

M13-RA6M3-EK

RA6M3 (Cortex-M4) m13_ra6m3_ek_server_demo

Application Note Guide

Updated on the: 16 Jul. 21

Board name: MCU: Version M13-RA6M3-EK R7FA6M3AH3CFC 1.0.1

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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	 Image: A set of the set of the
16Kbit I ² C EEPROM	×
4.3-inch 480x272 TFT LCD with capacitive touch panel	 Image: A second s
USB Interface	×
LAN Interface	 Image: A set of the set of the
SD/MMC Host Interface	×
I2S Audio codec	×
3-Axis accelerometer	 Image: A set of the set of the
On-board JLINK-OB debugger with VCOM	 Image: A set of the set of the
8bit camera	×
Mikrobus	×
PMOD	×
Mono-turn 10KΩ Potentiometer	 Image: A set of the set of the
User led	 Image: A second s
User switch and 1 x Reset switch	 Image: A second s

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-studiora?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-v310users-manual?language=en
- Renesas RA6M3 Group User's Manual https://www.renesas.com/eu/en/document/man/ra6m3-microcontroller-group-usersmanual?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.

	3_Workspace_e2studio_2020 - e ² stud	
<u>F</u> ile	<u>E</u> dit <u>Source</u> Refactor <u>N</u> avigat	e Se <u>a</u> rch <u>P</u> roject
	New	Alt+Shift+N >
	Open File	
	Open Projects from File System	
	Recent Files	>
	Close Editor	Ctrl+W
	Close All Editors	Ctrl+Shift+W
	Save	Ctrl+S
	Save As	
6	Save All	Ctrl+Shift+S
	Revert	
	Move	
	Rename	F2
8	Refresh	F5
	Convert Line Delimiters To	>
8	Print	Ctrl+P
	Import Import	
4	Export	
	Properties	Alt+Enter
	Switch Workspace	>
	Restart	
	Exit	

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"

Import Select Create new projects from an archive file or directory.	- • ×	
Select an import wizard: type filter text Select an import wizard: Select an import wizard: Select an import wizard: Select an import site of the select and se		
(?) < Back Next > Einis	h Cancel	

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.

3 Import -	X
Import Projects Select a directory to search for existing Eclipse projects.	~ ,
Select root directory: F:\10_SVN_M13\REN0001.2002_RA6M3\Offic <	B <u>r</u> owse
O Select <u>a</u> rchive file:	Browse
Projects:	
m13_ra6m3_ek_http_server_demo (F:\10_SVN_M13\REN0001.2002_ options Search for nested projects Copy projects into workspace Clgse newly imported projects upon completion Hide projects that already exist in the workspace	Deselect All Refresh
Working sets	
Add project to working sets	Ne <u>w</u>
Working sets:	S <u>e</u> lect
? < Back Next> Einish	Cancel

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.

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13 Workspace_e2studio_2020 - m13_rabm3_ek_http_sen Elle Edit Source Refactor Nevipate Search Doji		- 5 X
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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 "255.255.25.0"
- 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. FSF	P View	
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	g un	legarászsel – milj, demi, del, biz "serve "berne	, v

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.

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	Im13,rafm3,sk,http,server,demo) PSP Configuration 25	
v ∰ m13,n6m3,ek,http,server,deme) ∰ Binaries) ∰ Includes	Summary	Generate Button
 Sort Part Part Part Part Part Part Part Pa	Depict Community Control Liver Source S	Renesas
	Image: Description Particle P	CONSOLE AREA

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. B	Build button	
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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.

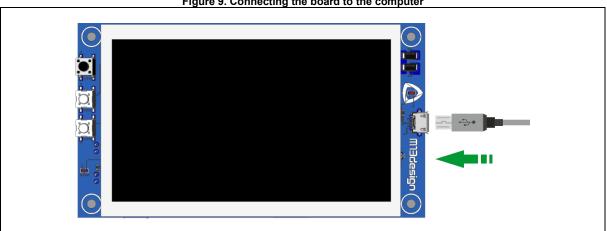


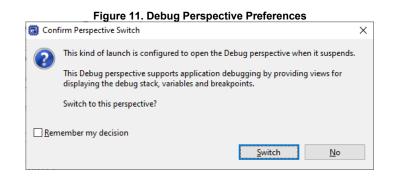
Figure 9. Connecting the board to the computer

Figure 10. Debug button

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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.



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.

