

RYZ014A Pmod LTE Connectivity with EK-RA4M2 Quick Start Guide

Cellular IoT Modules RYZ014A Pmod Module

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1. Precaution against Electrostatic Discharge (ESD)

A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity.

Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

2. Processing at power-on

The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.

3. Input of signal during power-off state

Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

4. Handling of unused pins

Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.

5. Clock signals

After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.

6. Voltage application waveform at input pin

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).

7. Prohibition of access to reserved addresses

Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

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Precautions

This Evaluation Kit is only intended for use in a laboratory environment under ambient temperature and humidity conditions. A safe separation distance should be used between this and any sensitive equipment. Its use outside the laboratory, classroom, study area, or similar such area invalidates conformity with the protection requirements of the Electromagnetic Compatibility Directive and could lead to prosecution.

The product generates, uses, and can radiate radio frequency energy and may cause harmful interference to radio communications. There is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off or on, you are encouraged to try to correct the interference by one or more of the following measures:

- Ensure attached cables do not lie across the equipment.
- Reorient the receiving antenna.
- Increase the distance between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that which the receiver is connected.
- Power down the equipment when not in use.
- Consult the dealer or an experienced radio/TV technician for help.

Note: It is recommended that wherever possible shielded interface cables are used.

The product is potentially susceptible to certain EMC phenomena. To mitigate against them it is recommended that the following measures be undertaken:

- The user is advised that mobile phones should not be used within 10 m of the product when in use.
- The user is advised to take ESD precautions when handling the equipment.

The Evaluation Kit does not represent an ideal reference design for an end product and does not fulfill the regulatory standards for an end product.

Cellular IoT Modules

RYZ014A Pmod with EK-RA4M2

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1. Introduction

This Quick Start Guide (QSG) provides:

- An overview of the RYZ014A_PMOD example project for the EK-RA4M2 board.
- Instructions for running the RYZ014A_PMOD example project on the EK-RA4M2 board.
- Instructions for flashing the RYZ014A_PMOD example project code using Renesas Flash Programmer

1.1 Assumptions and Advisory Notes

1. Tool experience: It is assumed that the user has prior experience working with a terminal emulation program such as TeraTerm.
2. Subject knowledge: It is assumed that the user has basic knowledge about microcontrollers, embedded systems, LTE communication and AT commands.
3. Prior to running the RYZ014A_PMOD project or programming the EK-RA4M2 board, default jumper settings must be used. Refer to the EK-RA4M2 user's manual ([R20UT4815EG0100](#)) **section 4.3 Jumper Settings** for the default jumper settings.
4. The screen shots provided throughout this document are for reference. The actual screen content may differ depending on the version of software and development tools used.

2. Kit Contents

The following components are included in the kit:

1. RYZ014A_PMOD module with antenna
2. EK-RA4M2 board (Not part of the kit)
3. Micro-USB device cable (type-A male to micro-B male)
4. SIM card

3. EK-RA4M2 Kit Setup

First, disconnect the USB power to the board. The RYZ014A_PMOD board should be connected to PMOD2 (J25) with the antenna attached (Figure 1). The included SIM card can be inserted in the card slot on the underside of the RYZ014A_PMOD Board. You may now reconnect the USB power cable.



Figure 1. EK-RA4M2 Setup with RYZ014A_PMOD Module Connected

4. Overview of the RYZ014A_PMOD Example Project

The RYZ014A_PMOD example project allows the user to activate, enable and test a RYZ014A_PMOD module and SIM card connectivity through a terminal menu.

When the EK-RA4M2 board is running the RYZ014A_PMOD example project and is connected to a host PC via USB as a Full Speed CDC Device, the kit and RYZ014A_PMOD information can be viewed, and the included SIM card activation can be validated.

5. Running the RYZ014A_PMOD Example Project

This section lists the requirements and instructions to power up the EK-RA4M2 board, flash the EK-RA4M2 board and run the RYZ014A_PMOD example project.

Hardware Requirements

- EK-RA4M2 board
- Micro-USB device cable
- A PC with at least 1 USB port
- RYZ014A_PMOD board

Software Requirements

- Windows® 10 operating system
- USB Serial Drivers (included in Windows 10)
- TeraTerm (or similar) terminal console application
- Renesas Flash Programmer V3.08.01 and later
- EK-RA4M2 example project .hex file

5.1 Flashing the Example Program on the EK-RA4M2 Board

1. Connect the micro-USB end of the micro-USB device cable to the micro-AB DEBUG port (J10) of the EK-RA4M2 board.
2. Open Renesas Flash Programmer and create a new project by using the **File** menu and selecting **New Project**.
3. In the Create a New Project window (Figure 2), Select the **RA** family from the Microcontroller drop-down. Next, enter a desired project name and select **J-link** for the communication tool. Click Connect.

