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Cardio Pulse PRO

User Manual

First Year Hardware Project

School of ICT

Metropolia University of Applied Sciences

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In this document ChatGPT was used for phrasing and language refinement.

1 Introduction

Introducing the Cardio Pulse PRO, your ultimate heart rate sensor. ATJ Wellness' advanced device offers state-of-the-art heart rate variability monitoring, empowering you to gain deeper insights into your heart health and stress levels. Elevate your wellness journey with our advanced heart rate variability monitoring gadget!

Cardio Pulse PRO is designed for health-conscious general users interested in monitoring their heart rate, heart rate variability (HRV), and stress and recovery levels. It is ideal for individuals seeking to enhance their wellbeing through real-time health indicators.

Users can expect to gain understanding into their heart health, stress levels, and recovery status. The device aims to help users make informed decisions about lifestyle, exercise, and relaxation habits to improve their overall wellbeing. Users can customize their exercise routines for optimal performance and recovery, understand their stress triggers and learn to manage them better, and track long-term trends in their health, potentially leading to informed lifestyle changes.

The user manual consists of four main sections:

1. **Getting Started** introduces the safety measures, device, and initial setup instructions.
2. **Device Usage** details how to properly wear the sensor, navigate the interface, and utilize key features for monitoring and analysis.
3. **Troubleshooting** addresses common problems with solutions and technical support contact information.
4. **Additional Information** offers technical specifications, glossary, maintenance tips, and warranty details.

2 Getting Started

Welcome to your Cardio Pulse PRO! This section will guide you through important safety measures and the initial setup process, ensuring you are swiftly ready to start monitoring your heart rate and HRV. It will also help you become more familiar with your new device.

2.1 Safety Information

Before you begin, it is important to read and understand the safety information provided in this section. Please take the time to familiarize yourself with these instructions before using the device.

⚠ Important

- Self-diagnosis and treatment using measured results may be dangerous. Contact a licensed healthcare professional for specific information and instructions about your heart rate.
- The device is not intended to be a diagnostic device.
- Operate the device only as intended. Do not use the device for other purposes.

⚠ Electrical Safety

- Do not attempt to repair the device yourself. Refer to customer support for any issues beyond basic troubleshooting.
- Use only the specified power source to avoid damage or fire risk.

⚠ Water Exposure

- Do not handle the device with wet hands or submerge it under water.
- If the device accidentally comes in contact with water, turn it off immediately and disconnect it from any power source.

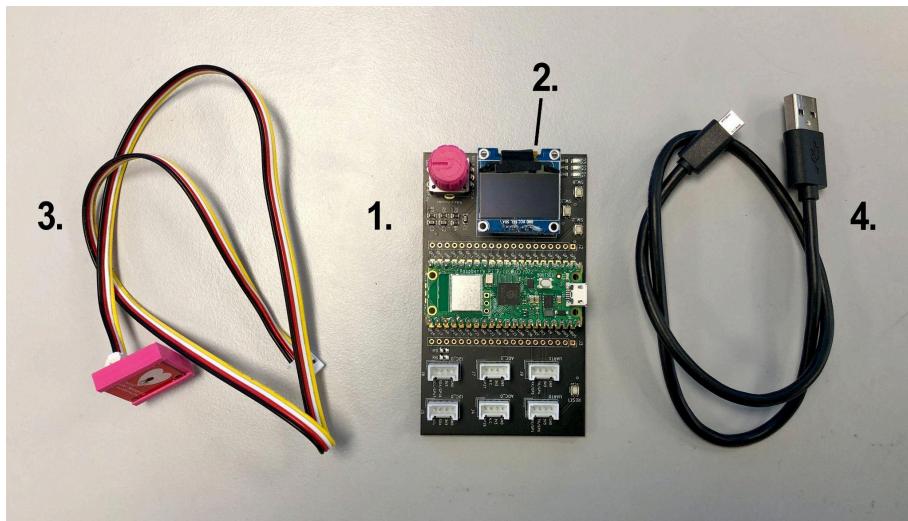
⚠ Child Safety

- Keep the device and the components away from young children to avoid any choking hazard
- This device is not a toy. Children should not be left unsupervised to make sure they do not play with the device.

