Renesas Synergy™ Platform

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

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

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
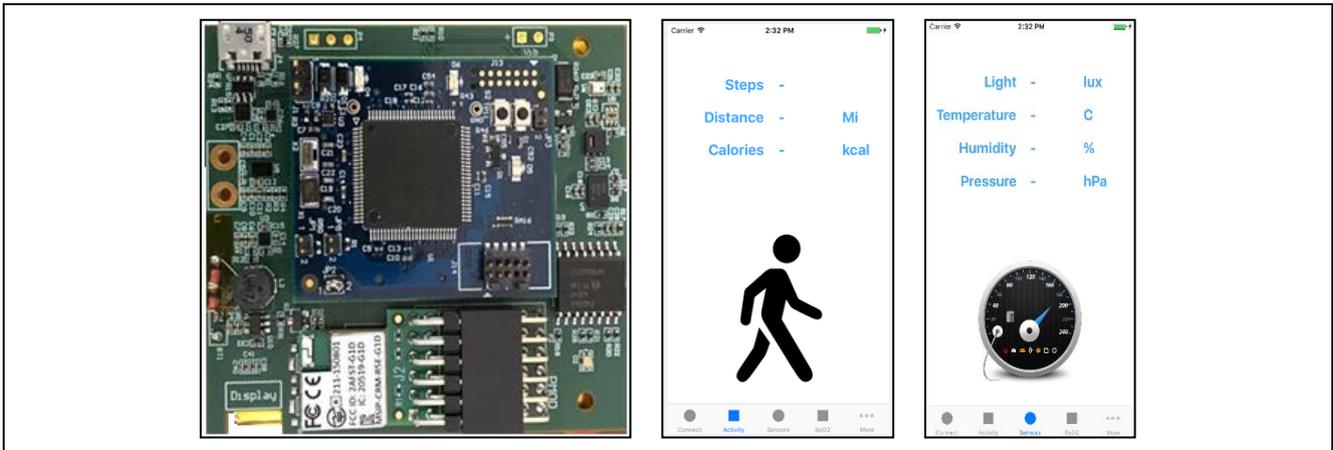
**Figure 3-1   Activity Module with Mobile App snapshot**

3.2   Blood Glucose Module
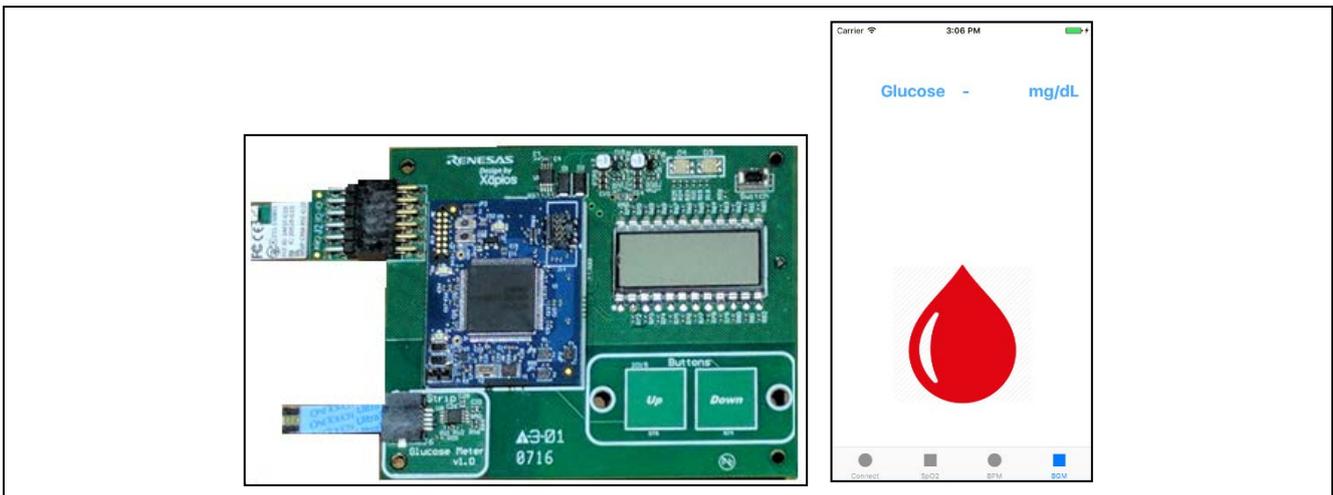
Figure 3-2   Blood Glucose Module with Mobile App snapshot