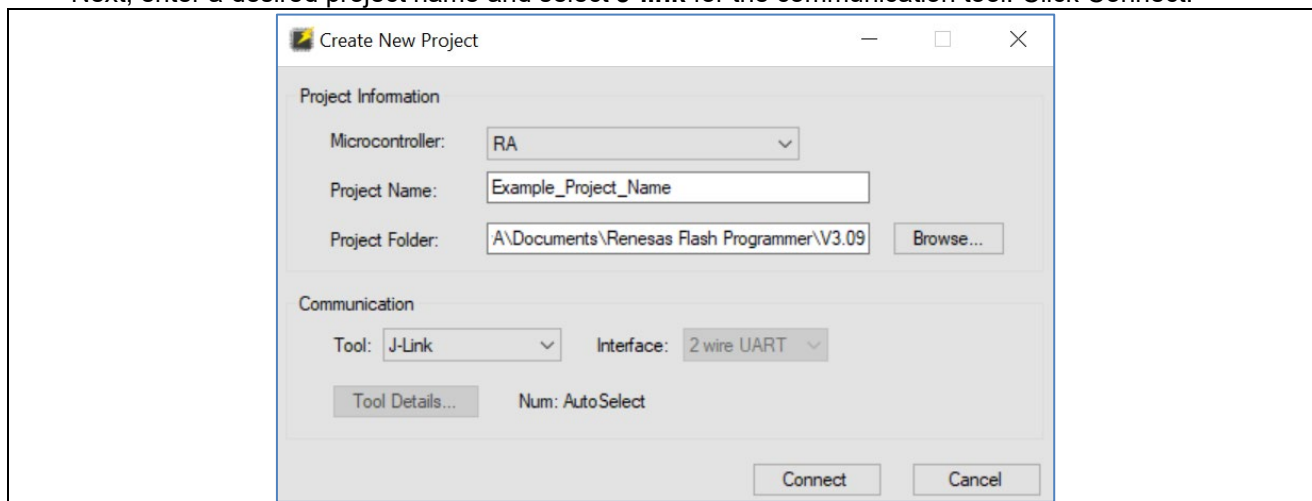


Figure 2. Creating a New Project on Renesas Flash Programmer

4. An authentication window should appear. Enable Auto Authentication and click OK.
5. Verify the message **Operation Complete** is printed in the main window after clicking Connect. Under Program File, click Browse to choose to the program file that will be flashed onto the board (Figure 3). Using the file explorer window, navigate to the example project's **ra4m2_catm.hex** file and click Open.

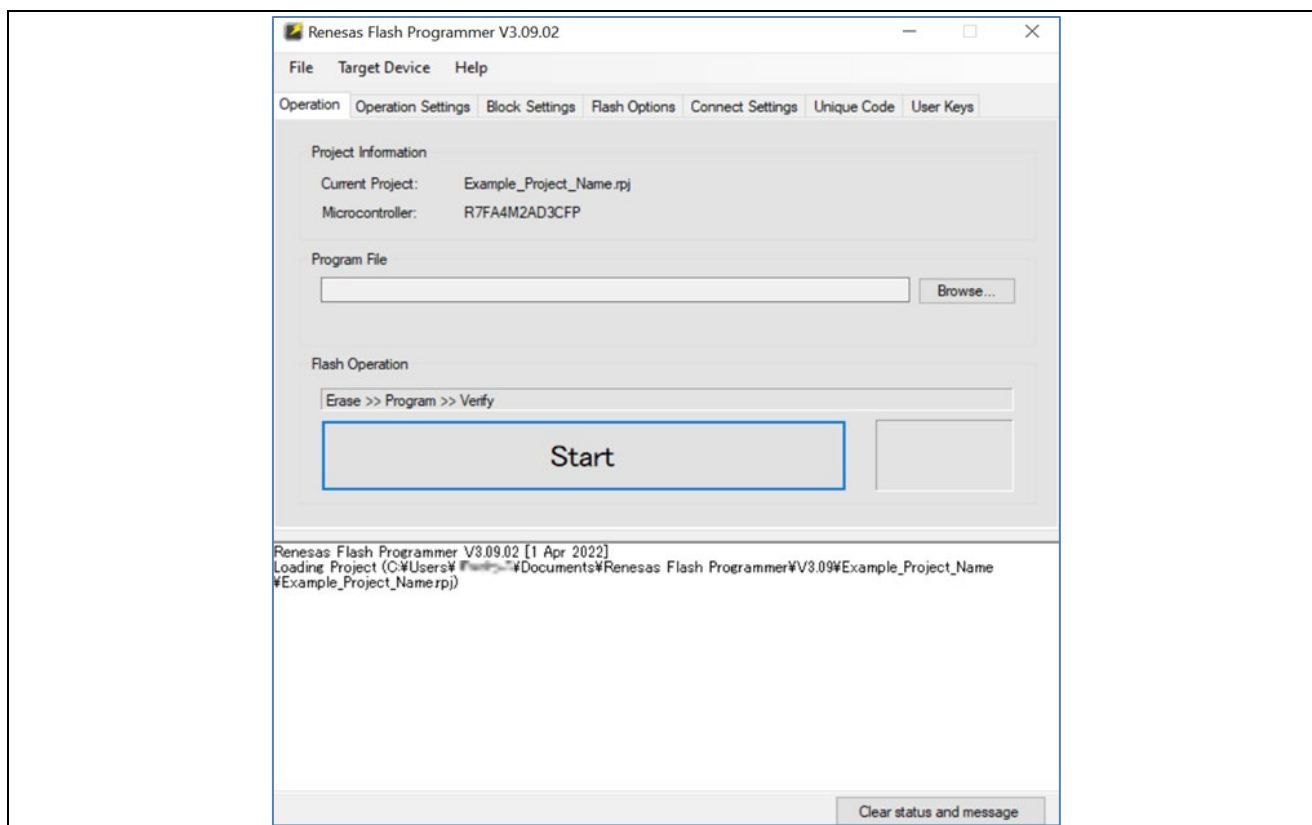


Figure 3. The Main Window of Renesas Flash Programmer After Creating a New Project

6. Click **Start** to begin flashing the example project code onto the board. Once completed, the message **Operation Complete** should be printed and the status **OK** should be displayed.
7. Disconnect the micro-USB device cable from the debug port of the EK-RA4M2 board.

