Iono Pi v3 User Guide

May 2026

Revision 001

IPMB30X41 *Iono Pi v3 with Raspberry Pi 4B 1GB*
IPMB30X42 *Iono Pi v3 with Raspberry Pi 4B 2GB*
IPMB30X44 *Iono Pi v3 with Raspberry Pi 4B 4GB*
IPMB30X48 *Iono Pi v3 with Raspberry Pi 4B 8GB*
IPMB30X51 *Iono Pi v3 with Raspberry Pi 5 1GB*
IPMB30X52 *Iono Pi v3 with Raspberry Pi 5 2GB*
IPMB30X54 *Iono Pi v3 with Raspberry Pi 5 4GB*
IPMB30X58 *Iono Pi v3 with Raspberry Pi 5 8GB*
IPMB30X516 *Iono Pi v3 with Raspberry Pi 5 16GB*

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Before opening the Iono Pi enclosure, disconnect all power sources and any connection to external devices, including USB and Ethernet cables.

Follow all applicable electrical safety standards, guidelines, specifications and regulations for installation, wiring and operations of Iono Pi.

Carefully read this user guide before installation.

Iono Pi is not authorised for use in safety-critical applications where a failure of the product would reasonably be expected to cause personal injury or death. Safety-critical applications include, without limitation, life support devices and systems, equipment or systems for the operation of nuclear facilities and weapons systems. Iono Pi is neither designed nor intended for use in critical military or aerospace applications or environments and for automotive applications or environment. Customer acknowledges and agrees that any such use of Iono Pi is solely at Customer's risk, and that Customer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

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Safety information

Carefully and fully read this user guide before installation and retain it for future reference.

Qualified personnel

The product described in this manual must be operated only by personnel qualified for the specific task and installation environment, in accordance with all relevant documentation and safety instructions. A qualified person should be capable of fully identifying all installation and operation risks and avoid potential hazards when working with this product.

Hazard levels

This manual contains information you must observe to ensure your personal safety and prevent damage to property. Safety information in this manual are highlighted by the safety symbols below, graded according to the degree of danger.

DANGER

Indicates a hazardous situation which, if not avoided, **will** result in death or serious personal injury.

WARNING

Indicates a hazardous situation which, if not avoided, **may** result in death or serious personal injury.

CAUTION

Indicates a hazardous situation which, if not avoided, can result in minor or moderate personal injury.

NOTICE

Indicates a situation which, if not avoided, can result in damage of property.

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Safety instructions

General safety instructions

Protect the unit against moisture, dirt and any kind of damage during transport, storage and operation. Do not operate the unit outside the specified technical data.

Never open the housing. If not otherwise specified, install in closed housing (e.g. distribution cabinet). Earth the unit at the terminals provided, if existing, for this purpose. Do not obstruct cooling of the unit. Keep out of the reach of children.

WARNING

Life threatening voltages are present within and around an open control cabinet.

When installing this product in a control cabinet or any other areas where dangerous voltages are present, always switch off the power supply to the cabinet or equipment.

WARNING

Risk of fire if not installed and operated properly.

Follow all applicable electrical safety standards, guidelines, specifications and regulations for installation, wiring and operations of this product.

The Raspberry Pi board could generate a substantial amount of heat when the software forces the CPU and/or GPU to operate at high load levels. Ensure that the product is properly installed and ventilated to prevent overheat.

The Iono Pi internal power supply could generate a substantial amount of heat, particularly when subject to a significant amount of electrical load.

An internal fan significantly improves the airflow and heat dissipation. Depending on external environment conditions, the fan could collect a significant amount of dust or other impurities, that could prevent it from spinning or could reduce its effectiveness. Periodically check that the fan is not blocked or partly obstructed.

NOTICE

The connection of expansion devices to this product may damage the product and other connected systems, and may violate safety rules and regulations regarding radio interference and electromagnetic compatibility.

Use only appropriate tools when installing this product. Using excessive force with tools may damage the product, alter its characteristics or degrade its safety.

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Battery

Iono Pi uses a small lithium non-rechargeable battery to power its internal real time clock (RTC).

WARNING

Improper handling of lithium batteries can result in an explosion of the batteries and/or release of harmful substances.

Worn-out or defective batteries can compromise the function of this product.

Replace the RTC lithium battery before it is completely discharged. The lithium battery must be replaced only with an identical battery. See the "Replacing the RTC backup battery" section for instructions.

Do not throw lithium batteries into fire, do not solder on the cell body, do not recharge, do not open, do not short-circuit, do not reverse polarity, do not heat above 85°C and protect from direct sunlight, moisture and condensation.

Dispose of used batteries according to local regulations and the battery manufacturer's instructions.

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Introduction

Iono Pi v3 is an industrial PLC based on the Raspberry Pi 4 or Raspberry Pi 5, designed for fast deployment of Linux-based automation, control, and IoT edge applications requiring reliable, continuous operation.

It integrates a robust 9-28 V DC power supply with surge and reverse polarity protection, four 5 A power relay outputs, high-resolution analog voltage and current inputs, and configurable GPIOs with support for interfaces such as 1-Wire and Wiegand. The platform also includes a hardware watchdog independent from the Raspberry Pi, a high-accuracy RTC with backup battery, and a hardware secure element based on the Microchip ATECC608 for device authentication and secure key storage.

Housed in a compact 4-module DIN-rail enclosure with screw terminal connections, Iono Pi v3 combines the flexibility of the Raspberry Pi ecosystem with protected industrial I/O and integrated power electronics, providing a ready-to-deploy solution for demanding automation and edge computing environments.



