	PETp1	DEVSLP (O)	38
39	GND	SMB_CLK (I/O)(0/1.8V)	40
41	PERn0/SATA-B+	SMB_DATA (I/O) (0/1.8V)	42
43	PERp0/SATA-B-	ALERT# (I) (0/1.8V)	44
45	GND	NC	46
47	PETn0/SATA-A-	NC	48
49	PETp0/SATA-A+	PERST# (O)(0/3.3V) or NC	50
51	GND	CLKREQ# (I/O)(0/3.3V) or NC	52
53	REFCLKn	PEWAKE# (I/O)(0/3.3V) or NC	54
55	REFCLKp	NC	56
57	GND	NC	58
	CONNECTOR Key M	CONNECTOR Key M	
	CONNECTOR Key M	CONNECTOR Key M	
	CONNECTOR Key M	CONNECTOR Key M	
	CONNECTOR Key M	CONNECTOR Key M	

67	NC	SUSCLK(32kHz) (O)(0/3.3V)	68
69	PEDET (NC-PCIe/GND-SATA)	3.3 V	70
71	GND	3.3 V	72
73	GND	3.3 V	74
75	GND		

5.5.4 - mPCIe

Pin	Function	Function	Pin
1	WAKE#	3.3V	2
3	NC	GND	4
5	NC	1.5V	6
7	CLKREQ#	UIM_PWR	8
9	GND	UIM_DATA	10
11	REFCLK-	UIM_CLK	12
13	REFCLK+	UIM_RESET	14
15	GND	UIM_SPU	16
	KEY	KEY	
17	NC	GND	18
19	NC	W_DISABLE1#	20
21	GND	PERST#	22
23	PERn0	3.3V	24
25	PERp0	GND	26
27	GND	1.5V	28
29	GND	SMB_CLK	30
31	PETn0	SMB_DATA	32
33	PETp0	GND	34
35	GND	USB 2.0_D-	36
37	GND	USB 2.0_D+	38
39	3.3V	GND	40
41	3.3V	NC	42
43	GND	NC	44
45	NC	NC	46
47	NC	1.5V	48
49	NC	GND	50
51	W_DISABLE2#	3.3V	52

5.6 Appendix E: Regulatory Compliance

5.6.1 CE

The computer system was evaluated for medical, IT equipment, automotive, and maritime EMC standards as a class A device. The computer complies with the relevant IT equipment directives for the CE mark. Modification of the system may void the certifications. Testing includes: EN 55032, EN 55035, IEC 60601-1, EN 62368-1, EN 60950-1, and IEC 60945. Product safety was evaluated to IEC 62368-1 and IEC 60950-1.

5.6.2 FCC Statement

This device complies with part 15 of the FCC rules as a Class A device. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation.

5.6.3 ISED

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

CAN ICES-003(A) / NMB-003(A)

5.6.4 UKCA

The computer system was evaluated for medical, IT equipment, automotive, maritime and railway EMC standards as a class A device. The computer complies with the relevant IT equipment directives for the UKCA mark.

5.6.5 VCCI

This is a Class A product based on the standard of the Voluntary Control Council for Interference (VCCI). If this equipment is used in a domestic environment, radio interference may occur, in which case the user may be required to take corrective actions.

この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

5.7 Appendix F: Safety Precautions, Safeguards & Information

Do not open and modify the device! The device complies with various national and international Safety, EMC and Environmental requirements per various standards.

Modification of the device may void certifications, warranty and/or cause possible injury to the user.

5.7.1 Safe use and installation instructions

1. Care must be taken handling the device to prevent injury to self or possibility of damaging the unit.
2. Read the entire manual before using the product.
3. Install the device securely per users manual instructions.
4. To protect against excessive RF exposure, maintain at least 20cm from any user and the RF antennas. Only use provided dual band antennas of 2dBi/2dBi gain.
5. Wall or ceiling mounting device requires use of OnLogic mounting plate or bracket.
6. Use M3x0.5mm Flat Head screws to attach mounting plate or mounting brackets to threaded holes on bottom or rear of chassis. Screws should be a minimum length of 4mm. Add 1mm of screw length for every mm of additional thickness of plate or bracket beyond 1.5mm.