3.3   Blood Pressure Module

Figure 3-3   Blood Pressure Module with Mobile App snapshot

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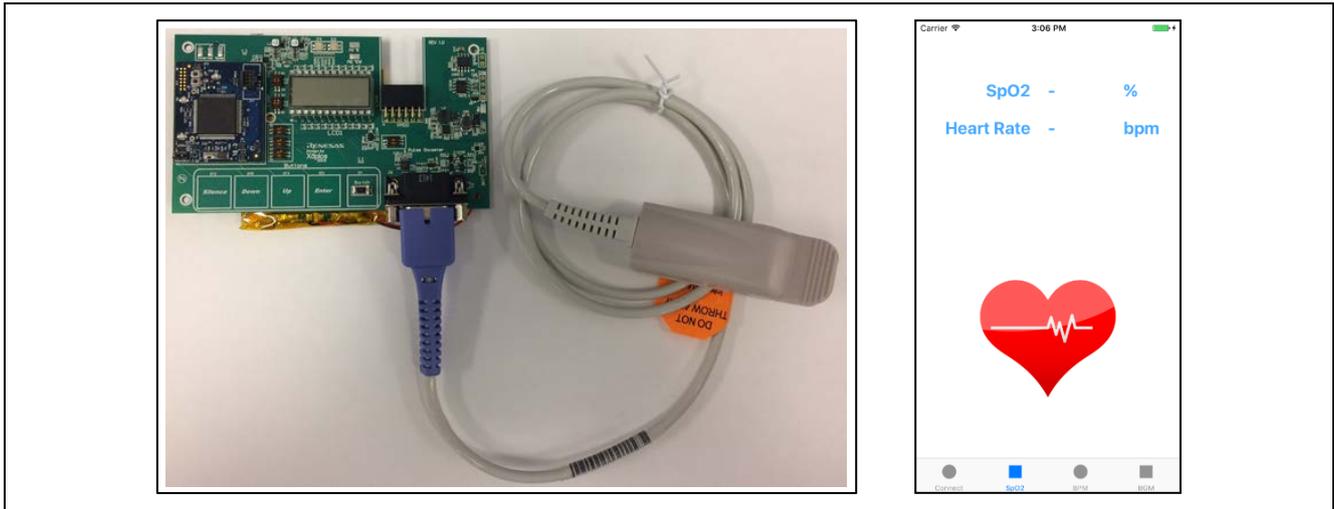
Figure 3-4   Heart Rate/Pulse Ox Module with Mobile App snapshot

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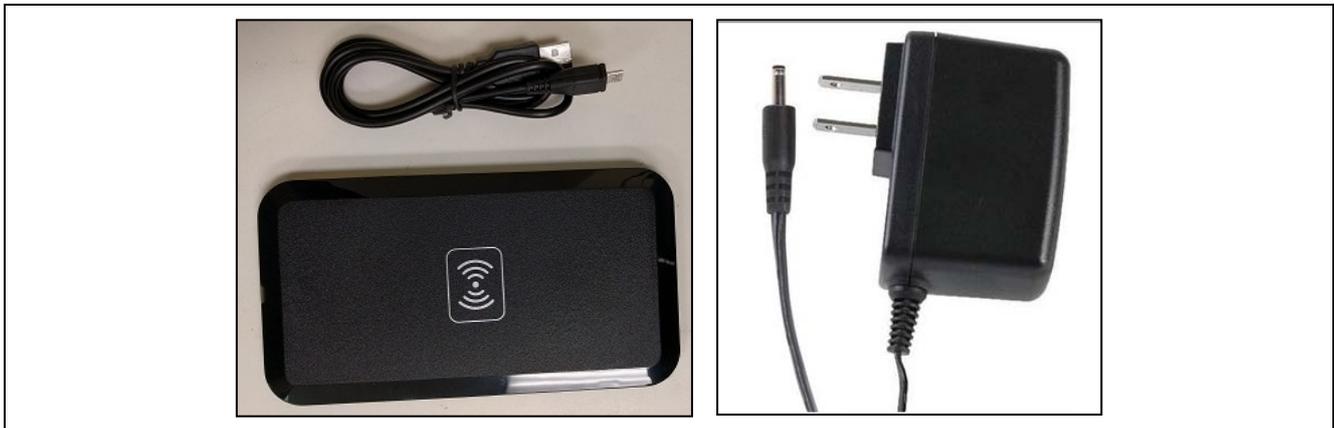
Figure 3-5   Micro USB charging cable with Qi Wireless Inductive Charger & 5V DC Adapter

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:
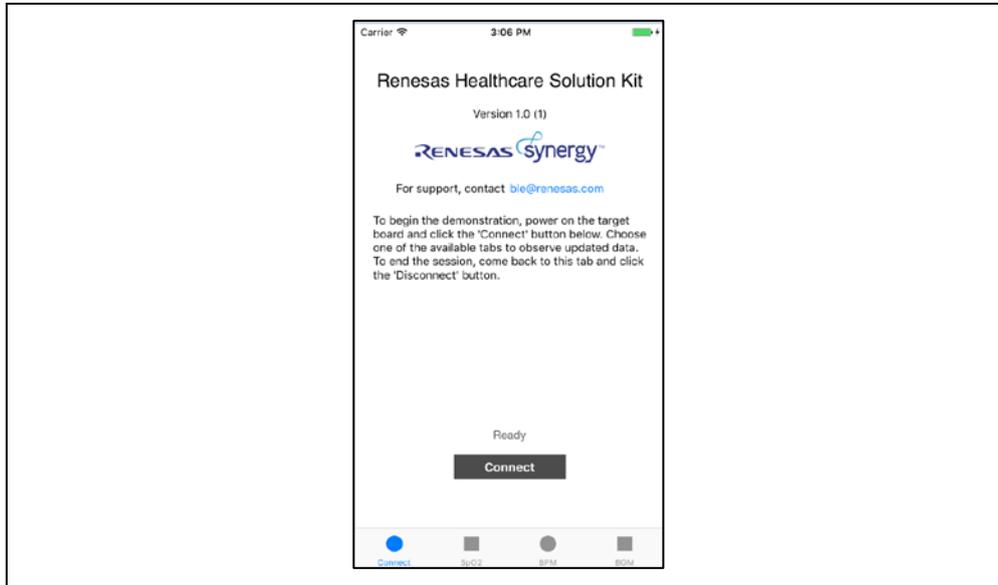
3) Click on Connect to establish Bluetooth link and the message Ready will change to Connected.