IONO PI V3

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Features

Core:

- Raspberry Pi 4B or 5

Mounting:

- 4 modules DIN rail case
- power supply and I/O connections on screw terminal blocks

Power supply:

- 9-28 V DC power supply, with surge and reverse polarity protection, and 2.2 A resettable fuse

I/O:

- 4 x power relay outputs rated for 5 A at 250 V
- 2 x analog voltage inputs 0-30 V
- 2 x analog current inputs 0-20 mA
- 7 x configurable GPIO pins
- 1-Wire and Wiegand support

LEDs:

- Power supply
- User application

High reliability and security:

- highly accurate real time clock (RTC) with temperature compensated oscillator and replaceable back-up battery
- embedded Microchip ATECC608 secure element chip
- hardware watchdog, fully independent from the Raspberry Pi board
- optional pre-assembled SPBF10X Strato Pi Fan for active cooling

Raspberry Pi embedded:

- 1 x Ethernet
- 4 x USB
- 2 x Micro HDMI
- 1 x microSD card slot
- Wi-Fi
- Bluetooth/BLE

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Device identification

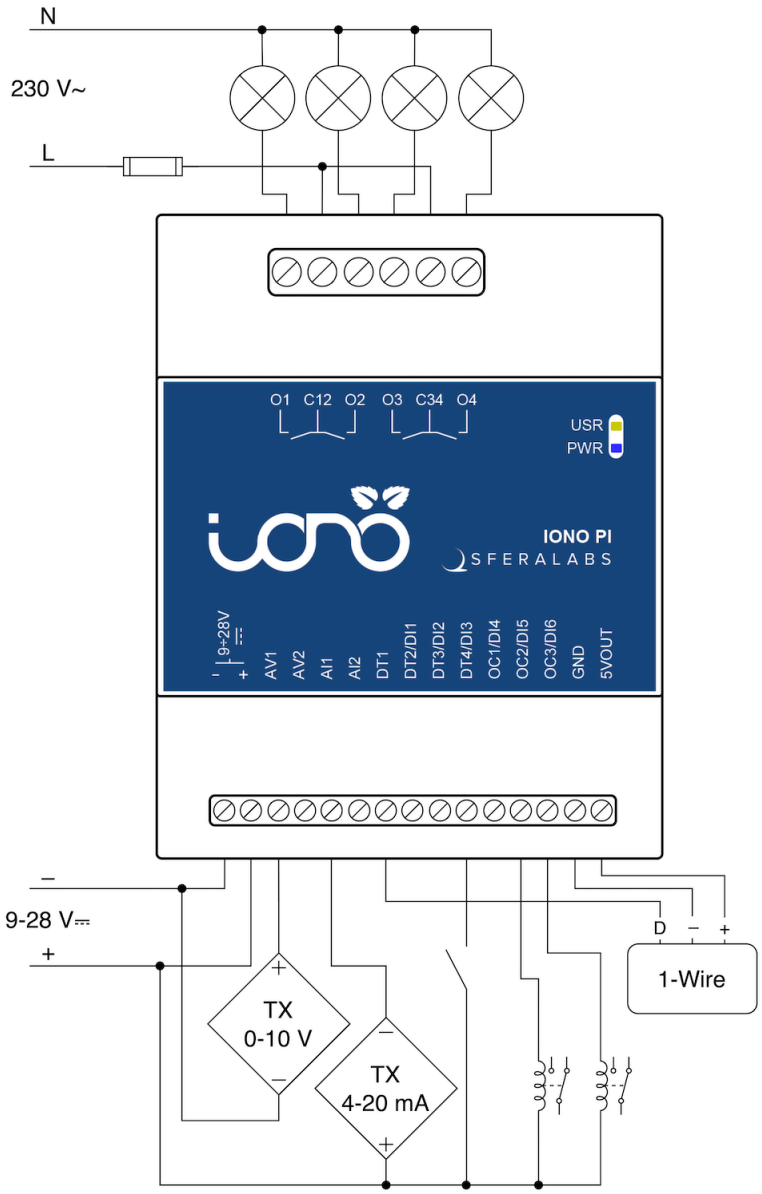
The device can be identified with the information provided in the rating and identification plate, permanently attached to the side of the case.



EXAMPLE IONO PI V3 RATING AND IDENTIFICATION PLATE

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Device overview



CONNECTION EXAMPLE

The core of Iono Pi is a standard Raspberry Pi single-board computer. It uses a microSD card as its boot and storage device and supports any operating system and software stack compatible with the Raspberry Pi platform.

To get started, install and configure your preferred operating system on the microSD card following the official Raspberry Pi documentation. Then proceed with the hardware setup described in the next chapter to power up and operate the device.

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Hardware setup

MicroSD card

Iono Pi uses a microSD card (not included) as its boot and storage device. The card can be inserted through the small opening on the top side of the enclosure. Use a small pin or paper clip to gently push the card in or to release and remove it.

Terminal blocks

Iono Pi features two terminal blocks:

- **Top terminal block**: 6 positions, 5.08 mm pitch, used for the power relay outputs. The maximum conductor cross section is 2.5 mm² (12 AWG). Recommended stripping length is 7 mm. Screw thread is M3. Never exceed 0.6 Nm torque when tightening the screws.
- **Bottom terminal block**: 15 positions, 3.81 mm pitch, used for DC power supply and low-power I/O connections. The maximum conductor cross section is 1.5 mm² (16 AWG), or 0.5 mm² when using ferrules (highly recommended). Recommended stripping length is 5 mm. Screw thread is M2. Never exceed 0.25 Nm torque when tightening the screws.

Power supply

Iono Pi must be powered with DC voltage only:

- **DC input voltage**: 9.0 V to 28.0 V (nominal range)
- **Maximum input current**: 2.2 A

Ensure correct polarity (+ / –) when connecting the power supply. The input stage includes reverse polarity protection with auto-resetting fuses and surge protection up to ±1000 V / 2 Ω 1.2 / 50 µs.

The blue PWR LED, visible on the front panel of the DIN-rail enclosure, indicates that input power is present.

The internal power supply stage is optimised to deliver up to 4 A total current at 5 V. Considering the amount of current needed to drive the relays and open collector outputs, it could provide up to 3.5 A at 5 V to the Raspberry Pi. Because Iono Pi has a 2.2 A resettable fuse (polyfuse) on the power supply line, the maximum current that its regulator can deliver is also limited by this fuse, and depends on the input voltage. The following table lists the typical measured output current of the power supply stage at different input voltages, and the corresponding input current.

