

Renesas Synergy™ Platform

Healthcare Meters Kit Quick Start Guide on S3A7 and RL78/G1D

R12AN0062EU0100

Rev.1.00

May 26, 2017

Introduction

This quick start guide describes how to setup Renesas' Healthcare Meters Kit. Renesas Synergy™ S3A7 Microcontroller Group, Renesas USB charger IC and Renesas RL78/G1D Bluetooth Smart are the highlighted components in this solution. Contact your nearest Renesas sale offices to request a live demonstration or kit for development.

Target Device

RL78/G1D and Renesas Synergy R7FS3A77C3A01CFP

Contents

1. Kit Content.....	2
2. Features.....	3
2.1 Activity Module	3
2.2 Blood Glucose Module	3
2.3 Blood Pressure Module.....	3
2.4 Heart Rate/Pulse Ox Module	3
3. Images.....	4
3.1 Activity Module	4
3.2 Blood Glucose Module	4
3.3 Blood Pressure Module.....	4
3.4 Heart Rate/Pulse Ox Module	5
3.5 Wireless Charging Unit.....	5
4. Setting up iOS/Android App	6
5. Using the Activity Module	8
6. Using the Blood Glucose Module	10
7. Using the Blood Pressure Module.....	12
8. Using the Heart Rate/Pulse Ox Module	14
9. Programming to the Synergy add-on board	16

1. Kit Content

The following components are included in the kit –

- Activity Module
- Blood Glucose Module with *ONETOUCH*® Measurement Strip
- Blood Pressure Module with Arm Cuff
- Heart Rate/Pulse Ox Module with Finger Clip
- Micro USB cable
- E1 to PMOD Adapter
- Inductive Wireless Charger
- 5 V AC-DC Adapter
- Firmware
- Mobile Apps – Download “Renesas HC Meters Kit” from iTunes or Google Play
- Quick Start Guide
- User Guide (r30an0297eu0100-synergy-s3a7.pdf file can be downloaded from below link)
<https://www.renesas.com/en-us/solutions/home/healthcare/hckit.html>
- *ONETOUCH*® Control Solution (not included due to inconvenience of shipping liquid)

2. Features

2.1 Activity Module

- Li-Ion battery with Wireless or USB charging
- Fuel Gauge IC
- Ambient light sensor
- Pressure Sensor
- Humidity Sensor
- Temperature Sensor
- Vibrate motor (optional)
- 9-axis motion sensor (accel, gyro, compass)
- BLE connectivity to the mobile app
- USB output for wired data transfer
- Mobile app displays Steps, Distance, Calories & Light, Temperature, Humidity, Pressure

2.2 Blood Glucose Module

- 1 Coin cell or 5 V DC power operation
- LCD displays blood glucose reading or status
- Cap Touch buttons which can be enabled for additional functionality
- BLE connectivity to the mobile app
- USB output for wired data transfer
- Mobile app displays Blood Glucose level

2.3 Blood Pressure Module

- 3 AAA batteries or 5 V DC power operation
- LCD displays systolic, diastolic, pulse rate readings or status
- Cap Touch buttons which can be enabled for additional functionality
- BLE connectivity to the mobile app
- USB output for wired data transfer
- Mobile app displays Systolic, Diastolic pressure and Pulse rate

2.4 Heart Rate/Pulse Ox Module

- Li-Ion battery or 5 V DC power operation
- LCD displays heart rate, pulse ox readings or status
- Cap Touch buttons which can be enabled for additional functionality
- BLE connectivity to the mobile app
- USB output for wired data transfer
- Mobile app displays Pulse Ox level and Heart rate

