M13-RA6M3-EK

RA6M3 (Cortex-M4)
m13_ra6m3_ek_server_demo

Application Note Guide

Updated on the: 16 Jul. 21	Board name:	**M13-RA6M3-EK**
	MCU:	R7FA6M3AH3CFC
	Version	1.0.1

TABLE OF CONTENT

1 INTRODUCTION

This application guide describes how to install the needed development tools/software, download the needed project, load it into the software environment and debug it with the M13-RA6M3-EK evaluation kit. The demo project **m13_ra6m3_ek_server_demo** is based on Oryx TCP/IP stack CycloneTCP.

1.1 PROJECT BRIEF DESCRIPTION

The project will demonstrate you how the board's Accelerometer and Potentiometer states are streamed through an ethernet local network and displayed on a web page. The following table shows you which hardware features of the board are being used in this demo.

Table 1. M13-RA6M3-EK Feature used

32Mbyte external SDRAM	✓
16Kbit I²C EEPROM	✗
4.3-inch 480x272 TFT LCD with capacitive touch panel	✓
USB Interface	✗
LAN Interface	✓
SD/MMC Host Interface	✗
I2S Audio codec	✗
3-Axis accelerometer	✓
On-board JLINK-OB debugger with VCOM	✓
8bit camera	✗
Mikrobus	✗
PMOD	✗
Mono-turn 10KΩ Potentiometer	✓
User led	✓
User switch and 1 x Reset switch	✓

Table 2 shows you by default, which option of the bsp is enabled/disabled for this project. These configurations can be switched in the **m13_ra6m3_ek_config.h** file at any time. Check section 6.3 Software configurations for the complete details.

Table 2. M13-RA6M3-EK software configuration

ENABLE_HEAP_IN_SDRAM	✗
ENABLE_LCD_BUFFER_IN_SDRAM	✗
ENABLE_LCD_DOUBLE_BUFFER	✓
ENABLE_LCD_GRAPHIC_LAYER2	✗

2 REQUIRED RESOURCES

2.1 DEVELOPMENT TOOLS AND SOFTWARE

- IDE: e2studio 2021-01 or greater
- Tool Chain: GNU ARM Embedded Toolchain 9-2019-q4-major
- Renesas Flexible Software Package (FSP) V3.1.0
- Serial Terminal (Free Serial Port Terminal, PuTTY)

2.2 HARDWARE

- M13design M13-RA6M3-EK Evaluation Kit
  https://www.m13design.fr/products/M13-RA6M3-EK.html
- USB cable: Micro-B male to USB-A male
- Ethernet Cable
- Ethernet Hub/switch

2.3 RELATED DOCUMENTS

- Getting Started Guide for e2studio for RA
  https://www.renesas.com/us/en/document/man/getting-started-guide-e2-studio-ra?language=en&r=488826

- Renesas Flexible Software Package (FSP) v3.1.0 User's Manual
  https://www.renesas.com/us/en/document/mas/renesas-flexible-software-package-fsp-v310-users-manual?language=en

- Renesas RA6M3 Group User’s Manual
  https://www.renesas.com/eu/en/document/man/ra6m3-microcontroller-group-users-manual?language=en&r=1054166

- M13-RA6M3-EK schematic
  https://www.m13design.fr/download/pdf/M13design_M13-RA6M3-EK_Schematic.pdf

- M13-RA6M3-EK User manual
  https://www.m13design.fr/download/pdf/M13design_M13-RA6M3-EK_User_Manual.pdf

3 DOWNLOAD AND INSTALLATION

3.1 E²STUDIO

The e2studio IDE is downloadable here https://www.renesas.com/us/en/software-tool/e-studio

Make sure to have Renesas account or create one before downloading

Refer to the “Getting Started Guide for e2studio for RA” section 2 for a compete installation guide.

3.2 PROJECT DEMO

You can find the **http_server_demo** project for the M13-RA6M3-EK board to download here:
https://www.m13design.fr/download/software/m13_ra6m3_ek_http_server_demo.zip

3.3 SERIAL TERMINAL CONFIGURATION

Make sure to launch your Serial Terminal program with the following configuration:

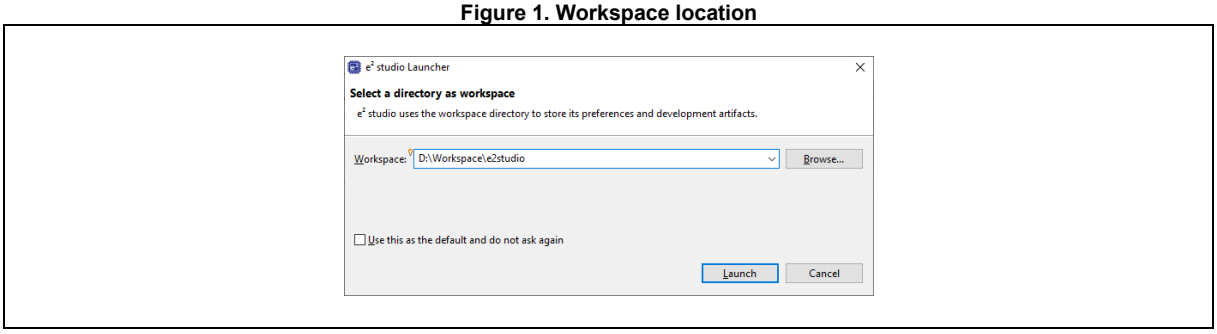
- Baud Rate: 115200
- Data Bits: 8
- Parity: None
- Stop Bits: 1
- Flow Control: None
- COM Port: As detected in your Windows™ Device Manager

4 IMPORTING THE DEMO PROJECT

4.1 STEP1: LAUNCH E²STUDIO

Assuming you have e²studio installed, launch the software and enter a workspace location as shown in Figure 1 below than click "**launch**" and wait until the environment is fully loaded.

