SunFounder Pironman

www.sunfounder.com

Jan 31, 2024

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Thanks for choosing our Pironman U1.



Meet the Pironman U1, the essential UPS case for Raspberry Pi, designed for seamless performance and sophisticated style. It features Advanced Hardware Power Path Switching for stable power, Triple Current Sensors for efficient power management, and Intelligent Charging to enhance battery life. Enjoy real-time battery monitoring via I2C Communication, extensive storage options with NVMe SSD Compatibility, and easy multimedia control with an IR Receiver. The case also boasts a retro-style Metal Power Button, an Extended 40-pin GPIO with labeled pins for easy access, and a robust, aesthetically pleasing build. With an efficient cooling fan and direct access to the microSD card slot, the Pironman U1 is the perfect blend of functionality and elegance for your Raspberry Pi.

If you have any questions, please send an email to service@sunfounder.com and we will respond as soon as possible.

ONE

1. WHAT ELSE SHOULD WE PREPARE?

Essential Components

• Raspberry Pi 5/4 Model B

The Pironman U1 is fully compatible with the Raspberry Pi 5/4 Model B.

• 5V/5A USB Type C Power Adapter

It is recommended to use the official 27W power supply of Raspberry Pi or other Pi5 dedicated USB PD protocol 5V/5A power sources.

Micro SD Card

It is recommended to use an SD card with a minimum of 16GB of storage for Raspberry Pi OS. For Raspberry Pi OS Lite, a minimum of 4GB is advised.

Optional Components

• M.2 NVMe SSD

The Pironman U1 features an NVMe PIP with an M.2 SSD connector, accommodating four NVMe M.2 SSD sizes: 2230, 2242, 2260, and 2280. It supports both PCIE2.0 and PCIE 3.0 NVMe M.2 SSDs.

• Screen

To access the Raspberry Pi's desktop environment, a screen such as a TV or a computer monitor is required.

Micro HDMI Cable

A Micro HDMI cable is required when you want to connect the Raspberry Pi to a screen.

• Mouse & Keyboard

Any USB port on the Raspberry Pi can be used to connect a wired keyboard and mouse, or a USB Bluetooth receiver for wireless peripherals.

2. ASSEMBLY INSTRUCTIONS

Before assembling the Pironman, please first verify that all parts and components have been included. If there are any missing or damaged components, please contact SunFounder immediately at service@sunfounder.com to resolve the issue as soon as possible.

Tips

- It is recommended to follow the paper installation instructions step by step.
- Before installation, sort and stack the components to find them more quickly.
- Repeatedly check the connections of FFC and FPC cables to avoid poor contact.

THREE

3. INSTALLING THE OS

Required Components

- Raspberry Pi 5B
- A Personal Computer
- A Micro SD card

Installation Steps

1. Visit the Raspberry Pi software download page at Raspberry Pi Imager. Choose the Imager version compatible with your operating system. Download and open the file to initiate installation.



2. A security prompt may appear during installation, depending on your operating system. For example, Windows might display a warning message. In such cases, select **More info** and then **Run anyway**. Follow the on-screen guidance to complete the installation of the Raspberry Pi Imager.



- 3. Insert your SD card into your computer or laptop's SD card slot.
- 4. Launch the Raspberry Pi Imager application by clicking its icon or typing rpi-imager in your terminal.

🍑 Rasp	oberry Pi Imager v1.8.1	berry Pi		×
	Raspberry Pi Device CHOOSE DEVICE	Operating System CHOOSE OS	Storage CHOOSE STORAGE	

5. Within the Imager, click **CHOOSE DEVICE** and select the **Raspberry Pi 5** model from the dropdown list.



6. Select CHOOSE OS and opt for the recommended operating system version.

berry Pill	mager v1.8.4	-	
	Operating System		x
õ	Raspberry Pi OS (64-bit) A port of Debian Bookworm with the Raspberry Pi Desktop (Recommended) (Reco Released: 2023-12-05 Online - 1.1 GB download	mmeno	ded)
õ	Raspberry Pi OS (32-bit) A port of Debian Bookworm with the Raspberry Pi Desktop Released: 2023-12-05 Online - 1.2 GB download		
\$	Raspberry Pi OS (other) Other Raspberry Pi OS based images		>
<u></u>	Other general-purpose OS Other general-purpose operating systems		>
൭	Media player OS		>

7. Click **Choose Storage** and select the appropriate storage device for the installation.

Note: Ensure you select the correct storage device. To avoid confusion, disconnect any additional storage devices if multiple ones are connected.



8. Click **NEXT** and then **EDIT SETTINGS** to tailor your OS settings. If you have a monitor for your Raspberry Pi, you can skip the next steps and click 'Yes' to begin the installation. Adjust other settings later on the monitor.

🥉 Raspberry	Pi Imager v1.8.1	_		×
X	Raspberry Pi			
Ras	Use OS customisation?	x		
RA	2 Would you like to apply OS customisation settings?		EV	
	EDIT SETTINGS NO, CLEAR SETTINGS YES NO			
	NEXT			

9. Define a hostname for your Raspberry Pi.

Note: The hostname is your Raspberry Pi's network identifier. You can access your Pi using <hostname>.local or <hostname>.lan.

ð	OS Customisation		- 🗆 X
	GENERAL	SERVICES	OPTIONS
	Set hostname: ras	pberrypi	
	🗹 Set username and p	assword	
	Username:		
	Password:		

10. Create a Username and Password for the Raspberry Pi's administrator account.

Note: Establishing a unique username and password is vital for securing your Raspberry Pi, which

lacks a default password.

OS Customisation		- 🗆 X
GENERAL	SERVICES	OPTIONS
Set hostname: ras	pberrypi . local	
Set username and p	assword	
Username: pi		
Password:		

11. Configure the wireless LAN by providing your network's SSID and Password.

Note: Set the Wireless LAN country to the two-letter ISO/IEC alpha2 code corresponding to your location.

2210:		
Password:		
Show pass	word Hidden SSID	
Wireless LAN cour	ntry: GB	
Set locale setting	s	
Time zone:	Asia/Shanghai	.
Keyboard layout:	us	Ŧ

12. Click SERVICES and activate SSH for secure, password-based remote access. Remember to save your settings.



13. Confirm your selected settings by clicking Yes.



14. If the SD card contains existing data, ensure you back it up to prevent data loss. Proceed by clicking **Yes** if no backup is needed.

🥉 R	aspberry l	Pi Imager v1.8.1	_		×
	8	Raspberry Pi			
		Warning	x		
	Ras RA	All existing data on 'Generic STORAGE DEVICE USB Device' will be erased. Are you sure you want to continue?		EV	
		NOYES			
		NEXT			

15. The OS installation process will commence on the SD card. A confirmation dialog will appear upon completion.



FOUR

4. SETTING UP YOUR RASPBERRY PI

4.1 Setting Up with a Screen

Having a screen simplifies the process of working with your Raspberry Pi.

Required Components

- Raspberry Pi 5/4 Model B
- Power Adapter
- Micro SD card
- Screen Power Adapter
- HDMI cable
- Screen
- Mouse
- Keyboard

Steps:

- 1. Insert the Micro SD card with Raspberry Pi OS installed into the Pironman U1.
- 2. Connect the Mouse and Keyboard to the Pironman U1.
- 3. Use the HDMI cable to connect the screen to the Pironman U1's HDMI port. Ensure the screen is plugged into a power source and turned on.
- 4. Power the Pironman U1 using the power adapter. The Raspberry Pi OS desktop should appear on the screen after a few seconds.



4.2 Setting Up Without a Screen

If you don't have a monitor, remote login is a viable option.

Required Components

- Raspberry Pi 5/4 Model B
- Power Adapter
- Micro SD card

Using SSH, you can access the Raspberry Pi's Bash shell, which is the default Linux shell. Bash offers a command-line interface for performing various tasks.

For those preferring a graphical user interface (GUI), the remote desktop feature is a convenient alternative for managing files and operations.

For detailed setup tutorials based on your operating system, refer to the following sections:

4.2.1 For Mac OS X Users

For Mac OS X users, SSH (Secure Shell) offers a secure and convenient method to remotely access and control a Raspberry Pi. This is particularly handy for working with the Raspberry Pi remotely or when it's not connected to a monitor. Using the Terminal application on a Mac, you can establish this secure connection. The process involves an SSH command incorporating the Raspberry Pi's username and hostname. During the initial connection, a security prompt will ask for confirmation of the Raspberry Pi's authenticity.