3. Images

3.1 Activity Module

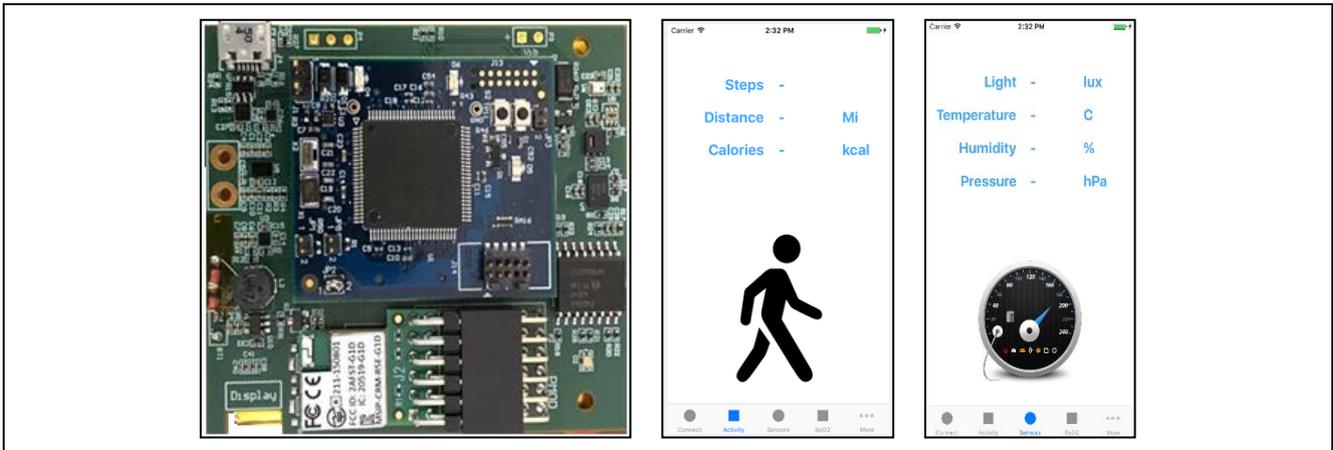


Figure 3-1 Activity Module with Mobile App snapshot

3.2 Blood Glucose Module

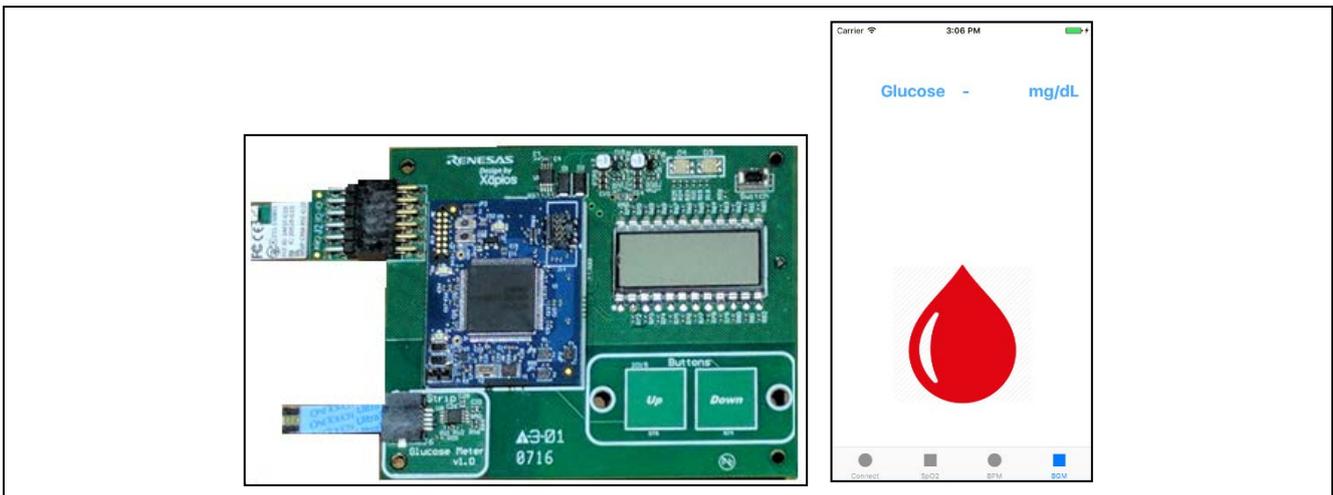


Figure 3-2 Blood Glucose Module with Mobile App snapshot

3.3 Blood Pressure Module



Figure 3-3 Blood Pressure Module with Mobile App snapshot

3.4 Heart Rate/Pulse Ox Module

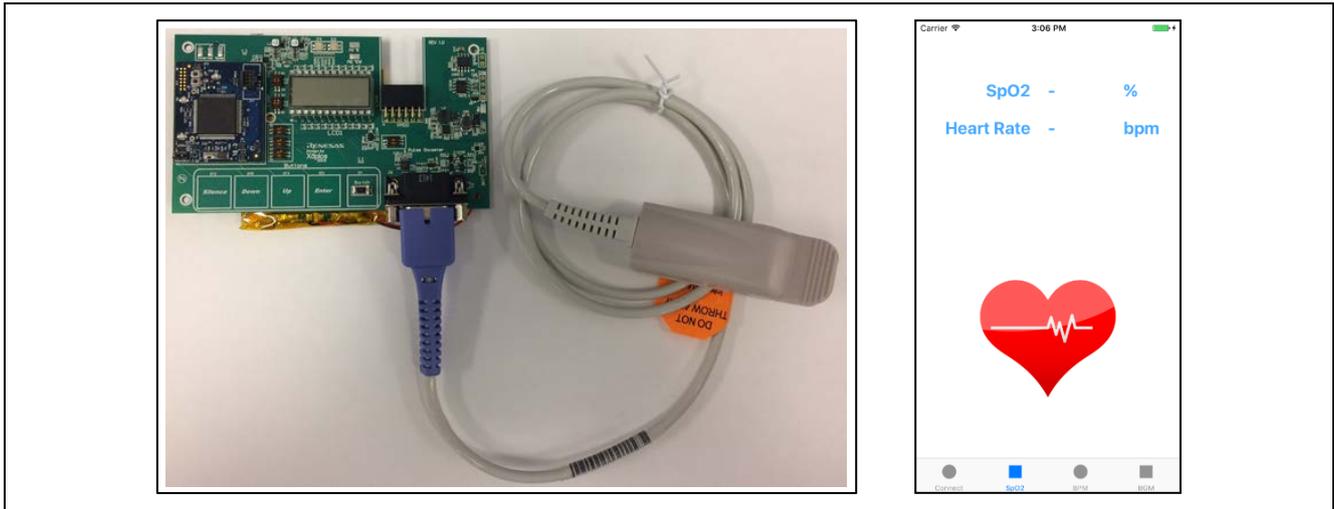


Figure 3-4 Heart Rate/Pulse Ox Module with Mobile App snapshot

3.5 Wireless Charging Unit

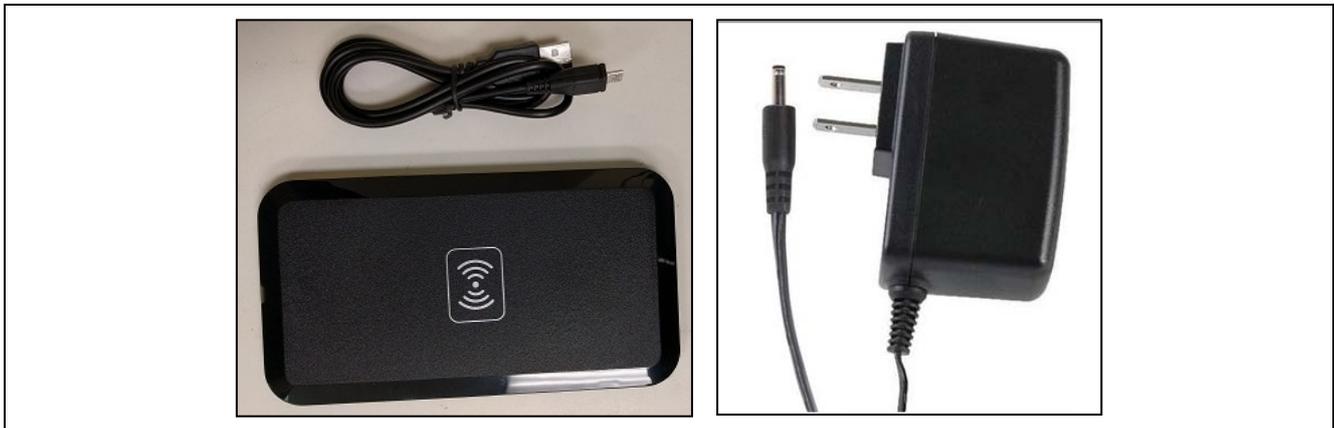
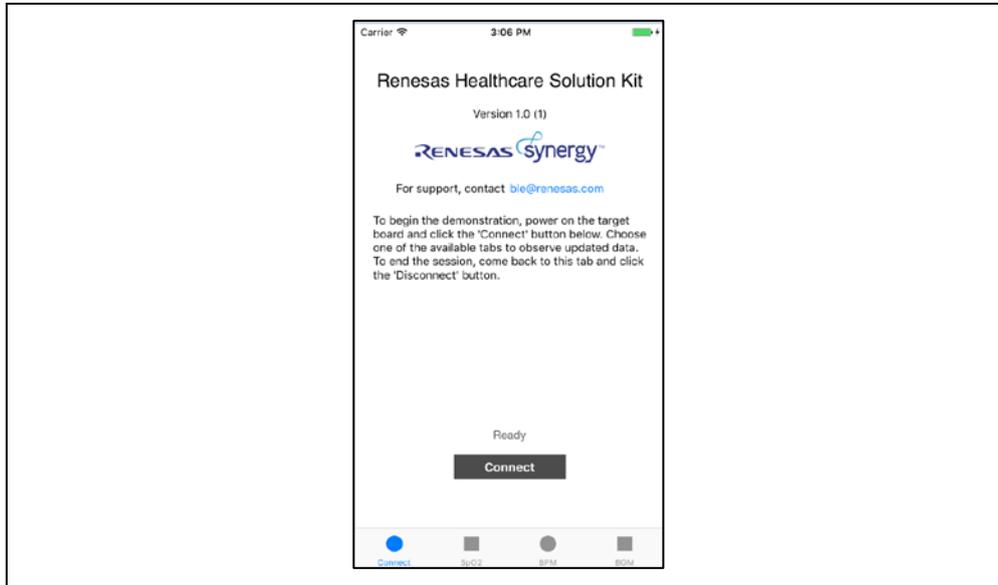


