



# RBX-I2000

---

Robot Controller  
User's Manual 1<sup>st</sup> Ed

## Copyright Notice

---

This document is copyrighted, 2022. All rights are reserved. The original manufacturer reserves the right to make improvements to the products described in this manual at any time without notice.

No part of this manual may be reproduced, copied, translated, or transmitted in any form or by any means without the prior written permission of the original manufacturer. Information provided in this manual is intended to be accurate and reliable. However, the original manufacturer assumes no responsibility for its use, or for any infringements upon the rights of third parties that may result from its use.

The material in this document is for product information only and is subject to change without notice. While reasonable efforts have been made in the preparation of this document to assure its accuracy, AAEMON assumes no liabilities resulting from errors or omissions in this document, or from the use of the information contained herein.

AAEMON reserves the right to make changes in the product design without notice to its users.

## Acknowledgement

---

All other products' name or trademarks are properties of their respective owners.

- Microsoft Windows® is a registered trademark of Microsoft Corp.
- ITE is a trademark of Integrated Technology Express, Inc.
- IBM, PC/AT, PS/2, and VGA are trademarks of International Business Machines Corporation
- Intel®, Celeron®, and Pentium® are registered trademarks of Intel Corporation
- Intel Atom™ is a registered trademark of Intel Corporation
- Intel Movidius® and Movidius Myriad™ 2 are registered trademarks of Intel Corporation

All other product names or trademarks are properties of their respective owners. Ownership is not implied nor claimed by the publisher of this document for any product or product names not herein listed.

## Packing List

---

Before setting up your product, please make sure the following items have been shipped:

Item	Quantity
● RBX-I2000	1

If any of these items are missing or damaged, please contact your distributor or sales representative immediately.

## About this Document

---

This User's Manual contains all the essential information, such as detailed descriptions and explanations on the product's hardware and software features (if any), its specifications, dimensions, jumper/connector settings/definitions, and driver installation instructions (if any), to facilitate users in setting up their product.

Users may refer to the product page at [AAEON.com](http://AAEON.com) for the latest version of this document.

## Safety Precautions

---

Please read the following safety instructions carefully. It is advised that you keep this manual for future references

1. All cautions and warnings on the device should be noted.
2. Make sure the power source matches the power rating of the device.
3. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
4. Always completely disconnect the power before working on the system's hardware.
5. No connections should be made when the system is powered as a sudden rush of power may damage sensitive electronic components.
6. If the device is not to be used for a long time, disconnect it from the power supply to avoid damage by transient over-voltage.
7. Always disconnect this device from any AC supply before cleaning.
8. While cleaning, use a damp cloth instead of liquid or spray detergents.
9. Make sure the device is installed near a power outlet and is easily accessible.
10. Keep this device away from humidity.
11. Place the device on a solid surface during installation to prevent falls
12. Do not cover the openings on the device to ensure optimal heat dissipation.
13. Watch out for high temperatures when the system is running.
14. Do not touch the heat sink or heat spreader when the system is running
15. Never pour any liquid into the openings. This could cause fire or electric shock.
16. As most electronic components are sensitive to static electrical charge, be sure to ground yourself to prevent static charge when installing the internal components. Use a grounding wrist strap and contain all electronic components in any static-shielded containers.

17. If any of the following situations arises, please contact our service personnel:
  - i. Damaged power cord or plug
  - ii. Liquid intrusion to the device
  - iii. Exposure to moisture
  - iv. Device is not working as expected or in a manner as described in this manual
  - v. The device is dropped or damaged
  - vi. Any obvious signs of damage displayed on the device
18. **DO NOT LEAVE THIS DEVICE IN AN UNCONTROLLED ENVIRONMENT WHERE THE STORAGE TEMPERATURE IS BELOW -20° C (-4°F) OR ABOVE 60°C (140°F) TO PREVENT DAMAGE.**

### **Warning!**



This device complies with Part 15 FCC Rules. 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.