1. To connect to the Raspberry Pi, type the following SSH command:

ssh pi@raspberrypi.local



2. A security message will appear during your first login. Respond with yes to proceed.

```
The authenticity of host 'raspberrypi.local.

→(2400:2410:2101:5800:635b:f0b6:2662:8cba)' can't be established.

ED25519 key fingerprint is SHA256:oo7x3ZSgAo032wD1tE8eW0fFM/

→kmewIvRwkBys6XRwg.

Are you sure you want to continue connecting (yes/no/[fingerprint])?
```

3. Input the password for the Raspberry Pi. Be aware that the password won't display on the screen as you type, which is a standard security feature.

```
pi@raspberrypi.local's password:
Linux raspberrypi 5.15.61-v8+ #1579 SMP PREEMPT Fri Aug 26 11:16:44 BST_
→2022 aarch64
The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Thu Sep 22 12:18:22 2022
pi@raspberrypi:~ $
```

4.2.2 For Windows Users

For Windows 10 or higher users, remote login to a Raspberry Pi can be achieved through the following steps:

1. Search for powershell in your Windows search box. Right-click on Windows PowerShell and select Run as administrator.

Windows PowerShell	G Run as administrator
Apps	D Open file location
Microsoft PowerPoint 2010	-⇔ Pin to Start
Windows PowerShell (x86)	- Pin to taskbar

2. Determine your Raspberry Pi's IP address by typing ping -4 <hostname>.local in PowerShell.

The Raspberry Pi's IP address will be displayed once it's connected to the network.

- If the terminal displays Ping request could not find host pi.local. Please check the name and try again., verify the hostname you've entered is correct.
- If the IP address still isn't retrievable, check your network or WiFi settings on the Raspberry Pi.
- 3. Once the IP address is confirmed, log in to your Raspberry Pi using ssh <username>@<hostname>.local or ssh <username>@<IP address>.

ssh pi@raspberrypi.local

Warning: If an error appears stating The term 'ssh' is not recognized as the name of a cmdlet..., your system may not have SSH tools pre-installed. In this case, you need to manually install OpenSSH following *Install OpenSSH via Powershell*, or use a third-party tool as described in *PuTTY*.

4. A security message will appear on your first login. Enter yes to proceed.

```
The authenticity of host 'raspberrypi.local.

→(2400:2410:2101:5800:635b:f0b6:2662:8cba)' can't be established.

ED25519 key fingerprint is SHA256:007x3ZSgA0032wD1tE8eW0fFM/

→kmewIvRwkBys6XRwg.

Are you sure you want to continue connecting (yes/no/[fingerprint])?
```

5. Enter the password you previously set. Note that the password characters won't be displayed on the screen, which is a standard security feature.

Note: The absence of visible characters when typing the password is normal. Ensure you input the correct password.

6. Once connected, your Raspberry Pi is ready for remote operations.



4.2.3 For Linux/Unix Users

- 1. Locate and open the Terminal on your Linux/Unix system.
- 2. Ensure your Raspberry Pi is connected to the same network. Verify this by typing *ping <hostname>.local*. For example:

ping raspberrypi.local

You should see the Raspberry Pi's IP address if it's connected to the network.

- If the terminal shows a message like Ping request could not find host pi.local. Please check the name and try again., double-check the hostname you've entered.
- If you're unable to retrieve the IP address, inspect your network or WiFi settings on the Raspberry Pi.
- Initiate an SSH connection by typing ssh <username>@<hostname>.local or ssh <username>@<IP address>. For instance:

ssh pi@raspberrypi.local

4. On your first login, you'll encounter a security message. Type yes to proceed.

The authenticity of host 'raspberrypi.local. →(2400:2410:2101:5800:635b:f0b6:2662:8cba)' can't be established. ED25519 key fingerprint is SHA256:007x3ZSgA0032wD1tE8eW0fFM/ →kmewIvRwkBys6XRwg. Are you sure you want to continue connecting (yes/no/[fingerprint])?

5. Enter the password you previously set. Note that for security reasons, the password won't be visible as you type.

Note: It's normal for the password characters not to display in the terminal. Just ensure to enter the correct password.

6. Once you've successfully logged in, your Raspberry Pi is now connected, and you're ready to proceed to the next step.

4.2.4 Access the Raspberry Pi desktop through VNC Viewer

For those preferring a graphical user interface (GUI) over command-line access, the Raspberry Pi supports remote desktop functionality. This guide will walk you through setting up and using VNC (Virtual Network Computing) for remote access.

We recommend using VNC® Viewer for this purpose.

Enabling VNC Service on Raspberry Pi

VNC service comes pre-installed in the Raspberry Pi OS but is disabled by default. Follow these steps to enable it:

1. Enter the following command in the Raspberry Pi terminal:

sudo raspi-config

2. Navigate to Interfacing Options using the down arrow key, then press Enter.

	Raspberry Pi Softwa	are Configuration Tool (raspi-config)
	1	
1	System Options	Configure system settings
2	Display Options	Configure display settings
3	Interface Options	Configure connections to peripherals
4	Performance Options	Configure performance settings
5	Localisation Options	Configure language and regional settings
6	Advanced Options	Configure advanced settings
8	Update	Update this tool to the latest version
9	About raspi-config	Information about this configuration tool
	<select></select>	<finish></finish>

3. Select **VNC** from the options.

Raspberry Pi Software Configuration Tool (raspi-config)						
I1	SSH		Enable/disable	remote command line access using SSH		
12	VNC		Enable/disable	graphical remote desktop access		
13	SPI		Enable/disable	automatic loading of SPI kernel module		
I4	I2C		Enable/disable	automatic loading of I2C kernel module		
15	Serial	Port	Enable/disable	shell messages on the serial connection		
16	1-Wire		Enable/disable	one-wire interface		
17	Remote	GPIO	Enable/disable	remote access to GPIO pins		
			<select></select>	<back></back>		

4. Use the arrow keys to choose **<Yes>** -> **<OK>** -> **<Finish>** and finalize the VNC service activation.



Logging in via VNC Viewer

- 1. Download and install VNC Viewer on your personal computer.
- 2. Once installed, launch VNC Viewer. Enter the hostname or IP address of your Raspberry Pi and press Enter.



3. When prompted, enter your Raspberry Pi's username and password, then click OK.

V2 raspberry	rpi - VNC Viewer	_		\times
	V2 Authentication	×		
	Authenticate to VNC Server raspberrypi::5900 (TCP)			
	Enter VNC Server credentials (Hint: NOT your RealVNC account details)			
	Username: pi			
	Password:	Ø		
	Remember password Forgot	password?		
	Catchphrase: Bundle secret slang. Nickel cola sp	onsor.		
	Signature: b2-d0-d9-a2-d7-a3-b1-a4			
	ОК	Cancel		
	Stop		-	

4. You'll now have access to your Raspberry Pi's desktop interface.



5. QUICK USER GUIDE

To effectively utilize the Pironman U1, we'll be employing the SunFounder Power Control Core (SPC).

This is a tool for power management and control of hardware devices. Its primary functions are to monitor battery voltage, current, capacity, and percentage, and to manage fan speed and modes. The SPC connects with devices via I2C communication, ensuring stable data transfer. Additionally, it supports real-time clock settings and features configuration and logging capabilities. This tool is ideal for professionals and hobbyists who require precise monitoring and control of hardware power.

5.1 1. Download and Install SPC

Note: For lite systems, initially install tools like git, python3, pip3, setuptools, etc.

```
sudo apt-get update
sudo apt-get install git -y
sudo apt-get install python3 python3-pip python3-setuptools -y
```

• Download and install spc. If you encounter any errors during the installation, it's recommended to rerun sudo python3 install.py.

```
cd ~
git clone https://github.com/sunfounder/spc.git
cd ~/spc
sudo python3 install.py
```

• After installation, a reboot is necessary to activate certain settings.

```
sudo reboot
```

- Instructions for Powering On and Off:
 - **Power On**: Press the button until the light turns green, indicating the system is powering on. You can then release the button.
 - Shutdown: Press and hold the button for 2 seconds until the light turns purple, then release. When the power button's light begins to flash purple, the Raspberry Pi will receive a shutdown signal and proceed to shut down. The power button's light will turn off once the shutdown process is complete.
 - Power Cut: If you haven't configured software on the Raspberry Pi, or for other reasons, you can opt for a
 power cut shutdown. Press and hold the button for 5 seconds and turns red, indicating a direct power cut.
 Be cautious with this method as it may damage data.

5.2 2. View Data from SPC Dashboard

Now, you can visit the SPC Dashboard to view various data.

• Enter <your pi ip>:34001 in your browser to open the SPC Dashboard designed by us.

	🏶 s	SPC Dashboard X + - D												
÷	÷	c (Not secure	192.168	.100.240:34001/dashboard					6 R	९ ☆	•	Ċ	🗖 🧕
	Pi	ironman	U1											٠
		¥				*		••						
	•••	Externa Status Voltage Current Power	Plugged 4.89 V 0.91 A 4.47 W		·	Fan State Mode Percentage • Temperature	ON Auto 40 % 54 °C		Battery Percentage Charging • Voltage • Current • Power	75 % Not charging 7.88 V 0.02 A 0.2 W				
		8												
	•••	Raspbe Source Voltage Current Power	FTY Pi Pov Externa 4.91 V 0.83 A 4.08 W	ver		Storage mmcbik0	68.8%		Memory Total Used Percent	3.95 GB 422.25 MB 12.4 %				

- The Dashboard will include the following:
 - External: Displays the status of the external USB power (Plugged in or Unplugged), its voltage, current, and power.