Figure 3-5 Micro USB charging cable with Qi Wireless Inductive Charger & 5V DC Adapter

4. Setting up iOS/Android App

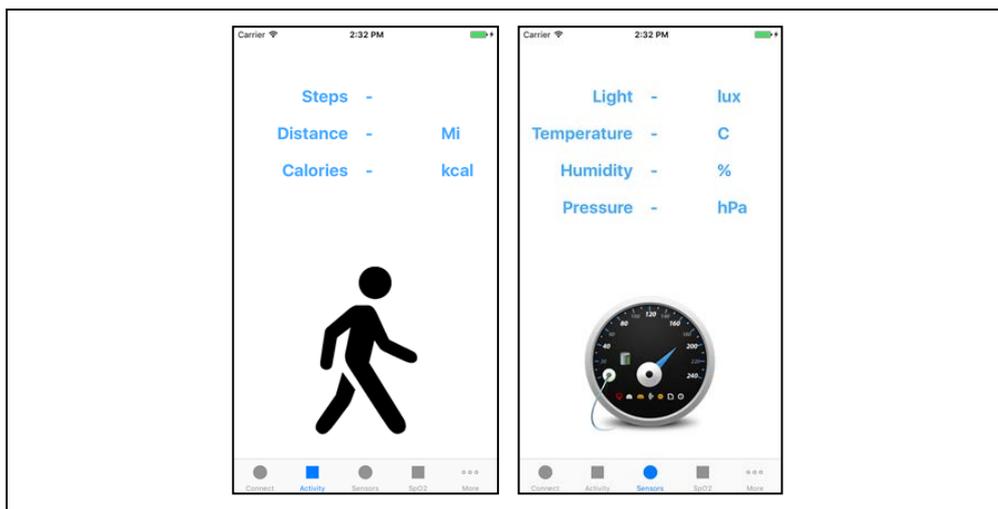
An application (Renesas HC Meters Kit) is available to demonstrate the connectivity portions of the development kit. The iOS version can be downloaded from the [Apple iTunes Store](#), and the Android version from [Google Play](#). Every effort has been made to ensure the apps work on a wide variety of phones but given the wide array of hardware and software it is possible the software may not work with your chosen device.

- 1) Before launching the application, ensure all apps trying to connect to Renesas HC Meters Kit device is closed. Then turn on Bluetooth for the mobile device. After that turn on any one of the HC Meters Kit module.
- 2) Launch Renesas HC Meters Kit application The following screen will appear:



- 3) Click on Connect to establish Bluetooth link and the message Ready will change to Connected.
- 4) Depending on which HC Meters Kit module you are working with select the appropriate tab at the bottom of the app. This will bring you to the following screen depending on which module you selected:

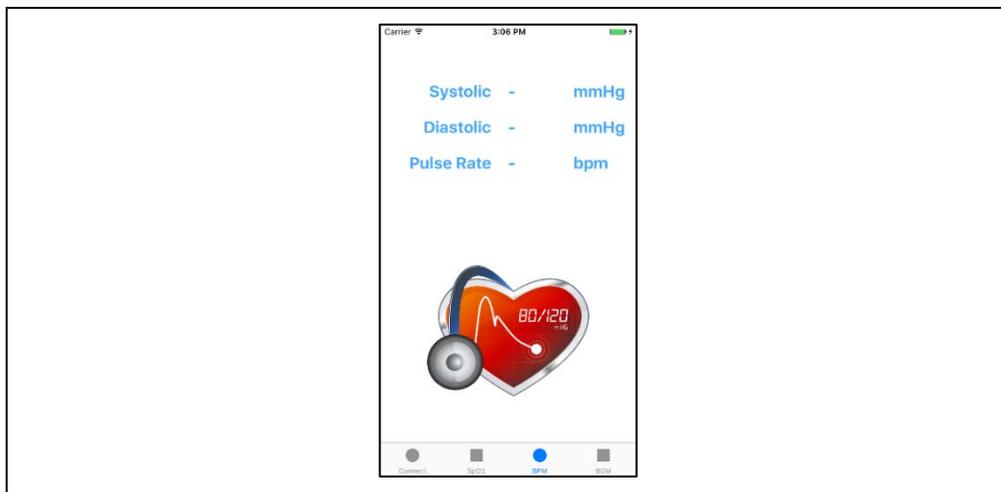
a. Activity



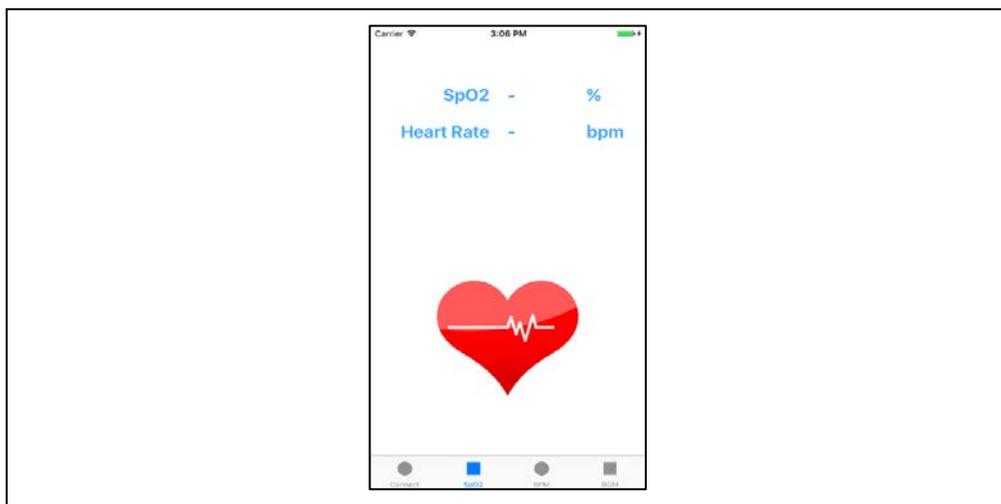
b. BGM (Blood Glucose Meter)



c. BPM (Blood Pressure Meter)