2.2 Device Setup

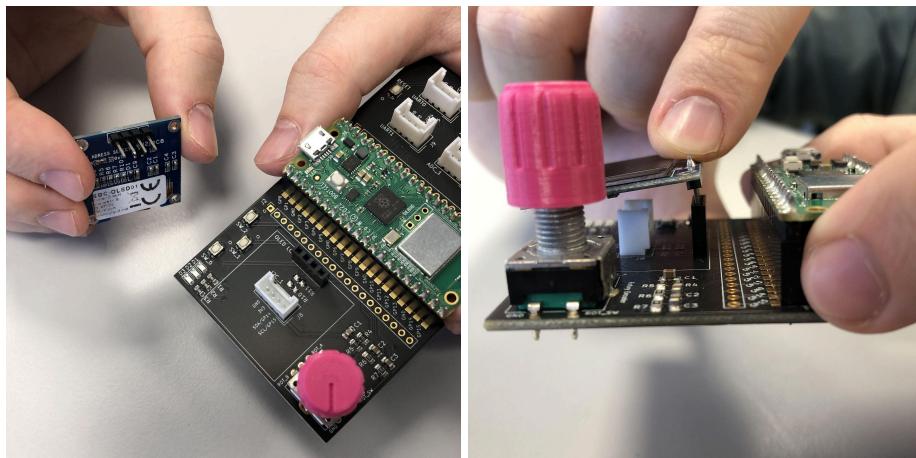
1. Unboxing and Initial Setup

1. Carefully remove the device and components from the case.
2. Locate the Raspberry Pi Pico board (1), OLED display (2), Pulse sensor and Grove cable (3), and the USB cable (4) included in your case.