### **Caution:**

*There is a danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions and your local government's recycling or disposal directives.*

### **Attention:**

*Il y a un risque d'explosion si la batterie est remplacée de façon incorrecte. Ne la remplacer qu'avec le même modèle ou équivalent recommandé par le constructeur. Recycler les batteries usées en accord avec les instructions du fabricant et les directives gouvernementales de recyclage.*



## 产品中有毒有害物质或元素名称及含量

AAEON System

QO4-381 Rev.A0

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯 醚(PBDE)
印刷电路板及其电子组件	×	○	○	○	○	○
外部信号连接器及线材	×	○	○	○	○	○
外壳	○	○	○	○	○	○
中央处理器与内存	×	○	○	○	○	○
硬盘	×	○	○	○	○	○
液晶模块	×	×	○	○	○	○
光驱	×	○	○	○	○	○
触控模块	×	○	○	○	○	○
电源	×	○	○	○	○	○
电池	×	○	○	○	○	○

本表格依据 SJ/T 11364 的规定编制。

○：表示该有毒有害物质在该部件所有均质材料中的含量均在 GB/T 26572 标准规定的限量要求以下。

×：表示该有害物质的某一均质材料超出了 GB/T 26572 的限量要求，然而该部件仍符合欧盟指令 2011/65/EU 的规范。

备注：

- 一、此产品所标示之环保使用期限，系指在一般正常使用状况下。
- 二、上述部件物质中央处理器、内存、硬盘、光驱、电源为选购品。
- 三、上述部件物质液晶模块、触控模块仅一体机产品适用。

**Hazardous and Toxic Materials List**

AAEON System

QO4-381 Rev.A0

Component Name	Hazardous or Toxic Materials or Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBBS)	Polybrominated diphenyl ethers (PBDES)
PCB and Components	X	O	O	O	O	O
Wires & Connectors for Ext. Connections	X	O	O	O	O	O
Chassis	O	O	O	O	O	O
CPU & RAM	X	O	O	O	O	O
HDD Drive	X	O	O	O	O	O
LCD Module	X	X	O	O	O	O
Optical Drive	X	O	O	O	O	O
Touch Control Module	X	O	O	O	O	O
PSU	X	O	O	O	O	O
Battery	X	O	O	O	O	O

This form is prepared in compliance with the provisions of SJ/T 11364.  
 O: The level of toxic or hazardous materials present in this component and its parts is below the limit specified by GB/T 26572.  
 X: The level of toxic of hazardous materials present in the component exceed the limits specified by GB/T 26572, but is still in compliance with EU Directive 2011/65/EU (RoHS 2).  
**Notes:**  
 1. The Environment Friendly Use Period indicated by labelling on this product is applicable only to use under normal conditions.  
 2. Individual components including the CPU, RAM/memory, HDD, optical drive, and PSU are optional.  
 3. LCD Module and Touch Control Module only applies to certain products which feature these components.

# Table of Contents

---

<b>Chapter 1 - Product Specifications</b> .....	<b>1</b>
1.1 Specifications .....	2
1.2 Block Diagram .....	4
<b>Chapter 2 – Hardware Information</b> .....	<b>5</b>
2.1 Dimensions .....	6
2.2 I/O Location.....	7
2.3 List of Connectors.....	8
2.3.1 Power Input Connector (1).....	9
2.3.2 Ethernet Port (2) .....	9
2.3.3 Multi-I/O Connectors (5) .....	10
2.3.4 CAN-FD Connectors (6).....	11
2.3.5 PM & GPIO Connectors (7) .....	12
2.3.6 GPS Receiver and Antenna Setup (8).....	13
2.3.7 Time Synchronization Output (10) .....	14
2.3.8 Serial Port Connectors (11).....	16
2.4 List of Internal Slots .....	17
2.4.1 Memory Slots .....	17
2.4.2 M.2 M Key Slot for Storage .....	18
2.4.3 M.2 E Key Slot for Wi-Fi Module .....	18
<b>Chapter 3 – Operating System and Certification</b> .....	<b>19</b>
3.1 Operating System.....	20
3.1.1 OS Version Support .....	20
3.1.2 ROS 2 Version Support .....	20
3.2 Certification Specification .....	20

