RZ/G2 Reference Boards

Start-up Guide

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Introduction

This document provides a guide to prepare RZ/G2 reference boards to boot up with the Verified Linux Package for 64bit kernel. Especially, procedures to write bootloader to each board are explained.

Bootloaders are written to the Flash ROM on the board using the Flash Writer or the Mini Monitor provided by Renesas. This document explains the way to write these files using the Flash Writer.

Target

RZ/G2 Group reference boards

- Hoperun Technology HiHope RZ/G2H platform (hihope-rzg2h)
- Hoperun Technology HiHope RZ/G2M platform (hihope-rzg2m)
- Hoperun Technology HiHope RZ/G2N platform (hihope-rzg2n)
- Silicon Linux RZ/G2E evaluation kit (EK874)

Verified Linux Package for 64bit kernel version 1.0.x

Contents

1. Preparing Flash Writer 2
1.1 Preparing cross compiler 2
1.2 Building Flash Writer 2
2. Hoperun Technology HiHope RZ/G2[HMN] platform (hihope-rzg2h, hihope-rzg2m, hihope-rzg2n) 3
2.1 Preparation 3
2.1.1 Building files to write 3
2.1.2 Settings 3
2.2 Booting Flash Writer 3
2.3 Writing Bootloader 5
2.4 Setting U-boot 6
3. Silicon Linux RZ/G2E evaluation kit (EK874) 8
3.1 Preparation 8
3.1.1 Building files to write 8
3.1.2 Settings 8
3.2 Booting Flash Writer 8
3.3 Writing Bootloader 9
3.4 Setting U-boot 9
Revision History 1

1. Preparing Flash Writer

Flash Writer is built automatically when building BSP by bitbake command. Please refer to the Release Note of the Verified Linux Package to obtain a binary file of Flash Writer.

If you need latest one, please get source code from the GitHub repository and build it according to the following instructions. In general, new revision of reference boards requires latest Flash Writer.

1.1 Preparing cross compiler

FlashWriter runs on target boards. Please get cross compiler built by Linaro or setup a Yocto SDK.

Linaro toolchain:

```
$ cd ~/
$ wget https://releases.linaro.org/components/toolchain/binaries/7.3-2018.05/a
arch64-elf/gcc-linaro-7.3.1-2018.05-x86_64_aarch64-elf.tar.xz
$ tar xvf gcc-linaro-7.3.1-2018.05-x86_64_aarch64-elf.tar.xz
```

Yocto SDK:

Build an SDK according to Release Notes and install it to a Linux Host PC. Then, enable the SDK as below.

```
$ source /opt/poky/2.4.3/environment-setup-aarch64-poky-linux
```

1.2 Building Flash Writer

Get source codes of Flash Writer from the GitHub repository and checkout the latest tag.

```
cd ~/
git clone https://github.com/renesas-rz/rzg2_flash_writer.git
cd rzg2_flash_writer
git checkout -b v1.05 v1.05
```

Build Flash Writer as an s-record file by the following commands. Please specify a target board by "BOARD" option.

Linaro toolchain:

```
$ make -f makefile.linaro clean
$ CROSS_COMPILE=~/gcc-linaro-7.3.1-2018.05-x86_64_aarch64-elf/bin/aarch64-elf-
 make -f makefile.linaro BOARD=<board>
```

Yocto SDK:

```
$ make clean
$ make BOARD=<board>
```

Please replace *<board>* to a proper option according to this table.

Target board	BOARD option	Image to be generated
HiHope RZ/G2H	HIHOPE	AArch64_Flash_writer_SCIF_DUMMY_CERT_E6300400_hihope.mot
HiHope RZ/G2M		
HiHope RZ/G2N		
EK874	EK874	AArch64_Flash_writer_SCIF_DUMMY_CERT_E6300400_ek874.mot

2. Hoperun Technology HiHope RZ/G2[HMN] platform (hihope-rzg2h, hihope-rzg2m, hihope-rzg2n)

2.1 Preparation

2.1.1 Building files to write

This board uses the files below as a bootloader. Please build them according to the Release Note and copy these files to the PC which runs a serial terminal software.

