User's Manual

RZ/V2M Evaluation Board Kit Start-Up Guide

User's Manual

Renesas Electronics
www.renesas.com

Rev.1.00 Jun, 2022

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 claims 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, drawings, charts, programs, algorithms, and 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 be responsible for determining what licenses are required from any third parties, and obtaining such licenses for the lawful import, export, manufacture, sales, utilization, distribution or other disposal of any products incorporating Renesas Electronics products, if required.
5. You shall not alter, modify, copy, or reverse engineer 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, copying or reverse engineering.
6. 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; 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.
   Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or 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 damage (space system; 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 any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user’s manual or other Renesas Electronics document.
7. No semiconductor product is absolutely secure. Notwithstanding any security measures or features that may be implemented in Renesas Electronics hardware or software products, Renesas Electronics shall have absolutely no liability arising out of any vulnerability or security breach, including but not limited to any unauthorized access to or use of a Renesas Electronics product or a system that uses a Renesas Electronics product. RENESAS ELECTRONICS DOES NOT WARRANT OR GUARANTEE THAT RENESAS ELECTRONICS PRODUCTS, OR ANY SYSTEMS CREATED USING RENESAS ELECTRONICS PRODUCTS WILL BE INVULNERABLE OR FREE FROM CORRUPTION, ATTACK, VIRUSES, INTERFERENCE, HACKING, DATA LOSS OR THEFT, OR OTHER SECURITY INTRUSION (“Vulnerability Issues”). RENESAS ELECTRONICS DISCLAIMS ANY AND ALL RESPONSIBILITY OR LIABILITY ARISING FROM OR RELATED TO ANY VULNERABILITY ISSUES. FURTHERMORE, TO THE EXTENT PERMITTED BY APPLICABLE LAW, RENESAS ELECTRONICS DISCLAIMS ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THIS DOCUMENT AND ANY RELATED OR ACCOMPANYING SOFTWARE OR HARDWARE, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE.
8. When using 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 dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
9. 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. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a 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. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using 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.
11. 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 comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
12. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
13. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
14. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.

(Note1) “Renesas Electronics” as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.

(Note2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

(Rev.5.0-1 October 2020)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

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:
www.renesas.com/contact/

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

Trademarks (continued)

eMMC™ is a trademark of MultiMediaCard Association.

Note that in each section of the Manual, trademark notation of ® and TM may be omitted.
All other trademarks and registered trademarks are the property of their respective owners.

How to Use This Manual

1. Objective and Target Users

This manual sets out initial procedures for operating the RZ/V2M evaluation board kit. Note that this manual is not intended for use in software development.

This document shows the installation and startup procedure of the first boot loader, second boot loader, and U-Boot on the RZ/V2M evaluation board kit. For details and notes on the RZ/V2M evaluation board kit, refer to *the RZ/V2M Evaluation Board Kit Hardware Manual*.

Table of Contents

Introduction

This document shows the startup procedure of the first boot loader, second boot loader, and U-Boot on the RZ/V2M evaluation board kit (V2MEVK).

For details on the procedure, refer to *the RZ/V2M Linux Package Manual*. Descriptions in this document are based on *the RZ/V2M Linux Package Rev1.2*. When referring to the different package version, follow the descriptions in that document.

Related Documents

The following documents have been prepared for this V2MEVK. Make sure to refer to the latest versions of these documents.

Document Type	Document Title	Document No.	Description
Startup guide	V2MEVK Startup Guide	This document	Startup procedure of the V2MEVK
User's manual: Hardware	RZ/V2M User's Manual: Hardware	R01UH0940EJ0120	RZ/V2M hardware specifications (pin assignments, memory maps, peripheral specifications, electrical characteristics, and timing charts) and descriptions of operation
Linux startup guide	RZ/V2M Linux Package Startup Guide	R01US0527EJ0120	Startup procedure of the RZ/V2M Linux package

1. Operating Environment

Table 2.1-1 lists the recommended environment for V2MEVK operation and **Figure 2.1-1** shows the connection method.