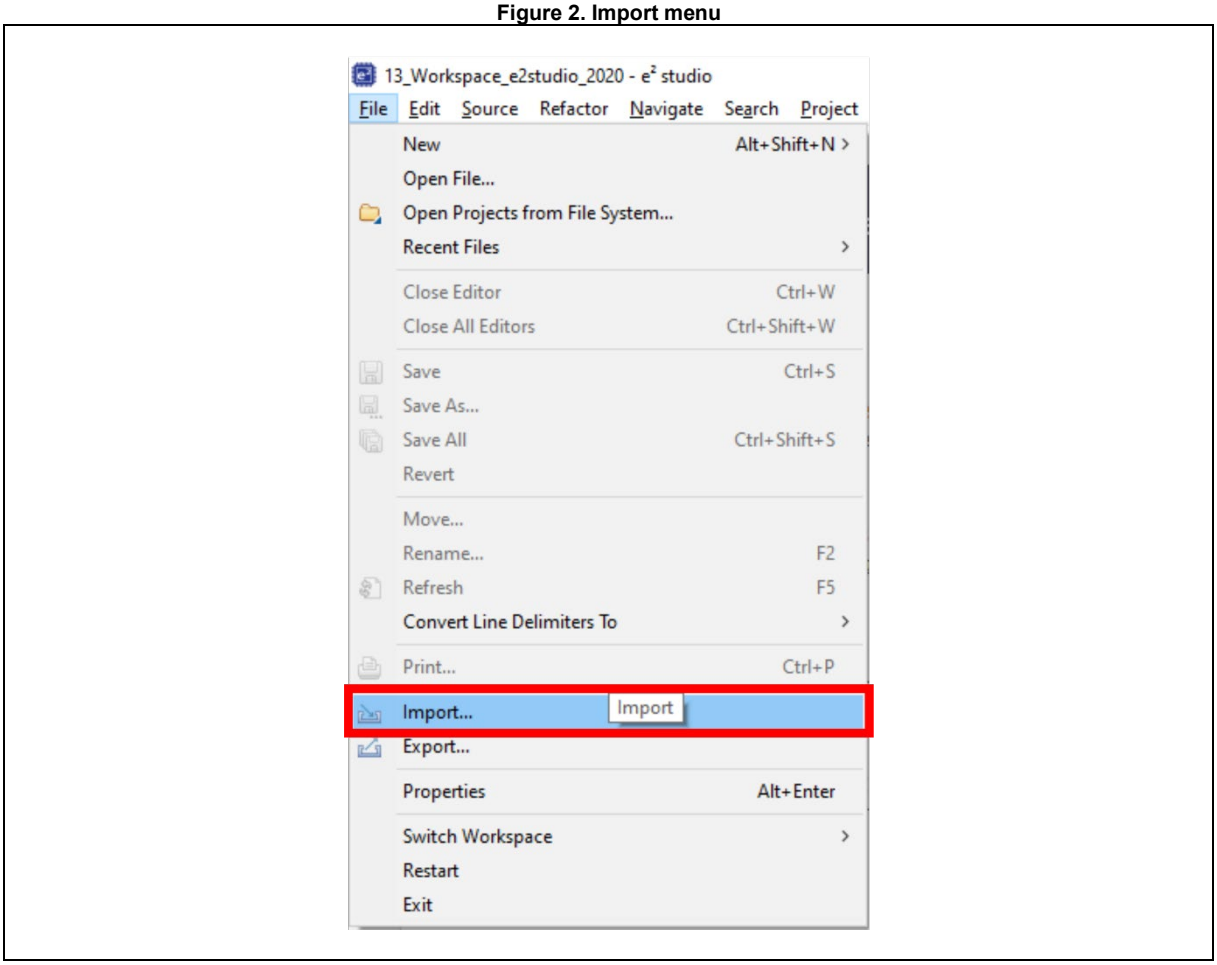
Figure 1. Workspace location



4.2 STEP2: FILE/IMPORT

To import the previously downloaded project, in the top menu, click on "**File**" and choose the "**import**" option in the dropdown menu as shown in the Figure 2 below.

