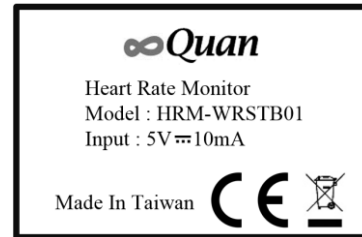


HRM-WRSTB01 User Manual

1. Packaged Contents

- RL78/I1E Sensor Board x 1
- RL78/G14 Option Board x 1
- RL78/G1D Communication Board x 1
- E1 Assist Board x 1
- Wrist Watch Casing x 1



2. Instructions

a. Outline

Created for developing and evaluating wearable pulse meter solutions, this evaluation kit comprises a sensor board, option board, and BLE communication board. The RL78/I1E mounted on the sensor board calculates the pulse from the signal obtained by the embedded LED photo reflector. The results are sent to the user's smartphone via integrated BLE module (RL78/G1D). Detailed logs can also be retrieved by connecting the option board via USB OTG. The unit consists of a dedicated wristband case and wristband.



Figure 1 Overall System Photo

b. System Configuration

The wristband case encloses the sensor board, option board, and wireless board. This section describes the configuration of each component.

i. RL78/I1E Sensor Board

The sensor board is equipped with an RL78/I1E Renesas Electronics microcomputer (MCU), a pulse sensor and an accelerometer sensor. The MCU comes with pulse measurement and motion cancelling algorithms. The NJL5304R pulse sensor is manufactured by NJRC, while the KX022 accelerometer sensor is a Kionix product.

ii. RL78/G1D Communication Board

The wireless communication board is equipped with both antenna and Bluetooth Smart (v4.1), which is certified under the Japan Radio Law and FCC. Bluetooth Smart uses the Renesas RL78/G1D MCU to send measurement results from the HRP (Heart Rate Profile) every second. The pulse rate is displayed on an Android OS (ver4.4 or higher) or iOS-based Smartphone via a compatible application.

iii. RL78/G14 Option Board

The option board allows the user to output log data required for pulse measurement analysis, such as pulse A/D value or acceleration data, via the USB connector, using the Renesas RL78/G14 MCU. A dedicated Android OS app and USB host cable are required to retrieve logs and charge the battery which can be downloaded from Renesas website.

c. E1 Assist Board

Use the E1 Assist Board to write programs or debug the MCUs included in this solution kit. The E1 Assist Board is mounted with E1 connectors and board connectors for both programming and debugging.

The device is enclosed in a black watch-type case that stores a sensor board, wireless board, and option board. The wireless board is positioned so that the Start/Stop button can be accessed on the side of the case.