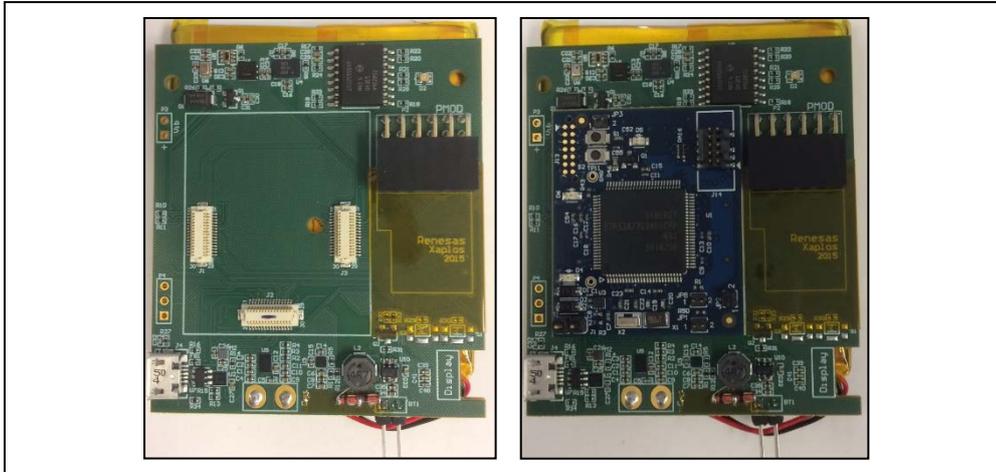
d. HRM/SpO2



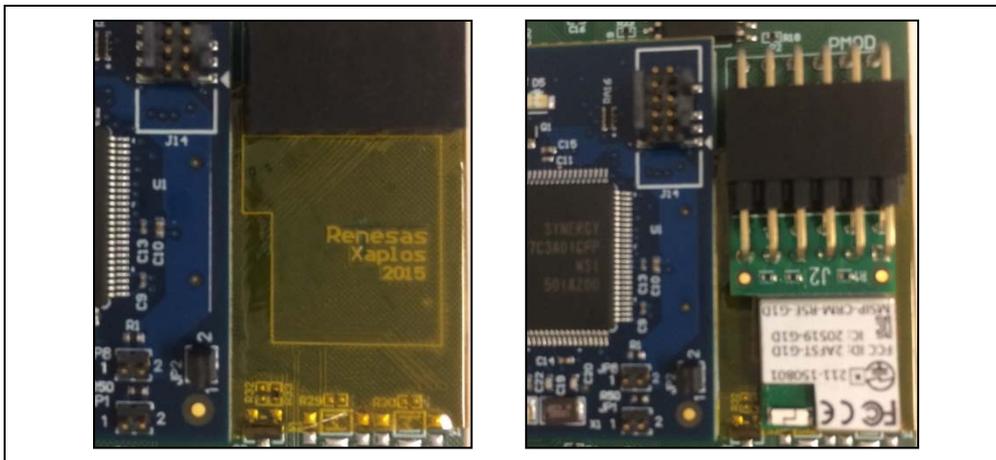
- 5) Mobile app displays the status of the module, action to be taken by the user or the reading for the vital measurement taken. It is a very intuitive user interface.
- 6) Once you are done taking the measurement go back to the main screen and click on Disconnect to release the Bluetooth link.

5. Using the Activity Module

Step 1. Attach Synergy S3A7 Target board (blue) to Activity board (green) and apply pressure until all three connectors are properly attached. S3A7 TB is programmed for Activity module function out of the box.



Step 2. Insert RL78/G1D BLE PMOD module into the PMOD connector on Activity board.



Step 3. Connect the battery to the power terminals keeping the polarity in mind (red and black wires to be connected appropriately). If the power is properly available some LEDs will light up.



Step 4. If battery power is diminished, connect to Qi wireless charging pad to charge the battery. Other option to charge the battery is to power the board using USB port.



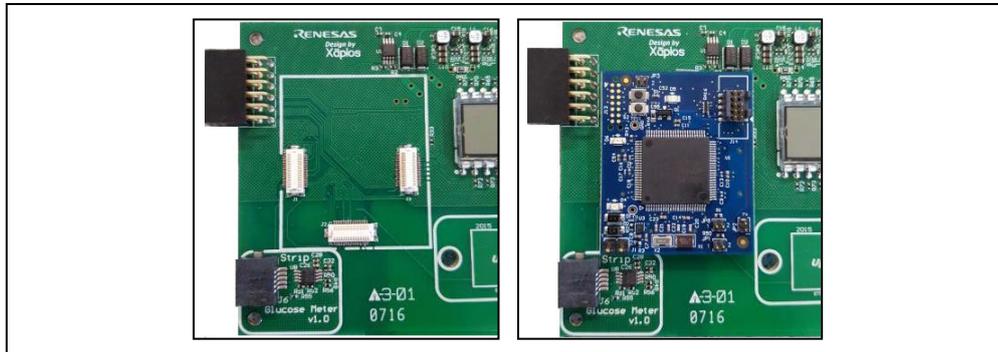
Step 5. Launch Renesas HC Meters Kit smartphone app

1. Connect device to smartphone app and select activity or sensors tab
2. Generate movement with activity board to record steps
3. On the sensors screen raw data from the sensors is displayed

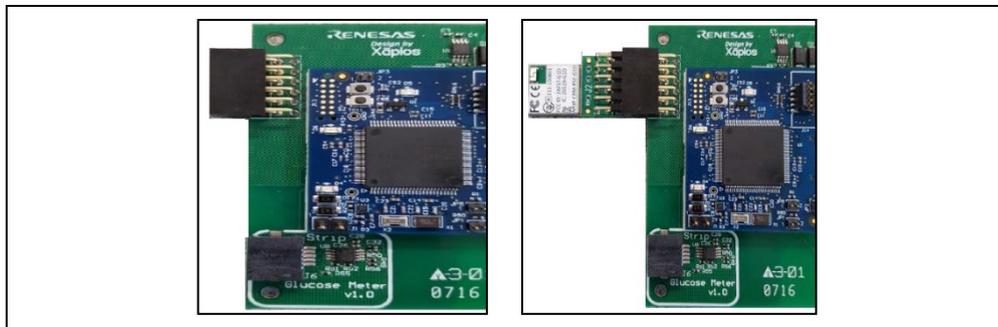
Step 6. Note: Since this kit is setup as a development platform not all the functions are enabled in the demo stage. End user can use the existing project base and add functions which leverage the various sensors preloaded on the activity module.

6. Using the Blood Glucose Module

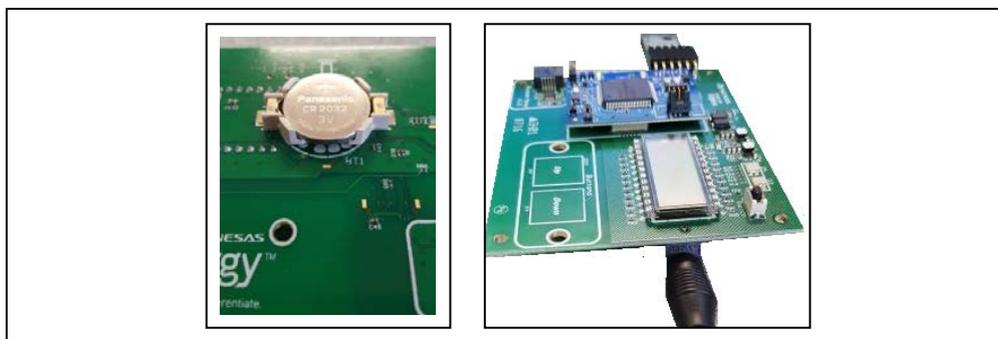
Step 1. Attach the Synergy S3A7 Target board (blue) to BGM board (green) and apply pressure until all three connectors are properly attached. S3A7 TB must be programmed for BGM function. Refer to the User Guide for further details.