5.2 Connecting and Powering Up the EK-RA4M2 Board

1. Check that J12 is set to link pins 2-3. And that J15 link is closed.
2. Connect the micro-USB end of the micro-USB device cable to the micro-AB USB Full Speed port (J11) of the EK-RA4M2 board.
3. Connect the other end of this cable to the USB port of the host PC. The Power LED (LED4) on the EK-RA4M2 board will light up white, indicating that the EK-RA4M2 board is powered on.

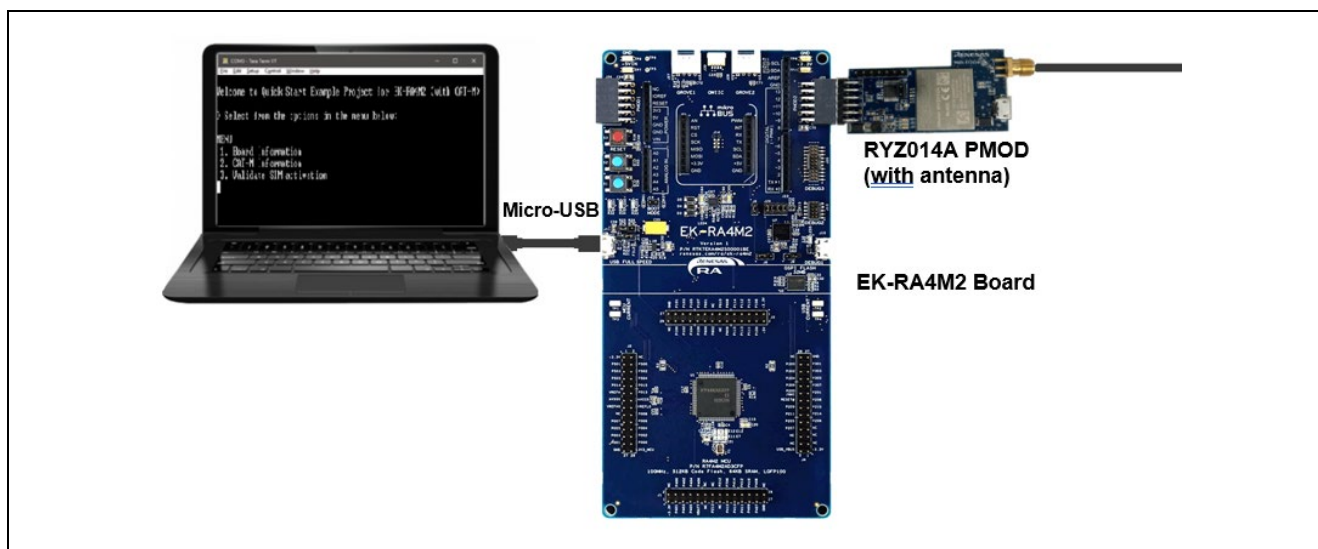


Figure 4. Connecting the EK-RA4M2 Board to the Host PC via USB Full Speed Port

5.3 Running the RYZ014A_PMOD example project

To run the RYZ014A_PMOD example project, use the following instructions:

1. On the host PC, open Windows Device Manager. Expand **Ports (COM & LPT)**, locate **USB Serial Device (COMxx)** and note down the COM port number for reference in the next step.