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**
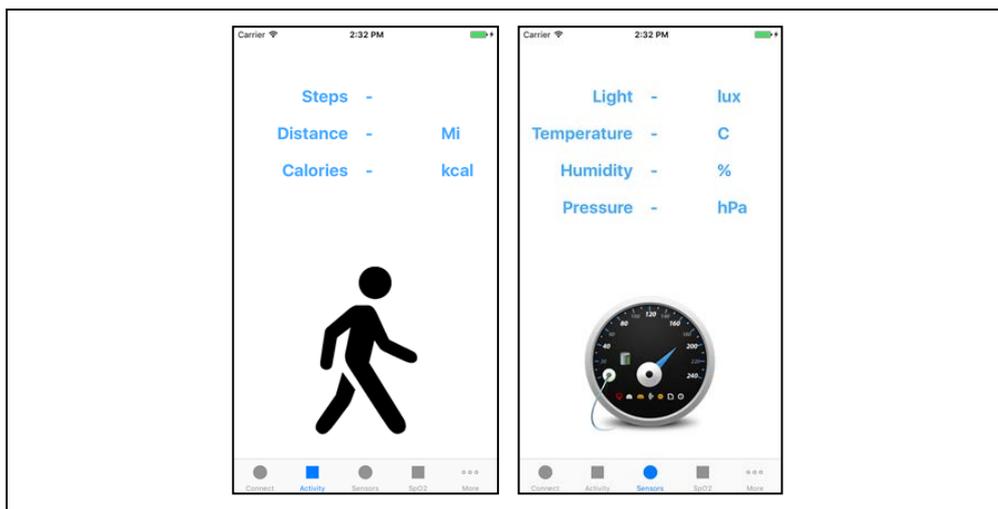
b. BGM (Blood Glucose Meter)

c. BPM (Blood Pressure Meter)
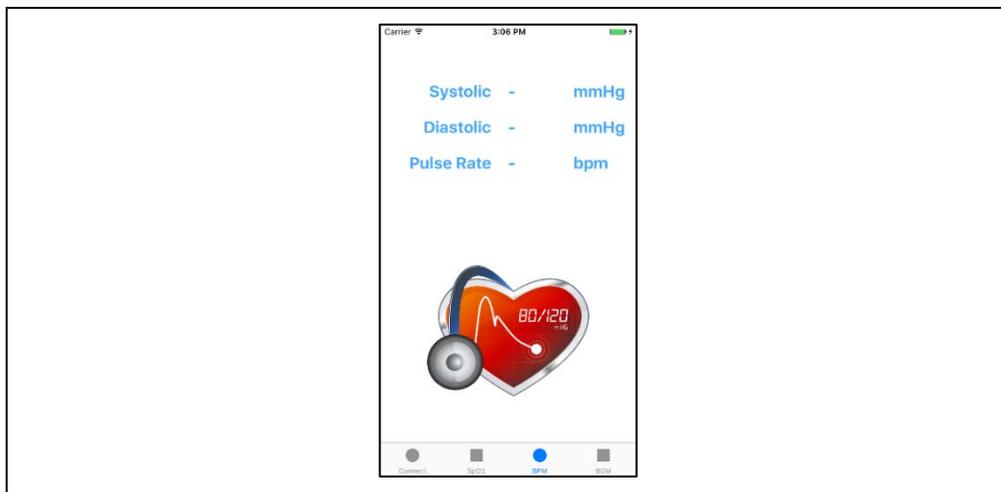
d. HRM/SpO2
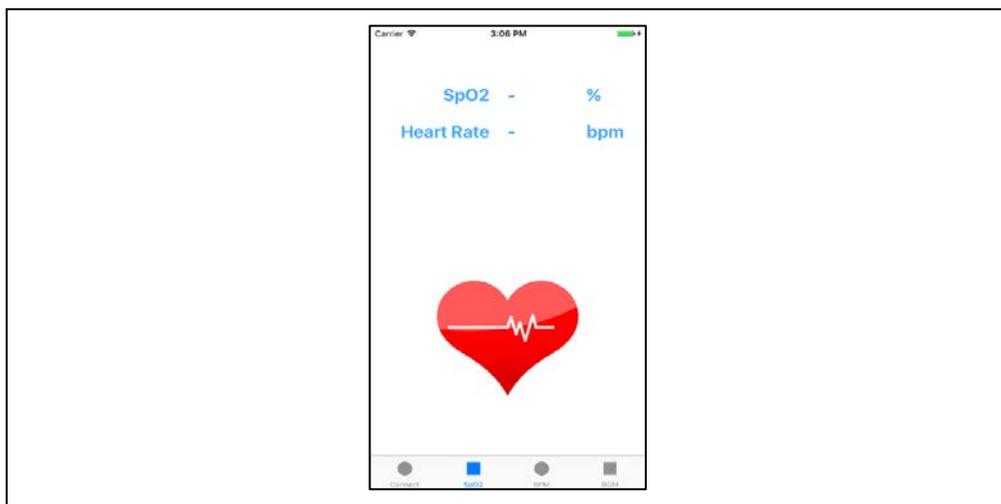
5) Mobile app displays the status of the module, action to be taken by the user or the reading for the vital measurement taken. It is a very intuitive user interface.