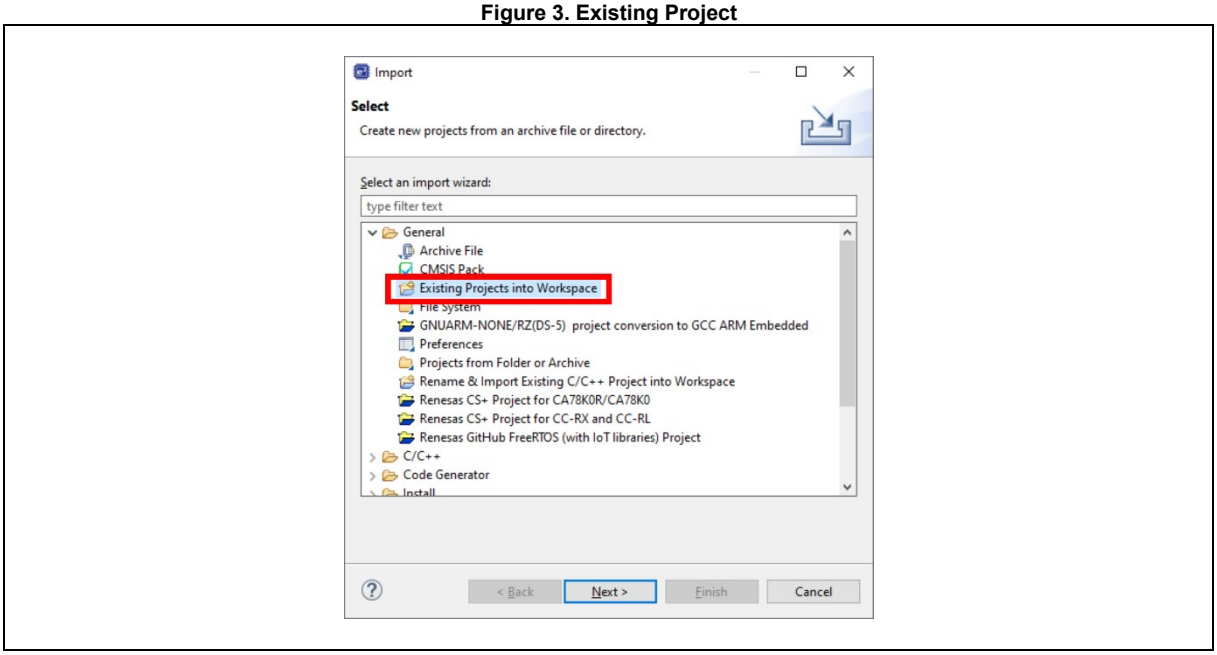
Figure 2. Import menu



4.3 STEP3: EXISTING PROJECT

From the “**Import**” popup box, select in the “**General**” file section the option “**Existing Projects into Workspace**” and click “Next”

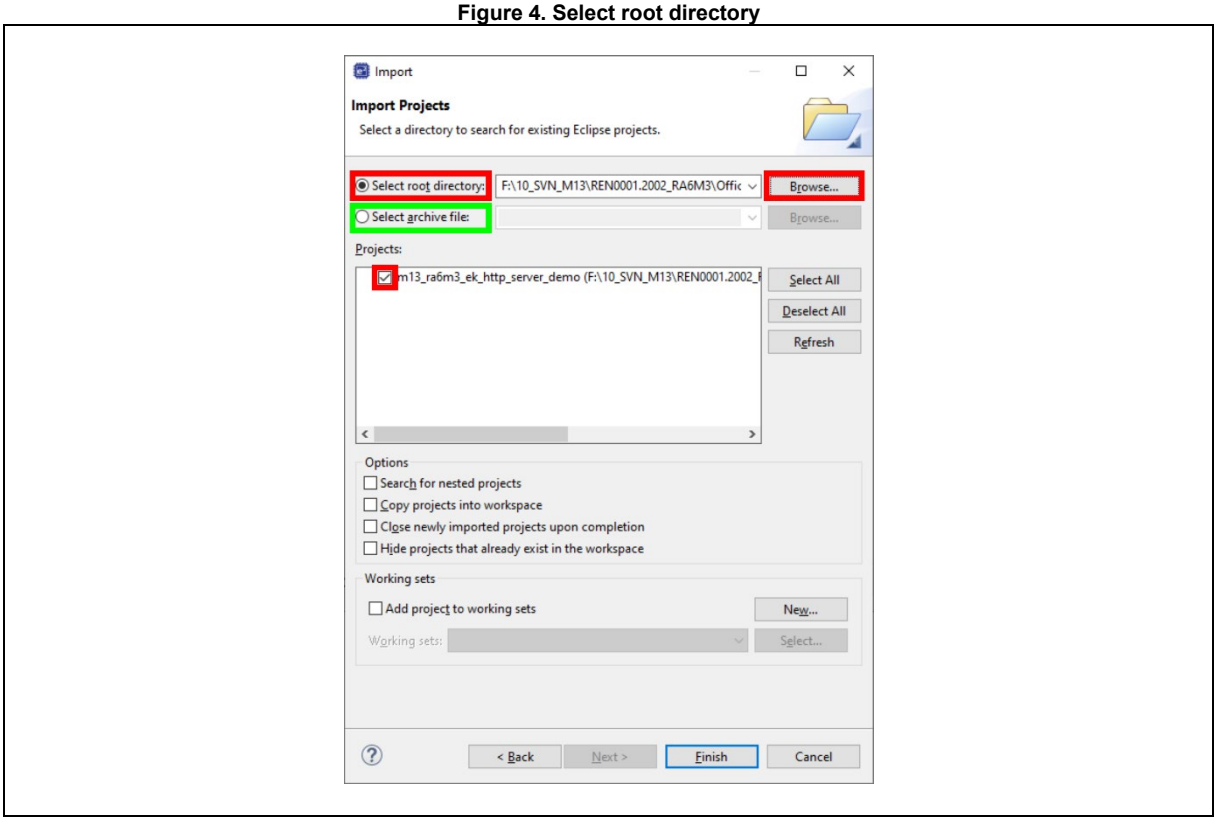
Figure 3. Existing Project



4.4 STEP4: PROJECT LOCATION

In the next box, select your project location by clicking on the “**Browse**” button on the right side as shown in Figure 4. If preferred, you can import an archived project instead by checking the “**Select Archive file**” mark. In both cases, make sure the project is checked in the “**Project**” area. Any other options can be left unmarked and click the “**Finish**” button down below.