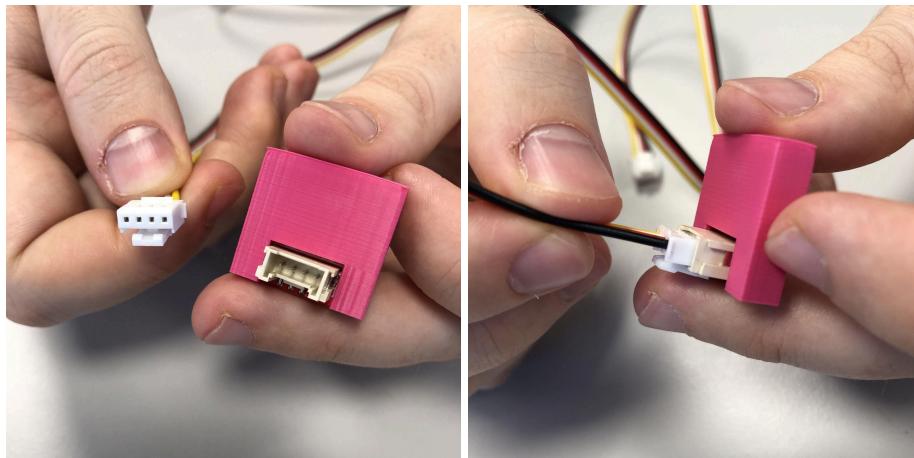


2. Assembling the Device

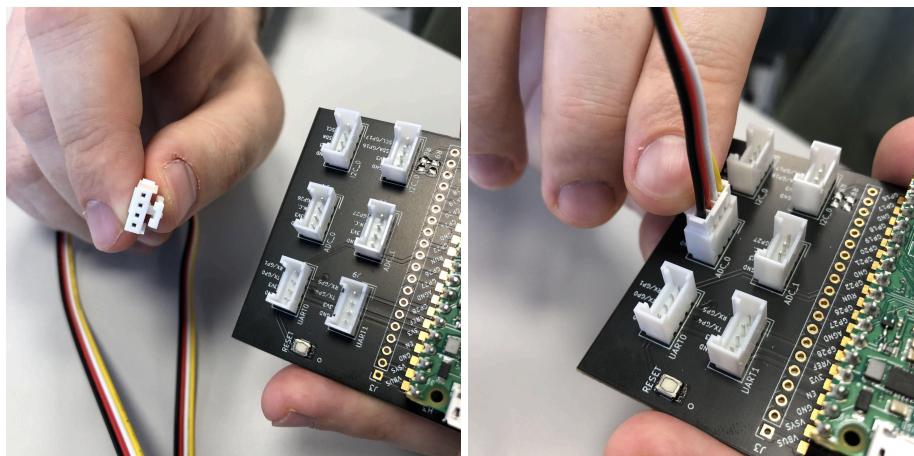
1. Connect the OLED display to the designated pins on the Raspberry Pi Pico board. Ensure it is securely attached.



2. Plug the Pulse sensor into the Grove connector, you will hear a click once the sensor is properly attached.

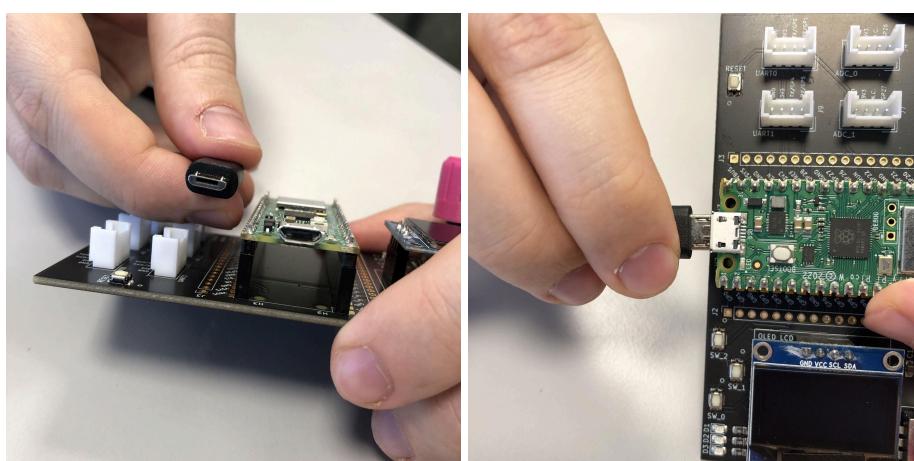


3. Connect the Grove cable to the ADC_0 pin on the board, you will hear a click once the cable is properly attached.



3. Powering On

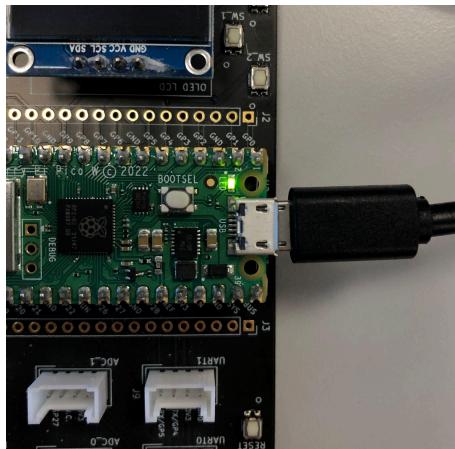
1. Plug the USB-C end of the USB cable to the device's USB port.



2. Plug the USB-A end of the USB cable into a power source.



3. Look for a green light on the device or screen to confirm it has powered on successfully.



4. Installing Required Software

1. Install Thonny IDE from thonny.org for running the device's code.

5. Device Connections

Connecting to a PC or other devices.

1. Connect your Cardio Pulse PRO to your computer or other devices using the USB cable.

Wi-Fi Configuration.

1. Open Thonny IDE

2. In the editor, open the following Wi-Fi script:
https://gitlab.metropolia.fi/saanapi/hardware-1-networks-final-assignment/-/blob/master/connect_to_wlan.py?ref_type=heads
3. Within the script, locate the section with variables for SSID and password. Replace the placeholders with your network details.
4. After entering the Wi-Fi details, run the script. It will connect your device to the Wi-Fi network.