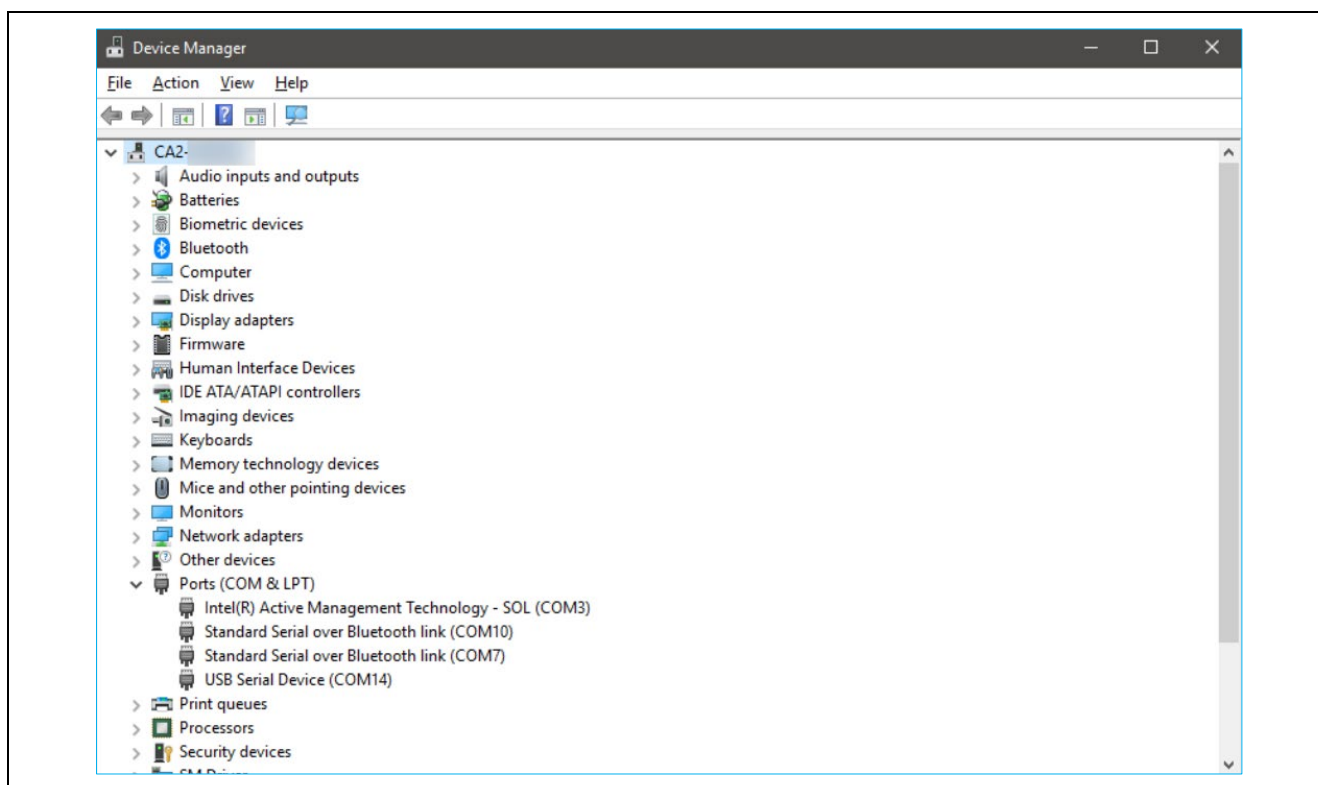


Figure 5. USB Serial Device in Windows Device Manager

- Open Tera Term, select **Serial** and **COMxx: USB Serial Device (COMxx)** and click **OK**.

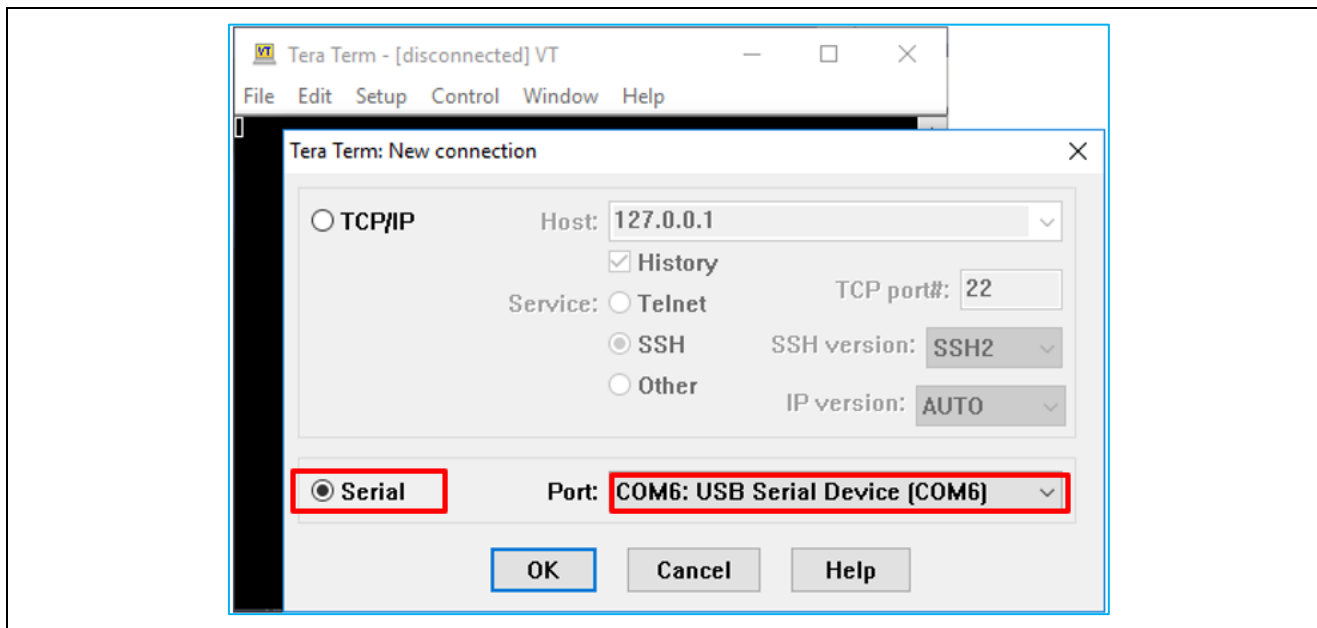


Figure 6. Selecting the Serial Port on Tera Term

- Using the **Setup** menu pull-down, select **Serial port...** and ensure that the speed is set to 115200, as shown below.