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.
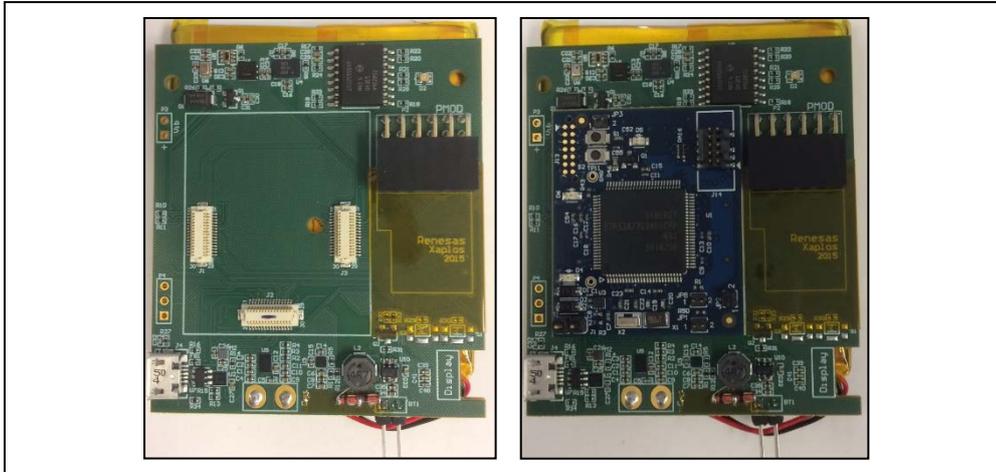
Step 2.   Insert RL78/G1D BLE PMOD module into the PMOD connector on Activity board.
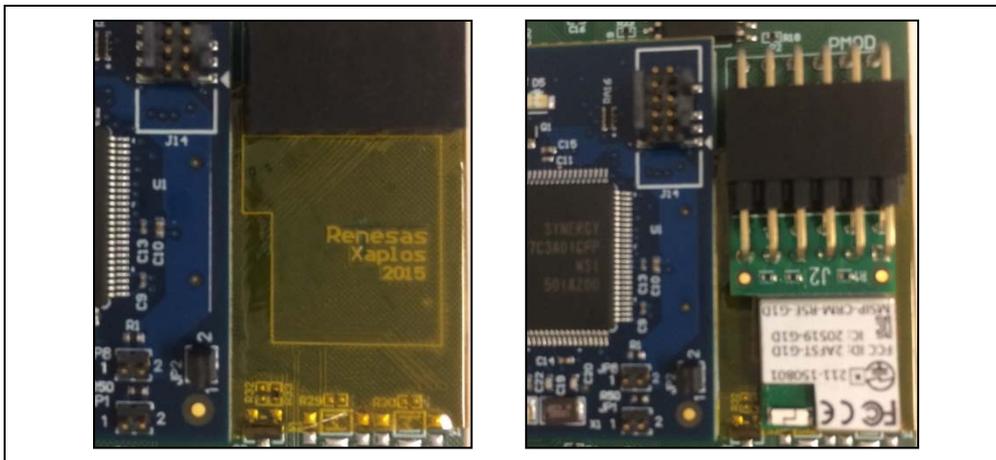
*Step 3.*   Connect the battery to the power terminals keeping the polarity in mind (red and black wires to be connected appropriately). If the power is properly available some LEDs will light up.

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.
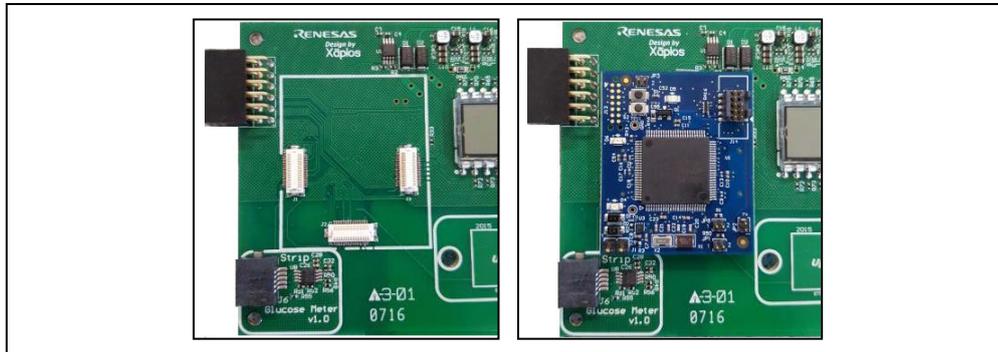

Step 2.   Insert RL78/G1D BLE PMOD module into the PMOD connector on BGM board.
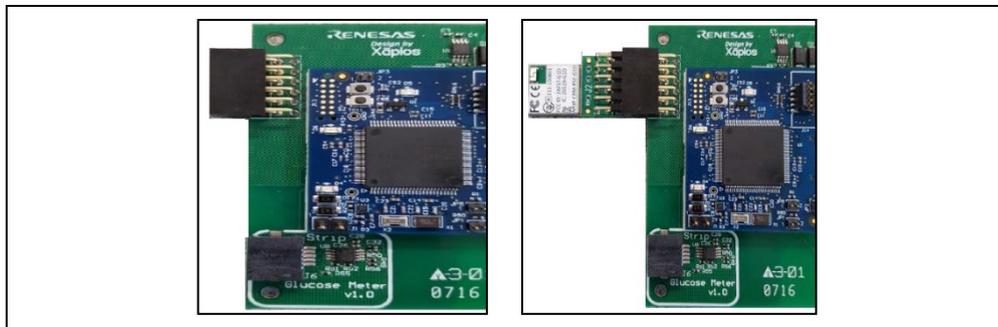
Step 3.   Insert coin cell battery or connect DC adapter to the power jack.
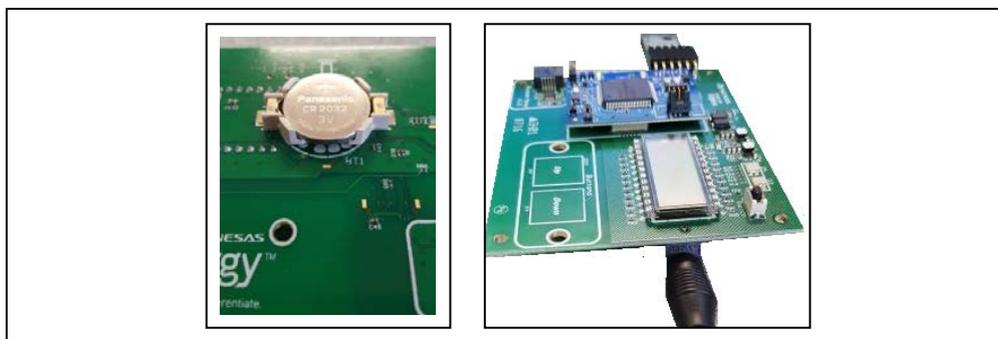
Step 4.   Launch Renesas HC Meters Kit smartphone app