# Chapter 1

---

Product Specifications

## 1.1 Specifications

---

### System

Processor	Intel® 11th Generation Core™ i7/i5/i3/Celeron® SoC Intel® i7-1185G7E Intel® i5-1145G7E Intel® i3-1115G4E Celeron® 6305E
System Memory	Max. up to 64G DDR4 3200MHz, SO-DIMM x 2, non-ECC type
Storage	M.2 2280 M Key slot x 1 (PCIe x 4), up to 2TB NVMe SSD 2.5" SATA SSD/HDD bay 3.0 x 1
Real Time Clock	RTC x 1 (with 3V CR2032 lithium battery)
Security	TPM 2.0
Indicators	-
Cellular	-
Wireless LAN	M.2 2230 E Key slot x 1 (Wi-Fi 802.11 ac/b/g/n, BT 5.0)
Operating System	Windows 10 IoT Enterprise / Linux (by request)
Support Protocol	-

## I/O

Serial Port	COM1/2, DB-9 connector x 2 (RS232/485)
Ethernet	10/100/1GBase-T(X) Ethernet port x 3 2.5 Gigabit Ethernet port x 1
USB	USB 3.0 Gen1 x 4
Multi-I/O	8-bit DIO, 2-channel CAN interface
SyncOut	1PPS + time date output x 4
Antenna	FAKRA Z code for Wi-Fi x 2 FAKRA C code for GPS x 1
Display	HDMI 2.0 x 1 (support 3840 x 2160 @ 30Hz)
Power Connector	2-Pin 3.81mm Pitch Phoenix Connector
Expansion Slot	Mini PCIe slot x 1, 3026 for GPS module Mini PCIe slot x 1, 3052 for PEAK CANbus
Other Interface	CAN1/2 x 2, DB9 connector for CANbus PM & GPIO interface x 1

## Power Supply

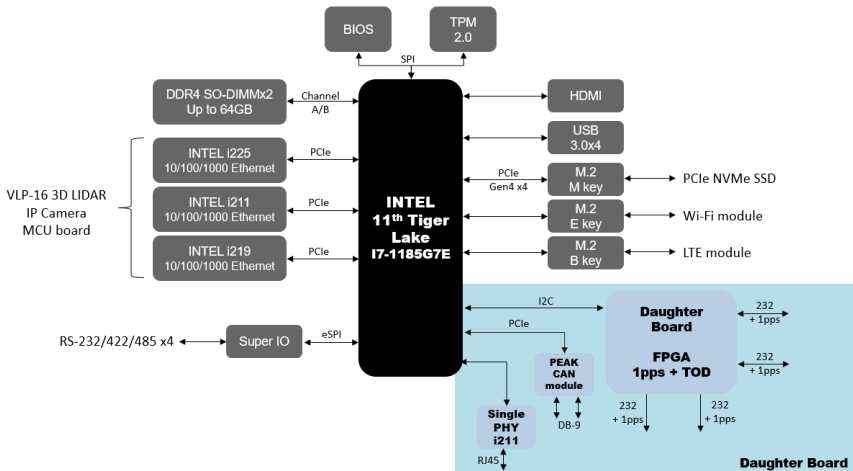
Power Requirement	DC 9 ~ 36V (optional DC12V), AT Type
Power Consumption	67W (full loading)
Power Mode	Support system auto-power on

## Environmental and Mechanical

Dimension	6.88" x 5.9" x 2.8" (175mm x 150mm x 72mm)
Weight	4.4 lbs. (2kg)
Mount Options	Wall mount