7. **Caution, Hot Surface!** It is normal for the unit to heat up and be hot to touch. **Do not touch** the heatsink area or enclosure during operation and 30 minutes after shutdown allowing the unit to cool down.
8. Ambient operating temperature must be between 0 °C to 50 °C with a non-condensing relative humidity of 10-85%.
9. The device can be stored at temperatures between -10 °C to 85 °C. Note: Unit must be stabilized within operating temperature before use, minimum 3HR.
10. Keep the device away from liquids and flammable materials. Not to be installed in a hazardous environment.
11. Do not clean the device with liquids. The chassis can be cleaned with a dry cloth or duster only. To prevent injury to self and/or damage to the device the unit must be powered down and all connecting power and other peripherals shall be disconnected prior to cleaning.
12. Allow adequate space around all sides of the device for proper cooling and to not exceed its maximum operating temperature limit. If the device is mounted to a vertical surface then recommended device orientation is such that heatsink fins allow air to rise unobstructed. Alternative orientations may result in reduced operational temperature range.
13. This device is intended for indoor operation only.

14. **Caution, Risk of Electric Shock!** Unit is powered by low voltage DC (Direct Current) only! Do not connect AC (Alternating Current) into the device!
15. To power the device use only UL ITE Listed external power supplies with DC output of 12-24VDC, see specs for details.
16. Wiring methods used for the connection of the equipment to the mains supply shall be in accordance with the National Electrical Code, NFPA 70, and the Canadian Electrical Code, Part I, CSA C22.1.
17. Allow ample space for terminal block wiring connections such that the wires do not bend and are protected from accidental damage.

18. Install the device only with shielded network cables.
19. The installer should be experienced in aftermarket installation and familiar with general practices for installing electronics.
20. Radio device is not intended for emergency service use.
21. Service and repair of the device must be done by qualified service personnel. This includes, but is not limited to, replacement of the CMOS battery. Replacement CMOS battery must be of the same type as the original.
22. Proper disposal of CMOS battery must comply with local governance.
23. Product must only be connected to a certified router, switch or similar network equipment
24. Product is intended for indoor use only.
25. Product cannot be connected to the public network.
26. This equipment is not suitable for use in locations where children are likely to be present.

WARNING: There is danger of explosion if the CMOS battery is replaced incorrectly. Disposal of battery into fire or a hot oven, or mechanically crushing or cutting of a battery can result in an explosion.

5.7.2 Précautions et guide d'installation

Ne pas ouvrir et modifier l'appareil ! L'appareil est conforme à diverses exigences nationales et internationales en matière de sécurité, de CEM et d'environnement selon diverses normes.

La modification de l'appareil peut annuler les certifications, la garantie et/ou causer des blessures à l'utilisateur.

.

1. Des précautions doivent être prises lors de la manipulation de l'appareil pour éviter de se blesser ou d'endommager l'appareil.
2. Lisez l'intégralité du manuel avant d'utiliser le produit.
3. Installez l'appareil en toute sécurité selon les instructions du manuel de l'utilisateur.
4. Pour vous protéger contre une exposition RF excessive, maintenez au moins 20 cm de tout utilisateur et des antennes RF. Utilisez uniquement les antennes double bande fournies avec un gain de 2 dBi/2 dBi.
5. Le dispositif de montage mural ou au plafond nécessite l'utilisation d'une plaque ou d'un support de montage. La plaque ou le support doit être en métal et avoir une épaisseur minimale de 1 mm.
6. Utilisez des vis à tête plate M4x0,5 mm pour fixer la plaque de montage ou les supports de montage aux trous filetés au bas ou à l'arrière du châssis. Les vis doivent avoir une longueur minimale de 4 mm. Ajoutez 1 mm de longueur de vis pour chaque mm d'épaisseur supplémentaire de plaque ou de support au-delà de 1,5 mm.