6. Device Configuration

1. On the first power-up, follow the on-screen instructions to configure your device. This includes setting the time, date, and user preferences.
2. Use the USB cable to connect the device to your computer if software updates are required.

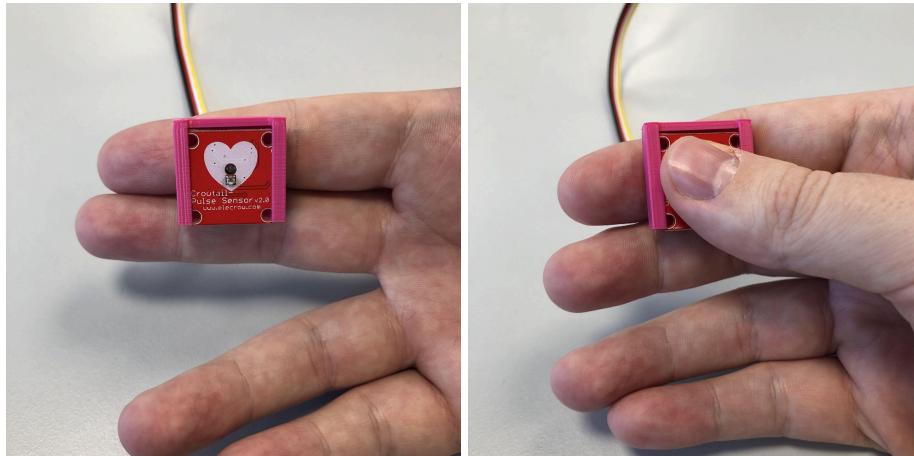
3 Device Usage

This section walks you through how to use your Cardio Pulse PRO effectively, from basic operations to more advanced functions. If you run into operational issues at any point, please refer to the Troubleshooting section.

The following steps will guide you through the primary functions of the device:

1. **Connect to a Power Source:** Plug the USB cable into your device and then into a power source. A green light will indicate the device is powered on, and the OLED display will light up.
2. **Using the Rotary Knob:** Locate the pink knob next to the OLED screen. This knob lets you navigate through the device's menu.
 - **Rotate** the knob to scroll through the menu options displayed on the screen.
 - **Press** the knob to select the highlighted menu option.
3. **Starting the Measurement Process:** Use the rotary knob to navigate to the "Start Measurement" option and press the knob to select it.
 - Follow the on-screen instructions, which will tell you when to place your finger on the sensor.

- Keep still and wait for the measurement to complete as indicated on the OLED display.



4. **Interpreting Your Results:** Once the measurement is done, your HRV data will be displayed on the screen.
 - **Rotate** the knob to scroll through the analysis results, such as heart rate, HRV score, and stress level.
5. **Accessing Settings (Optional):** If you need to adjust settings like time, date, or measurement units.
 - Navigate to the “Settings” menu using the rotary knob and press it to enter.
6. **Returning/Powering Off:** To either return to the main menu or power off the device.
 - Hold the knob down for 3 seconds to return to the options menu.
 - Unplug the USB-cable to power off the device.

4 Troubleshooting

This section is designed to help you identify and resolve the most common problems you may face while using Cardio Pulse PRO. Follow these steps to troubleshoot issues on your own. If the problem still persists, please do not hesitate to contact customer support for further assistance.

4.1 Common Issues and Solutions

Connectivity Issues	If the device fails to connect, verify your Wi-Fi details. Make sure your network is running and within range. Repeat the configuration steps detailed in the Device Setup section if necessary.
Inaccurate Readings	For accurate heart rate and HRV readings, make sure the sensor is correctly placed and in full contact with your skin. Avoid unnecessary movement during measurements.
Power Supply	If your device doesn't power on, check the USB-C and USB-A connections for a secure fit and inspect the cable for damage. Ensure the power source meets the device's voltage requirements.
Display Navigation	Refer to the "Device Usage" section for the OLED display step-by-step instructions.