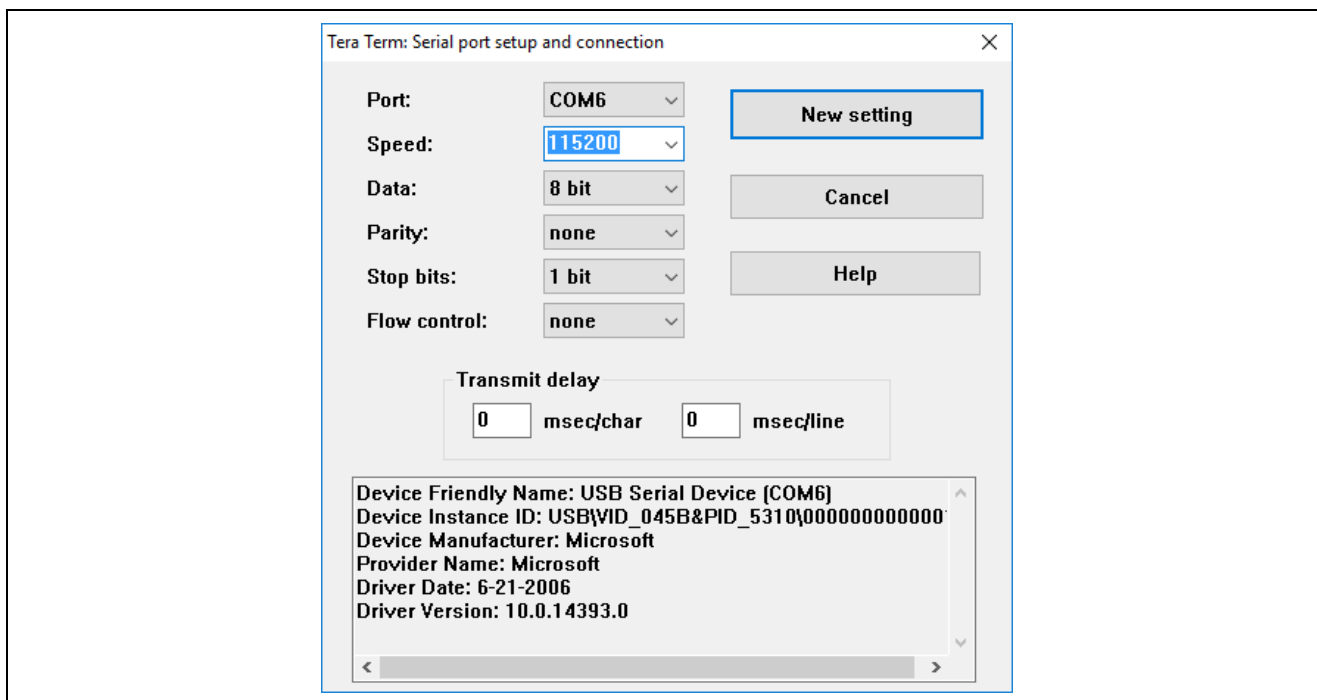
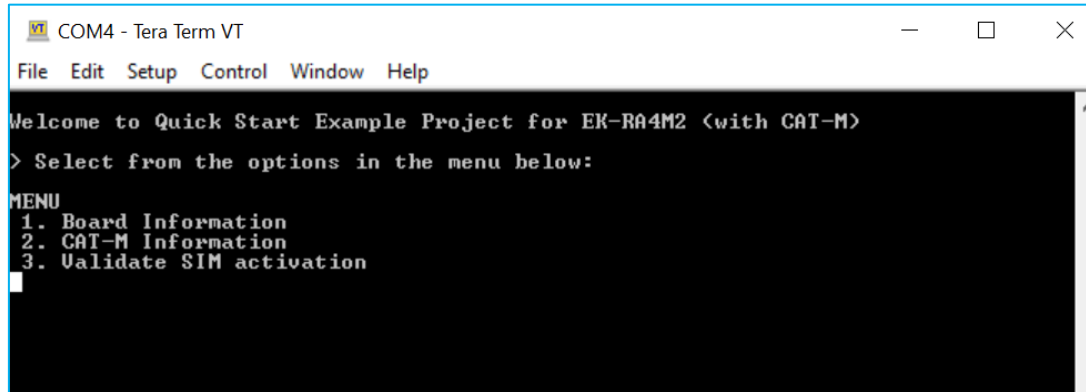


Figure 7. Select 115200 on the Speed Pulldown

4. Complete the connection. The 'welcome and main menu' screen will be displayed.



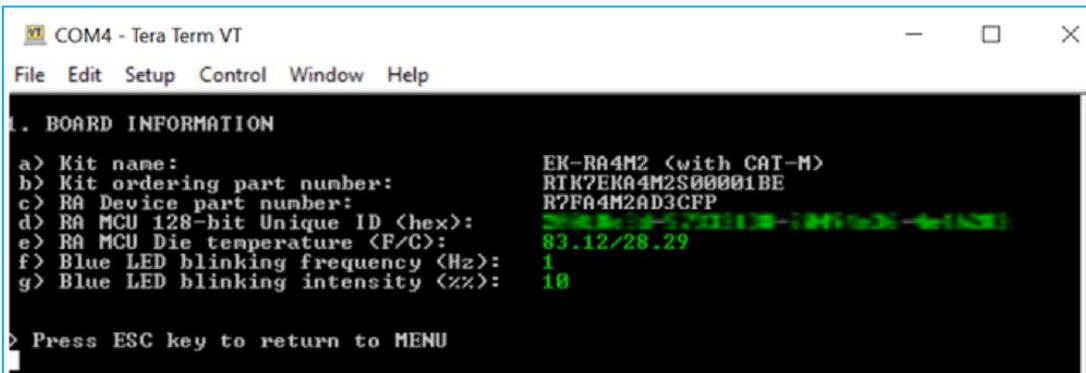
```
COM4 - Tera Term VT
File Edit Setup Control Window Help

Welcome to Quick Start Example Project for EK-RA4M2 (with CAT-M)
> Select from the options in the menu below:

MENU
1. Board Information
2. CAT-M Information
3. Validate SIM activation
```