- bootparam_sa0.srec
- bl2-hihope-rzg2h.srec (RZ/G2H) or bl2-hihope-rzg2m.srec (RZ/G2M) or bl2-hihope-rzg2n.srec (RZ/G2N)
- cert_header_sa6.srec
- bl31-hihope-rzg2h.srec (RZ/G2H) or bl31-hihope-rzg2m.srec (RZ/G2M) or bl31-hihope-rzg2n.srec (RZ/G2N)
- u-boot-elf-hihope-rzg2h.srec (RZ/G2H) or u-boot-elf-hihope-rzg2m.srec (RZ/G2M) or u-boot-elf-hihope-rzg2n.srec (RZ/G2N)

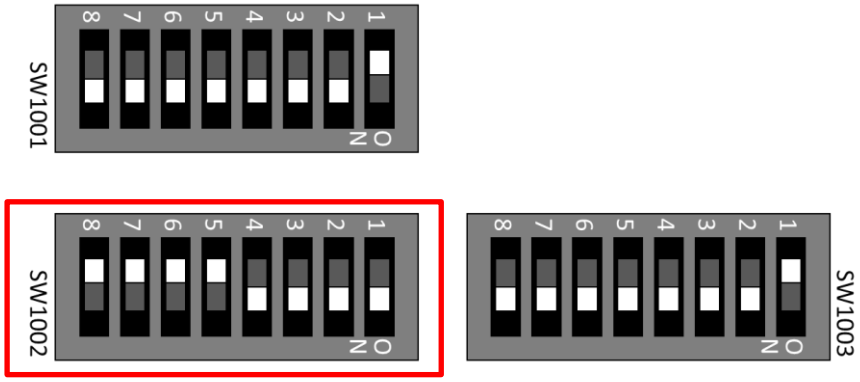
2.1.2 Settings

Connect between the board and a control PC by USB serial cable according to the Release Note.

Set the settings about serial communication protocol on a terminal software as below:

- Speed: 115200 bps
- Data: 8bit
- Parity: None
- Stop bit: 1bit
- Flow control: None

To set the board to SCIF Download mode, set the SW1002 as below:



SW1002

8	7	6	5	4	3	2	1
OFF	OFF	OFF	OFF	ON	ON	ON	ON

Note) Be careful not to change the SW1001 and SW1003

2.2 Booting Flash Writer

Turn on the power of the board by changing the SW2402. Messages below are shown on the terminal.

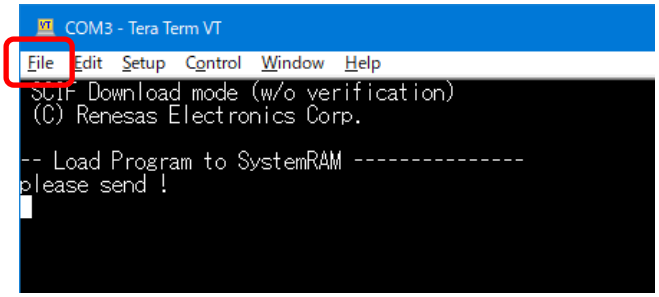
```
SCIF Download mode (w/o verification)
(C) Renesas Electronics Corp.
```

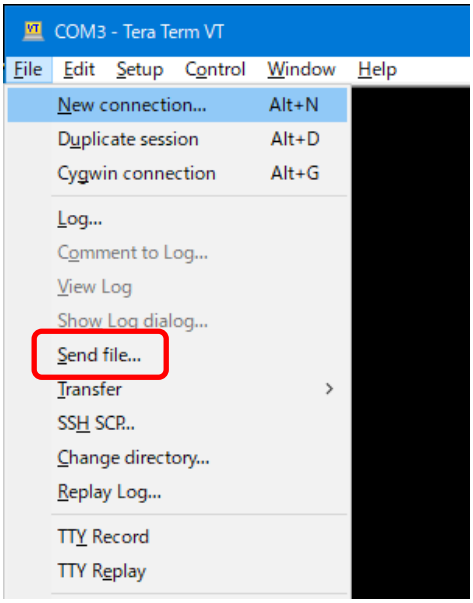
```
-- Load Program to SystemRAM ---------------
please send !
```