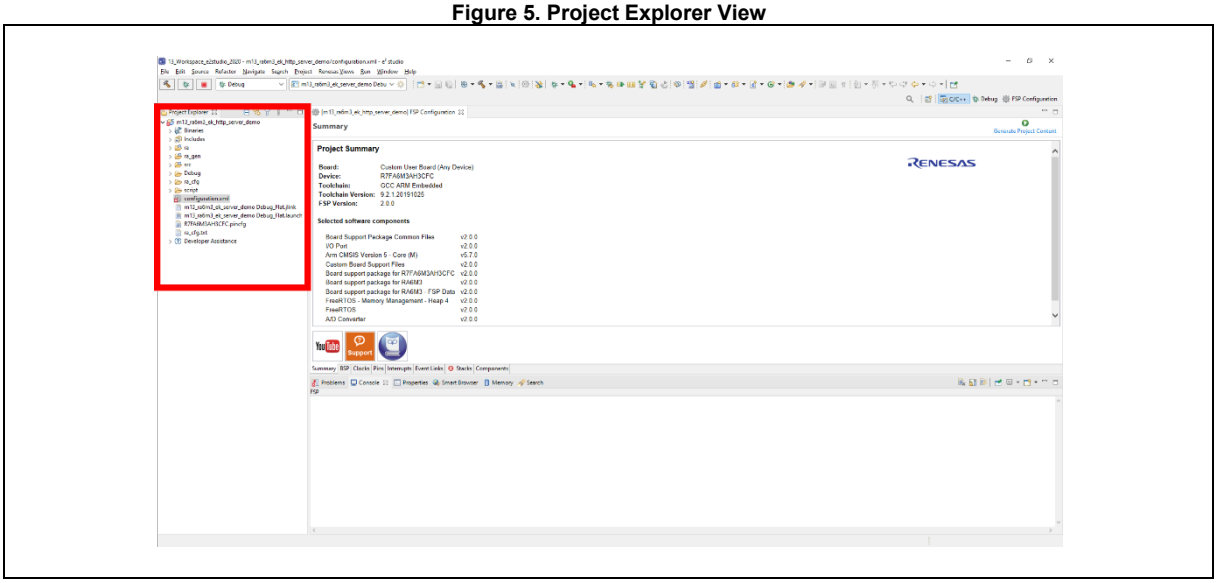
Figure 4. Select root directory



4.5 STEP5: PROJECT EXPLORER VIEW

Close the “**Welcome**” page if you haven’t done it yet and you should see your newly imported project on the left side “**Project Explorer view**” as shown in Figure 5.

Figure 5. Project Explorer View



4.6 STEP6: NETWORK CONFIGURATION (OPTIONAL)

By default, the demo is configurated in DHCP mode and should acquire an IP address automatically when connected to your network.

Should you need to switch to static IP address mode, change the **APP_USE_HDCP_CLIENT** macro from “ENABLED” to “DISABLED” and then manually configure the following Ethernet Interface to match your need.

These below configurations can be found in the **file src>>main_thread_entry.c**

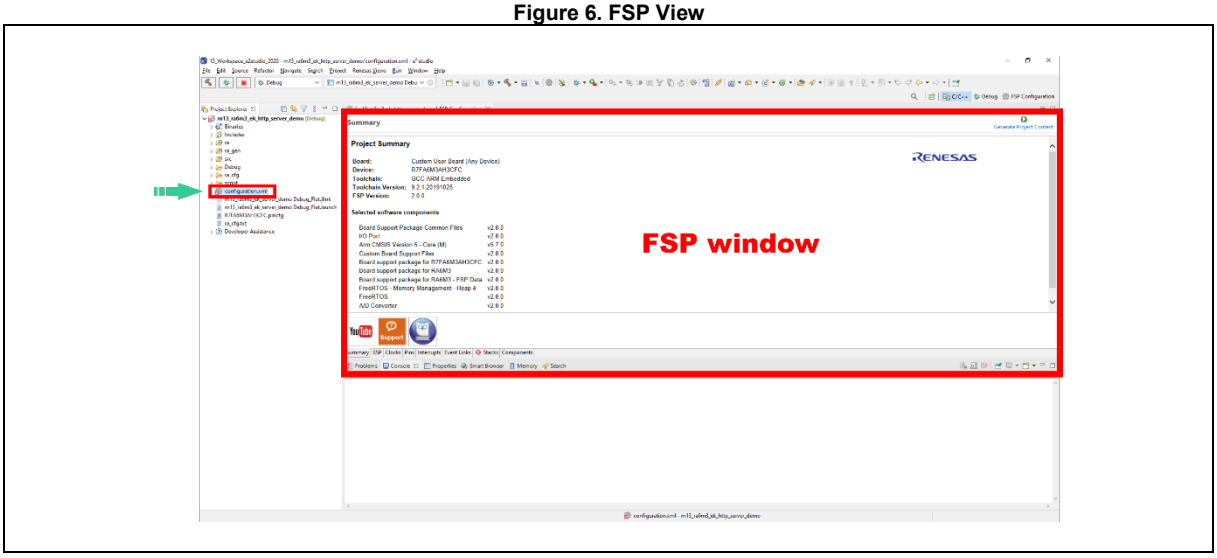
- `APP_USE_DHCP_CLIENT ENABLED`
- `APP_IPV4_HOST_ADDR "192.168.0.20"`
- `APP_IPV4_SUBNET_MASK "255.255.255.0"`
- `APP_IPV4_DEFAULT_GATEWAY "192.168.0.254"`
- `APP_IPV4_PRIMARY_DNS "8.8.8.8"`
- `APP_IPV4_SECONDARY_DNS "8.8.4.4"`

5 GENERATE, BUILD AND DEBUG

5.1 STEP1: FSP INTERFACE

Before building the project, you need to generate the missing project files (APIs and such) from the FSP interface. In order to do so, from the “Project Explorer view”, click on “configuration.xml” as pointed by the green arrow in the below figure. (If the FSP does not open correctly, this time right click on “configuration.xml” and go to **Open with > FSP Configuration Editor**). The FSP window should appear as shown in Figure 6.