Operation Temperature	32°F ~ 122°F (0°C ~ 50°C)
Storage Temperature	-40°F ~ 176°F (-40°C ~ 80°C)
Operation Humidity	10% ~ 90% relative humidity, non-condensing
Vibration	3Grm/ operation – eMMC, MicroSD (IEC68-2-64)
Shock	30G peak acceleration (11 msec. duration, eMMC, microSD, or SSD) IEC 68-2-27
EMI	CE & FCC Class A

## 1.2 Block Diagram



# Chapter 2

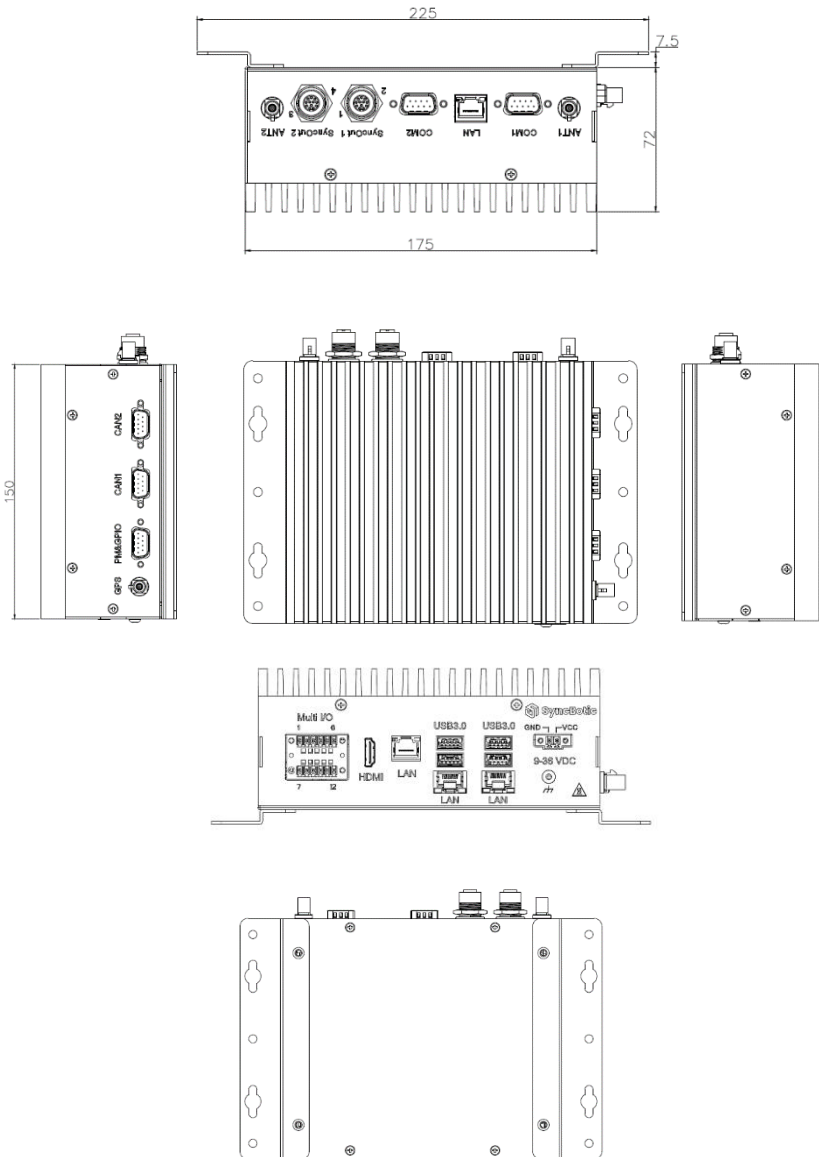
---

Hardware Information

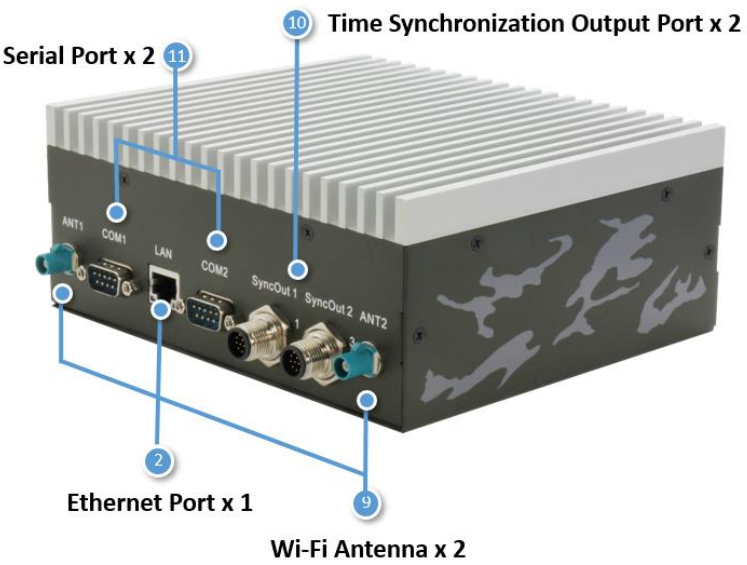
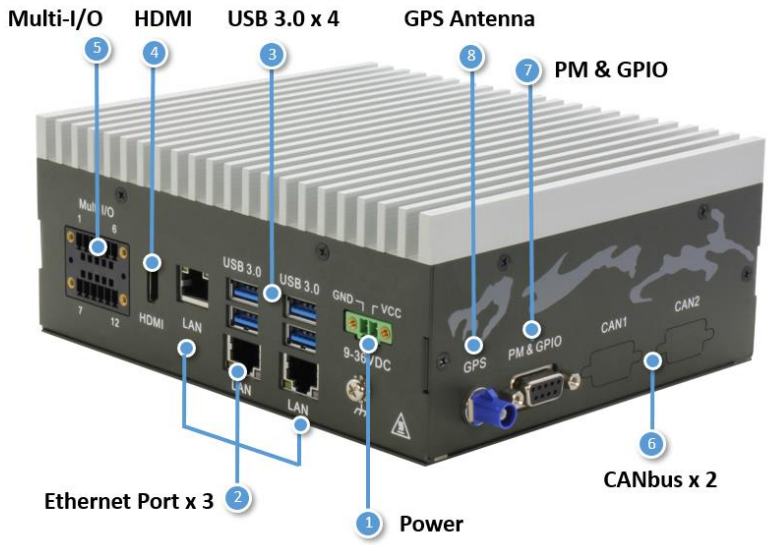


## 2.1 Dimensions

### System



## 2.2 I/O Location



## 2.3 List of Connectors

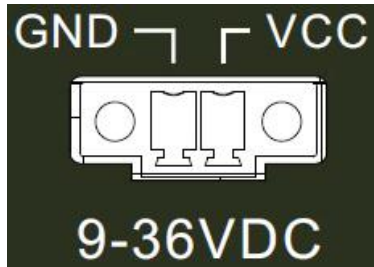
---

Please refer to the table below for all of the board's connectors that you can configure for your application

Label	Function
1	Power
2	Ethernet Port 1~4
3	USB 3.0 1~4
4	HDMI
5	Multi-I/O
6	CANbus 1~2
7	DB-9 for PM & GPIO
8	GPS Antenna
9	Wi-Fi Antenna 1~2
10	Time synchronization output port
11	Serial Port 1~2

### 2.3.1 Power Input Connector (1)

The controller provides a 2-pin terminal block with screw type. Power input range is 9~36VDC and supports reverse polarity to avoid system damage.



PIN	Function
VCC	VCC (9-36VDC)
GND	GND

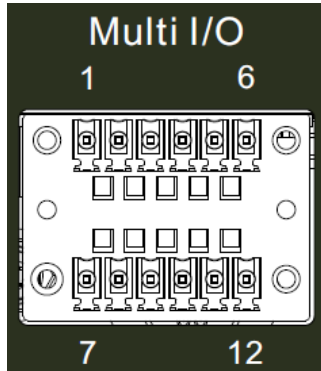
### 2.3.2 Ethernet Port (2)

The controller provides four Gigabit Ethernet ports and supports 10/100/1000Base-TX and LED indicator, see the details as below. Yellow for LINK/ACT LED on right side, Green for Gigabit and Amber for 100Mbps on left side.