Step 2. Insert RL78/G1D BLE PMOD module into the PMOD connector on BGM board.

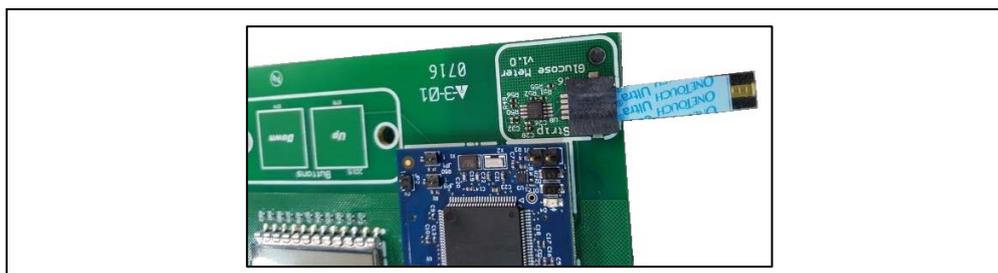


Step 3. Insert coin cell battery or connect DC adapter to the power jack.



Step 4. Launch Renesas HC Meters Kit smartphone app

- a. Connect device to smartphone app and select BGM tab
- b. Press Switch S4 to start reading operation
- c. Insert *ONETOUCH*® Ultra Test Strip into the connector



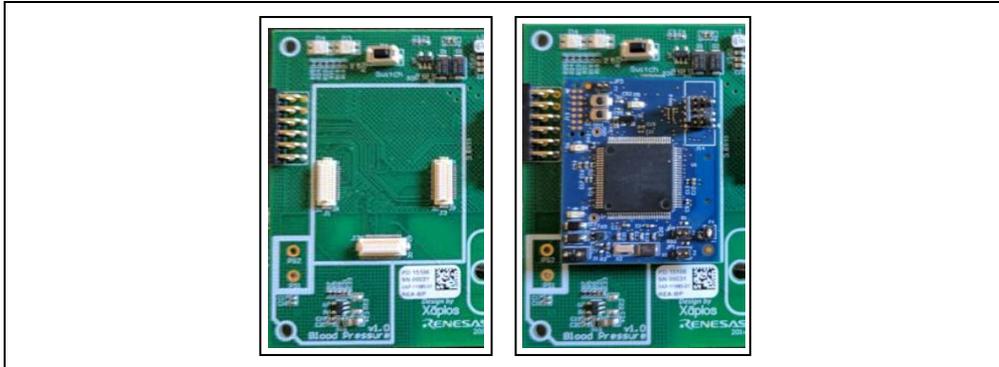
- d. Apply *ONETOUCH*® control solution to test strip



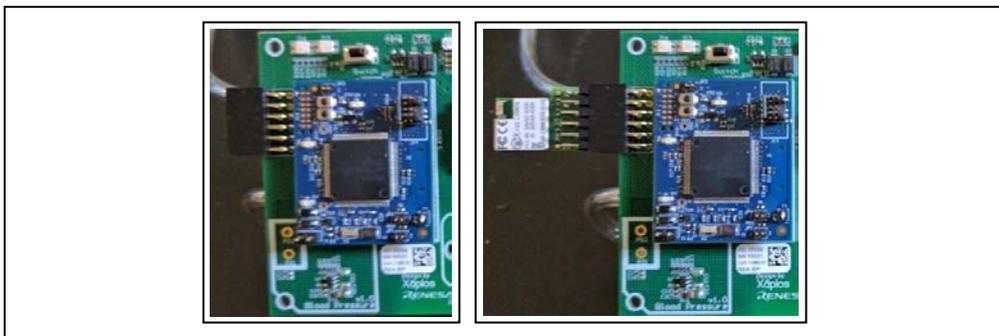
- e. After 3 – 5 seconds blood sugar level reported on the mobile app and LCD
f. While not recommended because of biohazard concerns, a lancet could be used to prick finger for a real blood draw and the BGM unit will operate the same way as for a control solution.
g. Restart using switch S4 in case of failed operation.

7. Using the Blood Pressure Module

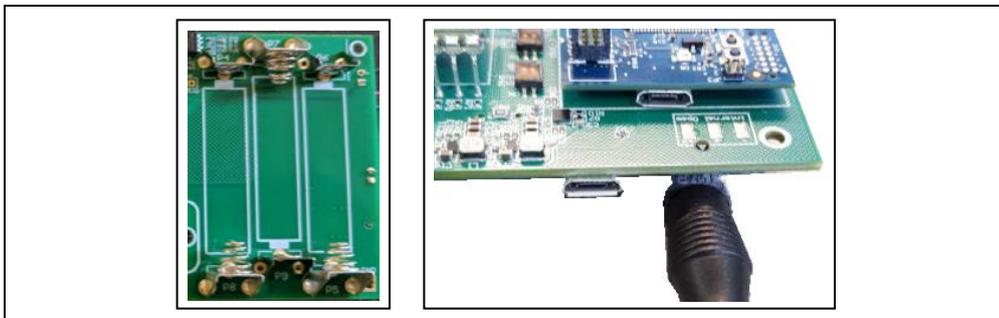
Step 1. Attach Synergy S3A7 Target board (blue) to BPM board (green) and apply pressure until all three connectors are properly attached. S3A7 TB must be programmed for BPM function. Refer to the User Guide for further details.



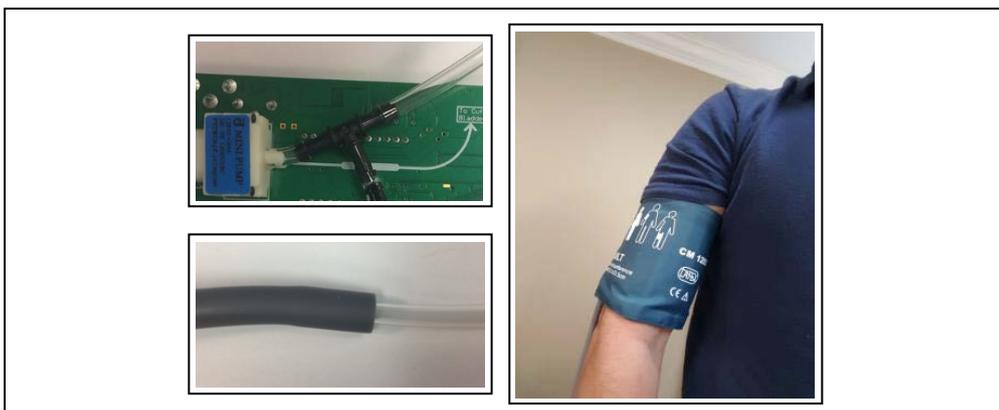
Step 2. Insert RL78/G1D BLE PMOD module into the PMOD connector on BPM board.