Send an image of Flash Writer (AArch64_Flash_writer_SCIF_DUMMY_CERT_E6300400_hihope.mot) using terminal software after the message “please send !” is shown.

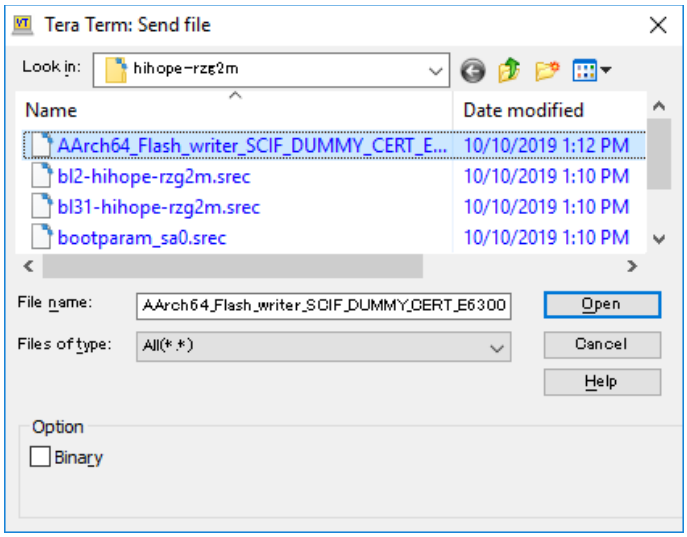
Below is a sample procedure with Tera Term.

Open a “Send file” dialog by selecting “File” → “Sendfile” menu.

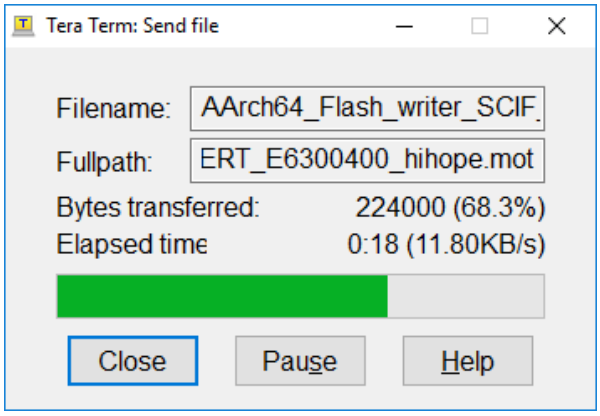




Then, select the image to be send and click “Open” button.



The image will be sent to the board via serial connection.



After successfully download the binary, Flash Writer starts automatically and show a message like below on the terminal.

```
Flash writer for RZ/G2M V1.00 Sep.24,2019
>
```

2.3 Writing Bootloader

"xls2" command of Flash Writer is used to write binary files. This command receives binary data from the serial port and write the data to specified address of the Flash ROM with information where the data should be loaded on the address of the main memory.

This is an example of writing "bootparam_sa0.srec" which should be placed to E6320000h of the main memory to 000000h of the Flash ROM.

```
>xls2
===== Qspi writing of RZ/G2 Board Command =============
Load Program to Spiflash
Writes to any of SPI address.
 Winbond : W25M512JW
Program Top Address & Qspi Save Address
===== Please Input Program Top Address ============
  Please Input : H'E6320000

===== Please Input Qspi Save Address ===
```

```
  Please Input : H'000000
Work RAM(H'50000000-H'53FFFFFF) Clear....
please send ! ('.' & CR stop load)
```

Send the data of “bootparam_sa0.srec” from terminal software after the message “please send !” is shown.