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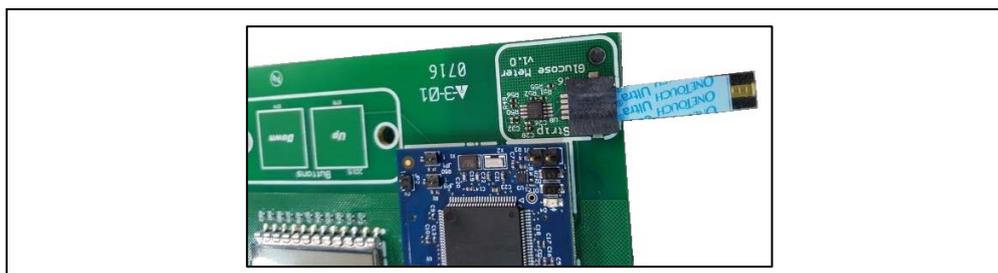
d. Apply *ONETOUCH®* control solution to test strip

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.
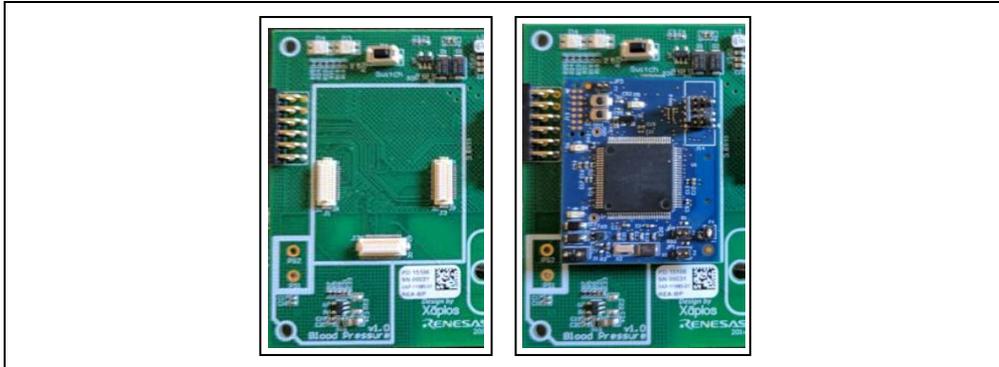
Step 2.   Insert RL78/G1D BLE PMOD module into the PMOD connector on BPM board.
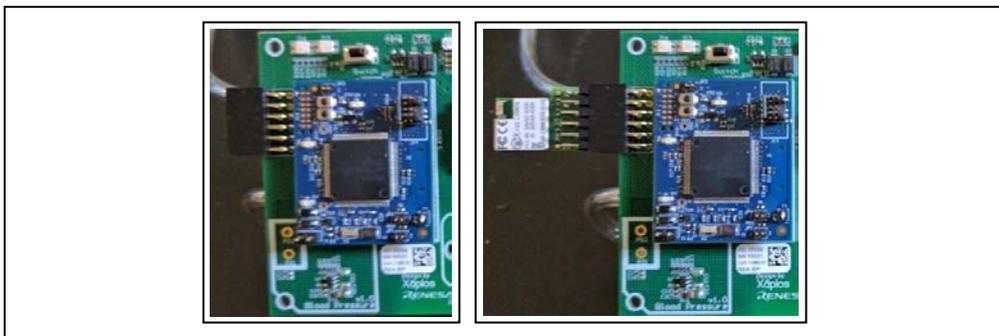
Step 3.   Insert 3 AAA batteries or connect DC adapter to the power jack.
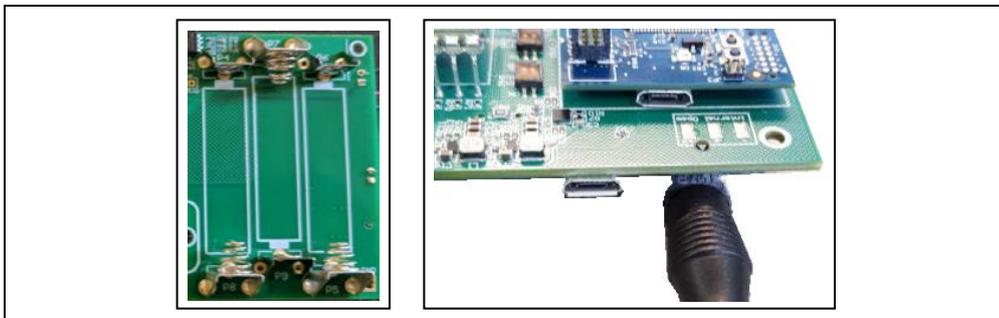
Step 4.   Fully assembled unit should look like below with tubes and arm cuff.
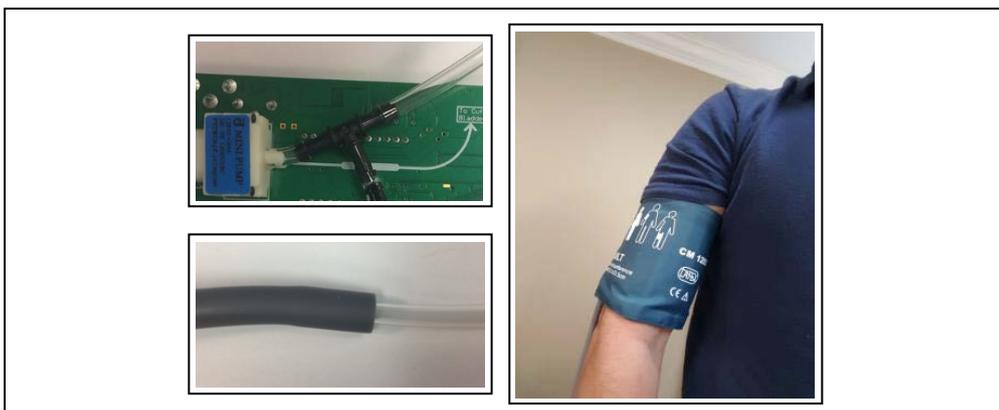
Step 5.   Launch Renesas HC Meters Kit smartphone app