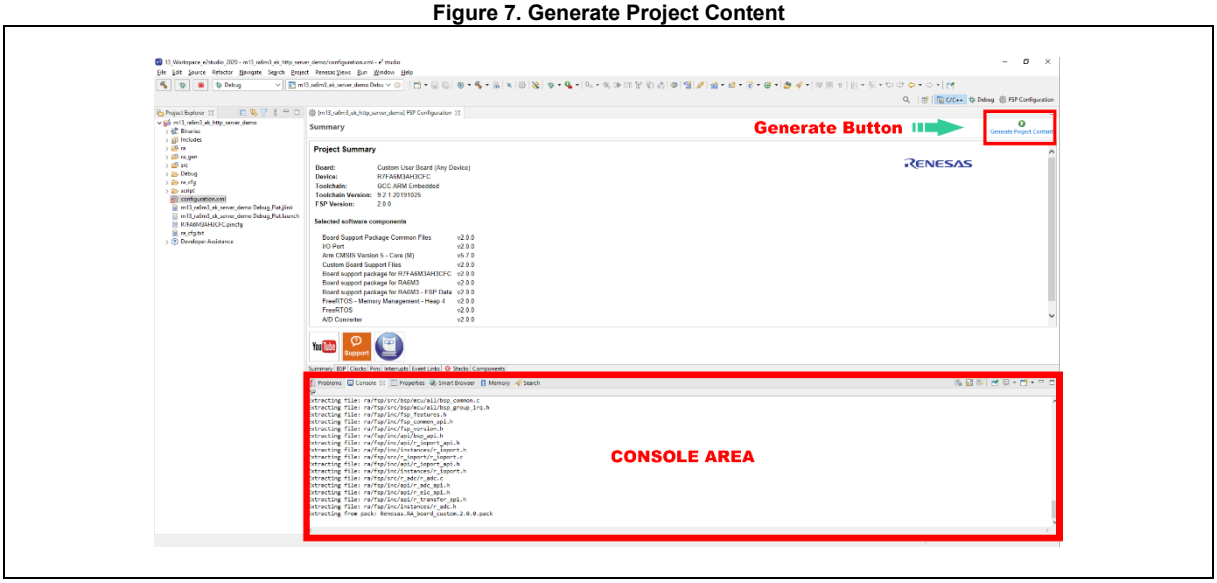
Figure 6. FSP View



5.2 STEP2: GENERATE

Make sure the “Console Tab” is activated in the bottom view then in the top right corner on the FSP window section click on the “Generate Project Content” button. The generated files should output in the “Console view/area” as they are generated.

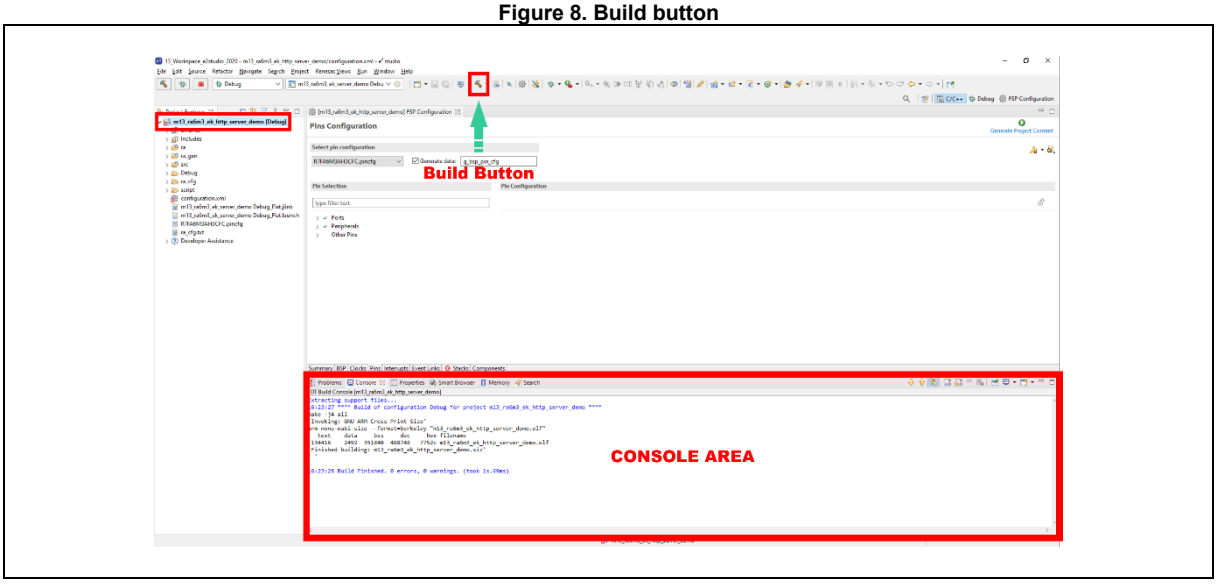
Figure 7. Generate Project Content



5.3 STEP3: BUILD

From here on we can build the project. If you have more than one project in your workspace, make sure to select the project to be built in the “Project Explorer view” then click on the “Build” Icon in the top menu as shown in Figure 8. The build result should output “*Build Finished. 0 errors, 0 warnings*” in the “Console view”.

Figure 8. Build button



5.4 STEP4: DEBUG

Before launching the debug session, make sure the M13-RA6M3-EK board is connected to your computer via the USB connector CN5 as shown in Figure 9.