Step 3. Insert 3 AAA batteries or connect DC adapter to the power jack.

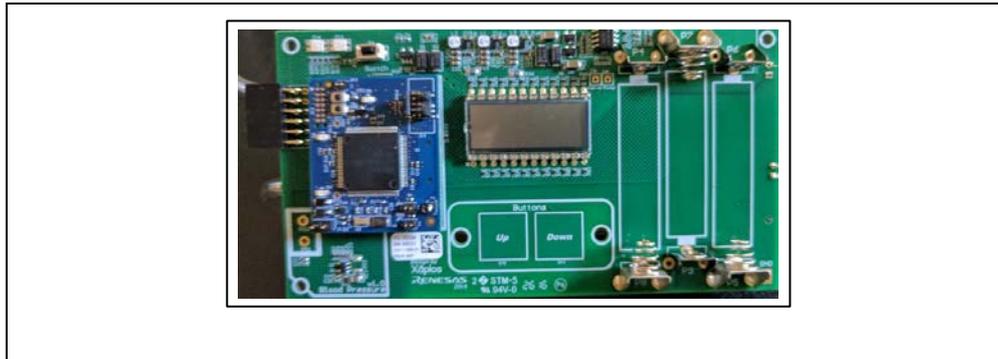


Step 4. Fully assembled unit should look like below with tubes and arm cuff.



Step 5. Launch Renesas HC Meters Kit smartphone app

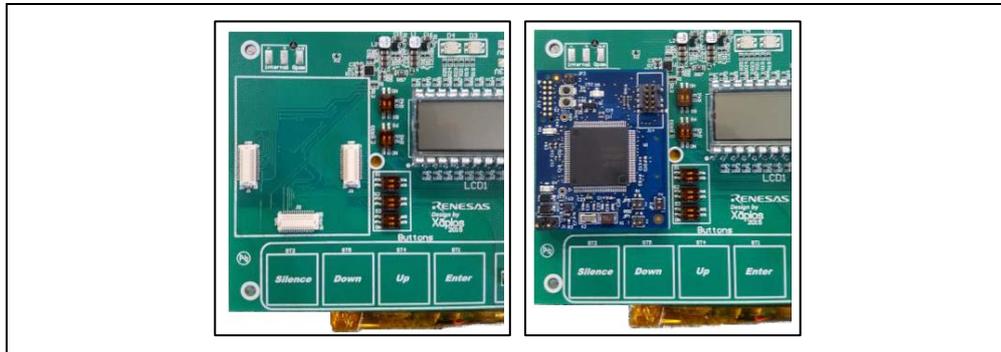
- a. Connect device to smartphone app and select BPM tab
- b. Wrap the arm cuff around the arm
Note: need to tight enough the Bladder unit at arm to meet 90 seconds interval for building up the pressure. If not, get test result as fail, “FA”.
- c. Press switch S4 to begin blood pressure reading
Note: do not move while measuring. If not, the sensor measures wrongly because of the disturbance of human body movement and get test result as fail, “FA”.
- d. After 45-60 seconds systolic pressure, diastolic pressure and pulse rate readings are displayed on the mobile app and LCD.



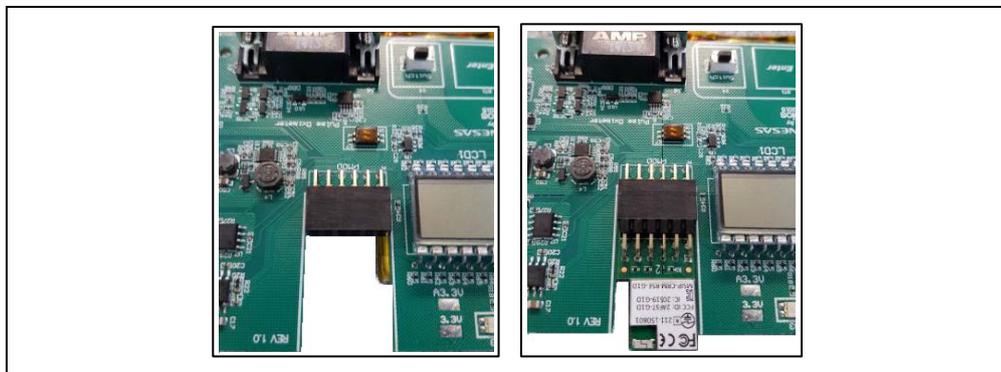
- Step 6.** Note: There can be variability from unit to unit due to differences in tube lengths and arm cuffs. There is a patch available in the software package to calibrate each unit.

8. Using the Heart Rate/Pulse Ox Module

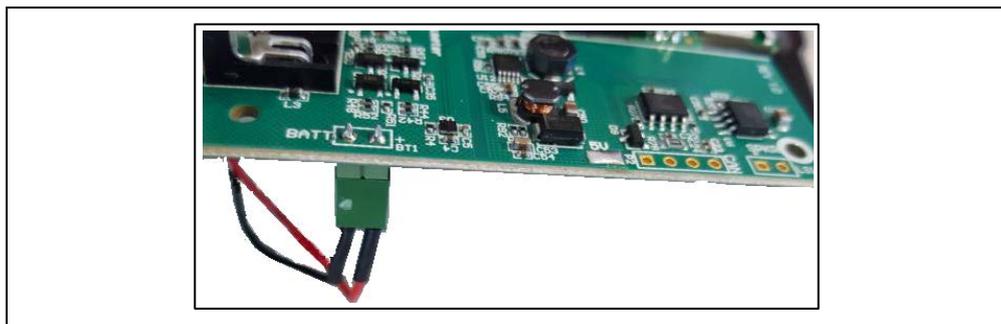
- Step 1.** Attach Synergy S3 Target board (blue) to HRM/SpO2 board (green) and apply pressure until all three connectors are properly attached. S3A7 TB must be programmed for HRM/SpO2 function. Refer to the User Guide for further details.



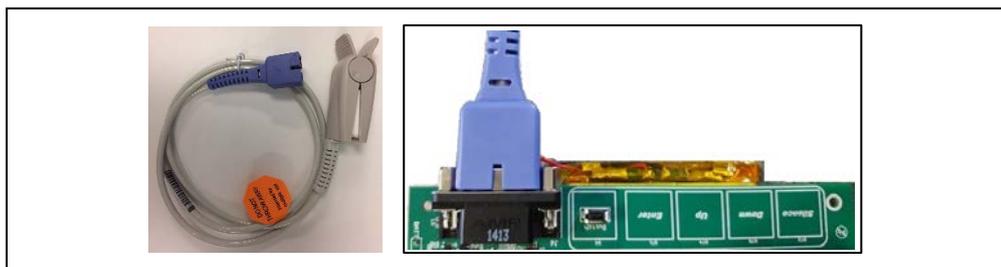
- Step 2.** Insert RL78/G1D BLE PMOD module into the PMOD connector on HRM/SpO2 board.