Figure 8. Welcome and Main Menu

5. Press **1** to display the **Kit Information** including the kit name, part number, MCU ID, MCU die temperature, and the user LED's current intensity.



```
COM4 - Tera Term VT
File Edit Setup Control Window Help

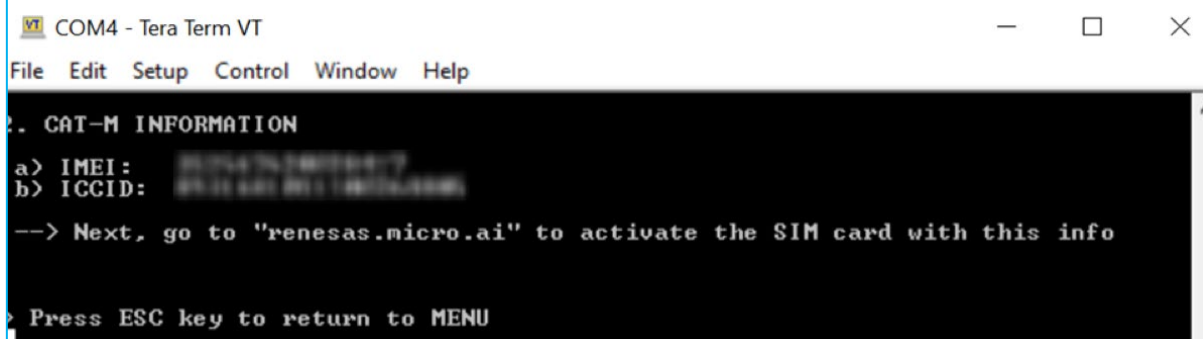
1. BOARD INFORMATION

a> Kit name: EK-RA4M2 (with CAT-M)
b> Kit ordering part number: RTK7EKA4M2S00001BE
c> RA Device part number: R7FA4M2AD3CFP
d> RA MCU 128-bit Unique ID (hex): 204840145733138-10456026-461A2E1
e> RA MCU Die temperature (F/C): 83.12/28.29
f> Blue LED blinking frequency (Hz): 1
g> Blue LED blinking intensity (%): 10

> Press ESC key to return to MENU
```

Figure 9. Kit Information

6. Press **ESC** to return to the 'welcome and main menu' screen.
7. Press **2** to display **CAT-M Information**. This menu will communicate with the RYZ014A_PMOD module to obtain the IMEI and ICCID values needed for activating the SIM card. Upon success, the IMEI and ICCID values will be displayed on the terminal screen. The program will continue to attempt to communicate with the RYZ014A_PMOD module until it has successfully connected or timed out. After obtaining the IMEI and ICCID values, go to MicroAI Launchpad to activate the SIM card (see section **Activating the SIM card on Launchpad**).



```
COM4 - Tera Term VT
File Edit Setup Control Window Help

2. CAT-M INFORMATION

a> IMEI: 89307420000000000000
b> ICCID: 89307420000000000000

--> Next, go to "renesas.micro.ai" to activate the SIM card with this info

> Press ESC key to return to MENU
```

Figure 10. RYZ014A_PMOD Information

8. Press **ESC** to return to the 'welcome and main menu' screen.

- Press **3** to enter the **Validate SIM Activation** screen. The program will attempt to ping the Quad9 server for a response to determine whether the SIM card has been activated. Upon success, the text "*** SIM card active! ***" will be displayed on the terminal screen.

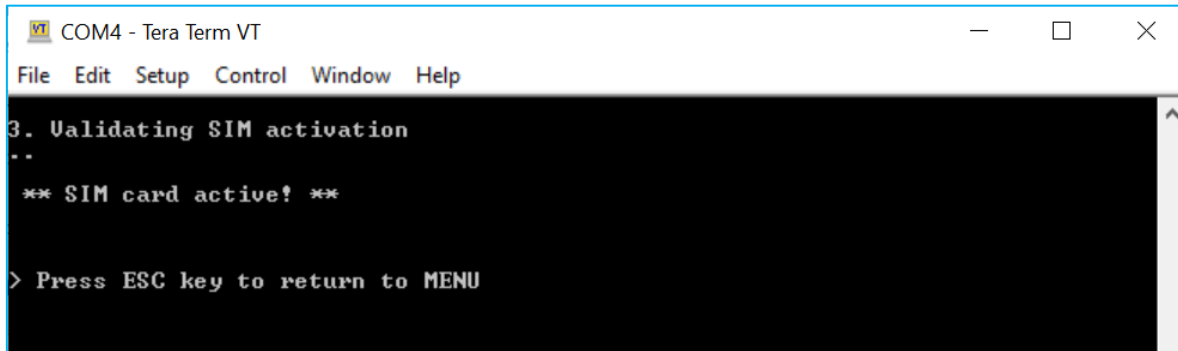


Figure 11. Validating SIM Activation

- Press **ESC** to return to the 'welcome and main menu' screen.

6. Activating the SIM card on MicroAI Launchpad

To register the EK-RA4M2 device and activate the included SIM card, please visit the MicroAI Launchpad platform at <https://renesas.micro.ai/auth/login> and use following steps:

- Create a Launchpad account by registering on the sign-up page and verifying the account through the verification email sent after registration.
- Login to the new Launchpad account and click on the **Create Device Profile** tile. Make sure **Renesas EK-RA4M2** is selected for the Device Type and **CAT-M (RYZ014A-PMOD)** for the Connectivity Type. Fill other fields as desired then click Next.

