RBX-I2000

Robot Controller

User's Manual 1st Ed

Last Updated: June 21, 2022

Copyright Notice

Acknowledgement

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 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 the 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.

FCC Statement

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.

China RoHS Requirements (CN)

产品中有毒有害物质或元素名称及含量

AAEON Main Board/ Daughter Board/ Backplane

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	O	O	O	O	O	O
外部信号连接器及线材	O	O	O	O	O	O

O：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 SJ/T 11363-2006 标准规定的限量要求以下。

X：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T 11363-2006 标准规定的限量要求。

备注：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。

China RoHS Requirement (EN)

Poisonous or Hazardous Substances or Elements in Products

AAEON Main Board/ Daughter Board/ Backplane

Component	Poisonous or Hazardous Substances or Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
PCB & Other Components	O	O	O	O	O	O
Wires & Connectors for External Connections	O	O	O	O	O	O

O：The quantity of poisonous or hazardous substances or elements found in each of the component's parts is below the SJ/T 11363-2006-stipulated requirement.

X: The quantity of poisonous or hazardous substances or elements found in at least one of the component's parts is beyond the SJ/T 11363-2006-stipulated requirement.

Note: The Environment Friendly Use Period as labeled on this product is applicable under normal usage only

Table of Contents

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

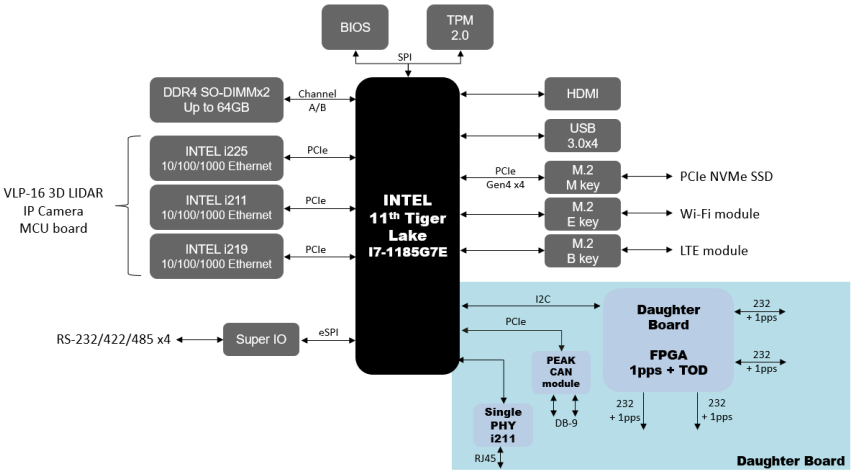
Power Requirement	DC 9 ~ 36V (optional DC12V), AT Type
Power Consumption	67W (full loading)
Power Mode	Support system auto-power on