Table 2.1-1 Recommended Environment

Equipment		Details
RZ/V2M evaluation board kit		Evaluation board kit for RZ/V2M
Windows PC		For controlling the target board with terminal software
	OS	Windows 10 recommended
	Terminal software	Control serial console of the target board. Tera Term is recommended and available at "Tera Term Open Source Project (osdn.jp)".
	VCP driver	Virtual COM port driver to enable communications between the Windows PC and the target board via USB. This is virtually used as a serial port and available at "CP210x USB to UART Bridge VCP Drivers - Silicon Labs (silabs.com)". Install "CP210x VCP Windows" at the above web site.
Serial to micro–USB cable (USB cable: Standard-A-Micro-B)		Serial communications (UART) between the RZ/V2M evaluation board kit and Windows PC
Micro–SD card		Used to write the flash writer software to the V2MEVK. Use it as SDHC, formatted as FAT32, with one partition.
AC adapter		12 V, 5 A (Plug: Inner diameter 2.1 mm, outer diameter 5.5 mm)

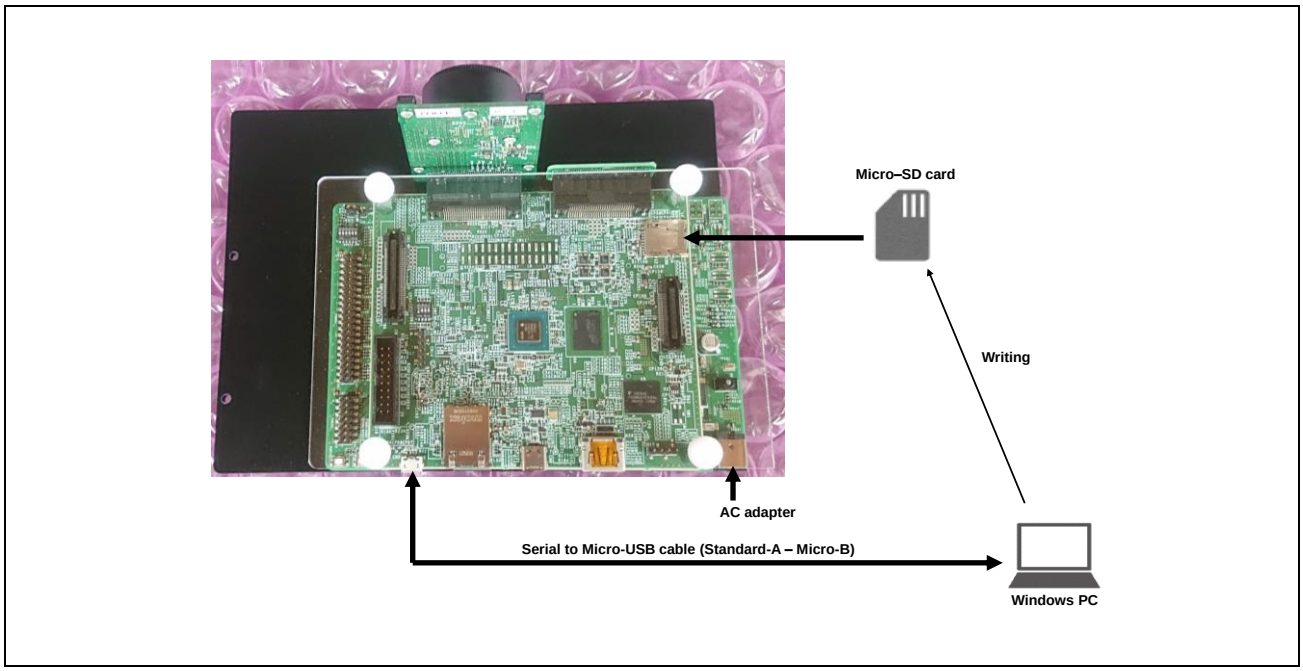


Figure 2.1-1 Connection Method

2. Startup Procedure

This section describes the procedure for writing the first boot loader, second boot loader, and U-Boot required to boot the Linux kernel. This procedure is accomplished by executing the following two functions in order.