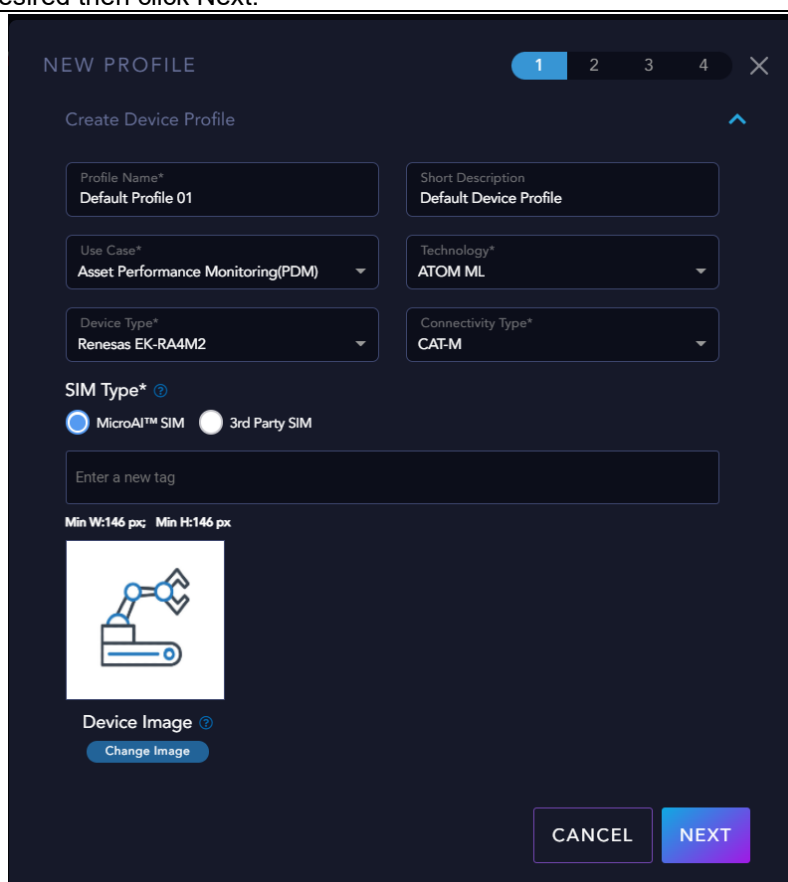


Figure 12. Creating a Device Profile on MicroAI Launchpad

- On Data Schema, click Next.

4. On Select a Plan, apply any valid promo codes if applicable and click Next.
 - a. The RYZ014A_PMOD kit comes with a prepaid SIM Card which is free to user for 30 days from activation and 50MB of data.
5. Provide a Payment Method and accept the terms and conditions. Click Finish.
6. Next, a link is provided to download the latest firmware.
7. Navigate back to the home screen (click on “Launchpad” at the top of the left panel) and click the **Add Device** button on the right to begin registering the **EK-RA4M2** kit and SIM card.
8. Select the device profile created from the **Device Profile** drop-down. Enter a **Device Name**. For the **Device ID**, enter the **IMEI** value obtained as seen in Figure 10. RYZ014A_PMOD Information. Fill other fields as needed.

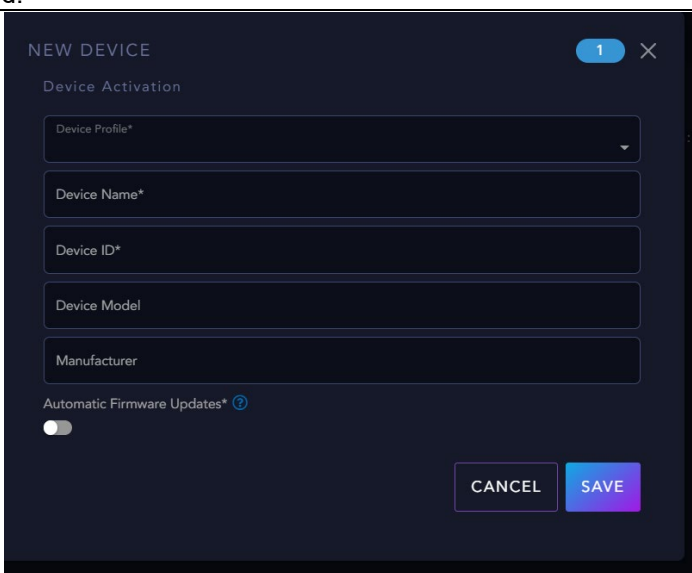


Figure 13. Adding a new device on MicroAI Launchpad

9. Click Next and click **Add New SIM**.

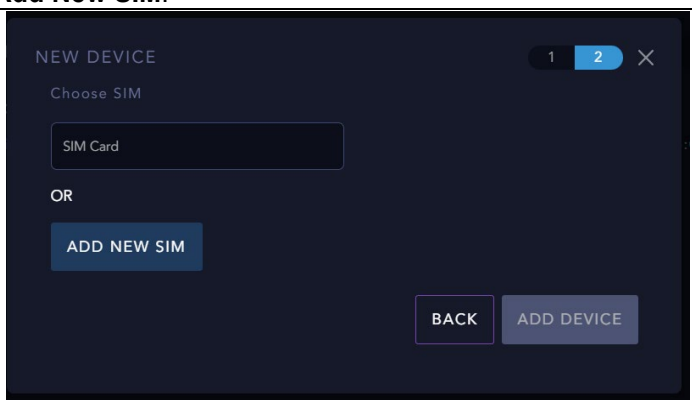


Figure 14. Activating the SIM card on MicroAI Launchpad

10. Enter the **ICCID (or EID)** value for the **SIM EID** field, select the **Region/Country** and click Save SIM.
Note: the **ICCID** value is found in Figure 10. RYZ014A_PMOD Information. Alternately, the EID is supplied with the SIM card documentation.