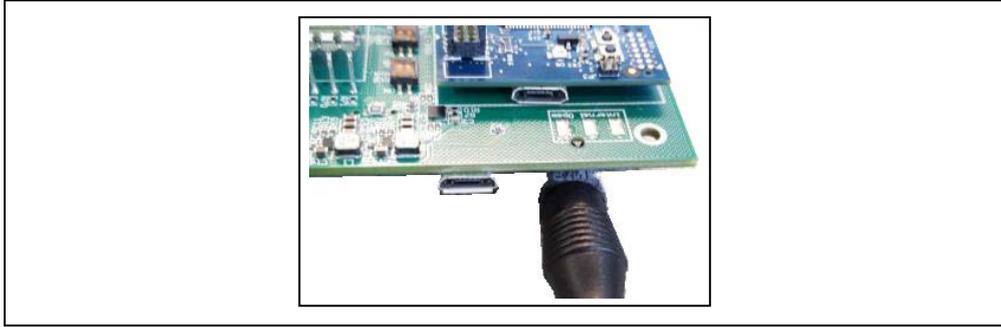
- Step 3.** Connect the battery to the power terminals keeping the polarity in mind (red and black wires to be connected appropriately, R= +ve, B= -ve).



- Step 4.** Connect Pulse Oximeter Probe to board using the provided connector.



Step 5. If power is diminished, connect to the DC adapter to the power jack.



Step 6. Launch Renesas HC Meters Kit smartphone app.

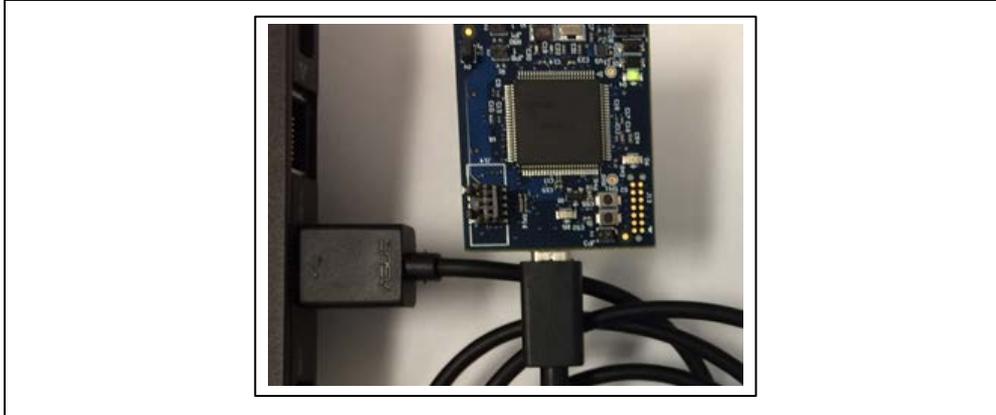
- a. Connect device to smartphone app and select SpO2 tab
- b. Place finger probe on index finger with the wired side on top of your finger
- c. Press Switch S4 to start reading operation
- d. Remain still for 5 – 10 seconds
- e. Oxygen saturation and heart rate readings displayed on the mobile app and LCD.

Step 7. Restart using switch S4 in case of failed operation.

9. Programming to the Synergy add-on board

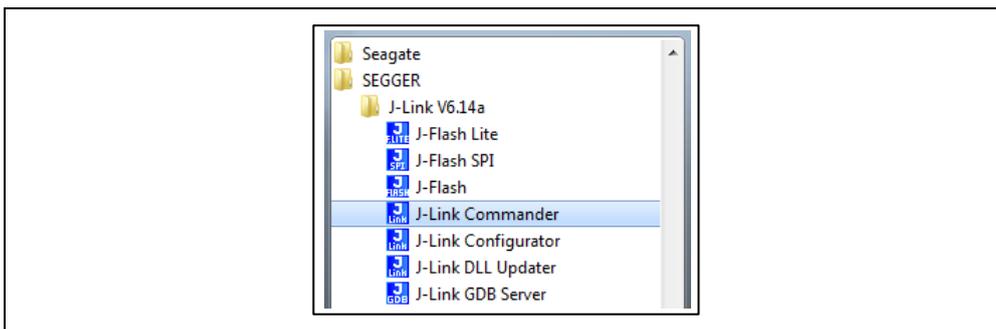
Step 1. Insert shunt jumper at JP2 to the Synergy S3A7 Target board (blue) and attach to PC USB connector via micro USB cable.

Note: setup the Synergy S3A7 board only (not mounted onto application Module known as application Base Board) for programming with on-board J-Link debugger/programmer



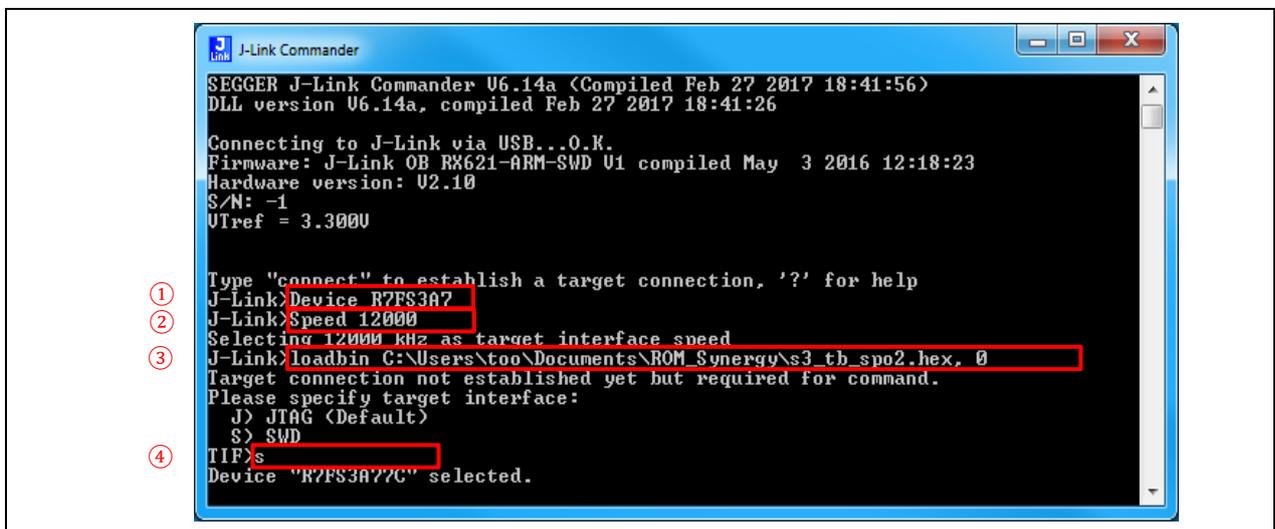
Step 2. Open J-Link Commander from Start menu in All Programs, SEGGER folder.