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

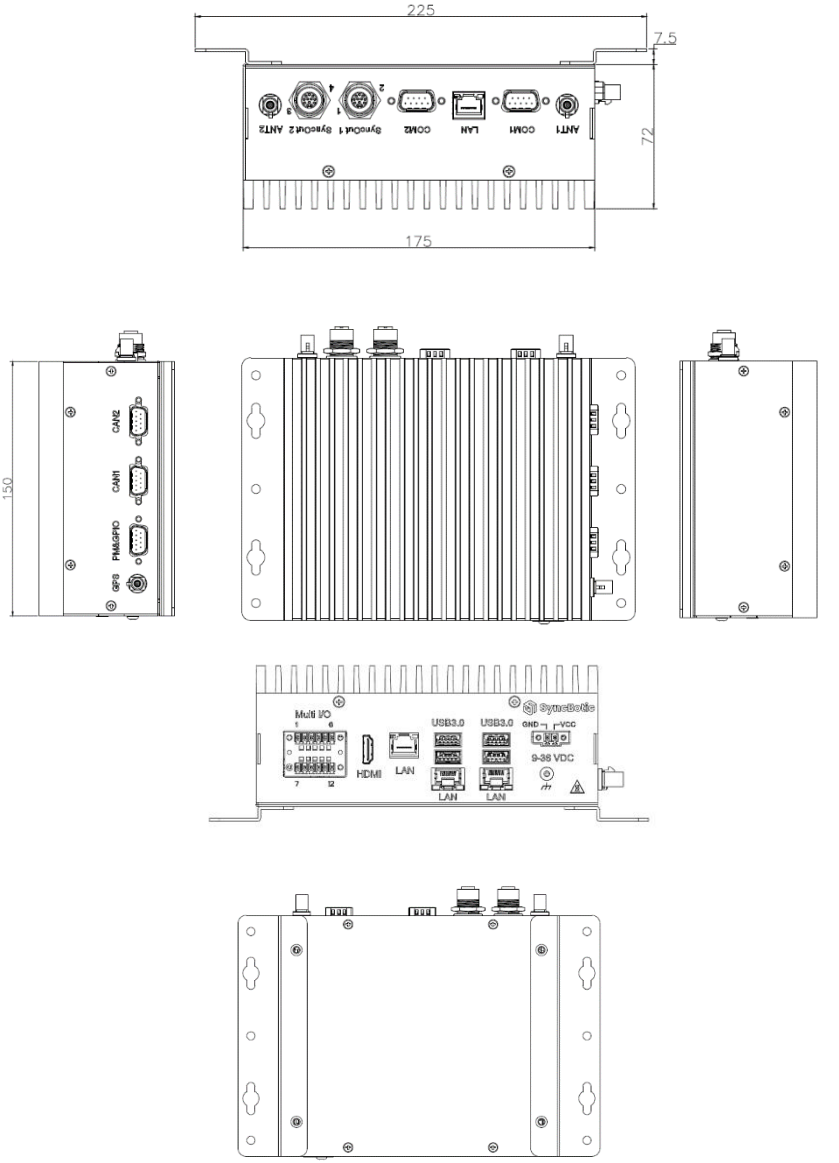


Chapter 2

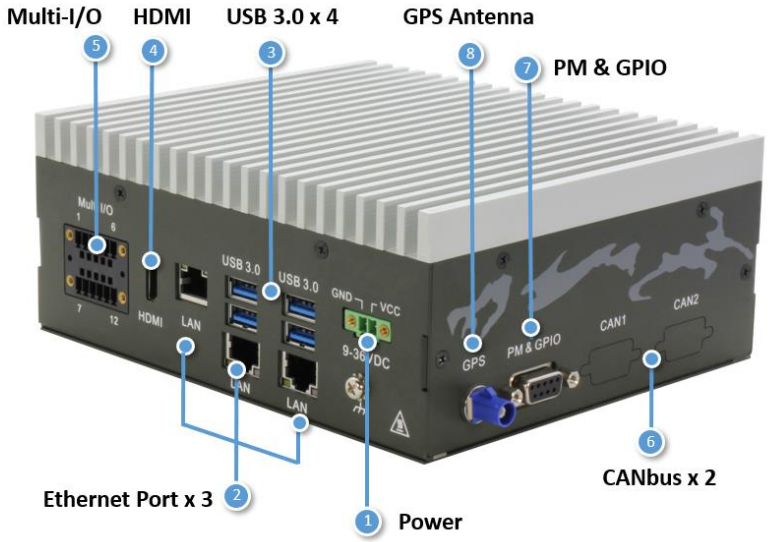
Hardware Information

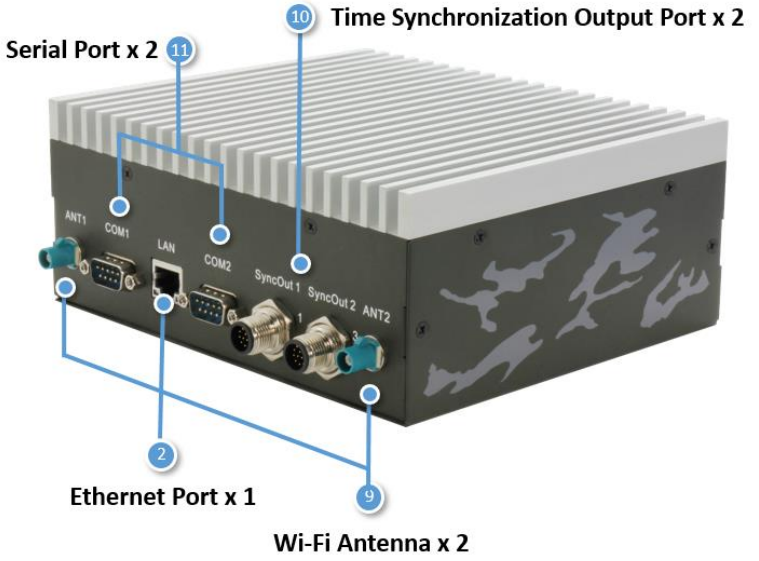
2.1 Dimensions

System



2.2 I/O Location





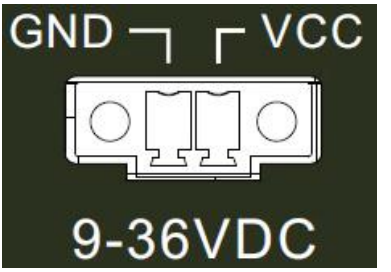
2.3 List of Connectors

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.