- Fan: Shows the fan status, mode, speed, and the current temperature of the Raspberry Pi.

* You can manually turn the fan on or off and select different rotation modes for it.



- Battery: Displays the battery's percentage, charging status, voltage, current, and power.
 - * When an external USB power source is plugged in, the battery is in charging mode, showing its voltage, charging current, and power.
 - * When the external USB is not plugged in, the current and power are negative, indicating the battery's output current and power.



- **Raspberry Pi Power**: Displays the power supply to the Raspberry Pi (External or battery), its voltage, current, and power.



- **Storage**: Displays the storage capacity of a Raspberry Pi, showing various disk partitions with their used and available space.



- Memory: Shows the Raspberry Pi's RAM usage and percentage.



- **Processor**: Illustrates the Raspberry Pi's CPU performance, including the status of its four cores, operating frequencies, and CPU usage percentage.


- Network: Displays the current network connection type, upload, and download speeds.



• You can also switch this page to a white mode.

			\$
		_	
Settings	×	<	
Dark mode Whether to enable Dark Theme mode			
Temperature Unit Set prefer temperature unit	CELIUS FAHRENHEIT	78 %	
AUTO		7.75 V	
Shutdown Stratagy Set the minimum battery level for automatic device shutdown when external power is lost.	•	-3.53 W	
ΜΩΤΤ	TEST		
Host MQTT broker host	core-mosquitto		
Port MQTT broker port, normally 1883	1883		
Username Username to login to MQTT broker	mqtt	3.95 GB	
CANCEL	SAVE	427.56 MB 12.5 %	

5.3 3. Modify Configuration from Terminal

You can also view data related to the battery, fan, etc., from the Terminal.

1. The spc program runs in a python3 virtual environment. Use the following command to enter the virtual environment:

```
source /opt/spc/venv/bin/activate
```

2. Once entered, use the following command to view the available instructions.

spc -h

```
usage: spc [-h] [-m] [-a] [-f [speed percentage]] [-F [{auto,quiet,normal,
\rightarrow performance}]] [-b] [-e] [-o] [-p] [-c] [-j]
       [-st [battery percentage]]
options:
 -h, --help
                        show this help message and exit
 -m, --monitor
                        open a monitor
 -a, --all
                        print all the data of spc
 -f [speed percentage], --fan [speed percentage]
                        get/set the speed of fan
 -F [{auto,quiet,normal,performance}], --fan-mode [{auto,quiet,normal,
\rightarrow performance}]
                        get/set the mode of fan
 -b, --battery
                        battery voltage, current, percentage
  -e, --external_input external input
  -o, --raspberry_pi_power
                        raspberry pi voltage, current
  -p, --powered
                        power source
  -c, --charge
                        is charging
  -j, --json
                        output json format
  -st [battery percentage], --shutdown-strategy [battery percentage]
                         get/set battery percentage for Shutdown Strategy
```

• For most commands, simply use spc -x to print the relevant data. For example, you can use the following command to get the battery voltage, current, and percentage.

spc -b

• For -f, -F, -st, you can use them without parameters to get the current data. For example, use the command below to get the current fan speed.

spc -f

• You can also use them with parameters to set values.

spc -f 40

3. View log files.

• First, enter the log directory.

cd /opt/spc/log

• To see what log files are available, use the 1s command.

```
config.log ha_api.log spc.log system_status.log
```

• To view the contents of a log file, such as spc.log, use the cat command.

cat spc.log

4. To view the logs generated by systemctl, press Q to exit the current page.

```
sudo systemctl status spc.service
```

• spc.service includes software shutdown, fan control, dashboard, and MQTT functionality. If the program isn't running properly, you can try restarting spc.service.

sudo systemctl restart spc.service

CHAPTER

6. ABOUT HARDWARE

This chapter is a detailed description of all the components in Pironman U1, as well as the associated software configuration.

6.1 Features

Functions

- Raspberry Pi 5/4 Model B UPS Case
- Hardware power path switching to ensure power supply to the Raspberry Pi
- Equipped with 3 current sensors to measure: USB input current, Raspberry Pi current, and battery charge/discharge current.
- Intelligent adjustment of charging current
- I2C communication to read battery voltage, current, and other information
- PCIe 3.0 x1 M.2 M key 2230, 2242, 2260, 2280 for NVMe SSD
- IR Receiver for multimedia centers like Kodi or Volumio
- Comes with a fan controlled by Raspberry Pi via I2C to MCU
- Retro metal power button with indicator light for safe shutdown
- Extend the 40-pin GPIO outward with pin name label, for easy access
- Direct Access to Raspberry Pi's microSD Card Slot
- · Aluminum main body with a black Acrylic side panel

Parameters

- Dimension: 100x95x47mm
- Material
 - Main body: aluminum alloy
 - Two side panel: acrylic
- Support Platform: Raspberry Pi 5B/4B
- Power Input: USB Type C input, 5V/5A, supports PD protocol. It is recommended to use the official 27W power supply of Raspberry Pi or other Pi5 dedicated USB PD protocol 5V/5A power sources.
- Power supply to Raspberry Pi: 5V/5.5A
- Charging Power: 7.4V/1A

- Interfaces
 - Raspberry Pi standard 40-Pin GPIO
 - micro SD
 - USB Type C power input
 - 2 x USB 2.0
 - 2 x USB 3.0
 - Gigabit LAN port
 - 2 x 4Kp60 HDMI Type A
- 1 x Fan: 40x40x10mm
- 38KHz IR Receiver
- PCIe 3.0 x1 M.2 M key 2230, 2242, 2260, 2280 for NVMe SSD
- A CR1220 non-rechargeable battery for RTC
- RGB LED Metal Power Button

Dimensional Drawing





6.2 Main Board



6.2.1 Power Supply

Power Input

USB Type C input, 5V/5A, PD protocol. It's recommended to use the official 27W power supply of Raspberry Pi or other Pi5 dedicated USB PD protocol 5V/5A power sources.

Battery

Equipped with a custom battery pack made by SunFounder, consisting of two 18650 batteries with a capacity of 2000mAh. The connector is XH2.54, 3P, which can be directly charged after being inserted into the board.

The battery includes a built-in protection circuit, with an over-discharge protection voltage of 2.6V and an over-charge protection voltage of 4.2V.

Power Path

The Pironman U1 features an integrated power path function, which can automatically switch power paths to reduce battery wear and ensure uninterrupted power supply to the Raspberry Pi.

- When an external USB power source is connected, it directly supplies power to the Raspberry Pi and can also charge the battery if needed.
- If external power is lost, the system automatically switches to battery power, ensuring uninterrupted operation.
- If external power voltage drops below 4.72V, the system automatically switches to battery power to prevent low voltage issues in the Raspberry Pi.

Advantage: Normally powered by an external USB power source, extending the lithium battery's lifespan. In critical moments, it timely switches to battery power to ensure the safety of the Raspberry Pi.

Charging Current

Capable of intelligently adjusting the charging current. When the input current from the external USB power source is sufficient, the charging current for the battery is increased, up to a maximum of 7.4V/1A. When the Raspberry Pi requires more current, or the input current is insufficient, the charging current is automatically reduced.

Overcharge Protection

Charging ends when the total battery voltage reaches 8.4V. Charging resumes when the battery voltage drops below 8V.

Charge Balancing

During charging, the voltage of each of the two batteries is continuously monitored. If the voltage of any one battery reaches the balance initiation voltage of 4.1V, the corresponding balance MOS is activated to reduce the charging current of that battery.

Balance is turned off under the following conditions:

- The voltage of both batteries exceeds the balance initiation voltage of 4.1V.
- Exiting normal charging state (input overvoltage, battery full, etc.).

6.2.2 Power-On Startup

The module supports power-on startup, initiating as soon as the external power source is plugged in. To disable automatic power-on, remove the **ALWAYS ON** jumper cap. This requires manually pressing the power button to start the Raspberry Pi, even when an external power source is connected or after a power outage.



6.2.3 Raspberry Pi Status Monitoring

To turn off the Pironman U1, you need to press and hold the power button for 2 seconds until the button light turns purple, then release.

At this point, Pironman U1 will send a shutdown signal to the Raspberry Pi via I2C. If you have followed the *1*. *Download and Install SPC*, the Raspberry Pi will then proceed with a safe shutdown.

After shutdown, the configured Raspberry Pi shutdown signal pin, GPIO26, will go low. Once the main board detects this low signal, it cuts off the power to the Raspberry Pi.

In the spc program, the shutdown signal pin is set by adding the following line to the Raspberry Pi's /boot/config.txt file.

```
dtoverlay=gpio-poweroff,gpio_pin=26,active_low=0
```

The **RPI STAT** jumper cap connects the microcontroller's shutdown signal with the Raspberry Pi's GPIO26. You can also remove this jumper cap to free up GPIO26. However, doing so means you won't be able to perform a safe shutdown of the Raspberry Pi.