d. Overall System Diagram

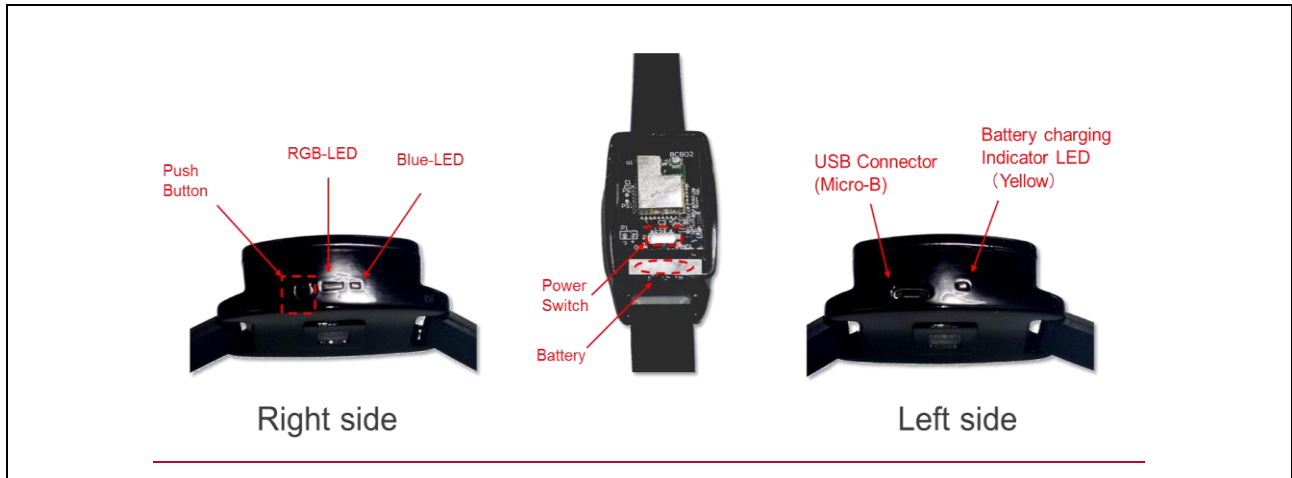


Figure 2 Overall System Diagram

e. System Diagram

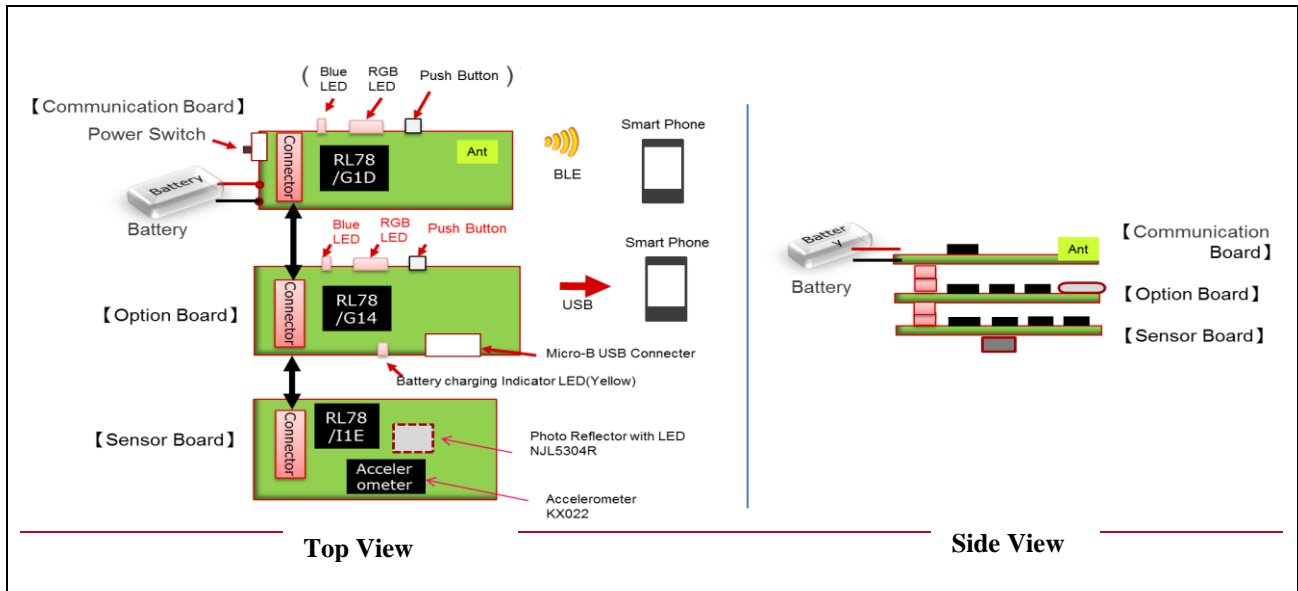


Figure 3 System Diagram (3 boards configuration)

Note: Only LEDs on the option board will be operational in 3 boards configuration.