### 2.3.3 Multi-I/O Connectors (5)

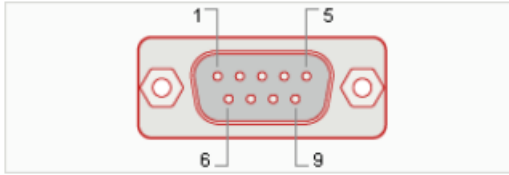
The controller provides an 8 channel DIO and 2 channel CANbus internal interface, see the pin definition as below.



PIN	Function
1	DIO_0
2	DIO_1
3	DIO_2
4	DIO_3
5	DIO_4
6	DIO_5
7	CAN1_H
8	CAN1_L
9	CAN2_H
10	CAN2_L
11	DIO_6
12	DIO_7

## 2.3.4 CAN-FD Connectors (6)

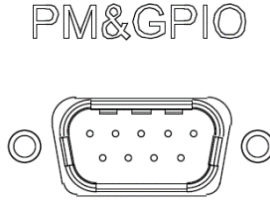
The controller provides two DB-9 CANbus ports for external sensor device connection. The system default supports a PEAK CAN module and the appropriate part number is IPEH-004046. Please see the DB-9 pin assignment and table as below.



PIN	Function
2	CAN-L
3	GND
6	GND
7	CAN-H

### 2.3.5 PM & GPIO Connectors (7)

The controller provides a DB-9 connector for power management and GPIO signal, see the information as below.



PIN	Function
1	GND
2	5V
3	UART_TXD
4	UART_RXD
5	GND
6	GPIO_PWM
7	GPIO_PWM
8	Power ON/OFF
9	System ready signal output

## 2.3.6 GPS Receiver and Antenna Setup (8)

---

The controller will install a GPS receiver module by default, and support GPS, QZSS, SBAS, Galileo, GLONASS and Beidou. The module number is GE-8264T and the brand is Navisys,

The module will provide 1pps and GPS data through UART interface, the antenna connector will use FAKRA C code for GPS module without any EMC or connection loss issues.

The connector type is FAKRA C, and will be on the side panel, see the drawing as below.

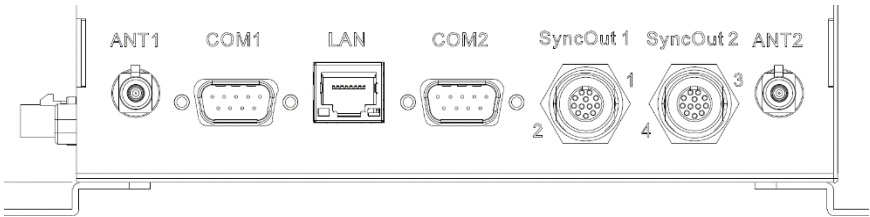
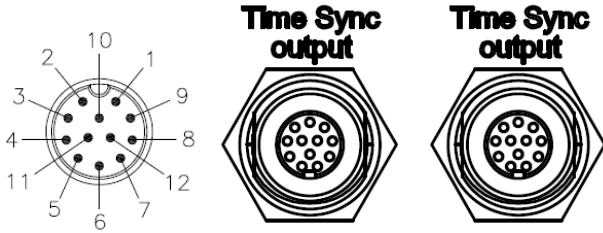
GPS





### 2.3.7 Time Synchronization Output (10)

The controller provides four 1PPS and SyncOut output for external sensor synchronization on two connectors, see the connector information as below.