Figure 9. Connecting the board to the computer

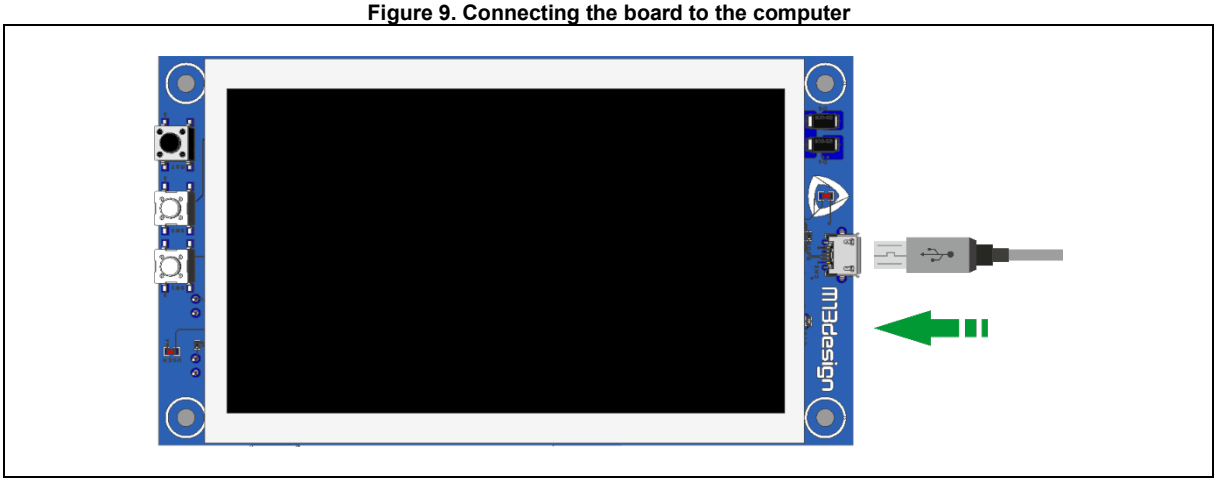
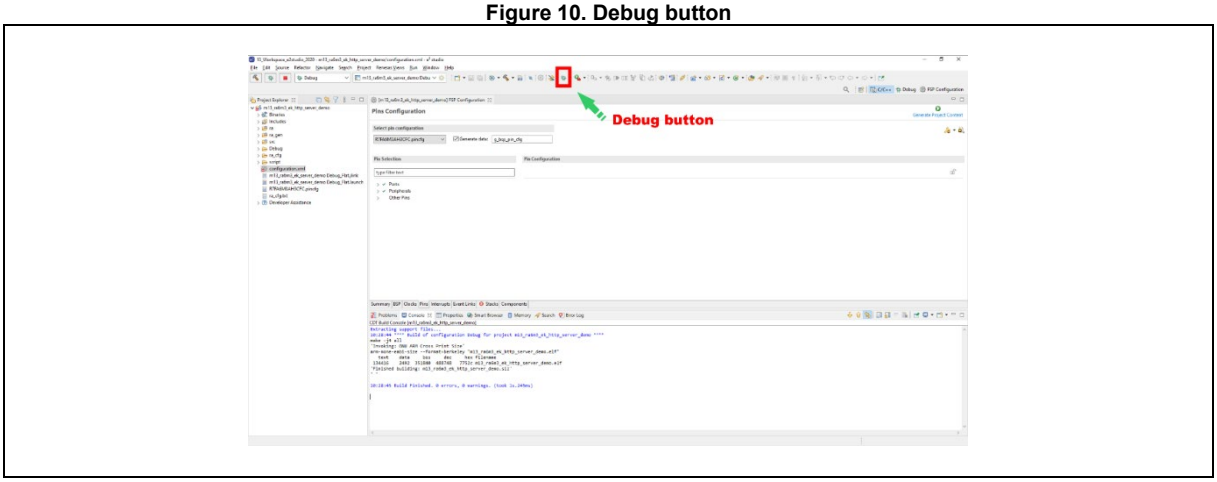


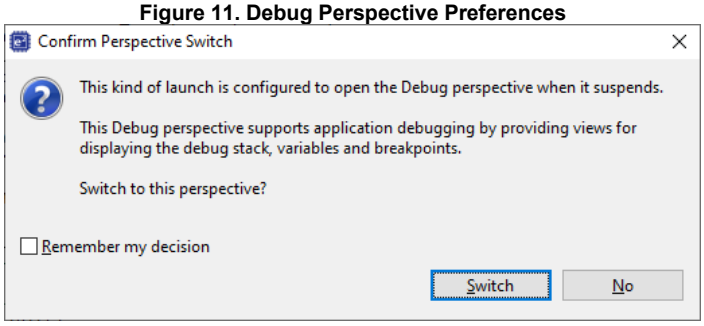
Figure 10. Debug button



Click on the dropdown arrow just right to the "**Debug**" button as shown in Figure 10 and choose the "**debug as>3 Renesas GDB Hardware Debugging**" option.

On the next window choose your debug view preference to finish the launch of the debug session as shown in Figure 11.

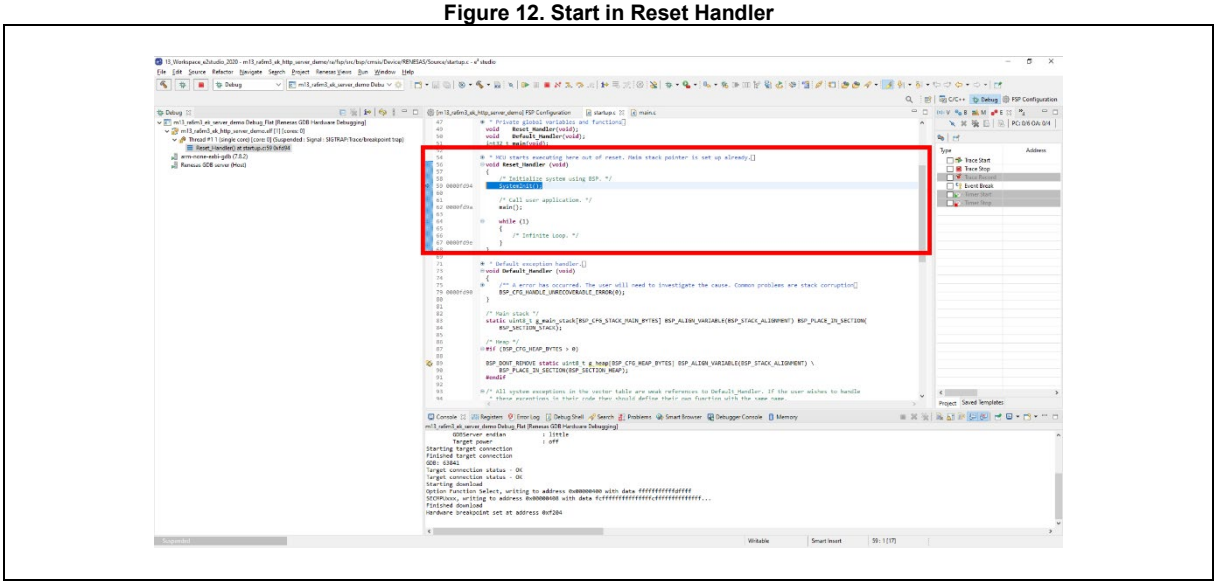
Figure 11. Debug Perspective Preferences