		9V	12V	24V
Iout	**Vout**	**Iin**	**Iin**	**Iin**
0.1	5.09	0.09	0.08	0.06
1.0	5.06	0.67	0.49	0.26

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1.3	5.05	0.87	0.64	0.33
1.5	5.04	1.01	0.73	0.38
1.8	5.04	1.23	0.88	0.45
2.0	5.03	1.34	0.98	0.50
2.5	5.02	1.75	1.24	0.62
2.8	5.01	1.99	1.40	0.69
2.9	5.01	FUSE	1.46	0.72
3.0	5.00		1.51	0.74
3.5	4.99		1.81	0.87
3.8	4.98		FUSE	0.95
4.0	4.97			1.01
4.2	4.96			1.07
4.3				REG

IONO PI POWER SUPPLY STAGE TYPICAL IN/OUT VOLTAGE AND CURRENT

Replacing the RTC backup battery

Iono Pi includes a hardware real-time clock (RTC) powered by a dedicated long-life, non-rechargeable backup battery.

The device is shipped with a CR1220[1] Lithium/Manganese Dioxide (Li/MnO_2) battery pre-installed. This battery powers the RTC only when the main supply is not available. Depending on operating and environmental conditions, it is expected to last three or more years if the device remains unpowered for extended periods, or up to the battery's nominal lifetime when external power is regularly applied.

The battery is not externally accessible. To replace it, remove the enclosure following the procedure described below.

WARNING

Improper handling of lithium batteries can result in an explosion of the batteries and/or release of harmful substances.

Worn-out or defective batteries can compromise the function of this product.

KEEP OUT OF REACH OF CHILDREN. Swallowing may lead to serious injury or death in as little as 2 hours due to chemical burns and potential perforation of the esophagus. Immediately see doctor.

[1] BR1220 batteries (Lithium Poly-carbonmonofluoride) can also be used, for improved shelf and service life.

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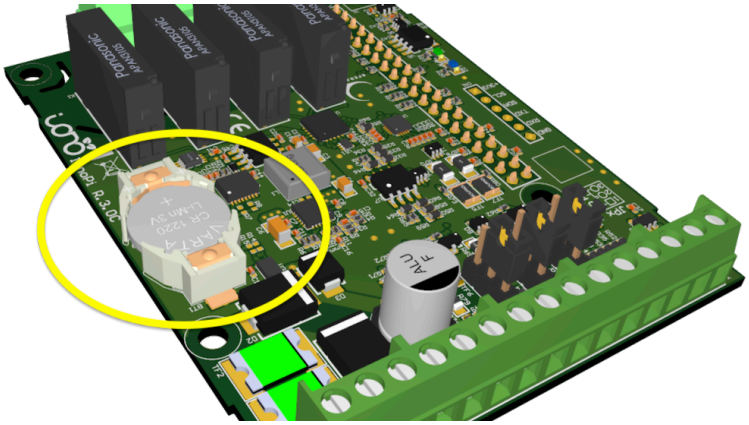
WARNING

Replace the RTC lithium battery before it is completely discharged. Replace the battery every 5 years even if the battery is still working properly. The lithium battery must be replaced only with an identical **CR1220** or **BR1220** battery.

WARNING

Do not throw lithium batteries into fire, do not solder on the cell body, do not recharge, do not open, do not short-circuit, do not reverse polarity, do not heat above 85 °C and protect from direct sunlight, moisture and condensation.

Dispose of used batteries according to local regulations and the battery manufacturer's instructions.



RTC BACKUP BATTERY

Once the circuit board assembly has been removed from the enclosure, use a non-conductive pin or small tool to carefully extract the battery from its holder. Insert the new battery with a gentle push; no tools are required for installation, as it is secured by a spring contact.

Ensure that the negative (–) terminal faces the circuit board and makes contact with the central pad of the battery holder, as shown in the image above.

The real-time clock will immediately reset when the backup battery is disconnected.

Opening the case

Opening the case is required for replacing the RTC battery or to move internal jumpers.

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NOTICE

Before opening the Iono Pi enclosure, disconnect all power sources and any connection to external devices, including USB and Ethernet cables.

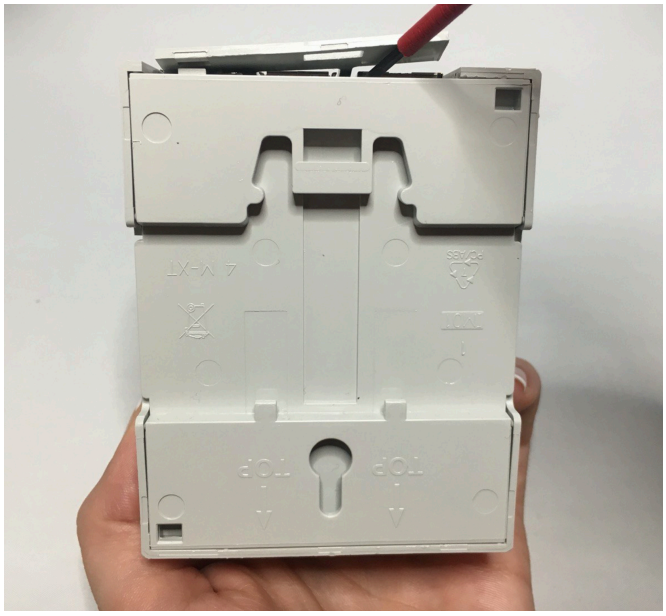
Follow the steps below in the exact order:

1. **Remove the microSD card**

NOTICE

Opening the case with the microSD card inserted will damage both the card and the Raspberry Pi board.

2. Remove the black plastic DIN-rail hook
3. Using a small flat screwdriver, gently separate the bottom part of the enclosure (with the board assembly) from the top cover (see image below)
4. Replace the battery or move the jumpers
5. Refit the bottom part of the enclosure, applying gentle pressure on the corners until it snaps into place
6. Reinstall the black plastic DIN-rail hook
7. Reinsert the microSD card.



OPENING THE CASE

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System architecture

On Iono Pi, system features are managed either directly through dedicated GPIOs or via peripheral ICs connected to the Raspberry Pi over SPI or I²C buses.