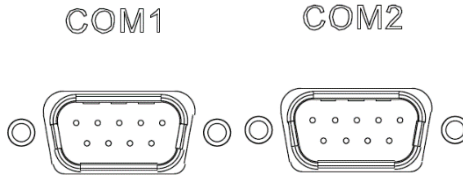


Connector	Channel	PIN	RS-232	Output Signal	
M12 12P Left (SyncOut 1)	Channel 1	2	RXD	Baud-rate: 9600bps	
		3	N.C		
		4	TXD		
		5	N.C		
		6	PPS out		1Hz
		11	GND		
	Channel 2	1	RXD	Baud-rate: 115200bps / 4Hz	
		7	N.C		
		8	TXD		
		9	N.C		
		10	PPS out		1Hz
		12	GND		
Connector	Channel	PIN	RS-232	Output Signal	
M12 12P Right (SyncOut 2)	Channel 3	2	RXD	Baud-rate: 9600bps	
		3	N.C		
		4	TXD		
		5	N.C		
		6	PPS out		1Hz
		11	GND		
	Channel 4	1	RXD	Baud-rate: 115200bps / 4Hz	
		7	N.C		
		8	TXD		
		9	N.C		
		10	PPS out		1Hz
		12	GND		

## 2.3.8 Serial Port Connectors (11)

The controller provides two DB-9 connectors for RS-232/422/485 interface, if you want to change the mode, please go to the BIOS setting page.

See the hardware pin assignment and table as below.



Serial Port	PIN	RS-232 (default)	RS-422	RS-485
COM 1	1	DCD	TXD-	D-
	2	RXD	TXD+	D+
	3	TXD	RXD+	-
	4	DTR	RXD-	-
	5	GND	GND	GND
	6	DSR	-	-
	7	RTS	-	-
	8	CTS	-	-
	9	RI	-	-

Serial Port	PIN	RS-232 (default)	RS-422	RS-485
COM 2	1	DCD	TXD-	D-
	2	RXD	TXD+	D+
	3	TXD	RXD+	-
	4	DTR	RXD-	-
	5	GND	GND	GND
	6	DSR	-	-
	7	RTS	-	-
	8	CTS	-	-
	9	RI	-	-

## 2.4 List of Internal Slots

Slot	Function
Memory Slots	SO-DIMM 260-pin slots x 2
Storage Slots	M.2 M Key slot x 1
Wi-Fi Module Slots	M.2 2230 E Key slot x 1 (for Intel AC9260 2T2R Wi-Fi module)

### 2.4.1. Memory Slots

The controller provides two SO-DIMM 260-pin slots and memory size max. up to 64G, along with clock frequency up to 3200MHz.

## 2.4.2 M.2 M Key Slot for Storage

---

The controller provides a PCIe Gen4 x4 interface and M.2 M key slot for NVMe storage.

## 2.4.3 M.2 E Key Slot for Wi-Fi Module

---

- The controller provides one M.2 2230 E key slot for Wi-Fi module and to pre-install Intel AC9260 2T2R Wi-Fi module on the controller.
- See the wi-fi module card information as below.

```
ros2@ros2-SRG-TG01:~$ ifconfig | grep -i wlp3s0 -A8
wlp3s0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet 10.42.0.1 netmask 255.255.255.0 broadcast 10.42.0.255
inet6 fe80::964a:80f8:bc72:a8ee prefixlen 64 scopeid 0x20<link>
ether 1c:99:57:a6:cf:25 txqueuelen 1000 (Ethernet)
RX packets 4462 bytes 786314 (786.3 KB)
RX errors 0 dropped 7 overruns 0 frame 0
TX packets 4066 bytes 2278149 (2.2 MB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

# Chapter 3

---

## Operating System and Certification

## 3.1. Operating System

---

### 3.1.1. OS Version Support

---

The Robot controller supports Ubuntu 18.04 and 20.04 versions.

### 3.1.2. ROS 2 Version Support

---

The robot controller supports the ROS 1 and ROS 2 framework.

## 3.2. Certification Specification

---

The controller hardware design meets FCC part 15B class A and EN 55032/35 certification requirements.