After successfully download the binary, messages like below are shown on the terminal.

```
SPI Data Clear(H'FF) Check :H'00000000-H'00007FFF Erasing.
........Erase Completed
SAVE SPI-FLASH.......
======= Qspi  Save Information  =================
 SpiFlashMemory Stat Address : H'00000000
 SpiFlashMemory End Address  : H'00000E67
============================================================
```

```
SPI Data Clear(H'FF) Check : H'00000000-0000FFFF,Clear OK?(y/n)
```

In case a message to prompt to clear data like above, please enter “y”.

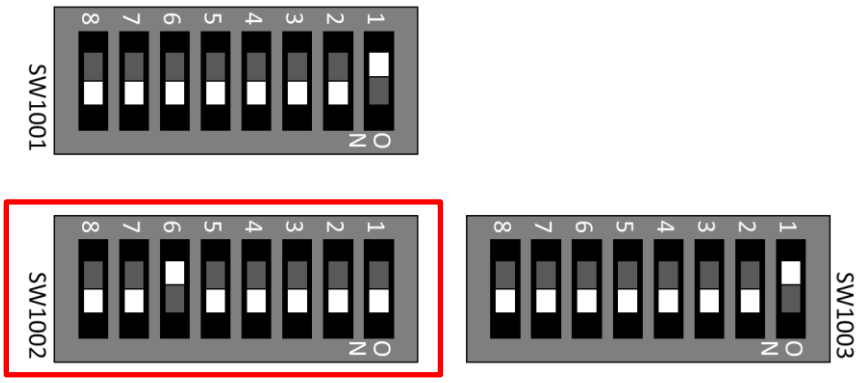
Write all necessary files using the addresses listed at Table 1 and turn off the power of the board by changing the SW2402.

Table 1. Addresses for each file

File name	Address to load to RAM	Address to save to ROM
bootparam_sa0.srec	E6320000	000000
bl2-hihope-rzg2h.srec or bl2-hihope-rzg2m.srec or bl2-hihope-rzg2n.srec	E6304000	040000
cert_header_sa6.srec	E6320000	180000
bl31-hihope-rzg2h.srec or bl31-hihope-rzg2m.srec or bl31-hihope-rzg2n.srec	44000000	1C0000
u-boot-elf-hihope-rzg2m.srec or u-boot-elf-hihope-rzg2n.srec	50000000	300000

2.4 Setting U-boot

To set the board to SPI Boot mode, set the SW1002 as below:



SW1002

8	7	6	5	4	3	2	1
ON	ON	OFF	ON	ON	ON	ON	ON

Note) Be careful not to change the SW1001 and SW1003

Turn on the power of the board by changing the SW2402.

```
U-Boot 2020.10 (May 07 2021 - 13:48:35 +0000)

CPU: Renesas Electronics R8A774A1 rev 1.1/rev 1.2
Model: Hoperun Technology HiHope RZ/G2M platform (hihope-rzg2m)
DRAM:  3.9 GiB
Bank #0: 0x048000000 - 0x0bfffffff, 1.9 GiB
Bank #1: 0x600000000 - 0x67fffffff, 2 GiB

MMC:   sd@ee100000: 0, sd@ee160000: 1
Loading Environment from SPI Flash... SF: Detected w25m512jw with page size 25
6 Bytes, erase size 4 KiB, total 32 MiB
*** Warning - bad CRC, using default environment
```

Following the messages above, many warning messages will be shown. These warnings are eliminated by setting correct environment variables. Please set default value and save them to the Flash ROM.

```
=> env default -a
## Resetting to default environment
=> saveenv
Saving Environment to SPI Flash... SF: Detected w25m512jv with page size 256 B
ytes, erase size 4 KiB, total 32 MiB
Erasing SPI flash...Writing to SPI flash...done
OK
```