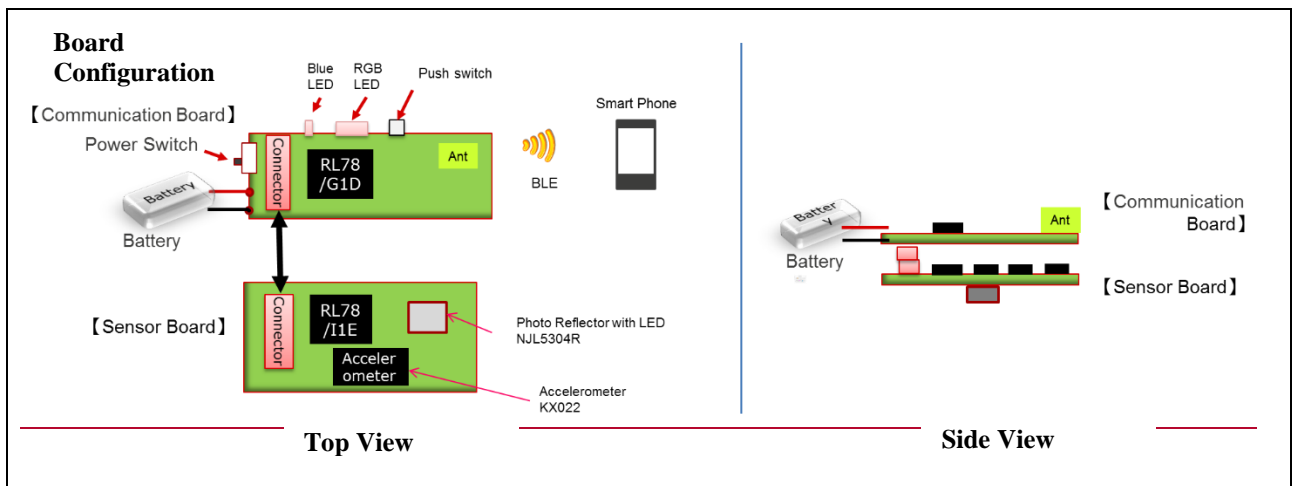


Figure 4 System Diagram (2 boards configuration)