7. **Attention surface chaude!** Il est normal que l'appareil chauffe et soit chaud au toucher. Ne touchez pas la zone du dissipateur thermique ou le boîtier pendant le fonctionnement et 30 minutes après l'arrêt pour permettre à l'unité de refroidir.
8. La température ambiante de fonctionnement doit être comprise entre 0 °C et 50 °C avec une humidité relative sans condensation de 10 à 85 %.
9. L'appareil peut être stocké à des températures comprises entre -10 °C et 85 °C. Remarque : L'unité doit être stabilisée à la température de fonctionnement avant utilisation, minimum 3 heures.
10. Gardez l'appareil à l'écart des liquides et des matériaux inflammables. Ne pas installer dans un environnement dangereux.
11. Ne nettoyez pas l'appareil avec des liquides. Le châssis peut être nettoyé uniquement avec un chiffon sec ou un plumeau. Pour éviter de se blesser et/ou d'endommager l'appareil, l'appareil doit être éteint et toutes les alimentations et autres périphériques doivent être déconnectés avant le nettoyage.

12. Prévoyez un espace suffisant autour de tous les côtés de l'appareil pour un refroidissement correct et pour ne pas dépasser sa limite de température de fonctionnement maximale. Si l'appareil est monté sur une surface verticale, l'orientation recommandée de l'appareil est telle que les ailettes du dissipateur thermique permettent à l'air de monter sans obstruction. Des orientations alternatives peuvent entraîner une plage de températures de fonctionnement réduite.
13. Cet appareil est destiné à une utilisation en intérieur uniquement.

14. **Attention, risque de choc électrique !** L'unité est alimentée uniquement par une basse tension CC (courant continu) ! Ne connectez pas le courant alternatif (courant alternatif) à l'appareil !
15. Pour alimenter l'appareil, utilisez uniquement des alimentations externes répertoriées UL ITE avec une sortie CC de 12-24 VCC, voir les spécifications pour plus de détails.
16. Les méthodes de câblage utilisées pour le raccordement de l'équipement à l'alimentation secteur doivent être conformes au Code national de l'électricité, NFPA 70, et au Code canadien de l'électricité, Partie I, CSA C22.1.
17. Prévoyez suffisamment d'espace pour les connexions de câblage du bornier afin que les fils ne se plient pas et soient protégés contre les dommages accidentels.
18. Installez l'appareil uniquement avec des câbles réseau blindés.
19. L'installateur doit avoir de l'expérience dans l'installation de pièces de rechange et être familiarisé avec les pratiques générales d'installation de composants électroniques.
20. L'appareil radio n'est pas destiné aux services d'urgence.
21. L'entretien et la réparation de l'appareil doivent être effectués par un personnel qualifié. Cela inclut, mais sans s'y limiter, le remplacement de la batterie CMOS. La batterie CMOS de remplacement doit être du même type que celle d'origine.
22. L'élimination appropriée de la batterie CMOS doit être conforme à la gouvernance locale.
23. Le produit doit uniquement être connecté à un routeur, un commutateur ou un équipement réseau similaire certifié
24. Le produit est destiné à une utilisation en intérieur uniquement.
25. Le produit ne peut pas être connecté au réseau public.
26. Cet équipement n'est pas adapté à une utilisation dans des endroits où des enfants sont susceptibles d'être présents.

ATTENTION: Il existe un risque d'explosion si la pile CMOS n'est pas remplacée correctement. L'élimination de la batterie dans le feu ou dans un four chaud, ou l'écrasement ou le découpage mécanique d'une batterie peut entraîner une explosion.

5.8 Appendix G: Errata

5.8.1 HX511-1: DisplayPort Audio not Functional in Ubuntu 22.04 Desktop

Overview

Category:	Software
SKU(s) Affected:	HX511
Revision(s) Affected:	All
Revision Resolved:	Unresolved
Severity:	Low

Description

Audio output over DisplayPort for HX511 products running Ubuntu 22.04 is currently unsupported due to kernel driver incompatibility.

There is no line-out or headphone jack present on this product. Customers who require audio support on the HX511 may consider an external USB-audio adapter.

Resolution

OnLogic is working with upstream partners to enable. New software will be available when enablement is complete.