6.2.4 Infrared Receiver



- Model: IRM-56384, operating at 38KHz.
- Two pins for enabling the infrared function. By default, a jumper cap is inserted for immediate functionality. Remove the cap to free GPIO13 if the IR receiver is not in use.
- An infrared reception indicator that blinks upon signal detection.

To utilize the IR receiver, verify its connection and install the necessary module:

• Test the connection:

sudo ls /dev |grep lirc

• Install the lirc module:

sudo apt-get install lirc -y

• Now, test the IR Receiver by running the following command. After running the command, press a button on the remote control, and the code of that button will be printed.

mode2 -d /dev/lirc0

6.2.5 Fans Pin



Fan Pin, for connecting a 4010 fan.

• You can set the fan's operation mode via command: auto, quiet, normal, performance.

spc -F auto

• Alternatively, you can directly set the fan speed, ranging from 0% to 100%.

spc -f 40

• You can use them without parameters to get the current data. For example, use the command below to get the current fan speed.

spc -f

6.2.6 RTC Function

The onboard microcontroller supports the RTC (Real-Time Clock) function. Install a button cell battery in the onboard 1220 battery holder, and connect the **jumper cap** (**RTCEN**) on the battery holder (by default, it is connected) to use the microcontroller's RTC function.



For Raspberry Pi 4

When the Pironman U1 is powered off or shut down, the microcontroller is powered by the button cell battery, recording the time, with a standby current of about 2uA. The board does not support charging the RTC battery, so there is no need to use a rechargeable battery. The **CR1220 non-rechargeable** battery provided in the kit is recommended.

If you have followed the 1. Download and Install SPC instructions, the Raspberry Pi will automatically synchronize with the RTC time upon booting.

For Raspberry Pi 5

• Since the Raspberry Pi 5 itself supports RTC functionality, you can choose to remove the **RTCEN** jumper cap to disconnect the battery from the microcontroller.



• And use a SH1.0 2Pin reverse cable to connect the **RTC** socket to the Raspberry Pi's **BAT** power socket. This way, the onboard RTC battery is completely disconnected from the board and only serves as a battery holder.





Enable Trickle Charging

• The Raspberry Pi 5 supports charging the RTC battery. By default, the trickle charging feature for the battery is disabled. The sysfs files indicate the current trickle charging voltage and limits:

Warning:

- A rechargeable ML1220 battery can be used here.
- If you are using the **CR1220 non-rechargeable** battery provided in the kit, make sure not to enable the Trickle Charging feature.

- To enable trickle charging, add rtc_bbat_vchg to /boot/firmware/config.txt.
 - Open the /boot/firmware/config.txt.

sudo nano /boot/firmware/config.txt

- Add rtc_bbat_vchg to /boot/firmware/config.txt.

```
dtparam=rtc_bbat_vchg=3000000
```

• After rebooting, the system will display:

```
pi@raspberrypi:~ $ cat /sys/devices/platform/soc/soc:rpi_rtc/rtc/rtc0/charging_

...voltage

3000000

pi@raspberrypi:~ $ cat /sys/devices/platform/soc/soc:rpi_rtc/rtc/rtc0/charging_

...voltage_max

4400000

pi@raspberrypi:~ $ cat /sys/devices/platform/soc/soc:rpi_rtc/rtc/rtc0/charging_

...voltage_min

1300000
```

This confirms the battery is now under trickle charging. To disable this feature, simply remove the dtparam line from config.txt.

6.2.7 Pin Headers



The Pironman U1 extends the GPIO of the Raspberry Pi, but note that the Pironman U1 utilizes some of these pins. You can choose to disable certain features according to your needs to free up these pins.

Pironman U1	Raspberry Pi
IR Receiver(Optional)	GPIO16(Optional)
I2C SDA	SDA
I2C SCL	SCL
Soft Shutdown Status Monitoring	GPIO26(Optional)

6.3 Pi5 NVMe PIP

The Pi5 NVMe PIP (PCIe Peripheral Board), as defined by the Raspberry Pi Foundation, is a PCIe adapter board designed specifically for NVMe solid-state drives. It supports four different sizes of NVMe SSDs: 2230, 2242, 2260, and 2280, all fitting into an M.2 M key slot.



- The board connects through a 16P 0.5mm reverse FFC (Flexible Flat Cable) or a custom impedance-matched FPC (Flexible Printed Circuit) cable.
- STA: A Status LED indicator.
- **PWR**: A Power LED indicator.
- The onboard 3.3V power supply can support up to 3A output. However, since the Raspberry Pi PCIe interface is limited to providing 1A output (equivalent to 5W), additional power for 3.3V/3A usage can be supplied through the J3 connector from a 5V source.

6.3.1 Configure PCIe

Enabling PCIe

By default the PCIe connector is not enabled.

• To enable it you should open the /boot/firmware/config.txt file.

```
sudo nano /boot/firmware/config.txt
```

• Then add the following line to the file.

```
# Enable the PCIe External connector.
dtparam=pciex1
```

• A more memorable alias for pciex1 exists, so you can alternatively add dtparam=nvme to the /boot/ firmware/config.txt file.

dtparam=nvme

Note: Enumeration of PCIe devices behind a switch is not currently supported.

PCIe Gen 3.0

• The connection is certified for Gen 2.0 speeds (5 GT/sec), but you can force it to Gen 3.0 (10 GT/sec) if you add the following lines to your /boot/firmware/config.txt.

```
# Force Gen 3.0 speeds
dtparam=pciex1_gen=3
```

Warning: The Raspberry Pi 5 is not certified for Gen 3.0 speeds, and connections to PCIe devices at these speeds may be unstable.

• You should then reboot your Raspberry Pi for these settings to take effect.

```
sudo reboot
```

6.3.2 About the Model

M.2 SSDs, known for their compact size, come in various types mainly differentiated by their keying (notch design on the connector) and the interface they use. Here are the primary types:

- M.2 SATA SSDs: These use the SATA interface, similar to 2.5-inch SATA SSDs but in the smaller M.2 form factor. They are limited by the SATA III maximum speeds of around 600 MB/s. These SSDs are compatible with M.2 slots keyed for B and M keys.
- M.2 NVMe SSDs: These SSDs use the NVMe protocol over PCIe lanes and are significantly faster than M.2 SATA SSDs. They are suitable for applications requiring high read/write speeds like gaming, video editing, and data-intensive tasks. These SSDs typically require M-keyed slots. These drives utilize the PCIe (Peripheral Component Interconnect Express) interface, with different versions like 3.0, 4.0, and 5.0. Each new version of PCIe effectively doubles the data transfer speed of its predecessor. However, the Raspberry Pi 5 uses a PCIe 3.0 interface, capable of delivering transfer speeds up to 3,500 MB/s.

M.2 SSDs come in three key types: B key, M key, and B+M key. However, later on, the B+M key was introduced, combining the functionalities of the B key and M key. As a result, it replaced the standalone B key. Please refer to the image below.



In general, M.2 SATA SSDs are B+M-keyed (can fit in sockets for B-keyed and M-keyed modules), while M.2 NVMe SSDs for PCIe 3.0 x4 lane are M-keyed.



6.3.3 About the Length

M.2 modules come in different sizes and can also be utilized for Wi-Fi, WWAN, Bluetooth, GPS, and NFC.

Pironman 5 supports four (PCIE2.0 / PCIE 3.0) NVME M.2 SSD sizes based on their names: 2230, 2242, 2260, and 2280. The "22" is the width in millimeters (mm), and the two following numbers are the length. The longer the drive, the more NAND flash chips can be mounted; therefore, the more capacity.



6.3.4 Booting from the SSD

After you install the SSD into the Pironman 5 and reboot, an NVMe disk connected through the PCIe should be visible. If you want to boot your Raspberry Pi from the SSD, you need to do some configurations and install an operating system on the SSD.

1. Configure boot from the SSD

• To enable boot support, you need to change the BOOT_ORDER in the bootloader configuration. Edit the EEPROM configuration by:

```
sudo rpi-eeprom-config --edit
```

• Then, change the BOOT_ORDER line to be as below.

BOOT_ORDER=0xf416

2. Install an Operating System on the SSD

There are two ways to install an operating system on the SSD:

- Copy the system from the Micro SD to the SSD: This method is simpler, and your previous configurations can also be directly copied.
- Install via Raspberry Pi Imager: If your Raspberry Pi uses a desktop version of the operating system, you can use an imaging tool (like Raspberry Pi Imager) to burn the system to the SSD. This example uses Raspberry Pi OS bookworm, but other systems might require installing the imaging tool first. However, this method requires you to reinstall the prionman module, and other configurations need to be redone as well.

Copying the System from the Micro SD Card to the SSD

1. Connect a display or *Access the Raspberry Pi desktop through VNC Viewer*. Then click **Raspberry Pi logo** -> Accessories -> SD Card Copier.