1. SD card forced write function
2. Flash writer write function

For details, see *section 7, Flash Writer*, in *the RZ/V2M Linux Package Startup Guide*.

Download the latest version of the following software package from the Renesas Web site.

Software Package	Description
RZ/V2M Linux Package	Linux package for the RZ/V2M

RZ/V2M — *AI-only Accelerator (DRP-AI), 4K-compatible Image Signal Processor (ISP), Vision-AI ASSP for Real-time Human and Object Recognition (2022.4)*
https://www.renesas.com/jp/en/products/microcontrollers-microprocessors/rz-cortex-a-mpus/rzv2m-dual-cortex-a53-lpddr4x32bit-ai-accelerator-isp-4k-video-codec-4k-camera-input-fhd-display-output

2.1 Flash Writer Writing Procedure (using SD Card Forced Write Function)

2.1.1 Preparing the SD Card

Store the files included in the RZ/V2M Linux package on an SD card.

1. SD card format specifications
   — FAT32
   — 1 partition
   — SDHC

2. Store the flash writer software on SD card
   The files to be stored are included in the following directory of the Linux package.

```
r01an5971ej0<xxx>-rzv2m-linux (<xxx>: Package version)
└─ option
    └─ flash_writer
        └─ B2_intSW.bin
```

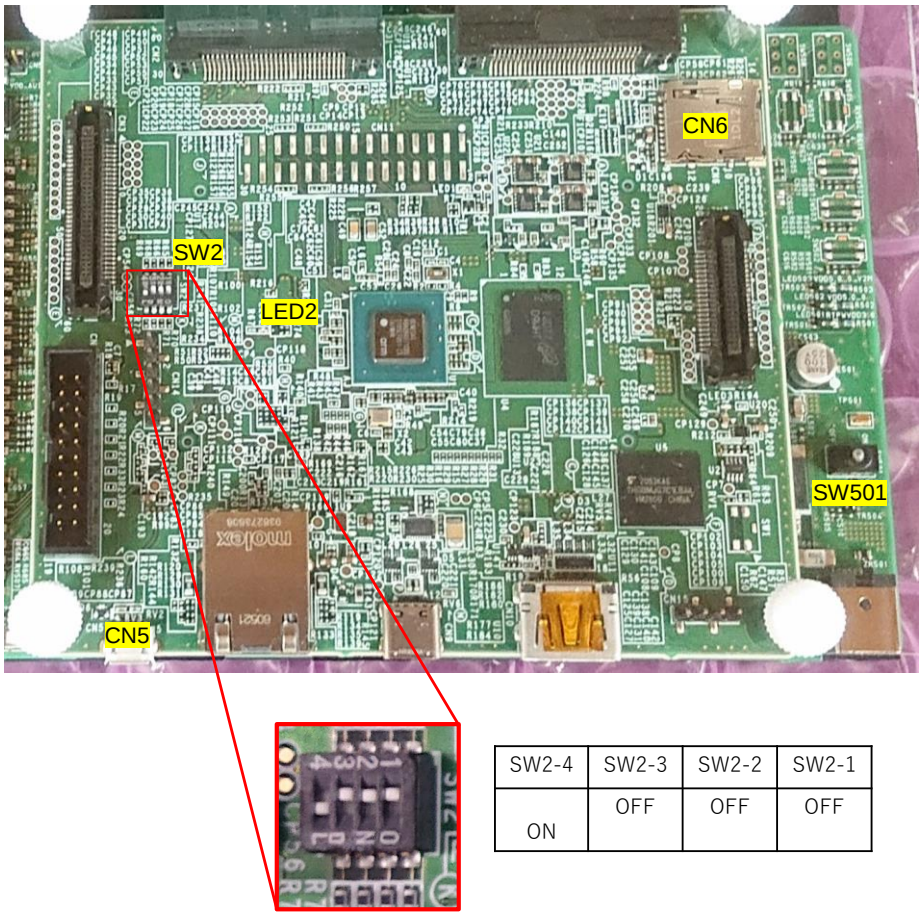
2.1.2 Writing Flash Writer Software (SD Card Forced Write Execution)

Write the prepared file (Flash writer, file name: B2_intSW.bin) to eMMC™ on the board by using the forced write function of RZ/V2M.