(Note: SEGGER J-Link download link: <https://www.segger.com/downloads/jlink>)



Step 3. Enter the below commands to program target device.

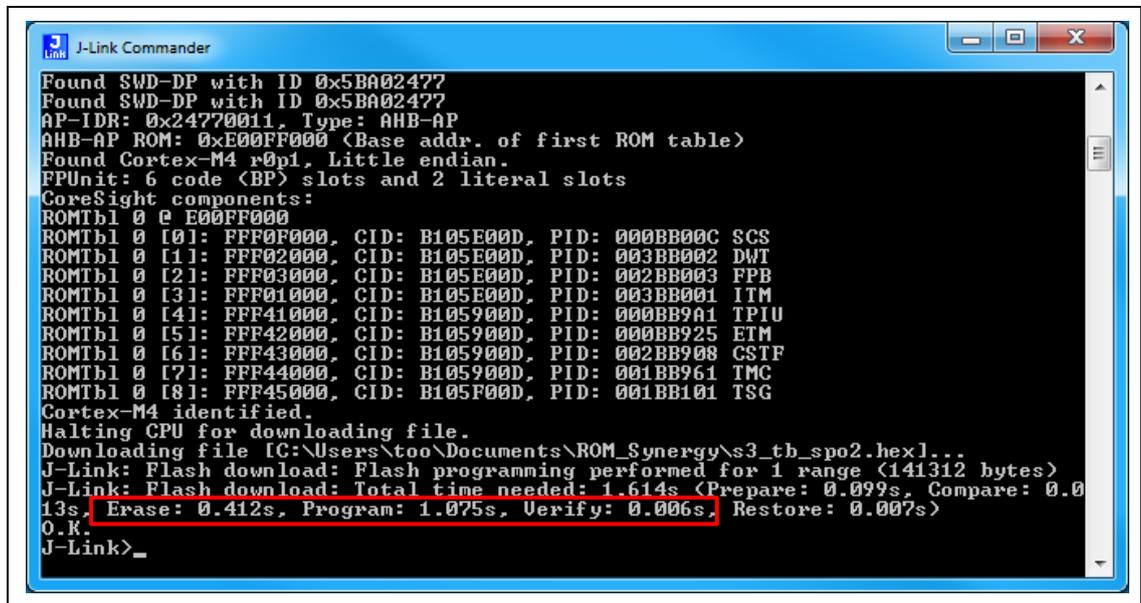
1. Device R7FS3A7
2. Speed 12000
3. loadbin C:\...\ROM_Synergy\file_name.hex, 0
4. s



Step 4. Note: This Healthcare Meters Kit includes following Hex files for respective modules

- a. The Activity Module: activity_monitor.hex
- b. The Blood Glucose Module: blood_glucose.hex
- c. The Blood Pressure Module: blood_pressure.hex
- d. The Heart Rate/Pulse Ox Module: pulse_oximeter.hex

Step 5. After programming, disconnect the target board from PC to evaluate.



Website and Support

Support: <https://synergygallery.renesas.com/support>

Technical Contact Details:

- America: https://renesas.zendesk.com/anonymous_requests/new
- Europe: <https://www.renesas.com/en-eu/support/contact.html>
- Japan: <https://www.renesas.com/ja-jp/support/contact.html>

All trademarks and registered trademarks are the property of their respective owners.

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	May 26, 2017	-	First release

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
 2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other disputes involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawing, chart, program, algorithm, application examples.
 3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
 4. You shall not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copy or otherwise misappropriation of Renesas Electronics products.
 5. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The intended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.
"Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; and industrial robots etc.
"High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.
Renesas Electronics products are neither intended nor authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems, surgical implantations etc.), or may cause serious property damages (space and undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for which the product is not intended by Renesas Electronics.
 6. When using the Renesas Electronics products, refer to the latest product information (data sheets, user's manuals, application notes, "General Notes for Handling and Using Semiconductor Devices" in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat radiation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions or failure or accident arising out of the use of Renesas Electronics products beyond such specified ranges.
 7. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please ensure to implement safety measures to guard them against the possibility of bodily injury, injury or damage caused by fire, and social damage in the event of failure or malfunction of Renesas Electronics products, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures by your own responsibility as warranty for your products/system. Because the evaluation of microcomputer software alone is very difficult and not practical, please evaluate the safety of the final products or systems manufactured by you.
 8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please investigate applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive carefully and sufficiently and use Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
 9. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall not use Renesas Electronics products or technologies for (1) any purpose relating to the development, design, manufacture, use, stockpiling, etc., of weapons of mass destruction, such as nuclear weapons, chemical weapons, or biological weapons, or missiles (including unmanned aerial vehicles (UAVs)) for delivering such weapons, (2) any purpose relating to the development, design, manufacture, or use of conventional weapons, or (3) any other purpose of disturbing international peace and security, and you shall not sell, export, lease, transfer, or release Renesas Electronics products or technologies to any third party whether directly or indirectly with knowledge or reason to know that the third party or any other party will engage in the activities described above. When exporting, selling, transferring, etc., Renesas Electronics products or technologies, you shall comply with any applicable export control laws and regulations promulgated and administered by the governments of the countries asserting jurisdiction over the parties or transactions.
 10. Please acknowledge and agree that you shall bear all the losses and damages which are incurred from the misuse or violation of the terms and conditions described in this document, including this notice, and hold Renesas Electronics harmless, if such misuse or violation results from your resale or making Renesas Electronics products available any third party.
 11. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
 12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.
- (Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.
(Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

(Rev.3.0-1 November 2016)



SALES OFFICES

Renesas Electronics Corporation

<http://www.renesas.com>

Refer to "<http://www.renesas.com/>" for the latest and detailed information.

Renesas Electronics America Inc.

2801 Scott Boulevard Santa Clara, CA 95050-2549, U.S.A.
Tel: +1-408-588-6000, Fax: +1-408-588-6130

Renesas Electronics Canada Limited

9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3
Tel: +1-905-237-2004

Renesas Electronics Europe Limited

Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: +44-1628-585-100, Fax: +44-1628-585-900

Renesas Electronics Europe GmbH

Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.

Room 1709, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100191, P.R.China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.

Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, P. R. China 200333
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited

Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022

Renesas Electronics Taiwan Co., Ltd.

13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.

80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.

Unit 1207, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics India Pvt. Ltd.

No.777C, 100 Feet Road, HAL II Stage, Indiranagar, Bangalore, India
Tel: +91-80-67208700, Fax: +91-80-67208777

Renesas Electronics Korea Co., Ltd.

12F., 234 Teheran-ro, Gangnam-Gu, Seoul, 135-080, Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5141