 B. Workspace, eðitudio 2020 - mB / sémd, sk þitig, server, demor/se/fag/tur.bisp/consis/Device/RE/RE Ein júti Saurce Refector bjørigste Segrið þinjeti Renessa júres þun Window Help B. B. B. Babug ∨ Emili, server, demo Delu ∨ Ø 	\$250cchange - 4°ade - 回 句 ② • ⑤ • ⑤ × ③ × ③ ※ ③ ● # ● # ス ③ ※ ③ (* ○ ○) ※ ⑤ • ⑥ • ◎ * ◎ * ◎ ◎ ※ ◎ ◎ (* ◎ Ø) ◎ Ø ● Ø ● Ø +	- σ x
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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

Free Serial Port Terminal 1.0.0.710	- 🗆 ×
Eile View Log Settings Help	
COM Port COM5 V X Close 2 Refresh Clear Auto Scroll	
19/03/2021 10:48:29,307 <cl>************************************</cl>	^
19/03/2021 10:48:29,317 <cl>*** CycloneTCP HTTP Server Demo ***</cl>	<u>New</u>
19/03/2021 10:48:29,318 <cl>************************************</cl>	
19/03/2021 10:48:29,318 <cl>Copyright: 2010-2021 Oryx Embedded SARL</cl>	
19/03/2021 10:48:29,319 <cl>Compiled: Mar 18 2021 11:19:46</cl>	
19/03/2021 10:48:29,319 <cl>Target: RA6M3</cl>	
19/03/2021 10:48:29,319 <cl></cl>	
19/03/2021 10:48:29,320 <cl>Initializing WSEN-ITDS</cl>	
19/03/2021 10:48:29,332 <cl>Initializing RA6 Ethernet MAC</cl>	
19/03/2021 10:48:29,332 <cl>Initializing KSZ8081</cl>	
19/03/2021 10:48:29,342 <cl>Initializing DHCP client</cl>	
19/03/2021 10:48:29,342 <cl>Starting DHCP client</cl>	
19/03/2021 10:48:29,343 <cl>Initializing SLAAC</cl>	
19/03/2021 10:48:29,343 <cl>Starting SLAAC</cl>	
19/03/2021 10:48:29,354 <cl>Initializing HTTP server</cl>	
19/03/2021 10:48:29,354 <cl>Starting HTTP server</cl>	
19/03/2021 10:48:29,354 <cl>Ready to accept a new connection</cl>	
۲ <u>۲</u>	Send
COM Port: COM5, 115200, 8, None, 1 DTR 🔵 RTS 🛑	

• 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:

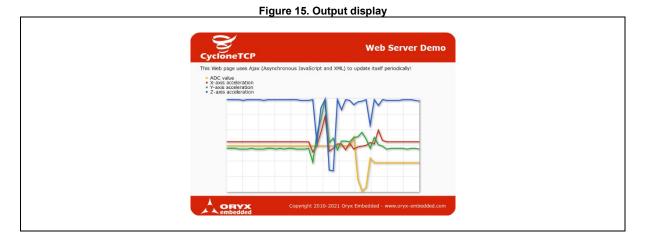
Figure 14. Output in Serial Terminal

🎭 Free Serial Port Terminal 1.0.0.710	– 🗆 ×
Eile View Log Settings Help	
COM Port COM5 V X Close 2 Refresh	
19/03/2021 11:48:57,913 <cl> DNS Server 2 = 2001:41d0:1:e2b8::1</cl>	^
19/03/2021 11:48:57,914 <cl> MTU = 1456</cl>	<u>New</u>
19/03/2021 11:48:57,915 <cl></cl>	
19/03/2021 11:48:58,39 <cl></cl>	
19/03/2021 11:48:58,69 <cl>DHCP configuration:</cl>	
19/03/2021 11:48:58,88 <cl> Lease Start Time = 11min 36s 544ms</cl>	
19/03/2021 11:48:58,90 <cl> Lease Time = 86400s</cl>	
19/03/2021 11:48:58,92 <cl> T1 = 43200s</cl>	
19/03/2021 11:48:58,94 <cl> T2 = 75600s</cl>	
19/03/2021 11:48:58,96 <cl> IPv4 Address = 192.168.1.21</cl>	
19/03/2021 11:48:58,97 <cl> Subnet Mask = 255.255.255.0</cl>	
19/03/2021 11:48:58,99 <cl> Default Gateway = 192.168.1.254</cl>	
19/03/2021 11:48:58,100 <cl> DNS Server 1 = 91.121.58.181</cl>	
19/03/2021 11:48:58,101 <cl> DNS Server 2 = 91.121.61.147</cl>	
19/03/2021 11:48:58,103 <cl> MTU = 1500</cl>	
19/03/2021 11:48:58,104 <cl></cl>	
19/03/2021 11:48:58,105 <cl>11min 37s 766ms: DHCP client BOUND stat</cl>	e
	✓ 3 Send
COM Port: COM5, 115200, 8, None, 1 DTR 🔵 RTS 🔵	

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-serverdemo". Doing so, should open a web page as the below figure.



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.

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m13_ra6m3_ek_bsp m13_ra6m3_ek_http_server_demo		Stacks Configura	ation			Generate Project Content	
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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**

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

Table 3 Povisio Tabl

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Headquarters

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

www.m13design.fr/

Contact information

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