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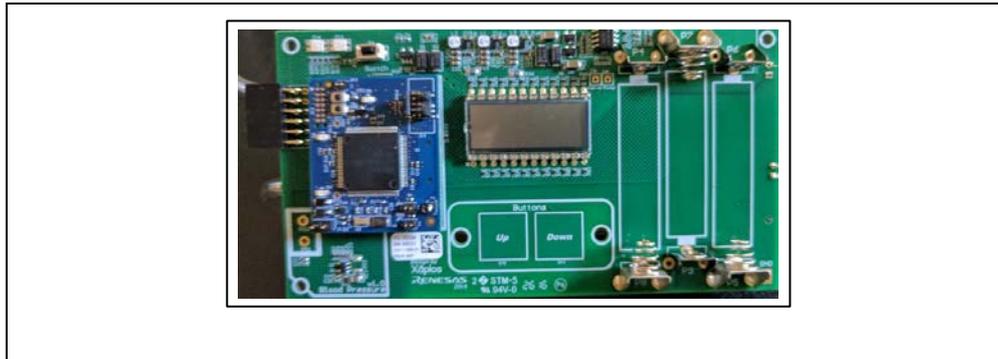
Step 6.   Note: There can be variability from unit to unit due to differences in tube lengths and arm cuffs. There is a patch available in the software package to calibrate each unit.