1. With the V2MEVK board power turned off, insert the prepared SD card into the V2MEVK's CN6 connector and set SW2 (see **Figure 2.1-1** for the SW2 setting method)
2. Turn on SW501 of V2MEVK
3. The RZ/V2M automatically acquires data from the SD card and writes the data to eMMC.
   LED2 lights up when writing is successfully completed.

SUPPLEMENTARY EXPLANATION

If LED2 is blinking, the write operation has failed and an error may have occurred on the SD card.
Check whether the SD card is inserted and formatted correctly.



SW2-4	SW2-3	SW2-2	SW2-1
ON	OFF	OFF	OFF

Figure 2.1-1 SW2 Settings

2.2 Writing Procedure for First Boot Loader, Second Boot Loader, and U-Boot (Using Flash Writer Writing Function)

2.2.1 Starting Flash Writer

Start the flash writer written in section **2.1 Flash Writer Writing Procedure (using SD Card Forced Write Function)**.

1. Turn off SW501 of V2MEVK
2. Turn off all SW2 switches (SW2-1, SW2-2, SW2-3, and SW2-4) of V2MEVK
3. Connect CN5 of V2MEVK and the Windows PC with a USB cable (standard-A-micro-B) and start Tera Term. See **Figure 2.2-1** for Tera Term settings.
4. Turn on SW501 of V2MEVK
   Check that the display is as shown in **Figure 2.2-2**.

Note: **Figure 2.2-1** shows the configuration for RZ/V2M Linux Package Ver1.2. If you will be using a different version, refer to *the RZ/V2M Linux Package Startup Guide for that version*.