The table below provides an overview of each functionality, its corresponding control interface, and the related front-panel label (where applicable).

Functionality	Interface	Control	Label
User application LED	GPIO OUT	GPIO23	USR
Digital input 1	GPIO IN	GPIO16	DI1
Digital input 2	GPIO IN	GPIO19	DI2
Digital input 3	GPIO IN	GPIO13	DI3
Digital input 4	GPIO IN	GPIO12	DI4
Digital input 5	GPIO IN	GPIO6	DI5
Digital input 6	GPIO IN	GPIO5	DI6
5 V GPIO 1	GPIO IN/OUT	GPIO4	DT1
5 V GPIO 2	GPIO IN/OUT	GPIO26	DT2
5 V GPIO 3	GPIO IN/OUT	GPIO20	DT3
5 V GPIO 4	GPIO IN/OUT	GPIO21	DT4
Voltage input 1	SPI0 (GPIO9-11) CE0 (GPIO8)	MCP3462 CH0	AV1
Voltage input 2		MCP3462 CH1	AV2
Current input 1		MCP3462 CH2	AI1
Current input 2		MCP3462 CH3	AI2
Power relay 1	SPI0 (GPIO9-11) CE1 (GPIO7)	MAX4896 OUT1	O1
Power relay 2		MAX4896 OUT2	O2
Power relay 3		MAX4896 OUT3	O3
Power relay 4		MAX4896 OUT4	O4
Open collector output 1		MAX4896 OUT5	OC1
Open collector output 2		MAX4896 OUT6	OC2
Open collector output 3		MAX4896 OUT7	OC3
Outputs (O/OC) reset	GPIO OUT	GPIO17	-
Outputs (O/OC) error flag	GPIO IN	GPIO18	-
Outputs (O/OC) short-circuit protection control	GPIO OUT	GPIO22	-
Outputs (O/OC) pull-down control	GPIO OUT	GPIO27	-
5 V AUX output	-	-	5VOUT

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Functionality	Interface	Control	Label
5 V AUX output fault	GPIO IN	GPIO24	-
RTC	I2C1 (GPIO2-3) address 0x53	PCF2131	-
Watchdog			
Power control			
Secure element	I2C1 (GPIO2-3) address 0x60	ATECC608	-

To simplify integration, Iono Pi is supported by a driver for Raspberry Pi OS (Debian-based Linux). The driver exposes all features and configuration parameters through the sysfs file system, allowing interaction via simple file read/write operations from any programming language or tool that supports standard file access. Refer to the "Software installation and usage" chapter for details.

The following sections provide additional information on each functionality.

USR LED: User application LED

Iono Pi includes a green USR LED visible on the front panel for user-defined applications.

The LED is controlled by GPIO23 of the Raspberry Pi. Set the GPIO line high to turn the LED on and low to turn it off.

Depending on the Raspberry Pi operating system configuration, GPIO23 may default to a high state during startup. In this case, the LED may briefly turn on before your application configures and takes control of the GPIO line.

GND: Ground reference

The GND pin on the bottom terminal block provides the voltage reference for all digital and analog inputs and outputs.

It is internally connected to, and electrically equivalent to, the negative (–) terminal of the power supply input.

DI1-DI6: Digital inputs

Pins DI1 through DI6 on the bottom terminal block are generic digital inputs accepting positive voltage levels up to 40 V DC.

Each input is protected by a resistor network and is pulled to ground when left unconnected. The front-end circuitry includes a 2.2 kΩ pull-down resistor and a 4.7 kΩ series resistor.

The corresponding GPIO (see table above) switches high when the input voltage exceeds 4.2 V and low when it drops below 3.4 V.

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WARNING

Never apply voltage levels outside the specified operating limits.

DI1-DI3 share their terminal block pins with the DT lines. Internal jumpers are used to select the desired function:

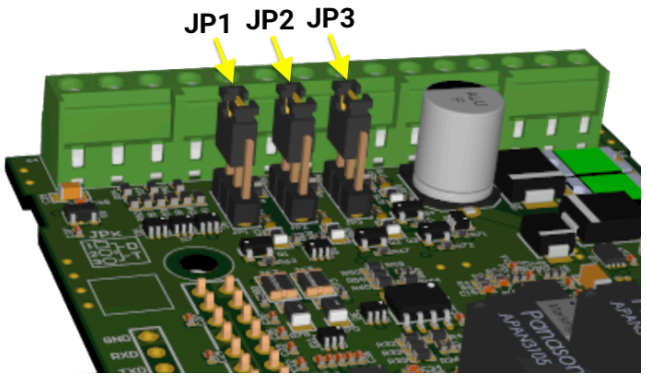
- Place the jumper across the two pins closest to the terminal block to configure the pin as a DI input
- Place the jumper across the center pin and the pin opposite the terminal block to configure it as a DT line