4.2 Technical Support and Customer Service

Use the following contact information for assistance with any issues not resolved by this manual.

Email
Send us an email at support@cardiopulsepro.com . We are ready to assist with any questions or concerns.
Phone
Call us at +358 50 123 4567. We are available from 8 AM to 4 PM EET, Monday to Friday. Calls are free of charge.
Online Support Form
Visit our website at www.cardiopulsepro.com/support to fill our support request form.
Online Resources
To access our troubleshooting guide and FAQ, visit www.cardiopulsepro.com/FAQ .

5 Additional Information

In this section you will find key details including technical specifications, a glossary for understanding terms, maintenance tips for device care, and warranty information.

5.1 Technical Specifications

Microcontroller Raspberry Pi Pico with dual-core ARM processor, 246 kB SRAM, 2 MB Flash, 2.4 GHz wireless LAN, 26 multifunction GPIO pins.

Heart Rate Sensor Crowtail Pulse sensor v2.0, featuring LED, photodiode, analog amplifier, and analog signal output, operating voltage 3-5 V.

Display OLED SSD1306 compatible 128x64 monochrome display, supporting I2C or UART protocol.

Interface Digital rotary knob with push button for user interaction.

Protoboard Specifically engineered to connect the Raspberry Pi Pico, OLED display, and Crowtail Pulse Sensor v2.0, along with other components.

Connectivity Grove connectors for easy attachment of various sensors and devices, USB port for programming, and data transfer.

Power Supply USB-C to USB-A cable for continuous operation through a direct power connection. The device connects via USB-C, supporting an input voltage of $5V \pm 0.25V$, and connects to the power source with a USB-A end, compatible with standard USB ports.

Compatibility The device integrates with Kubios Cloud for advanced HRV analysis, syncs data over Wi-Fi and connects to Raspberry Pi Pico for wide compatibility with external health monitoring devices.

5.2 Glossary

In the following glossary you will find definitions to key terms and concepts related to the topics mentioned throughout this manual.

BPM	Beats Per Minute, measurement of heart rate
HF	High Frequency (0.15 - 0.4 Hz)!!!
HR	Heart Rate, number of beats per minute (BPM)
HRV	Heart Rate Variability, variation in time intervals between heartbeats
LED	Light Emitting Diode, a semiconductor light source
OLED	Organic Light Emitting Diode
USB	Universal Serial Bus, standard for computer connectivity
Wi-Fi	Wireless Fidelity, technology for wireless local area networking

5.3 Warranty

Limited one-year warranty

Cardio Pulse PRO is covered under a one-year warranty from the date of original purchase, guaranteeing the device against any possible defects in materials and workmanship under normal use. This warranty only applies to the original buyer.

➤ **Warranty Coverage**

- Repair or replacement of the device. The product will be either repaired or replaced, based on our decision, if any components fail due to manufacturing defects.
- No charge for repair, replacement parts, or service.

➤ **Exclusions**

- Damage that has resulted from accidents, misuse, neglect, or unauthorized modifications.
- Wear and tear from regular use.
- Loss or theft of the product.

➤ **How to Access Service**

- Contact customer support with a proof of purchase.
- Obtain a return authorization and shipping instructions.

➤ **Limitation of Damages**

- Our responsibility is limited to the product's replacement cost. We are not responsible for any type of damages resulting from any breach of warranty.

➤ **Governing Law**

- This warranty follows the laws of the country where the product was bought.

5.4 Maintenance Tips

For optimal performance and longevity of your wellness device, our maintenance tips section provides essential advice and practices.

Clean Regularly	Wipe the device with a soft dry cloth to remove any dust and perspiration.
Sensor Care	Make sure the heart rate sensor's surface is clean for accurate readings.
Avoid Harsh Conditions	Do not expose the device to extreme temperatures or moisture.
Software Update	Regularly check for and install software updates to enhance functionality and security.
Software Compatibility	Keep the connected smart devices and computer's operating systems updated to ensure compatibility with the device's software.
Storage	When not in use. Store the device in a cool and dry place away from direct sunlight.