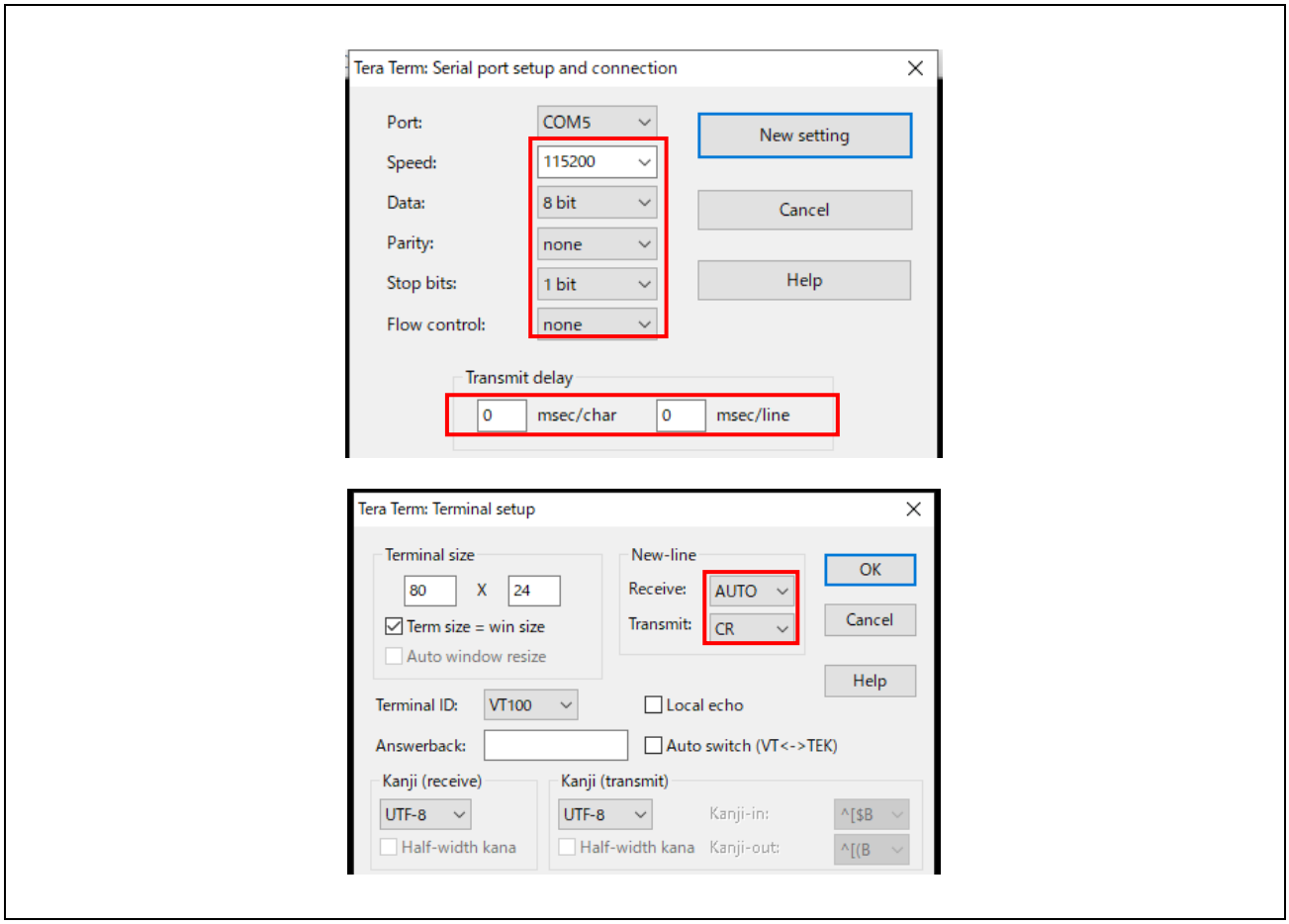


Figure 2.2-1 Settings of Tera Term

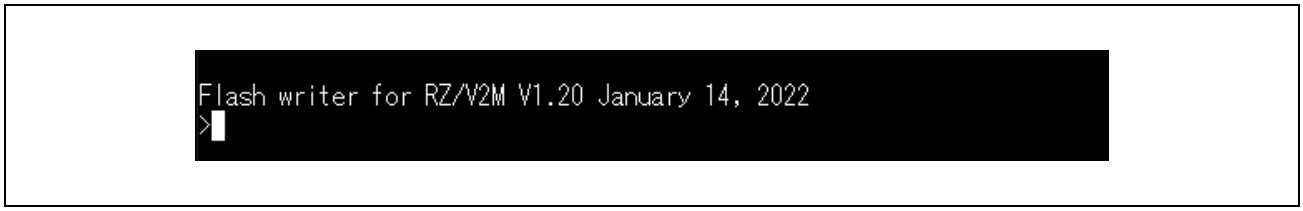


Figure 2.2-2 Starting the Flash Writer

2.2.2 Erasing the Area to be Written in eMMC

Erase the area in the eMMC for storing (writing) the first and second boot loaders and U-Boot.

1. Refer to **Table 2.2-1** and enter the contents of the input column with Tera Term.

Table 2.2-1 Procedure of eMMC Initialization

Step	Tera Term Display	Input	Supplemental Information
1	>	EM_E	The first and second boot loaders and U-Boot are stored in boot partition 1. For the sector number of boot partition 1 that first and second boot loaders and U-Boot are stored, refer to **Figure 2.2-5**.
2	Select area(0-2)>	1	
3	EM_E Complete!	—	

Figure 2.2-3 shows an example of the screen display when the above procedure is successfully executed.