2. Make sure to select the correct Copy From and Copy To devices. Be careful not to mix them up.

		SD Card Cop	ier	~ ~ ×
Copy From [Device:	SS08G (/dev/	mmcblk0)	~
Copy To Device:		NVME SSD 128GB (/dev/nvme0n1) -		vme0n1) 🔻
			New Part	ition UUIDs
Help		R	Close	Start

3. After selection, click Start.

	SD Card Cop	ier	~ ^ X
Copy From Device:	SS08G (/dev/mmcblk0) 🔹		
Copy To Device: NVME SSD 128GB (/dev/nvme0			vme0n1) 🔻
		New Part	tition UUIDs
Help		Close	Start

4. You will be prompted that the content on the SSD will be erased. Make sure to back up your data before clicking Yes.

	SD Card Copier	~ ^ X
This will erase all content	on the device 'NVME S	SD 128GB'. Are you sure?
No		Yes
негр	CIO	se Start

5. Wait for some time, and the copying will be completed.

Installing the System with Raspberry Pi Imager

1. If your MicroSD card has a desktop version of the system installed, you can use an imaging tool (like Raspberry Pi Imager) to burn the system to the SSD. This example uses Raspberry Pi OS bookworm, but other systems might require installing the imaging tool first.



2. Select Pi 5.



3. Choose an operating system.

	Operating System	>
	Raspberry Pi OS (64-bit)	
*	A port of Debian Bookworm with the Raspberry Pi Desktop (Recommerged) (Recommended)	
W	Released: 2023-12-05	
	Online - 1.1 GB download	
	Raspberry Pi OS (32-bit)	
X	A port of Debian Bookworm with the Raspberry Pi Desktop	
G	Released: 2023-12-05	
	Online - 1.2 GB download	
88	Raspberry Pi OS (other)	
₩	Other Raspherry Pi OS based images	>

- 4. Select the NVMe SSD card.
- 5. After configuration, click Yes.

3. Restart Pironman 5

After restarting the Raspberry Pi, it will boot from the SSD.

sudo reboot

Note: If you are using the **Raspberry Pi Imager** to install the system on the SSD, you will need to reconfigure the setup after the Raspberry Pi boots up by following the steps to *5. Quick User Guide*.

6.4 18650 Battery



- VCC: Battery positive terminal, here there are two sets of VCC and GND is to increase the current and reduce the resistance.
- Middle: To balance the voltage between the two cells and thus protect the battery.
- GND: Negative battery terminal.

This is a custom battery pack made by SunFounder consisting of two 18650 batteries with a capacity of 2000mAh. The connector is XH2.54, 3P, which can be charged directly after being inserted into the board.

Features

- Battery charge: 5V/2A
- Battery output: 5V/5A
- Battery capacity: 3.7V 2000mAh x 2
- Battery life: 90min
- Battery charge time: 130min
- Connector: XH2.54, 3P
- Over-discharge protection: 2.6V
- Overcharge protection: 4.2V

6.5 Fan



- External dimension: 40*40*10MM
- Weight: 13.5±5g/pcs
- Life: 40,000 hours (room temperature 25°C)
- Maximum Air Flow: 2.46CFM
- Max.Air Pressure: 0.62mm-H2O
- Accoustic Sound: 22.31dBA
- Rated Input power: 5V/0.1A
- Rated Speed: 3500±10%RPM
- Operating Temperature: -10°C~+70°C
- Storage Temperature: -30°C~+85°C

6.6 Power Button

Button Operations

- **Power On**: Press the button until the light turns green, indicating the system is powering on. You can then release the button.
- **Shutdown**: After powering on, press and hold the button for 2 seconds until the light turns purple, then release. When the power button's light begins to flash purple, the Raspberry Pi will receive a shutdown signal and proceed to shut down. After the shutdown is complete, the Pironman U1 will turn off. If the **RTCEN** is connected, the Pironman U1 will enter **RTC** standby mode. If not connected, the Pironman U1 will power off completely. The power button's light will turn off once the shutdown process is complete.

• **Power Cut**: If you haven't configured software on the Raspberry Pi, or for other reasons, you can opt for a power cut shutdown. Press and hold the button for 5 seconds and turns red, indicating a direct power cut. Be cautious with this method as it may damage data.

RGB

The RGB is a common-cathode RGB. Once the RGB button is connected, the RGB light will display the current status, which includes:

RGB	Status
Green Light	External Power Input Status
Yellow Light	Battery Power Status
Orange Light Cycling from Dim to Bright	Charging
Red Light Flashing	Low Battery (and not charging)
Purple	Long Press 2 Seconds, Soft Shutdown
Red	Long Press 5 Seconds, Hardware Shutdown
Off	Sleep/Not Powered

Wiring

The button interface is MX1.25 5P. Use the MX1.25 5P reverse cable to connect the button to the Pironman U1 HAT. The button pin definitions are:

K	Button Signal
В	Blue Positive Signal
G	Green Positive Signal
R	Red Positive Signal
С	GND

CHAPTER

SEVEN

HOME ASSISTANT(PI 4)

This section will guide you in installing the Home Assistant operating system on your Raspberry Pi. Please note that this process will result in the loss of all existing content on your Raspberry Pi system. It is important to backup your data before proceeding.

7.1 1. Install the Home Assistant OS

Required Components

- Raspberry Pi 5B
- A Personal Computer
- A 16G Micro SD card

Note: To install Home Assistant OS and add some add-ons, 8GB of Micro SD card memory is not sufficient. It is recommended to use a 16GB Micro SD card.

Installation Steps

1. Visit the Raspberry Pi software download page at Raspberry Pi Imager. Choose the Imager version compatible with your operating system. Download and open the file to initiate installation.



2. A security prompt may appear during installation, depending on your operating system. For example, Windows might display a warning message. In such cases, select **More info** and then **Run anyway**. Follow the on-screen guidance to complete the installation of the Raspberry Pi Imager.

Windows protected your PC

Microsoft Defender SmartScreen prevented an unrecognized app from starting. Running this app might put your PC at risk. <u>More info</u>

- 3. Insert your SD card into your computer or laptop's SD card slot.
- 4. Launch the Raspberry Pi Imager application by clicking its icon or typing rpi-imager in your terminal.



5. Within the Imager, click **CHOOSE DEVICE** and select the Raspberry Pi model from the dropdown list.



6. Click on CHOOSE OS, and finish select Home Assistant OS xx(xxxx) as shown in the images below.

🥉 Ras	pberry Pi Ir	nager v1.7.5	-		×
		Operating System		x	
	¢	Media player operating systems Emulation and game OS Emulators for running retro-computing platforms		>	
	0	Other specific-purpose OS Thin clients, digital signage and 3D printing operating systems		>	
	:	Freemium and paid-for OS Freemium and paid-for operating systems		>	
	Ŋ	Misc utility images Bootloader EEPROM configuration, etc.		>	
	±	Erase		_	

🦉 Rası	oberry Pi In	nager v1.7.5 —		×
		Operating System	x	
	<	Back Go back to main menu		
	₹ \$	3D printing 3D printer operating systems	>	
	🖄	Home assistants and home automation Home assistant and home automation operating systems	>	
	S Anthias	Anthias 🚯 The most popular open source digital signage project	>	
	KALI	Kali Linux 1 Kali Linux is an open-source, Debian-based Linux distribution geared towards various information security tasks, such as Penetration Testing, Security Research,	>	
🖲 Rasp	berry Pi In	nager v1.8.4 —	· 🗆	×
🖲 Rasp	oberry Pi In	Operating System	• □ ×	×
S. Rasp	oberry Pi In	Deperating System Back Go back to main menu	×	×
S Rasp	<	Operating System Back Go back to main menu Homebridge Turn your Raspberry Pi into a HomeKit smart home bridge.	×	×
S Rasp	< Soberry Pi In Comparison of the second seco	Anager v1.8.4 – Operating System Back Go back to main menu Homebridge Turm your Raspberry Pi into a HomeKit smart home bridge. Home Assistant Open source home automation that puts local control and privacy first.	×	×
S Rasp	<	Anager v1.8.4 Operating System Back Go back to main menu Homebridge Turn your Raspberry Pi into a HomeKit smart home bridge. Home Assistant Open source home automation that puts local control and privacy first. RaspberryMatic Lightweight Linux OS for running a HomeMatic/homematicIP IoT central.	× • • • • • • • • • • • • • • • • • • •	×
S Rasp	<	Imager v1.8.4 - Operating System - Back Go back to main menu Homebridge - Turn your Raspberry Pi into a HomeKit smart home bridge. - Home Assistant Open source home automation that puts local control and privacy first. RaspberryMatic Lightweight Linux OS for running a HomeMatic/homematicIP IoT central. nymea Smart Home/IoT platform, easy to use, open-source and privacy-focused.	× () () () () () () () () () () () () ()	×



7. Click **Choose Storage** and select the appropriate storage device for the installation.

Note: Ensure you select the correct storage device. To avoid confusion, disconnect any additional storage devices if multiple ones are connected.