5.5 STEP5: START

Before starting the debug, make sure your serial terminal client is activated and configurated as described in section 3.3 Serial Terminal configuration in order to see the demo debug messages. As shown in Figure 12, your starting point should be in the Reset Handler. A fist click on the "**Resume**" button (**Shortcut F8**) should take you to the main function. A second click on the "**Resume**" button should start the demo for good.

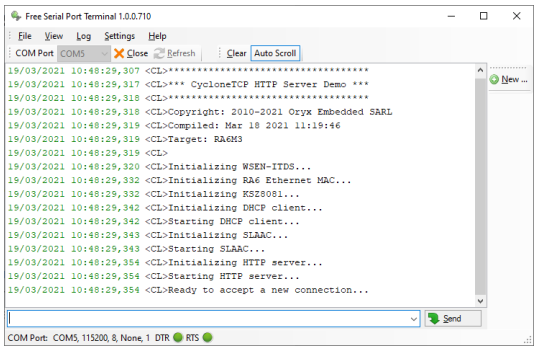
Figure 12. Start in Reset Handler



Here are the things to look out for to make sure the demo is running without any issues:

- Make sure your Serial Terminal is outputting debug messages

Figure 13. Serial Terminal View



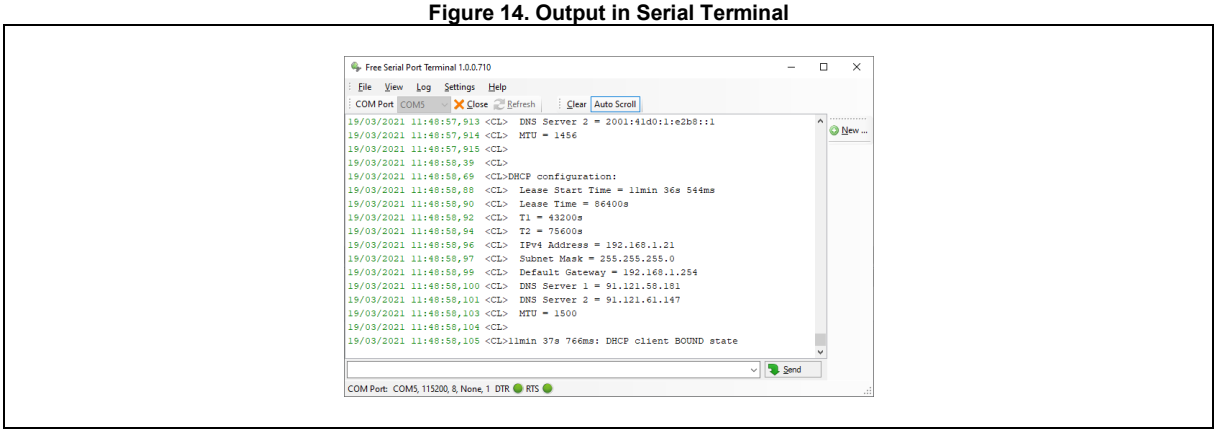
- Make sure your board's D2 Led is blinking

6 MANIPULATING THE DEMO

6.1 STEP1: ETHERNET CONNECTION

Assuming Section 5 Generate, Build and Debug has been executed thoroughly, connect the M13-RA6M3-EK board to your local network via an ethernet cable. Doing so, should output some debug messages in the Serial Terminal like shown below:

Figure 14. Output in Serial Terminal

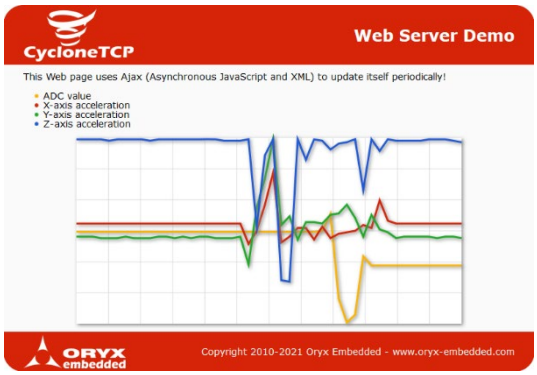


In fact, if the network connexion is a success, you should see the Ethernet configuration detail output such as its IPv4 address.

6.2 STEP2: DISPLAY ACCELEROMETER & POT VALUES

To display the board's Accelerometer and Potentiometer values, open your web browser and enter in its address bar either the board's IPv4 Address or the board's default Host Name "http://ttp-server-demo". Doing so, should open a web page as the below figure.

Figure 15. Output display



Moving the board around or turning the potentiometer's wheel will be live displayed on this webpage with the following match:

- Orange/Yellow: Potentiometer
- Red: X-axis acceleration
- Green: Y-axis acceleration
- Z-axis acceleration

6.3 SOFTWARE CONFIGURATIONS

At any time, the user can change the board's software configuration in the **m13_ra6m3_ek_config.h** file but there are two parameters two verify beforehand: The board's version and the FreeRTOS Memory Allocation Heap configuration.