In case booting from micro SD card, set environment variables using the commands below:

```
=> setenv bootargs 'root=/dev/mmcblk0p2 rootwait'
=> setenv bootcmd 'fatload mmc 0:1 0x48080000 Image-hihope-rzg2m.bin; fatload
mmc 0:1 0x48000000 Image-r8a774a1-hihope-rzg2m.dtb; booti 0x48080000 - 0x48000
000'
=> saveenv
Saving Environment to SPI Flash... SF: Detected w25m512jv with page size 256 B
ytes, erase size 4 KiB, total 32 MiB
Erasing SPI flash...Writing to SPI flash...done
OK
```

Note) The setting above assumes the SD card has two partitions and stores data as below:
First partition: formatted as FAT, includes Image-hihope-rzg2m.bin and Image-r8a774a1-hihope-rzg2m.dtb
Second partition: formatted as ext4, rootfs image is expanded

Note) Please replace the file names in “bootcmd” according to the Release Note.

Now the board can bootup normally. Please turn off and on the power again to boot up the board.

1. Silicon Linux RZ/G2E evaluation kit (EK874)

1.1 Preparation

1.1.1 Building files to write

This board uses the files below as a bootloader. Please build them according to the Release Note and copy these files to the PC which runs a serial terminal software.

- bootparam_sa0.srec
- bl2-ek874.srec
- cert_header_sa6.srec
- bl31-ek874.srec
- u-boot-elf-ek874.srec

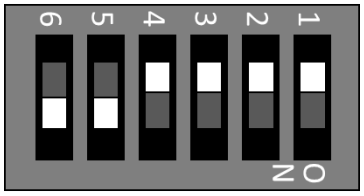
1.1.2 Settings

Connect between the board and a control PC by USB serial cable according to the Release Note.

Set the settings about serial communication protocol on a terminal software as below:

- Speed: 115200 bps
- Data: 8bit
- Parity: None
- Stop bit: 1bit
- Flow control: None

To set the board to SCIF Download mode, set the SW12 which is placed near the micro SD card slot as below:



6	5	4	3	2	1
ON	ON	OFF	OFF	OFF	OFF

1.2 Booting Flash Writer

Turn on the power of the board by changing the SW23. Messages below are shown on the terminal.

```
 SCIF Download mode (w/o verification)
 (C) Renesas Electronics Corp.

-- Load Program to SystemRAM ---------------
please send !
```

Send an image of Flash Writer (AArch64_Flash_writer_SCIF_DUMMY_CERT_E6300400_ek874.mot) from terminal software after the message “please send !” is shown.

For detail of the procedure, please refer to the section **2.2 Booting Flash Writer**.

After successfully download the binary, Flash Writer starts automatically and shows a message like below on the terminal.

```
Flash writer for RZ/G2E V1.00 Sep.24,2019
>
```

1.3 Writing Bootloader

"XLS2" command of Flash Writer is used to write binary files. This command receives binary data from the serial port and write the data to specified address of the Flash ROM with information where the data should be loaded on the address of the main memory.

For detail of the procedure, please refer to the section **2.3 Writing Bootloader**.

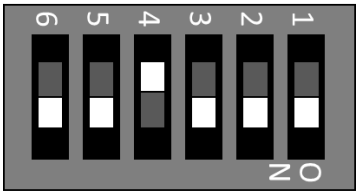
Write all necessary files using the addresses listed at Table 2 and turn off the power of the board by changing the SW23.