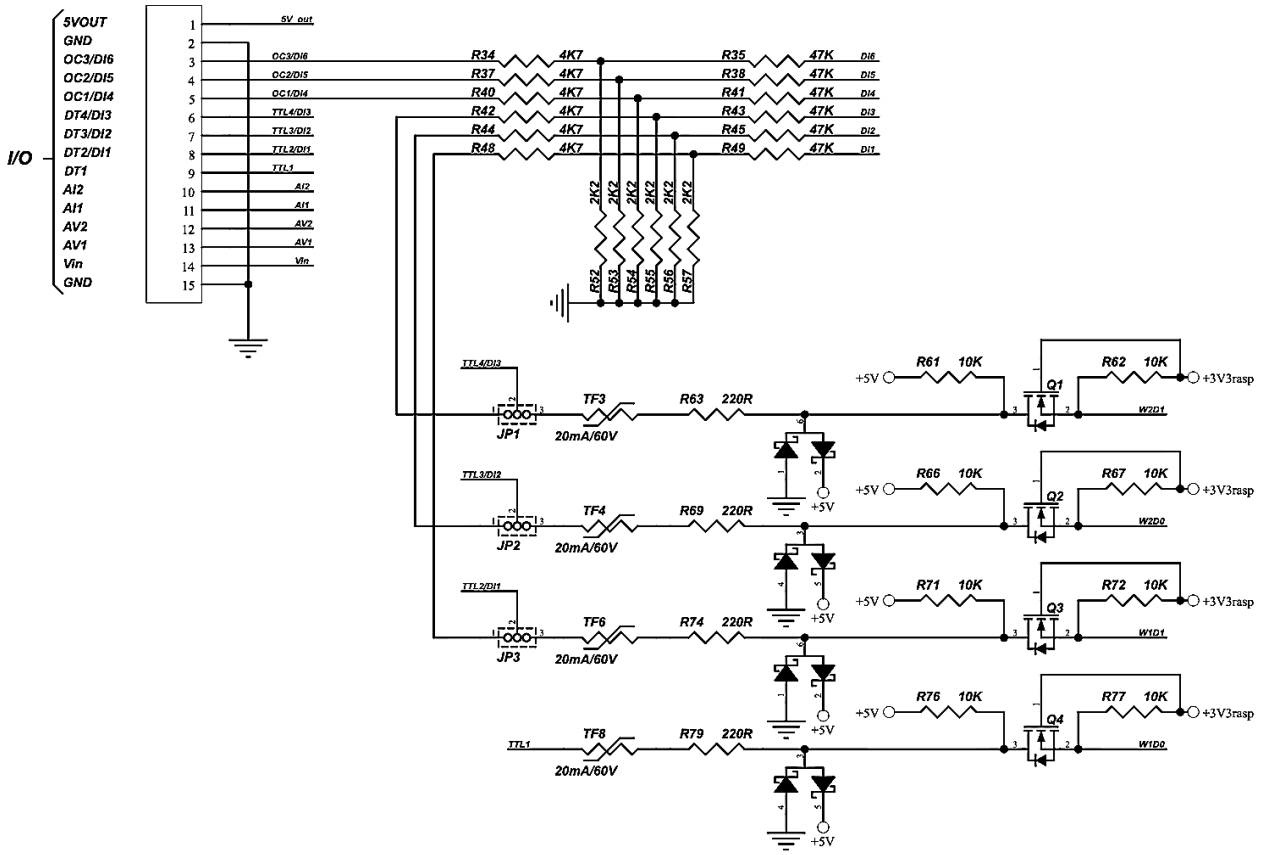
Refer to the table and image below for the exact jumper positions and the corresponding DT/DI pin mapping.

DI4-DI6 share their terminal block pins with the OC lines. No hardware configuration is required to switch between these functionalities.

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Pin	Jumper
DT2/DI1	JP3
DT3/DI2	JP2
DT4/DI3	JP1





DI, DT, OC LINES CIRCUIT

DT1-DT4: 5 V GPIOs

The DT lines are bidirectional 0-5 V I/O signals connected to the corresponding GPIOs of the Raspberry Pi (see table above) through bidirectional level shifters.

DT2-DT4 share their terminal block pins with the DI inputs. Internal jumpers are used to select the desired function, as described in the previous section.

The front-end circuitry includes a 10 kΩ pull-up resistor and a 470 Ω series resistor.

These lines can be used as general-purpose GPIOs or for interfacing with external devices using digital communication protocols such as 1-Wire, Wiegand, or I²C.

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WARNING

Never apply voltage levels outside the specified operating limits.

OC1-OC3: Open collector outputs

OC1 through OC3 are open-collector outputs with integrated open-circuit fault detection and overcurrent/short-circuit detection and protection. They are driven by three outputs of the MAX4896 load driver (see table above).

NOTICE

Open-circuit fault detection in the MAX4896 is implemented using a pull-down current source together with a voltage comparator, which maintains a small current flow when the contact is open. In some cases, this current may interfere with the correct operation of the connected device. This feature can be disabled for all open-collector outputs and relays if required.

The OC outputs share their terminal block pins with the DI inputs, as shown in the circuit diagram above. No hardware configuration is required to switch between these functionalities.

WARNING

Never apply voltage levels outside the specified operating limits of the DI inputs.

AV1-AV2: Voltage inputs

AV1 and AV2 are analog voltage inputs with an input range of 0-30 V.

The inputs are connected to the Microchip MCP3462 16-bit analog-to-digital converter (see table above), which supports sampling rates up to 153.6 ksps. The device features low temperature drift, low noise performance, and automatic offset error cancellation.

The input impedance of each channel is approximately 700 kOhm.

WARNING

Never apply voltage levels outside the specified operating limits.

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AI1-AI2: Current inputs

AI1 and AI2 are analog current inputs with a range of 0-20 mA.

The input current is converted to a voltage and measured by the Microchip MCP3462 16-bit analog-to-digital converter (see table above), supporting sampling rates up to 153.6 ksps. The converter provides low temperature drift, low noise, and automatic offset error cancellation.

The input impedance of each channel is approximately 100 Ohm.

WARNING

Never apply voltage levels outside the specified operating limits.

5VOUT: Auxiliary voltage output

Iono Pi provides a 5 V DC auxiliary output on the bottom terminal block, labeled 5VOUT, to power external low-power devices such as 1-Wire probes. The output can supply up to 500 mA and includes over-current and short-circuit protection, which automatically disable the output in fault conditions.

Output fault can be monitored via a dedicated GPIO (see table above).

O1-O4: Relay outputs

Iono Pi includes four normally-open relay outputs with contacts rated for 5 A at 250 V AC.

The relay contacts are available on the top terminal block. O1 and O2 share a common terminal (C12), while O3 and O4 share a second common terminal (C34).

The relay coils are driven by outputs of the MAX4896 load driver (see table above). The driver's short-circuit and open-load detection features monitor faults on the relay coils, not on the external circuits connected to the relay contacts.

ATECC608 secure element

Iono Pi embeds the ATECC608A or ATECC608B (depending on production lot) secure element chip from Microchip. The ATECC608 is connected via I²C bus (address 0x60).