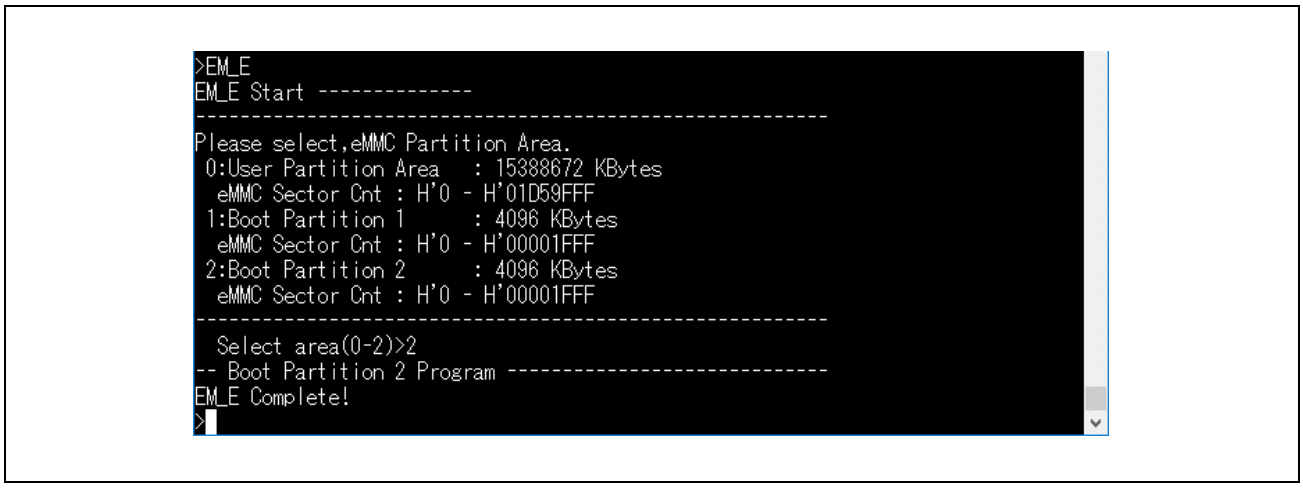


Figure 2.2-3 EM_E Command

2.2.3 Writing the First Boot Loader, Second Boot Loader, and U-Boot

Write first boot loader, second boot loader, and U-Boot, respectively, to eMMC.

1. Storage location of sample first boot loader, second boot loader, and U-Boot
   The files to be written are included in the following directory of the Linux package.
   r01an5971ej0<xxx>-rzv2m-linux (<xxx>: Package version)
   └─ bin
   ├─ loader_1st_128kb.bin
   ├─ loader_2nd.bin
   ├─ loader_2nd_param.bin
   ├─ u-boot.bin
   └─ u-boot_param.bin
2. Execute writing of first boot loader
   Use the flash writer function for writing.
3. Refer to **Table 2.2-2** and enter the contents of the input column with Tera Term.
   The following is an example of the first boot loader (file name to be written: loader_1st_128kb.bin).

Table 2.2-2 Procedure of Writing the Binary File

Step	Tera Term Display	Input	Supplemental Information
1	>	EM_WB	—
2	Select area(0-2)>	1	See **Figure 2.2-5** for details on specifying parameters. (For details, see *Table 7-3, Boot loader data stored in the eMMC* in *the RZ/V2M Linux Package Startup Guide*.)
3	Please Input Start Address in sector:	000	
4	Please Input File size(byte):	20000	
5	Please send binary file!	—	This control should be executed by the file transfer function, not by Tera Term command input. 1. Click “File” and “Send file...” 2 Select “loader_1st_128kb.bin” 3. Check “Binary” in “Option”. (see **Figure 2.2-4**) 4. Click “Open”.
6	EM_WB Complete!	—	—