8. Click **Next**. If your SD card currently has any files on it, you may wish to back up these files first to prevent you from permanently losing them. If there is no file to be backed up, click **Yes**.



9. After waiting for a period of time, the following window will appear to represent the completion of writing.



7.2 2. Configuring Your Home Assistant

1. Enable the I2C Interface

This involves activating the I2C interface on your device.

1. Remove and then reinsert the SD card into your computer. Open the **File Explorer** and locate the SD card named hassos-boot.



2. In the root directory, create a new folder named CONFIG.

2020/0/10 11:04	DIVENC
2023/6/28 10:04	File folder

3. Within the CONFIG folder, make a subfolder titled modules.

This PC > hassos-boot (I:) > CONFIG

• ^	Name	Date modified	Туре
•	modules	2023/6/28 10:10	File folder
1			

4. Turn on the display of file extensions in your settings.

Home S	Sha	re	View 🔶							
Preview pane		Extra large icon:	E Large icons	Medium icons	* * *	Sort by •	□ Group by ▼ ⊥ Add columns ▼ Size all columns to fit	Item check boxes File name extensions Hidden items	de selected items	
Panes				Layout				Current view	Show/hide	
* This PC > hassos-boot (I:) > CONFIG > modules										
ownloads	*	^	Name	^	Date modif	fied		Туре		
ocuments	*				This folder is enout a					
ictures	*				This folder is empty.					
assOS										

5. Inside the modules subfolder, create a text file and rename it to rpi-i2c.conf. Confirm the extension change when prompted.

rpi-	i2c.conf	2023/6/28 10:15	Text Document			
Renam	e					
	If you change a file name extension, the file might become unusable. Are you sure you want to change it?					
		<u>Y</u> es	No			

6. Edit rpi-i2c.conf to include the following line:

	i2c	c-dev						
--	-----	-------	--	--	--	--	--	--

7. Save and exit the file.

2. Setting Up WiFi

Now, let's set up the WiFi connection.

Note: Skip this step if you prefer using a wired network connection.

1. In the CONFIG folder, create a new folder named network.

This PC > hassos-boot (I:) > CONFIG >						
^	Name	Date modified	Туре			
		2023/6/28 10:10	File folder			
	network	2023/6/28 11:34	File folder			

2. Inside the network folder, create a text file and name it my-network (leave out the file extension).


3. Enter the following configuration in the my-network file, substituting MY_SSID and MY_WLAN_SECRET_KEY with your WiFi network's details:

```
[connection]
id=my-network
uuid=72111c67-4a5d-4d5c-925e-f8ee26efb3c3
type=802-11-wireless
[802-11-wireless]
mode=infrastructure
ssid=MY_SSID
# Uncomment if your SSID is hidden
#hidden=true
[802-11-wireless-security]
auth-alg=open
key-mgmt=wpa-psk
psk=MY_WLAN_SECRET_KEY
[ipv4]
method=auto
[ipv6]
addr-gen-mode=stable-privacy
method=auto
```

4. Save and close the file.

3. Adjusting Configuration

1. In the hassos-boot directory, find and open the config.txt file.

Name	Date modified	Туре
CONFIG	2023/6/28 10:04	File folder
🔜 overlays	2023/6/15 17:54	File folder
bcm2711-rpi-4-b.dtb	2023/6/15 17:54	DTB File
bcm2711-rpi-400.dtb	2023/6/15 17:54	DTB File
bcm2711-rpi-cm4.dtb	2023/6/15 17:54	DTB File
📧 boot.scr	2023/6/15 17:54	Screen saver
cmdline.txt	2023/6/15 17:54	Text Document
config.txt	2023/6/15 17:54	Text Document
fixup4.dat	2023/6/15 17:54	DAT File
📄 fixup4cd.dat	2023/6/15 17:54	DAT File
📄 fixup4x.dat	2023/6/15 17:54	DAT File
start4.elf	2023/6/15 17:54	ELF File
start4cd.elf	2023/6/15 17:54	ELF File
start4x.elf	2023/6/15 17:54	ELF File
u-boot.bin	2023/6/15 17:54	BIN File

2. Append the following settings at the end of the file:

```
dtparam=i2c_vc=on
dtparam=i2c_arm=on
dtoverlay=gpio-poweroff,gpio_pin=26,active_low=0
dtoverlay=gpio-ir,gpio_pin=13
```

3. Save and close the file.

4. Accessing Home Assistant

Eject the microSD card from your computer and insert it into your Raspberry Pi. Connect the power supply (and Ethernet cable, if applicable).

From your computer, go to homeassistant.local:8123.

Initial setup of Home Assistant may take some time during first use.



5. Creating Your Account

1. Follow the on-screen instructions to create your user account. This is the account you'll use to access the Home Assistant interface.

	Home Assistant Are you ready to awaken your home, reclaim your privacy and join a worldwide community of tinkerers? Let's get started by creating a user account. Name	
	Username	
	Password O	
_	Confirm Password 💿	
	CREATE ACCOUNT Alternatively you can restore from a previous backup.	

2. Proceed through the prompts to set your location and other preferences. You may be asked to install detected devices; you can choose to skip this for now by selecting **FINISH**.

Home Assistant	
Devices and services are represented in Home Assistant as integrations. You can set them up now, or do it later from the configuration screen.	
DC:A6:32:42:F6 Door Lock Door Lock HP LaserJet :D2 1BCA 3EE2 MFP M227fdw (XMZNMS04L (XMZNMS04L (C1BD6A) M) M)	
UPAP S 💀 💮	
RT-AC1200GU SunFounder_N Temperature/H More AS umidity Sensor (192.168.18.14 9468 4) (LYWSD02)	
FINISH	
4	

7.3 3. Home Assistant Addon

Pironman U1 offers a Home Assistant addon, facilitating the use of Pironman U1 for Home Assistant users.

Note: The addon only supports direct installation of the Home Assistant system on Raspberry Pi, and does not support installing Home Assistant as a Docker container on a Raspberry Pi system.

For this scenario, please directly 1. Download and Install SPC.

Now we will install the Pironman U1 addon for Home Assistant. Choose one of the following two methods to add it.

7.3.1 1. Automatic Addition

- 1. Please click the button below to quickly add it.
- 2. After visiting the link above, a popup will prompt to open a page in Home Assistant, click **Open link**.



The addon 'e5375b8b_pironman-u1-alpha' is a part of the add-on repository 'https://github.com/sunfounder/home-assistant-addon-dev', this repository is missing on your system, do you want to add that now?

4. After a few seconds, the **Pironman U1** addon will appear.

CANCEL

ADD



5. Then, start (or restart) the addon.

Pironman U1 Alpha Current version: 0.0.10 (Changelog)	
6 Rating Manager Apparmor Ingress Pironman U1 Support. Visit the Pironman U1 Alpha page for more details	
PIRONMAN	
Start on boot Make the add-on start during a system boot	
Watchdog This will start the add-on if it crashes	
Show in sidebar Add this add-on to your sidebar	
START	

6. Now you can select these options, such as **Start on boot** to enable Pironman U1 to start when the system boots up. Or **Show in sidebar** to show the dashboard specially designed for Pironman U1 in the sidebar.

Pironman U1 Alpha Current version: 0.0.12 (<u>Changelog</u>)	•
6 Rating Apparmor Constraints Pironman U1 Support. Visit the Pironman U1 Alpha page for more details	
PIRONMAN	
Start on boot Make the add-on start during a system boot	Hostname e5375b8b-pironman-u1-alpha
watchdog This will start the add-on if it crashes	0 %
Show in sidebar Add this add-on to your sidebar	Add-on RAM Usage

- 7. Instructions for Powering On and Off:
- **Power On**: Press the button until the light turns green, indicating the system is powering on. You can then release the button.
- **Shutdown**: Press and hold the button for 2 seconds until the light turns purple, then release. When the power button's light begins to flash purple, the Raspberry Pi will receive a shutdown signal and proceed to shut down. The power button's light will turn off once the shutdown process is complete.
- **Power Cut**: If you haven't configured software on the Raspberry Pi, or for other reasons, you can opt for a power cut shutdown. Press and hold the button for 5 seconds and turns red, indicating a direct power cut. Be cautious with this method as it may damage data.

7.3.2 2. Manual Addition

Alternatively, follow the steps below to install manually:

1. In Home Assistant, navigate to Settings -> Addons.



2. Navigate to the **ADD-ON STORE** tab.



3. In the top right corner, find and click on the **Repositories** button.

	Check for updates
	Repositories
er-based file editor for ant	Genie The open-source, privacy-preserving voice assistant

4. Type the repository URL: https://github.com/sunfounder/home-assistant-addon-dev, and click ADD. After adding the SunFounder repository, close the popup window.