Its key features are:

- Cryptographic co-processor with secure hardware-based key storage
- Protected storage for up to 16 Keys, certificates or data
- Hardware support for asymmetric sign, verify, key agreement – ECDSA: FIPS186-3 Elliptic Curve Digital Signature
  - ECDH: FIPS SP800-56A Elliptic Curve Diffie-Hellman
  - NIST standard P256 elliptic curve support

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- Hardware support for symmetric algorithms
  - SHA-256 & HMAC hash including off-chip context save/restore
  - AES-128: encrypt/decrypt, Galois field multiply for GCM
- Networking key management support
  - Turnkey PRF/HKDF calculation for TLS 1.2 & 1.3
  - Ephemeral key generation and key agreement in SRAM – Small message encryption with keys entirely protected
- Secure boot support
  - Full ECDSA code signature validation, optional stored digest/signature – optional communication key disablement prior to secure boot
  - Encryption/Authentication for messages to prevent on-board attacks
- Internal high-quality FIPS 800-90 A/B/C Random Number Generator (RNG)
- Two high-endurance monotonic counters
- Guaranteed unique 72-bit serial number.

Refer to its documentation and Microchip's software resources for usage details.

Real-Time Clock

Iono Pi includes an NXP PCF2131 hardware real-time clock (RTC) connected to the I²C bus (address 0x53) with a dedicated long-life non-rechargeable backup battery.

Once the RTC driver is installed, standard system commands can be used to read and set the hardware clock.

Watchdog / Timed power control

The RTC also enables a watchdog that performs a full power cycle of the Raspberry Pi if the system becomes unresponsive, and a timed power control function that can switch the Raspberry Pi off for a configurable period, allowing programmed power cycles for low-power applications.

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Software installation and usage

All Iono Pi features can be used with any Raspberry Pi-compatible operating system, programming language, or framework via GPIO, SPI, and I²C interfaces as described above.

To simplify integration, a driver for Raspberry Pi OS (Debian-based Linux) is available. It provides an RTC device and a hardware watchdog device, and exposes all other Iono Pi features through the sysfs file system, enabling control through simple file read/write operations from any programming language or tool supporting standard file access.

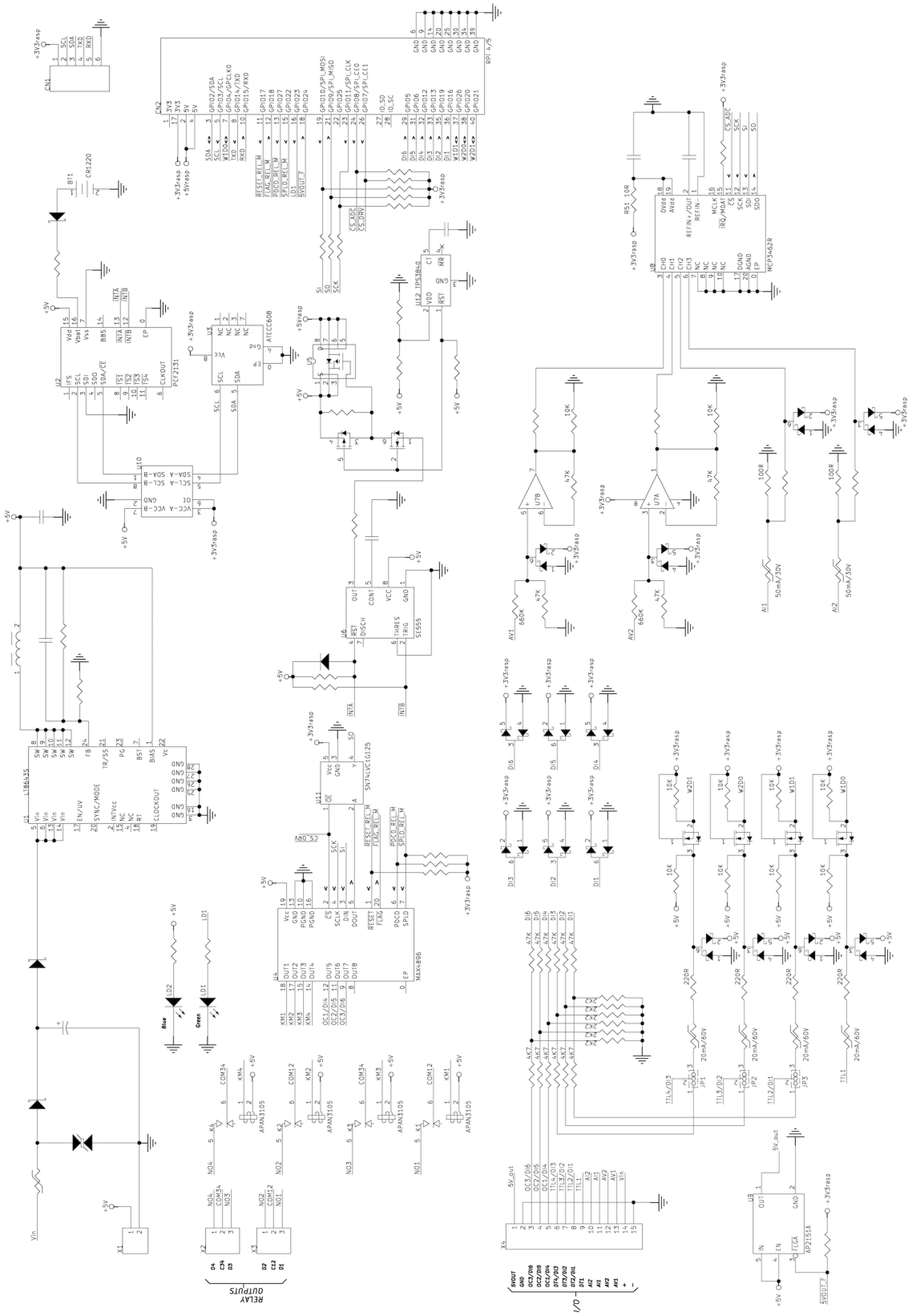
Installation instructions, usage details, and examples are available at:

https://github.com/sfera-labs/iono-pi-v3-kernel-module

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Schematic diagram

This simplified schematic illustrates only essential interconnections between main functional blocks and omits supporting components, bypass capacitors, and secondary signal paths.