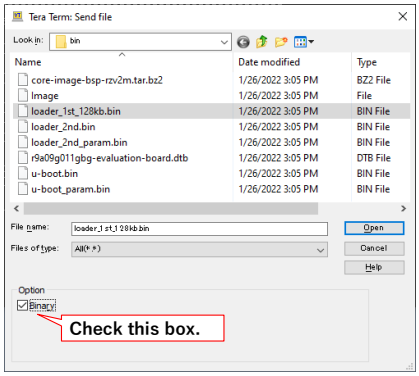


Figure 2.2-4 File Transmission

Table 7-3. Boot loader data stored in the eMMC

File name	Program top address	eMMC save partition	eMMC save sectors*1	File size(byte)*2	Description
loader_1st_128kb.bin	H'80100000	Boot partition 1	H'000000	H'20000	1st loader binary
loader_2nd_param.bin	On RAMA area *3	Boot partition 1	H'000100	H'8	Boot parameter for 2nd loader
loader_2nd.bin	H'B6000000	Boot partition 1	H'000101	H'30BD8	2nd loader binary
u-boot_param.bin	On RAMB area *3	Boot partition 1	H'000901	H'8	Boot parameter for u-boot
u-boot.bin	H'57F00000	Boot partition 1	H'000902	H'7EE01	U-Boot binary

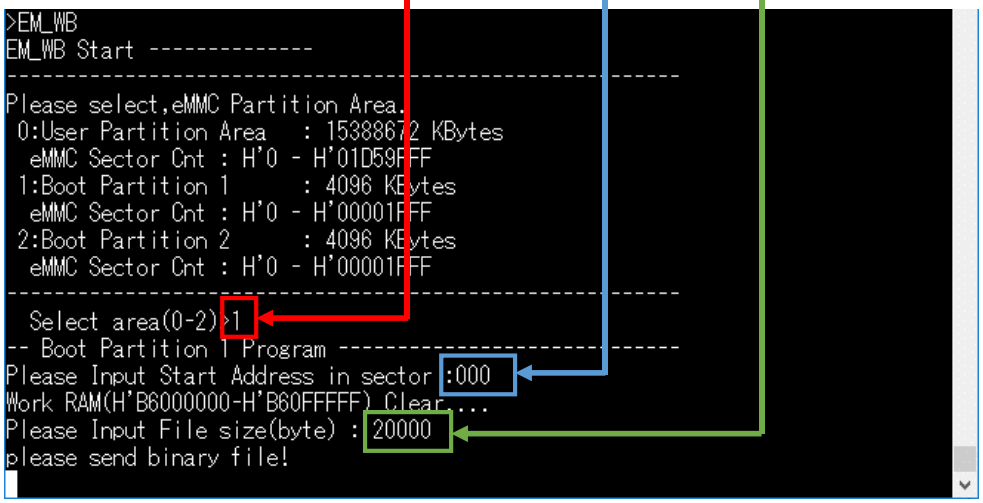


Figure 2.2-5 EM_WB Command (Determining the Specified Parameters)

4. Execution of writing second boot loader and U-Boot
   Writing the second boot loader and U-Boot also requires use of the functions of the flash writer. Change the following from the procedure for the first boot loader (file name to be written: loader_1st_128kb.bin) and write it.

4-1) Change the parameters specified in STEP 2 to 4.

4-2) Change the name of the file to be sent
   Second boot loader: “loader_2nd.bin”, “loader_2nd_param.bin”
   U-Boot: “u-boot.bin”, “u-boot_param.bin”

2.3 Startup with Written Information

Boot V2MEVK with the respective data for the first boot loader, second boot loader, and U-Boot that have been written to eMMC.

1. Turn off SW501 of V2MEVK
2. Turn on SW501 of V2MEVK
3. Restart V2MEVK and if the display is as shows in **Figure 2.3-1**, startup is complete.