5. Click the menu button again, and click Check for updates.



6. After a few seconds, the **Pironman U1** addon will appear at the end of the addon store. If not, try refreshing the page.



7. Enter the Pironman U1 addon and click INSTALL. This process may take a few minutes.



8. Then, start (or restart) the addon.

Pironman U1 Alpha Current version: 0.0.10 (<u>Changelog</u>)	
 Rating Manager Apparmor Kingress Pironman U1 Support. Visit the Pironman U1 Alpha page for more details 	
PIRONMAN	
Start on boot Make the add-on start during a system boot	
Watchdog This will start the add-on if it crashes	
Show in sidebar Add this add-on to your sidebar	
START	

9. Now you can select these options, such as **Start on boot** to enable Pironman U1 to start when the system boots up. Or **Show in sidebar** to show the dashboard specially designed for Pironman U1 in the sidebar.

Pironman U1 Alpha Current version: 0.0.12 (<u>Changelog</u>)	•
6 Rating Anager Apparmor 🛱 Ingress Pironman U1 Support. Visit the Pironman U1 Alpha page for more details	
PIRONMAN	
Start on boot Make the add-on start during a system boot	Hostname e5375b8b-piconman-u1-alpha
Watchdog	Add-on CPU Usage
This will start the add-on if it crashes	0%
Show in sidebar	Add-on RAM Usage
Add this add-on to your sidebar	1.4%
STOD DESTADT	

- 10. Instructions for Powering On and Off:
 - **Power On**: Press the button until the light turns green, indicating the system is powering on. You can then release the button.
 - **Shutdown**: Press and hold the button for 2 seconds until the light turns purple, then release. When the power button's light begins to flash purple, the Raspberry Pi will receive a shutdown signal and proceed to shut down. The power button's light will turn off once the shutdown process is complete.
 - **Power Cut**: If you haven't configured software on the Raspberry Pi, or for other reasons, you can opt for a power cut shutdown. Press and hold the button for 5 seconds and turns red, indicating a direct power cut. Be cautious with this method as it may damage data.

7.4 4. View Data from SPC Dashboard

If you select the **Show in sidebar** option in the Pironman U1 add-on and then refresh the webpage, you will be able to open the Pironman U1 dashboard from the sidebar.

•	🚯 Pironman U1 Alpha	– Home As	× +								- 🗆 ×
÷	→ C ▲ Not	ecure ha	omeassistant.local:8123/e537	5b8b_pironman-u1-alpha	/ingress					©	© 한 I 또 🛛 💿 :
$\equiv c$	Home Assista	nt	Bironman II	4							*
55	Overview										Ť
4	Energy										
₿	Map						• -	•			
≣	Logbook		External			Fan			Battery		
ilı	History		partornal			- an			Duttory		
۵	Media	_	Status Voltage	Plugged in 5.14 V		State Mode	ON Auto		Percentage Charging	7 % Not charging	
56	Pironman U1 Alpha		Current Rower	0.52 A		Percentage	0 % 45 76 %		Voltage Current	8.32 V	
自	To-do lists		Power	2.09 W	\sim		40.76 C		 Power 	0.16 W	
			96								
			65 3								
			Raspberr	y Pi Power		Storage			Memory		
~	Developer tools		Source	External		mmcblk0	87.6%		Total	1.80 GB	
\$	Settings		 Voltage Current 	0.38 A					Osed Percent	558.79 MB 33.9 %	
	Notifications	0	 Power 	2 W	hm						
d	daisy				·						
· ·											

- The Dashboard will include the following:
 - External: Displays the status of the external USB power (Plugged in or Unplugged), its voltage, current, and power.

V External		
Status Voltage Current Power 	Plugged in 4.89 V 0.91 A 4.47 W	

- Fan: Shows the fan status, mode, speed, and the current temperature of the Raspberry Pi.
 - * You can manually turn the fan on or off and select different rotation modes for it.



- Battery: Displays the battery's percentage, charging status, voltage, current, and power.
 - * When an external USB power source is plugged in, the battery is in charging mode, showing its voltage, charging current, and power.
 - * When the external USB is not plugged in, the current and power are negative, indicating the battery's output current and power.



- **Raspberry Pi Power**: Displays the power supply to the Raspberry Pi (External or battery), its voltage, current, and power.



- **Storage**: Displays the storage capacity of a Raspberry Pi, showing various disk partitions with their used and available space.



- Memory: Shows the Raspberry Pi's RAM usage and percentage.



- **Processor**: Illustrates the Raspberry Pi's CPU performance, including the status of its four cores, operating frequencies, and CPU usage percentage.



- Network: Displays the current network connection type, upload, and download speeds.



• You can also switch this page to a white mode.

		\$
Settings	×	
Dark mode Whether to enable Dark Theme mode		
Temperature Unit Set prefer temperature unit	CELIUS FAHRENHEIT 78 %	
AUTO	7.75 V	
Shutdown Stratagy Set the minimum battery level for automatic device shutdown when external power is lost.		~~~~
ΜΩΤΤ	TEST	
Host MQTT broker host	core-mosquitto	
Port MQTT broker port, normally 1883	1883	
Username Username to login to MQTT broker	mqtt 3 95 GB	
CANCEL	SAVE 427.56 MB 12.5 %	

7.5 5. Home Assistant MQTT Integration

Here, we will guide you through the essential steps required to set up MQTT (Message Queuing Telemetry Transport) within your Home Assistant environment. MQTT is a crucial protocol often used for IoT devices and home automation. By following these steps, you'll seamlessly integrate MQTT into your Home Assistant system, allowing for efficient communication and control.

Since MQTT operates within your local network, it's not limited to running Home Assistant on the same Raspberry Pi as the Pironman U1. If you have a separate Home Assistant server or Pironman U1 is running on a different system, you can still configure Home Assistant to monitor Pironman U1.

1. Installing MQTT on Home Assistant

- 1. Click the button to navigate to the **Mosquitto broker** homepage.
- 2. Click to INSTALL the Mosquitto broker.



3. After installation, click START.

	•
-	
-	
••	

4. Wait for it to start up, then check the log tab for errors. Logs do not auto-refresh, so you need to manually refresh. Successful startup logs should look like this:

	Info	Documentation	Configuration	Log
Mosquitto broker				
sh-rc: info: service shrc-oneshot	t-runner: sta	rting		
s6-rc: info: service s6rc-oneshot	t-runner succ	essfully started		
s6-rc: info: service fix-attrs: s	starting	,		
s6-rc: info: service fix-attrs su	uccessfully s	tarted		
s6-rc: info: service legacy-cont-	-init: starti	ng		
cont-init: info: running /etc/cor	nt-init.d/mos	quitto.sh		
[17:28:58] INFO: SSL is not enab]	led			
cont-init: info: /etc/cont-init.c	d/mosquitto.s	h exited 0		
cont-init: info: running /etc/cor	nt-init.d/ngi	nx.sh		
cont-init: info: /etc/cont-init.c	d/nginx.sh ex	ited 0		
s6-rc: info: service legacy-cont-	-init success	fully started		
s6-rc: info: service legacy-servi	ices: startin	g		
services-up: info: copying legacy	y longrun mos	quitto (no readiness	notification)	
services-up: info: copying legacy	y longrun ngi	nx (no readiness not:	ification)	
[1/:28:59] INFO: Starting NGINX 1	for authentic	ation handling		
Sb-rc: info: service legacy-servi	ices successt	ully started		
[17:29:00] INFO: Starting mosquit	cto mult brok	er		
2024-01-10 17:29:00: Mosquitto ve	squitto shoul	d not be run as root.	administrator	
2024-01-10 17:29:00: Warning: No.	ed from /etc/	mosquitto/mosquitto (rauminiscrator.	
2024-01-10 17:29:00: Loading plug	gin: /usr/sha	re/mosquitto/go-auth	. 50	
2024-01-10 17:29:00: - Usernar	me/password c	hecking enabled.		
2024-01-10 17:29:00: TLS-PSH	K checking en	abled.		
2024-01-10 17:29:00: Extende	ed authentica	tion not enabled.		
2024-01-10 17:29:00: Opening ipv4	4 listen sock	et on port 1883.		
2024-01-10 17:29:00: Opening ipv6	6 listen sock	et on port 1883.		
2024-01-10 17:29:00: Opening webs	sockets liste	n socket on port 1884	4.	
2024-01-10 17:29:00: mosquitto ve	ersion 2.0.18	running		
2024-01-10 17:29:00: New connecti	ion from 127.	0.0.1:57422 on port 1	1883.	
2024-01-10 17:29:00: Client <unkr< td=""><td>nown> disconn</td><td>ected due to protoco.</td><td>l error.</td><td></td></unkr<>	nown> disconn	ected due to protoco.	l error.	
[17:29:01] INFO: Successfully ser	nd discovery	information to Home /	Assistant.	
[T1:5a:05] INFO: Processently set	nu service in	Tormation to the Supe	ervisor.	

2. Adding a Dedicated User for MQTT

Create a separate account specifically for MQTT access.