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Technical specifications

Note: all values typical, at +25 °C and under normal operating conditions.

POWER SUPPLY	
Power supply operating voltage (VS)	⎓dc 24 V nominal (range 9-28 V), max 2.2 A Reverse polarity and surge protection with 2.2 A resettable fuse
Current consumption at VS+ 12 V⎓ including Raspberry Pi 5, with Ethernet connected, no USB devices	low CPU load: 350 mA, 100% CPU load, before throttling: 1 A 100% CPU load, throttled: 530 mA All relays ON add: 40 mA SPBF10X fan option, add: 50 mA Actual current consumption may vary based on working conditions
Current consumption at VS+ 24 V⎓ including Raspberry Pi 5, with Ethernet connected, no USB devices	low CPU load: 180 mA, 100% CPU load, before throttling: 470 mA 100% CPU load, throttled: 270 mA All relays ON add 15 mA SPBF10X fan option, add: 25 mA Actual current consumption may vary based on working conditions
5VOUT auxiliary voltage output	Max current: 50 mA Min voltage: 4.5 V
5VOUT AUX POWER OUTPUT	
5VOUT output voltage	5.0 V (5.15 V Max)
5VOUT output current	500 mA (Max)
RASPBERRY PI COMPATIBILITY	
Raspberry platform compatibility	Raspberry Pi 4 Model B Raspberry Pi 5
O1-O4: RELAY OUTPUTS	
Contact rating (resistive)	5 A 250 V AC, 5 A 30 V DC
Max. switching power (resistive)	1250 VA, 150 W
Max. switching voltage	250 V AC, 110 V DC (0.4 A)
Max. switching current	5 A (AC, DC)
Dielectric strength between open contacts (initial)	1000 Vrms for 1 min (detection current: 10 mA)
Dielectric strength between contact and coil (initial)	3000 Vrms for 1 min (detection current: 10 mA)
Expected mechanical life	Min. 20 x 106 ope. (switching frequency: at 180 times/min)

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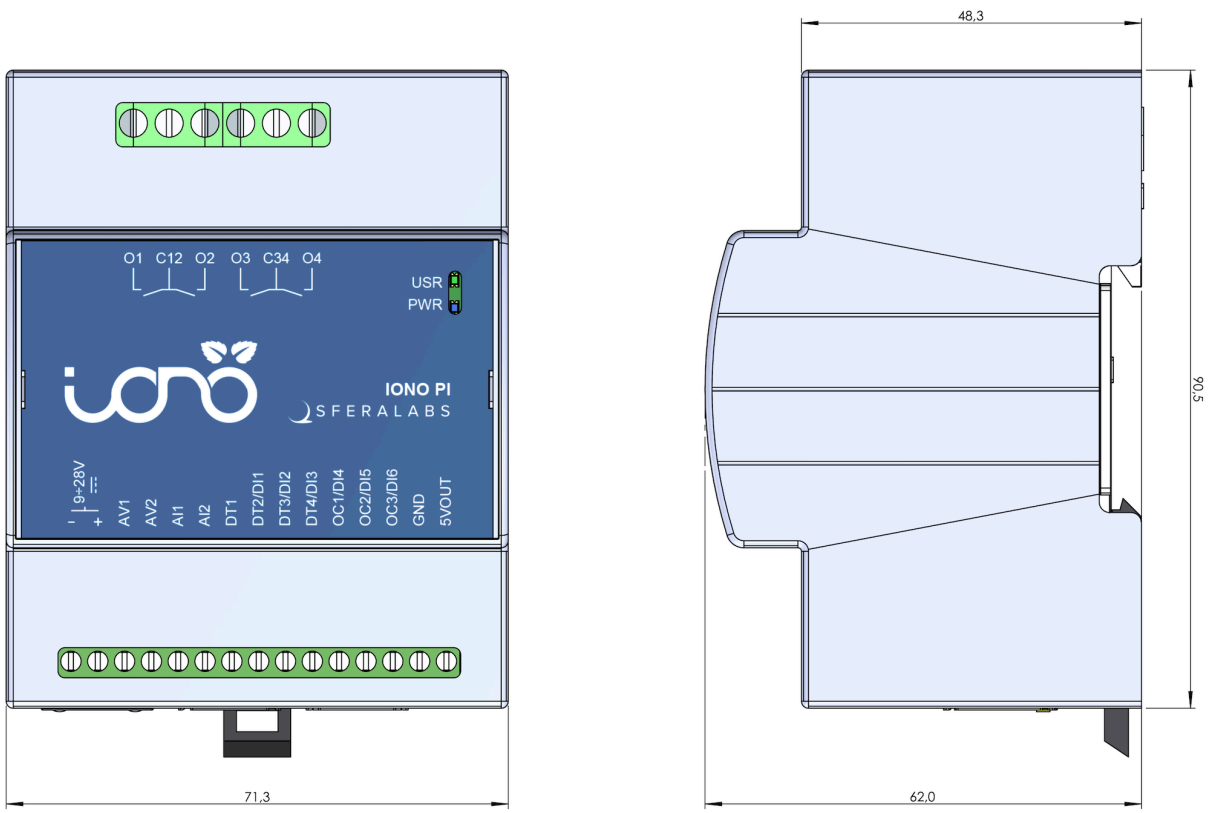
Expected electrical life	3 A 250 V AC Min. 100 x 103 ope. (Switching frequency at 20 times/min) 3 A 30 V DC Min. 100 x 103 ope. (Switching frequency at 20 times/min) 5 A 250 V AC Min. 50 x 103 ope. (Switching frequency at 6 times/min, ON : OFF = 1 s : 9 s) 5 A 30 V DC Min. 50 x 103 ope. (Switching frequency at 20 times/min) 2 A 250 V AC (cosϕ=0.4) Min. 100 x 103 ope. (Switching frequency at 6 times/min, ON : OFF = 1 s : 9 s)
OC1-OC3: OPEN COLLECTOR OUTPUTS	
Sink current	200 mA (Max)
On resistance	3 Ohm
Voltage range	0…40 V
DI1-DI6: DIGITAL INPUTS	
Voltage range	0…40 V
Impedance	6.9 kOhm
Thresholds	VIH: 4.2 V VIL: 3.4 V
Maximum recommended cable length	30 m
DT1-DT4: DIGITAL GPIO	
Output voltage	VOL: 0.2 V VOH: 5.0 V
Input voltage range	0…5 V
Input voltage thresholds	VIH: 2.4 V VIL: 0.8 V
Pull-up (+5 V)	10 kOhm
Maximum recommended cable length	2 m
AV1-AV2: ANALOG VOLTAGE INPUTS	
Voltage range	0…30 V
Impedance	700 kOhm
Resolution	16 bits (Max)
ADC specifications	Refer to Microchip MCP3462R datasheet
AI1-AI2: ANALOG CURRENT INPUTS	
Current range	0…20 mA
Impedance	100 Ohm