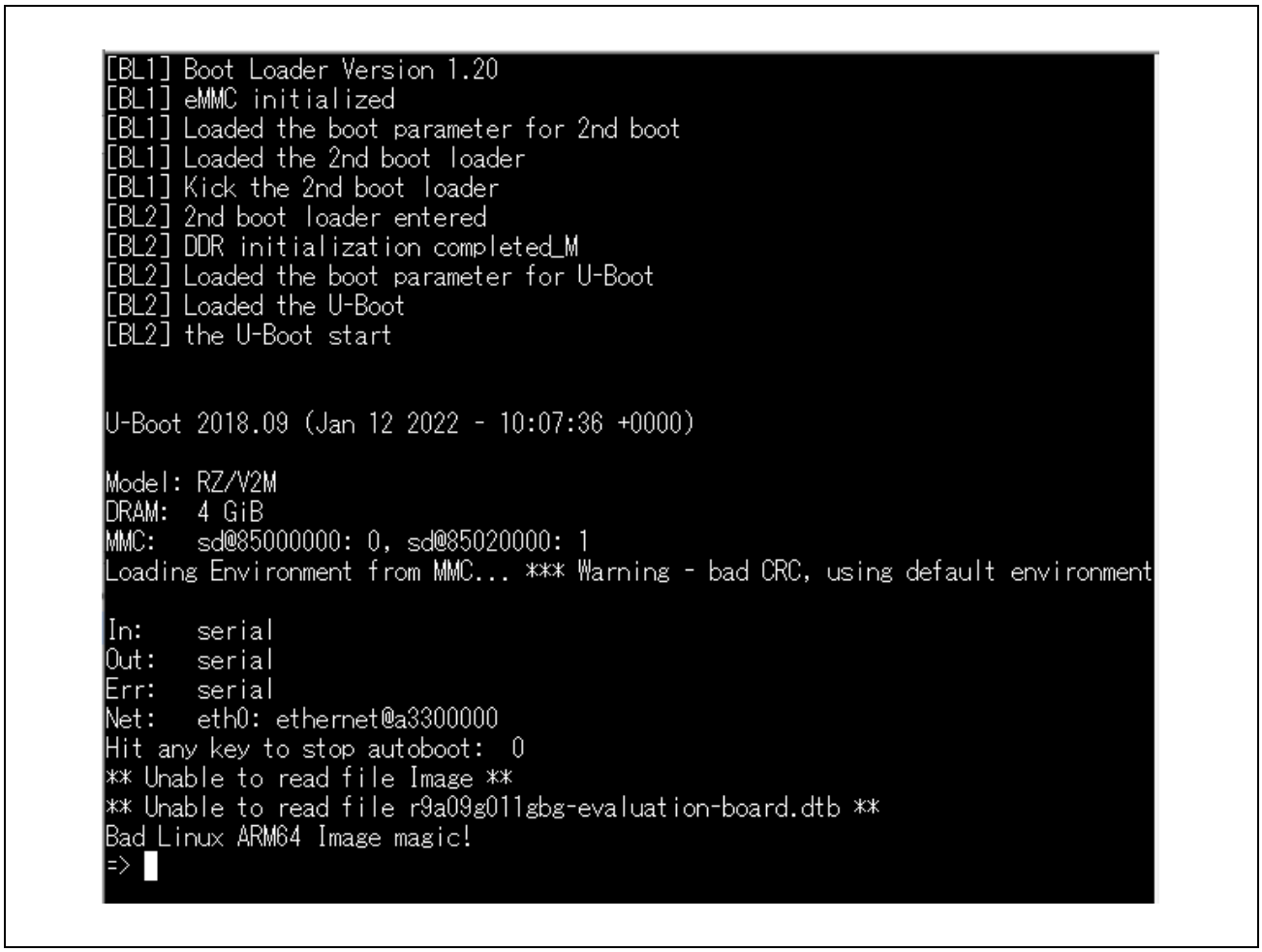


Figure 2.3-1 U-Boot Startup Display

REVISION HISTORY	RZ/V2M Evaluation Board Kit Start-Up Guide User's Manual

Rev.	Date	Description	
		Page	Summary
1.00	Jun 10, 2022	—	First edition, issued

RZ/V2M Evaluation Board Kit Start-Up Guide
User's Manual

Publication Date: Rev.1.00 Jun 10, 2022

Published by: Renesas Electronics Corporation

RZ/V2M Evaluation Board Kit Start-Up Guide

Renesas Electronics Corporation

R01UH1000EJ0100