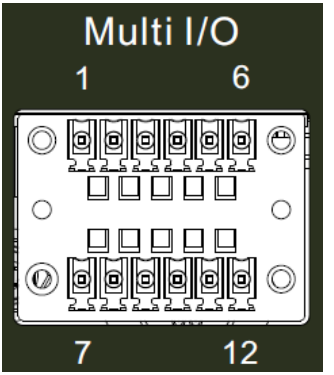
PIN	Function
VCC	VCC (9-36VDC)
GND	GND

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)

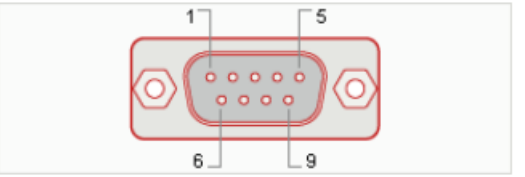
The controller provides an 8 channel DIO and 2 channel CANbus internal interface, see the pin definition as below.



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)

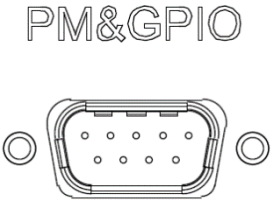
The controller provides two DB-9 CANbus ports for external sensor device connection. The system default supports a PEAK CAN module and the appropriate part number is IPEH-004046. Please see the DB-9 pin assignment and table as below.



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.



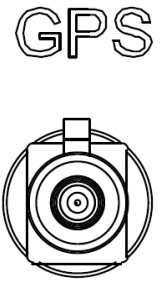
PIN	Function
1	GND
2	5V
3	UART_TXD
4	UART_RXD
5	GND
6	GPIO_PWM
7	GPIO_PWM
8	Power ON/OFF
9	System ready signal output

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,

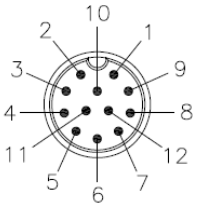
The module will provide 1pps and GPS data through UART interface, the antenna connector will use FAKRA C code for GPS module without any EMC or connection loss issues.

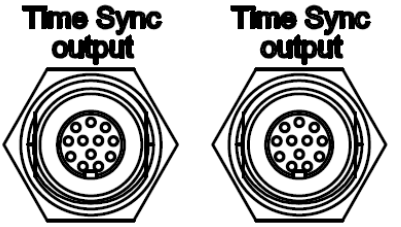
The connector type is FAKRA C, and will be on the side panel, see the drawing as below.

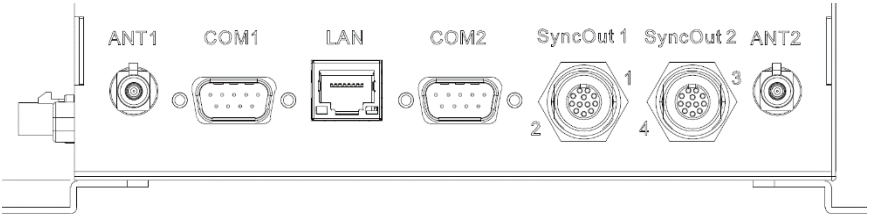


2.3.7 Time Synchronization Output (10)

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







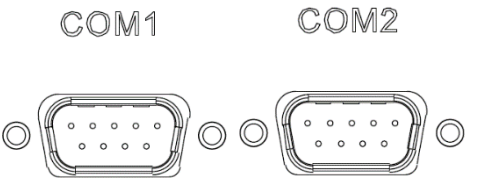
Connector	Channel	PIN	RS-232	Output Signal
M12 12P Left (SyncOut 1)	Channel 1	2	RXD	Baud-rate: 9600bps
		3	N.C	
		4	TXD	
		5	N.C	
		6	PPS out	1Hz
		11	GND	
	Channel 2	1	RXD	Baud-rate: 115200bps / 4Hz
		7	N.C	
		8	TXD	
		9	N.C	
		10	PPS out	1Hz
		12	GND	

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.