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Resolution	16 bits (Max)
ADC specifications	Refer to Microchip MCP3462R datasheet
REAL TIME CLOCK	
Oscillator frequency	32768 kHz
Frequency Tolerance	±3 ppm
Backup battery	Only use CR1220 or BR1220 Lithium / Manganese Dioxide (Li/MnO2) batteries. Expected battery life without main power supply: 3 or more years, depending on environmental conditions
EMI IMMUNITY STANDARDS	
Electromagnetic immunity compliance	EN 61000-4-2: 2025 (ESD) EN 61000-4-3: 2020 (Radiated RF Field) EN 61000-4-4: 2012 (Burst/fast transient) EN 61000-4-5: 2014 / A1: 2017 (Surge) EN 61000-4-6: 2023 (Conducted) EN 61000-4-8: 2010 (Power freq. magnetic field)
ENVIRONMENTAL	
Operating temperature	-20…+60 °C
Storage temperature	-30…+80 °C
Altitude	Up to 2000 m
Humidity	5% to 95% RH noncondensing
Protection degree	IP20
MECHANICAL	
3.81 mm pitch terminal block characteristics	Maximum conductor cross section: 1.5 mm^2 (16 AWG) Recommended stripping length: 5 mm Screw thread: M2 Maximum screws tightening torque: 0.25 Nm
5.08 mm pitch terminal block characteristics	Maximum conductor cross section: 2.5 mm^2 (12 AWG) Recommended stripping length: 7 mm Screw thread: M3 Maximum screws tightening torque: 0.6 Nm
Dimensions	4 module Din Rail enclosure width: 71.3 mm height: 91.0 mm depth: 62.0 mm
Weight	190 g

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Dimensions

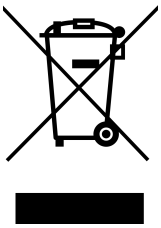


DIMENSIONS (mm)

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Disposal

Waste Electrical & Electronic Equipment



(Applicable in the European Union and other European countries with separate collection systems). This marking on the product, accessories or literature indicates that the product should not be disposed of with other household waste at the end of their working life. To prevent possible harm to the environment or human health from uncontrolled waste disposal, separate these items from other types of waste and recycle them responsibly to promote the sustainable reuse of material resources. Household users should contact either the retailer where they purchased this product, or their local government office, for details of where and how they can take these items for environmentally safe recycling. This product and its electronic accessories should not be mixed with other commercial wastes for disposal.

Iono Pi contains a small non rechargeable manganese dioxide lithium coin battery.

In the Iono Pi, the battery is not accessible from the outside. You should first remove the case body to gain access to the Iono Pi circuit boards. Always remove the battery before disposing of this product.

Installation and use restrictions

Standards and regulations

The design and the setting up of electrical systems must be performed according to the relevant standards, guidelines, specifications and regulations of the relevant country. The installation, configuration and programming of the devices must be carried out by trained personnel.

The installation and wiring of connected devices must be performed according to the recommendations of the manufacturers (reported on the specific data sheet of the product) and according to the applicable standards.

All the relevant safety regulations, e.g. accident prevention regulations, law on technical work equipment, must also be observed.

Safety instructions

Carefully read the safety information section at the beginning of this document.

Set-up

For the first installation of the device proceed according to the following procedure:

- make sure all power supplies are disconnected;
- install and wire the device according to the schematic diagrams on the specific product user guide;

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- after completing the previous steps, switch on the power supply and other related circuits.

Conformity Information

EU

This device complies with the following applicable European Community harmonised standards:

- 2014/30/EU - Electromagnetic Compatibility Directive (EMC)
- 2011/65/EU and 2015/863/EU - Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS 3)

The following harmonised standards have been used to demonstrate conformity to these directives:

- EN IEC 61000-6-2:2019 - EMC Immunity standard for industrial environments
- EN IEC 61000-6-3:2021 - EMC Emission standard for residential, commercial and light-industrial environments

The declaration of conformity is available at: https://www.sferalabs.cc

USA

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help.

Shielded cables must be used with this equipment to maintain compliance with FCC regulations.

This device complies with Part 15 of the 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.

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CANADA

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

RCM AUSTRALIA / NEW ZEALAND

This product meets the requirements of the standard EN 61000-6-3: 2021 - Emission for residential, commercial and light-industrial environments.

Compliance information for Raspberry Pi

Iono Pi contains a *Raspberry Pi 4 Model B* or *Raspberry Pi 5* single-board computer. These boards have WiFi and Bluetooth radios. They are user accessible and replaceable.

EU

Raspberry Pi 4 Model B and *Raspberry Pi 5* are in conformity with the essential requirements and other relevant requirements of the Radio Equipment Directive 2014/53/EU.

USA

Raspberry Pi 4 Model B FCC IDENTIFIER: **2ABCB-RPI4B**

Raspberry Pi 5 FCC IDENTIFIER: **2ABCB-RPI5**

The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be colocated or operating in conjunction with any other antenna or transmitter, except in accordance with FCC multitransmitter product guidelines. This (WiFi DTS) device has 20 MHz bandwidth mode.

CANADA

Raspberry Pi 4 Model B IC CERTIFICATION No.: **20953-RPI4B**

Raspberry Pi 5 IC CERTIFICATION No.: **20953-RPI5**

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.

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