Table 2. Addresses for each file

File name	Address to load to RAM	Address to save to ROM
bootparam_sa0.srec	E6320000	000000
bl2-ek874.srec	E6304000	040000
cert_header_sa6.srec	E6320000	180000
bl31-ek874.srec	44000000	1C0000
u-boot-elf-ek874.srec	50000000	300000

1.4 Setting U-boot

To set the board to SPI Boot mode, set the SW12 which is placed near the micro SD card slot as below:



6	5	4	3	2	1
ON	ON	OFF	ON	ON	ON

Turn on the power of the board by changing the SW23.

```
U-Boot 2020.10 (May 07 2021 - 13:48:35 +0000)

CPU: Renesas Electronics R8A7794C0 rev 1.1
Model: Silicon Linux CAT874 RZ/G2E board
DRAM:  1.9 GiB
Bank #0: 0x048000000 - 0x0bfffffff, 1.9 GiB

MMC:   sd@ee100000: 0
Loading Environment from SPI Flash... SF: Detected w25m512jv with page size 25
6 Bytes, erase size 4 KiB, total 32 MiB
```

Following the messages above, many warning messages will be shown. These warnings are eliminated by setting correct environment variables. Please set default value and save them to the Flash ROM.

```
=> env default -a
## Resetting to default environment
=> saveenv
Saving Environment to SPI Flash... SF: Detected w25m512jv with page size 256 B
ytes, erase size 4 KiB, total 32 MiB
Erasing SPI flash...Writing to SPI flash...done
OK
```

In case booting from micro SD card, set environment variables using the commands below:

```
=> setenv bootargs 'root=/dev/mmcblk0p2 rootwait'
=> setenv bootcmd 'fatload mmc 0:1 0x48080000 Image-ek874.bin; fatload mmc 0:1
 0x48000000 Image-r8a774c0-ek874.dtb; booti 0x48080000 - 0x48000000'
=> saveenv
Saving Environment to SPI Flash... SF: Detected w25m512jv with page size 256 B
ytes, erase size 4 KiB, total 32 MiB
Erasing SPI flash...Writing to SPI flash...done
OK
```

Note) The setting above assumes the SD card has two partitions and stores data as below:
First partition: formatted as FAT, includes Image-ek874.bin and Image-r8a774c0-ek874.dtb
Second partition: formatted as ext4, rootfs image is expanded

Now the board can bootup normally. Please turn off and on the power again to boot up the board.

Website and Support

Renesas Electronics Website
http://www.renesas.com/

Inquiries
http://www.renesas.com/contact/

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Revision History

		Description	
Rev.	**Date**	**Page**	**Summary**
1.00	Apr. 25, 2019	−	First edition issued.
1.01	May. 16, 2019	−	Information for RZ/G2M board is added.
1.02	Oct. 28, 2019	−	Information for RZ/G2N board is added. Changed to use Flash Writer instead of Mini Monitor.
1.03	Jan. 29, 2020	2	Changed to match the update that Flash Writer is built when BSP is built.
1.04	Jun. 29, 2020	−	Information for RZ/G2H board is added.
1.05	Nov. 30, 2020	2	Git command for Flash Writer is fixed.
1.06	Feb. 26, 2021	2	Git command for Flash Writer is fixed.
1.07	May. 31, 2021	7, 9	Update U-boot to v2020.10
1.08	Aug. 31, 2021	-	No new update, just update date and version to be consistent with new VLP64 version
1.09	Nov. 15, 2021	2	Git command for Flash Writer is fixed.
1.10	Feb. 28, 2022	-	No new update, just update date and version to be consistent with new VLP64 version
1.11	May. 31, 2022	-	No new update, just update date and version to be consistent with new VLP64 version
1.12	Aug. 31, 2022	-	No new update, just update date and version to be consistent with new VLP64 version
1.13	Nov. 30, 2022	-	No new update, just update date and version to be consistent with new VLP64 version
1.14	Feb. 28, 2023	-	No new update, just update date and version to be consistent with new VLP64 version
1.15	May. 31, 2023	-	No new update, just update date and version to be consistent with new VLP64 version
1.16	Aug. 31, 2023	-	No new update, just update date and version to be consistent with new VLP64 version
1.17	Nov. 30, 2023	-	No new update, just update date and version to be consistent with new VLP64 version
1.18	Feb. 29, 2024	-	No new update, just update date and version to be consistent with new VLP64 version