1. Click the **Settings** button, then select **People**.

	1 = 2 =	To-do lists			Tags
	٦	Developer tools			Set up NFC tags and QR codes
	¢ (Settings		8	People Manage who can access your home
Click	ADD	PERSON.			
	\leftarrow	People			
	Pe	eople			
	Her	re you can add each person o	f interest in Home Assistant.		
	Lea	irn more about people			
		d daisy			
					+ ADD PERSON

3. Enter a Name, and make sure to check Allow person to login.

Note:

2.

- The name cannot be homeassistant or addons, as these are reserved usernames.
- If you can't see the option to create a new user, ensure that **Advanced Mode** is enabled in your Home Assistant profile.

New person	×
Name* pironman_mqtt 1	
Name is required	
ADD PICTURE	
Or drop your file here	
Supports JPEG, PNG, or GIF image.	
·	'
Allow person to login 2	

4. In the popup, enter a password, confirm it, and then click **CREATE**.

Add user			×
^{Username*} pironman_mqt	:		
Password*			
Confirm password*			
Can only log in	from the local net	work	
Administrator			
he user group feat o administer the in nanagement API er occess to administr	ure is a work in p stance via the UI Idpoints to ensu ators.	progress. The use I. We're still auditi re that they correc	r will be unab ng all ctly limit

5. Finally, click **CREATE** again to finish adding the user.



When you have devices that indicate the presence of a person, you will be able to assign them to a person here. You can add your first device by adding a presencedetection integration from the integrations page.

- Presence Detection Integrations
- Integrations page

CREATE

3. Adding MQTT Integration

1. Navigate to **Settings -> Devices & Services**.



2. On the **Integrations** page, you should see the MQTT integration.

\leftarrow		Integrations	Devices	Entities	Helpers
Q Search integrations			_		
Discovered					
G :	IPP	:	3	:	
DESKTOP-M	HP LaserJet MFP M227fdw (C1E	BD6A)	mqtt		
DLNA Digital Media Renderer	Internet Printing Protocol (IPP)		MQTT		
CONFIGURE	CONFIGURE		CONFIGURE	GNORE	

3. Click CONFIGURE -> SUBMIT -> FINISH. Afterward, you will see mqtt under Configured.

Meteorologisk institutt (Met.no)	>	mqtt
1 SERVICE	0	1 ENTRY
Sun	>	Xiaomi BLE
1 SERVICE		1 DEVICE

4. Configuring MQTT Using the Dashboard

To set up MQTT for Pironman U1, you have two options: configuring it through the dashboard or via the command line. We recommend using the dashboard for ease of use.

1. If you select the **Show in sidebar** option in the Pironman U1 add-on and then refresh the webpage, you will be able to open the Pironman U1 dashboard from the sidebar.



2. Click on the settings icon located in the upper right corner.

		\$
Settings	×	• • • • •
Set prefer temperature unit	CELIUS FAHRENHEIT	
AUTO		
Shutdown Stratagy Set the minimum battery level for automatic device shutdown when external power is lost.	•	
MQTT	TEST	
Host MQTT broker host	core-mosquitto	
Port MQTT broker port, normally 1883	1883	
Username Username to login to MQTT broker	mqtt	
CANCEL	SAVE	

3. Here are some MQTT parameters you need to configure:

	Settings	×	•
Plugged in	AUTO Shutdown Stratagy Set the minimum battery level for automatic device shutdown when external power is lost.	•	
4.96 V 1.97 A	матт	TEST	
9.81 W	Host MQTT broker host	core-mosquitto	
	Port MQTT broker port, normally 1883	1883	
	Username Username to login to MQTT broker	mqtt	
	Password	···· •	
	CANCEL	SAVE	

- The default value for host is core_mosquitto. If your Home Assistant is on Pironman U1, leave it as is; it points directly to the Home Assistant's MQTT plugin. If it's on another Home Assistant server, enter that server's hostname or IP.
- The default value for port is 1883. You can leave this unchanged unless you've modified the MQTT broker's settings.
- Fill in the username and password you created earlier.
- 4. Then click on the **TEST** button next to MQTT to test the connection to the MQTT server. A checkmark (✓) will appear if the connection is successful. If it fails, you'll see an error message: "Connection failed, Check hostname and port." Make sure your MQTT Addon is running correctly.



5. You can now view data for Pironman U1's battery, fan, and other data in the Overview.

Configuring MQTT via Command Line

If your Home Assistant is not installed on Pironman U1, you can configure MQTT using the command line.

Replace the placeholders in the following command with your desired values for host, username, and password. Use the username and password you created earlier. Running this command will restart the service.

```
/opt/spc/spc_server \
--mqtt-host <hostname or ip> \
--mqtt-port 1883 \
--mqtt-username <username> \
--mqtt-password <passowrd> \
restart
```

After the service restarts, you can add Pironman U1's sensors to the dashboard.

CHAPTER

EIGHT

7. APPENDIX

8.1 Get the IP address

There are many ways to know the IP address, and two of them are listed as follows.

Checking via the router

If you have permission to log in the router(such as a home network), you can check the addresses assigned to Raspberry Pi on the admin interface of router.

The default hostname of the Raspberry Pi OS is raspberrypi, and you need to find it. (If you are using ArchLinuxARM system, please find alarmpi.)

Network Segment Scanning

You can also use network scanning to look up the IP address of Raspberry Pi. You can apply the software, Advanced IP scanner and so on.

Scan the IP range set, and the name of all connected devices will be displayed. Similarly, the default hostname of the Raspberry Pi OS is raspberrypi, if you haven't modified it.

8.2 Install OpenSSH via Powershell

When you use ssh <username>@<hostname>.local (or ssh <username>@<IP address>) to connect to your Raspberry Pi, but the following error message appears.

ssh: The term 'ssh' is not recognized as the name of a cmdlet, function, →script file, or operable program. Check the spelling of the name, or if a path was included, verify that the path is_ →correct and try again.

It means your computer system is too old and does not have OpenSSH pre-installed, you need to follow the tutorial below to install it manually.

1. Type powershell in the search box of your Windows desktop, right click on the Windows PowerShell, and select Run as administrator from the menu that appears.



2. Use the following command to install OpenSSH.Client.

```
Add-WindowsCapability -Online -Name OpenSSH.Client~~~~0.0.1.0
```

3. After installation, the following output will be returned.

```
Path :
Online : True
RestartNeeded : False
```

4. Verify the installation by using the following command.

```
Get-WindowsCapability -Online | Where-Object Name -like 'OpenSSH*'
```

5. It now tells you that OpenSSH.Client has been successfully installed.

```
Name : OpenSSH.Client~~~~0.0.1.0
State : Installed
Name : OpenSSH.Server~~~0.0.1.0
State : NotPresent
```

Warning: If the above prompt does not appear, it means that your Windows system is still too old, and you are advised to install a third-party SSH tool, like *PuTTY*.

6. Now restart PowerShell and continue to run it as administrator. At this point you will be able to log in to your Raspberry Pi using the ssh command, where you will be prompted to enter the password you set up earlier.

pi@raspberrypi:~ - - - ×
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.
PS C:\Windows\system32> ssh pi@raspberrypi.local
key_load_public: invalid tormat
Load key "C:\\Users\\Daisy/.ssh/id rsa": invalid format
pi@raspberrypi.local's password
Linux raspberrypi 5.15.61-v7+ #1579 SMP Fri Aug 26 11:10:59 BST 2022 armv71
The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.
Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Mon Feb 13 08:16:12 2023 from 192.168.6.149
pi@raspberrypi: *

8.3 PuTTY

If you are a Windows user, you can use some applications of SSH. Here, we recommend PuTTY.

Step 1

Download PuTTY.

Step 2

Open PuTTY and click **Session** on the left tree-alike structure. Enter the IP address of the RPi in the text box under **Host Name (or IP address)** and **22** under **Port** (by default it is 22).

Category:		
 Session Logging Terminal Keyboard Bell Features Window Appearance Behaviour Translation Selection Colours Connection Data Proxy Telnet Rlogin SSH Serial 	Basic options for your Put Specify the destination you want to con Host Name (or IP address) 192.168.0.101 Connection type: Raw Telnet Rlogin	Onnect to Port 22 OSSH Serial
	Load, save or delete a stored session Saved Sessions Default Settings 102	n Load Save Delete
	Close window on exit Always Never On	ly on clean exit

Step 3

Click **Open**. Note that when you first log in to the Raspberry Pi with the IP address, there prompts a security reminder. Just click **Yes**.

Step 4

When the PuTTY window prompts "login as:", type in "pi" (the user name of the RPi), and password: "raspberry" (the default one, if you haven't changed it).

Note: When you input the password, the characters do not display on window accordingly, which is normal. What you need is to input the correct password.

If inactive appears next to PuTTY, it means that the connection has been broken and needs to be reconnected.



Step 5

Here, we get the Raspberry Pi connected and it is time to conduct the next steps.

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