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.
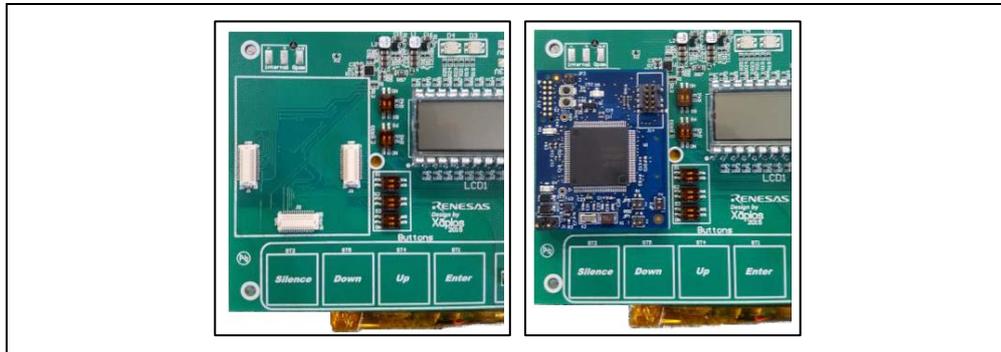
Step 2.   Insert RL78/G1D BLE PMOD module into the PMOD connector on HRM/SpO2 board.
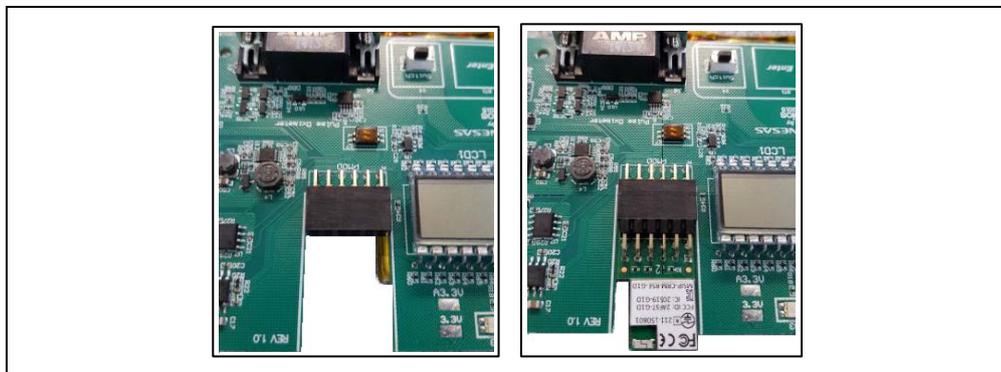
Step 3.   Connect the battery to the power terminals keeping the polarity in mind (red and black wires to be connected appropriately, R= +ve, B= -ve).
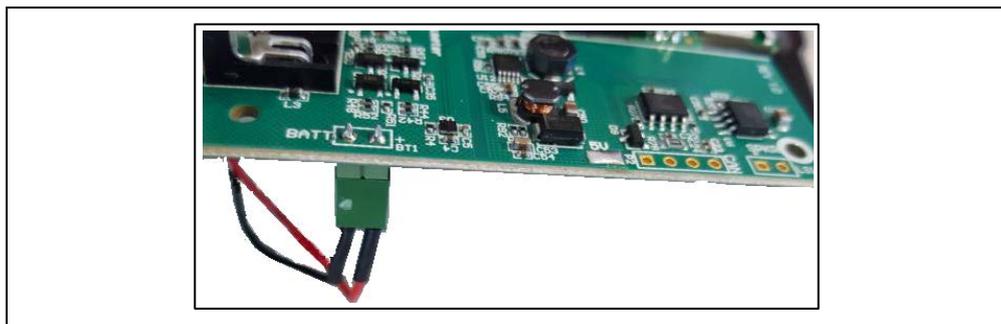
Step 4.   Connect Pulse Oximeter Probe to board using the provided connector.
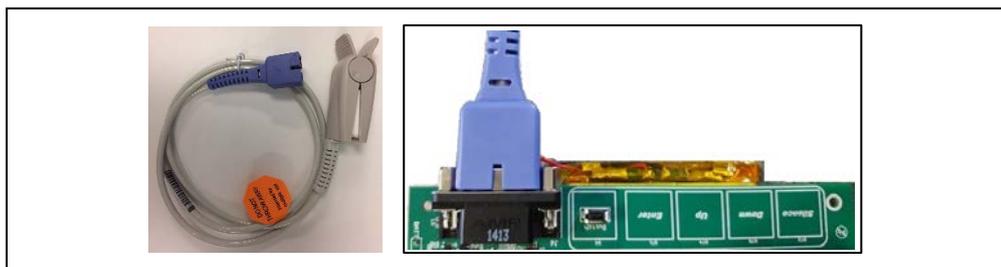
Step 5. If power is diminished, connect to the DC adapter to the power jack.
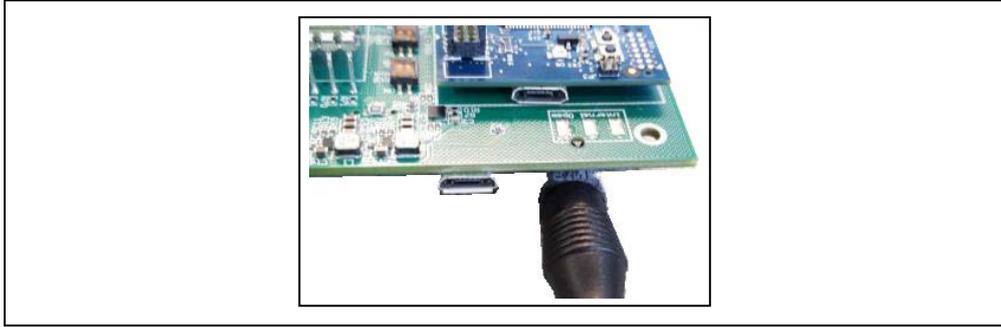
Step 6. Launch Renesas HC Meters Kit smartphone app.

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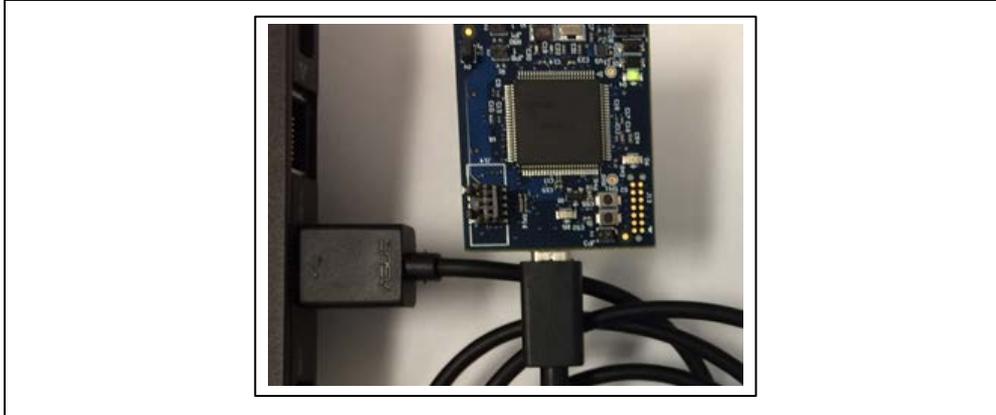
Step 2. Open J-Link Commander from Start menu in All Programs, SEGGER folder.