f. Board External Appearance and Key Devices

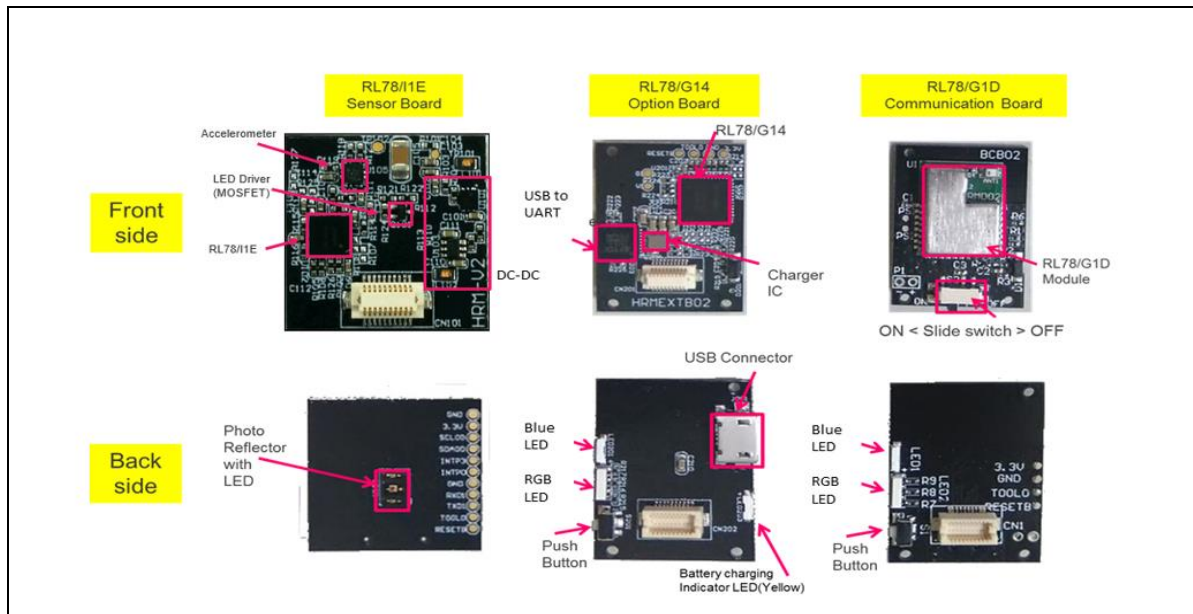


Figure 5 Board External Appearance and Key Devices

3. Operational Procedures

a. Measurement Start

- i. Supply power to device (the red LED will blink twice when the device is activated).
 - ① For battery-based operations: If the red LED fails to blink during normal operation, the battery may be running low. Refer to the battery charging section for instructions on switching to the Battery.
 - ② For USB-powered operations: Insert the cable into the micro B USB connector to power the device. If the red LED fails to blink, the cable or internal connector may be loose. Remove the cable and re-insert after confirming that there are no problems with the board.
- ii. Prepare the smartphone of the measurement environment.
 - ① For BLE communication: Start up the smartphone application and perform pairing. For details on pairing, refer to the smartphone and application software instructions.
 - ② For USB communication: Start up the dedicated application installed on the smartphone (log analysis app), and confirm it is ready to start measuring. See the instruction manual for details concerning the log analysis app.
- iii. Apply firmly to wrist, ensuring a tight fit between sensor window and skin.
- iv. Press the Start/Stop button on the side of the wrist case to start pulse measurement.
 - ① When the button is pressed, the HR Indicator LED (green->red->blue color) will blink once.
 - ② The pulse sensor LED will then start to blink.
 - ③ The display will show 78 BPM as the initial value, followed by pulse rates varying by user, until the measurement results stabilize. (There are individual differences, such as the location of the attachment.)
 - ④ Please re-attach If you wait more than 30 seconds, and you do not believe there is a pulse value.
- v. Finally, the pulse measurement results will be displayed in the smartphone app in about 10 to 30 seconds.

Note: If the device is removed from the wrist in the measurement state, a “measurement terminated due to detachment” notice is sent in the general notice information and pulse rate 0 is sent to the communication partner. If the device is attached to the wrist in the measurement stop state, the function automatically starts a measurement.

If the measurement is terminated due to detachment for more than 5 seconds, the function sends a measurement stop notice to the communication partner due to continued detached state in general notice information.

Press the Start/Stop button to resume measurement.

Note: If the battery starts to expire, connect the option and sensor boards to charge via the USB connection. Pulse measurements can be taken while the battery is charging. Note that the battery may not be USB-chargeable once it is fully discharged. We recommend charging the battery frequently to ensure this does not happen.

b. Measurement Stop

- i. Press the Start/Stop button to stop measurements.
- ii. Turn the power switch to OFF.
 - ① Battery-powered operations: Slide the power switch to OFF.
If the device has been in use for an extended period, charge the battery via the USB connector.
 - ② USB-powered operations: Detach the cable from the USB micro B connector.

c. How to Charge Battery

- i. Insert the option board between the sensor and communication boards.
- ii. Turn the communication board power switch to ON.
- iii. Connect the USB cable to the option board's USB connector and turn on the power feed to the device.
 - ① A 60mAh battery should completely charge in approximately 1 hour.
 - ② The LED (Yellow) adjacent to the USB connector will remain on while the battery is being charged.
 - ③ When the battery is fully charged, the LED (Yellow) light will turn off.
 - ④ A blinking LED (Yellow) indicates abnormal operations. Battery charging should be discontinued.
- iv. Remove the USB cable once the battery is fully charged.
- v. When not using the device, set the communication board power switch to OFF.

4. Usage Notes

- a. Be careful not to put unnecessary pressure on the device casing during measurement, as this can cause incorrect pulse readings.
- b. The device should be firmly attached to the wrist in the correct position. The user's pulse cannot be measured if the wristband is attached too loosely.
- c. Individual differences may affect pulse measurements, resulting in inaccurate results.
- d. Although this solution features an auto LED light intensity adjustment function, the range of adjustment is limited.
- e. Always turn the communication board switch to OFF after use to avoid draining the battery.
- f. When the smartphone assumes standby status after BLE communication, the connection may be lost. The user will need to pair the device and smartphone again for the next measurement.

※The following is an application note of additional upcoming.

- a. Configuration changes of the FFT interval
- b. Configuration changes of the HR value of the first time (Now: 78bpm)
- c. Configuration changes of the motion noise cancellation valid conditions
- d. Configuration changes of the pulse S / N indicator display

Declaration of Conformity

Quan International Co., Ltd. hereby declares that this Heart Rate Monitor is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.

This product is allowed to be used in all EU member states.