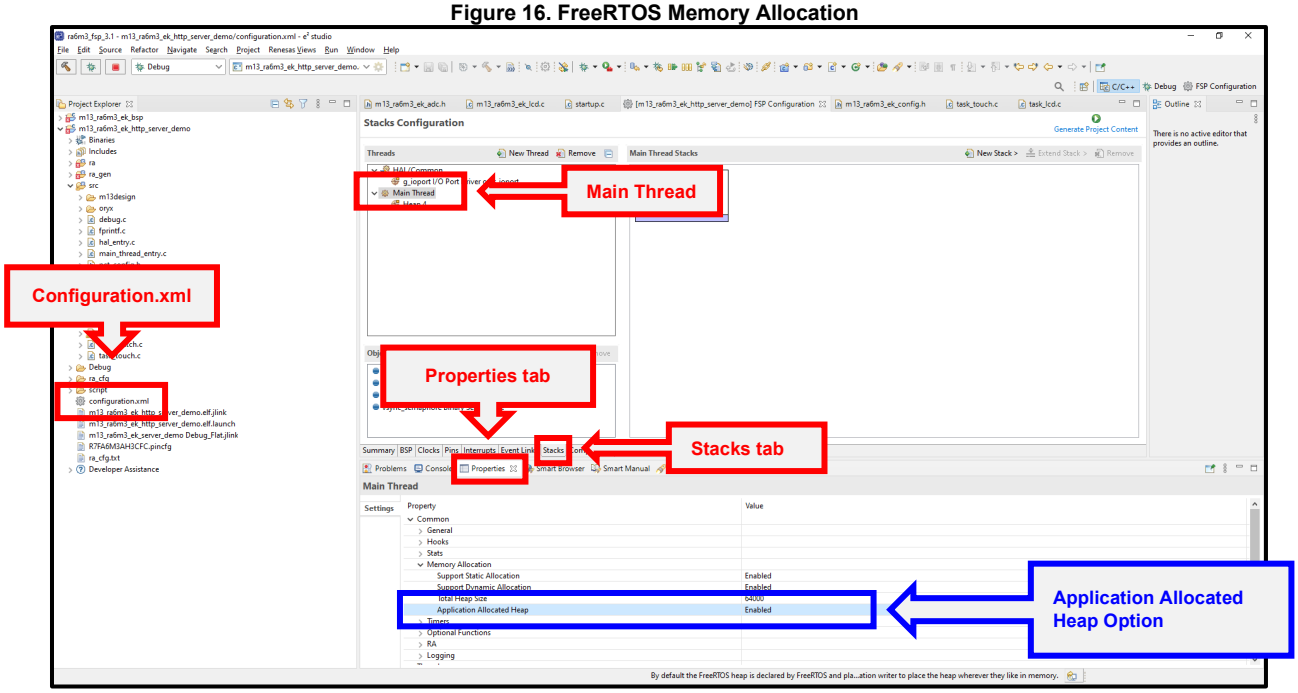
6.4.1 BOARD VERSION

For the SDRAM options, make sure your board version is either **M13-RA6M3-EK-SDRAM** or you have moved all your board's shunts to connect the SDRAM to the RA6M3 MCU (**see** User Manual**,** section 5.1.6 in order to do so).

6.4.2 APPLICATION ALLOCATED HEAP OPTION

Make sure the FreeRTOS "Application Allocated Heap" option is on "Enabled". This can be done through the configuration.xml in e2studio.

Figure 16. FreeRTOS Memory Allocation



As shown in Figure 16, to enable the "Application Allocated Heap" option,

- First double click on the configuration.xml in your Project Explorer on the left side of e2studio.

- Second, select the "Stacks" tab in order to display the project's thread details

- Click on "Main Thread" in the Thread region.

- Next, select the "Properties" tab to display the FreeRTOS general configuration

- And finally, go to Common>>Memory Allocation in order to reveal the "Application Allocated Heap" option

From here on, you can enable the option, save the Configuration.xml and then click "Generate" in order for the changes to be taken into account.

6.4.3 SOFTWARE CONFIGURATION DETAILS

```
ENABLE_HEAP_IN_SDRAM              true or false
```

When “true”, the FreeRTOS heap buffer will be mapped in the SDRAM region.
Can only be true if ““Application Allocated Heap” is Enabled (See section 6.4.3)

```
ENABLE_LCD_BUFFER_IN_SDRAM        true or false
```

When “true”, the LCD frame buffers will be mapped in the SDRAM region.

```
ENABLE_LCD_DOUBLE_BUFFER          true or false
```

When “true”, two frame buffers will be defined and usable for LCD routines in double buffer mode.

```
ENABLE_LCD_GRAPHIC_LAYER2         true or false
```

When “True”, the second Graphic Layer will be activated.

7 CONTACT AND SUPPORT

7.1 GENERAL CONTACT

For any general inquiries, fill-in our online contact form here: https://www.m13design.fr/contact/

Or send us a request by email at: sales@m13design.fr

7.2 SUPPORT CONTACT

For any technical support request, contact us via email at: support@m13design.fr

8 REVISION HISTORY

Table 3. Revision Table

Revision	Date	Revision content
V1.0	5th of July 2021	Initial release.
V1.0.1	16th of July 2021	Updated section 5.4 Step4: Debug Added section 6.3 Software configurations Updated company's address and logo

Disclaimer

Headquarters

M13DESIGN EURL
165, rue Louis Barran
38430 Saint Jean de Moirans – France

www.m13design.fr/

Contact information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit or product web page:

www.m13design.fr/contact/