(Note: SEGGER J-Link download link: https://www.segger.com/downloads/jlink)
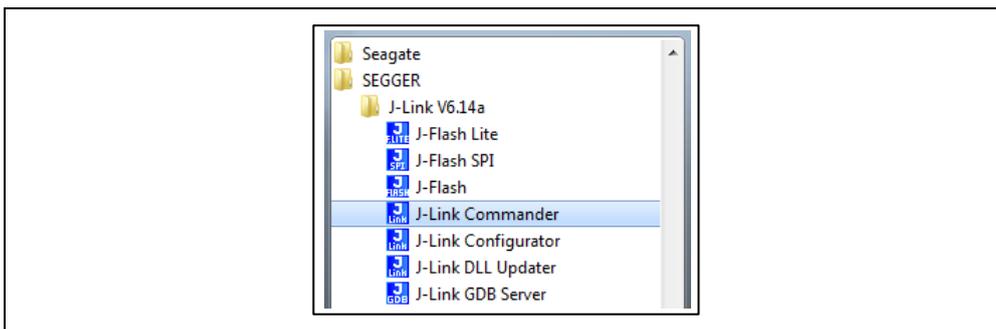
Step 3. Enter the below commands to program target device.
1. Device R7FS3A7
2. Speed 12000
3. loadbin C:\...\ROM_Synergy\file_name.hex, 0
4. s
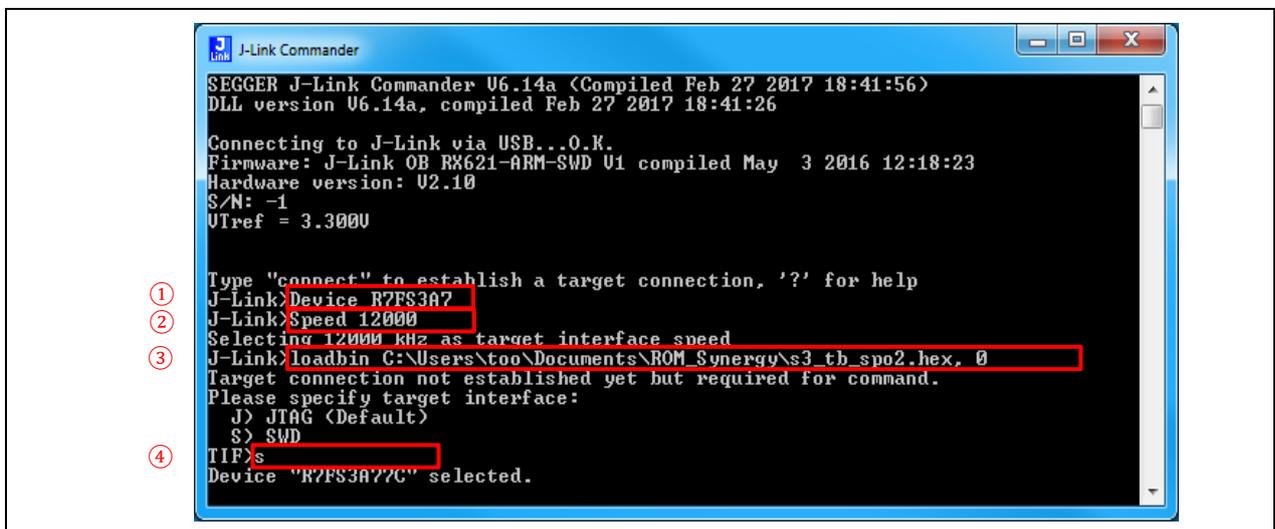
Step 4. Note: This Healthcare Meters Kit includes following Hex files for respective modules

    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.
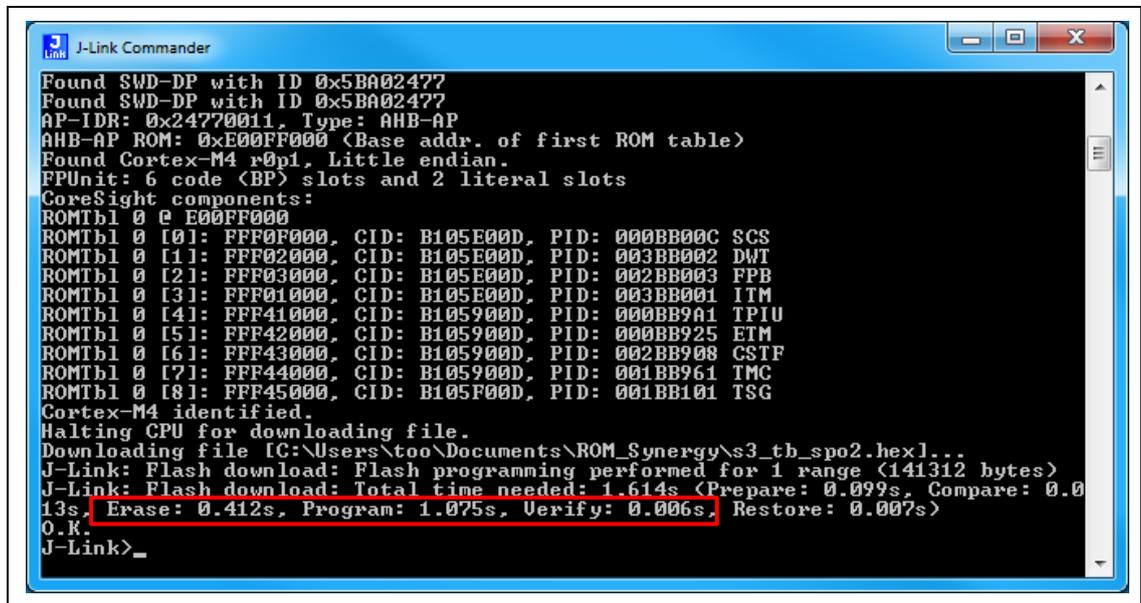
Website and Support

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

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Revision History

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

RENESAS

Renesas Electronics Corporation

http://www.renesas.com