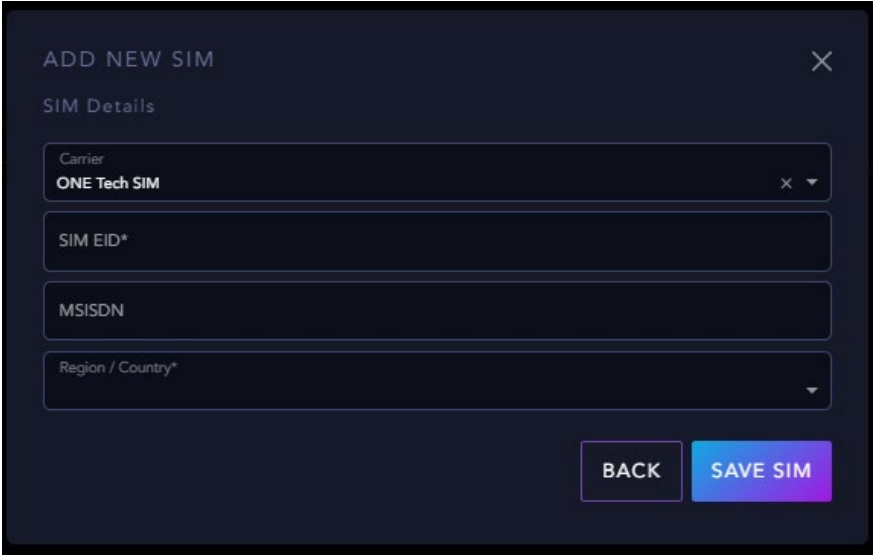


Figure 15. Adding a new SIM card on MicroAI Launchpad

11. Finish the device registration. The **EK-RA4M2** kit and SIM card should be activated on the Launchpad platform and can be validated on the Tera Term terminal as shown in Figure 11.

7. Troubleshooting

This section includes a common set of issues and how to resolve them.

7.1 Hardware Setup

A first step for any general issue is always to verify the proper connections are made. Refer to [Figure 1](#).

- The PMOD RYZ014A_PMOD board plugged into PMOD2 port (J25)
- RYZ014A_PMOD antenna cable plugged into PMOD RYZ014A_PMOD board
- The micro-USB cable plugged into the USB Full Speed port connector (J11)
- Check to see that the SIM card is fully inserted in SIM slot (on the underside of PMOD RYZ014A_PMOD module)

7.2 Power Problem

- If no LED's illuminate when the USB cable is connected, power may not be applied. In that case:
 - Check that J12 is set to link pins 2-3
 - Check that J15 is linked (pins 1-2)

7.3 SIM Card Activation Problem

- If the SIM activation fails, verify that the IMEI and ICCID numbers are correctly entered when registering the device on Launchpad (<https://renesas.micro.ai>)
- SIM cards cannot be activated more than once. If a SIM card has been activated, the SIM card activation will fail when trying to add a new SIM (see Figure 14). To verify whether the SIM card has already been activated, please contact MicroAI support through <https://renesas.micro.ai> by logging into your account and clicking on Contact Support in the dropdown menu or at the bottom of the home page.

7.4 Illegible/No Terminal Output (Tera Term)

This could be caused by the setup of the terminal connection. To fix this, use the following instructions:

- Please make sure the following settings in the setup of the serial connection are set up as such:
 - Speed: 115200
 - Data: 8 bit
 - Parity: None
 - Stop bits: 1 bit
 - Flow Control: None

7.5 Unable to Read RYZ014A Board Information

If there is a failure to read the RYZ014A_PMOD board/SIM information (IMEI and ICCID), check to confirm the included SIM card is fully inserted in the SIM card slot on the underside of the RYZ014A_PMOD board.

8. Next Steps

1. RYZ014A PMOD Module landing page
<https://www.renesas.com/us/en/products/interface-connectivity/wireless-communications/cellular-iot-modules/rkyz014a0b00000be-pmod-expansion-board-ryz014a#document>
2. RYZ014A Module Landing Page
<https://www.renesas.com/us/en/products/interface-connectivity/wireless-communications/cellular-iot-modules/ryz014a-lte-cat-m1-cellular-iot-module>
3. EK RA4M2 landing page
<https://www.renesas.com/us/en/products/microcontrollers-microprocessors/ra-cortex-m-mcus/ek-ra4m2-evaluation-kit-ra4m2-mcu-group>
4. CK-RA6M5 Cloud kit with RYZ014A PMOD
<https://www.renesas.com/eu/en/products/microcontrollers-microprocessors/ra-cortex-m-mcus/ck-ra6m5-cloud-kit-based-ra6m5-mcu-group>

9. Website and Support

Visit the following URLs to learn about the kit and the RA family of microcontrollers, download tools and documentation, and get support.

RYZ014A PMOD Resources	renesas.com/pmod_ryz014a
EK-RA4M2 Resources	renesas.com/ra/ek-ra4m2
RA Product Information	renesas.com/ra
RA Product Support Forum	renesas.com/ra/forum
Renesas Support	renesas.com/support

Revision History

Rev.	Date	Description	
		Page	Summary
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