RZ/A2M Group
DRP Custom Library User's Manual and Functional Design Specifications
First Edition (Rev. 1.00)

Users Guide

October 1, 2019		
Renesas Electronics		
Approved by	Examined by	Author

User's Manual

RZ/A2M Group

DRP Custom Library User's Manual

Users Guide

Renesas Electronics
www.renesas.com

Rev.1.00 October. 2019

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. 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 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. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

   The state of the product is undefined at the moment 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 moment 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 moment 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 moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

   Access to reserved addresses is prohibited.

   — The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has 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. Moreover, 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.

5. Differences between Products

   Before changing from one product to another, i.e. to a product with a different part number, confirm that the change will not lead to problems.

   — The characteristics of Microprocessing unit or Microcontroller unit products in the same group but having a different part number may differ in terms of the internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

How to Use This Manual

1. Purpose and Target Readers

This manual is intended to provide the user with an understanding of the functions of the DRP custom library and how to utilize them. It is aimed at users designing application systems making use of the DRP custom library. In order to use this manual, you will need a basic knowledge of programming languages and microprocessors.

> Particular attention should be paid to the precautionary notes when using the manual. These notes occur within the body of the text, at the end of each section.

> The revision history summarizes the locations of revisions and additions. It does not list all revisions. Refer to the text of the manual for details.

Contents

1. Introduction 6
1.1 Summary 6
2. Operation Conditions 7
3. File Structure 8
4. DRP Library Reference 9
4.1 How to Read the DRP Library Reference 9
4.2 Renesas e^2 studio lib integration 10
4.2.1 Definition of Custom Library location 10
5. Using the DRP Library 12
6. Reference Documents 13

1. Introduction

1.1 Summary

This manual describes the functions and usage of the DRP custom libraries, which run on the dynamically reconfigurable processor (DRP) of RZ/A2M Group Microprocessors.

The DRP can perform various functions according to user's setting. In this document, the function performed by DRP is called "circuit", and the data representing circuit information is called "configuration data". Writing of the circuit to DRP can be performed by loading the configuration data using DRP Driver[*1]. DRP Custom Library is a collection of configuration data with various functions, mainly image processing.

Note 1. For details of DRP Driver, refer to "RZ/A2M Group DRP Driver User's Manual (R01US0355)".

2. Operation Conditions

The DRP library operates under the conditions listed below.

Table 2.1 Operation Conditions

Item	Description
Microprocessor	RZ/A2M Group Microprocessors*1 • R7S921051VCBG • R7S921052VCBG • R7S921053VCBG

Note 1. The DRP library operates on RZ/A2M Group Microprocessors equipped with a DRP function module. It will not operate on RZ/A2M Group Microprocessors without a DRP function module.

The library integration procedure was confirmed to operate in the following development environment:

Renesas e^2 studio 7.5.0

The following toolchain is compatible:

GCC ARM Embedded Toolchain 6-2017-q2-update

3. File Structure

Figure 3.1 shows the file structure of configuration data and header files in the DRP custom library.

```
r_drp_<libraryName>                          <libraryNameShortForm>
   +asm
   |   +    r_drp_<libraryName>[_t<tileNum>].asm
   |
   +dat
   |  +    r_drp_<libraryName >[_t<tileNum>].dat
   |
   +inc
   |  +   r_drp_< libraryName >_x[_t<tileNum>].h
   |  +   r_drp_< libraryName >.h
   + doc
      + <pdf description of library>

Note:
        1.)  If more tjen 1 Tile is used [_t<tileNum>].is existing.
        2.)  In case several implementations with different Tile usage is existing then the *.asm, *.dat, and
             _x[_t<tileNum>].h can exist with different <tileNum> name parts.
        3.)  r_drp_< libraryName >.h contains the interface description for the library
```

Figure 3.1 File Structure

4. DRP Custom Library Reference

4.1 How to Read the DRP Custom Library Reference

In this section the specifications of the configuration data contained in the DRP library are presented in the format shown below.

Function name*1

Function outline

Configuration data file	The name of the configuration data file. Use the DRP Driver's R_DK2_Load() function to load the data in the DRP.
Supported version	Lists the version of the configuration data that operates under present specification. Use the DRP Driver's R_DK2_GetInfo() function to get the version.
Configuration data size (byte)	Lists the size of the configuration data. Lists all versions, if there are different versions.
Header file	The name of the header file for using the configuration data. Use #include "header file" to include the file.
Parameter	Lists the parameters required by the circuit. Parameters are passed from the CPU to the DRP by means of the DRP driver's R_DK2_Start() function. Parameters are defined as a structure within the header file. Before running the circuit, set the parameters on the CPU side. The data type defined in stdint.h is used. Also, the area where parameters are stored and the area indicated by parameters representing addresses such as 'src' and 'dst' must be located in physical memory. *2
I/O details	Lists the details of the data specified by the parameters. Unless otherwise indicated, the same address may be specified for the input buffer address and output buffer address.
Number of tiles	The number of tiles used by the circuit. The DRP has 6 tiles. The DRP Driver's R_DK2_Load() function is used to assign circuits to tiles.
Segmented processing	Indicates that the function can be processed in parallel by multiple circuits. In parallel processing, the input image is divided up in the vertical direction and processed accordingly. The segmented processing can be executed by utilizing the 6 tiles of DRP and loading multiple configuration data of 3 tiles or less. For details on loading multiple configuration data of 3 tiles or less into DRP, see the explanation of R_DK2_Load () function in "RZ/A2M Group DRP Driver User's Manual".

Example: A case where the input image is divided into three portions in the vertical direction

Description	Describes the specifications of the configuration data.
Note	Additional notes appear here.

Note 1. The function name of configuration data is a character string that can be obtained from the configuration data by using the DRP Driver's R_DK2_GetInfo() function.

Note 2. If the values of physical memory in the area of parameters and input/output data of the circuit are incorrect because the values are in the Cortex-A9 cache, etc., the circuit does not work properly. It must be necessary to clean the cache before calling the DRP driver's R_DK2_Start() function or to allocate the parameters and input/output data of circuit to a non-cached area.

For information on using the API functions of the DRP Driver, refer to "RZ/A2M Group DRP Driver User's Manual (R01US0355)".

4.2 Renesas e² studio lib integration

4.2.1 Definition of Custom Library location

In the following example several custom libraries are stored within the following path.

A library can be added or deleted on demand. The used path is an example and can be changed.

${ProjDirPath}/generate/sc_drivers/r_drp_custom/drp_lib_custom

The libraries r_drp_<libraryName> have to be copied into the above directory. In Figure 2 is an example with 6 custom libraries, which will be used within one project.

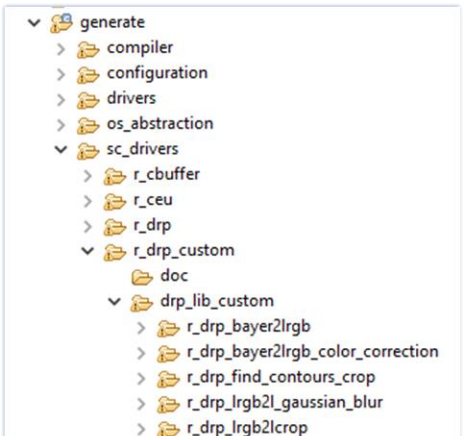

Figure 2 custom library hierarchy

For accessing the library include paths must be set. This are mainly for the C-header files *.h and the assembler binary search path

For assembler Include the following path within the assembler include menu:

${ProjDirPath}/generate/sc_drivers/r_drp_custom/drp_lib_custom

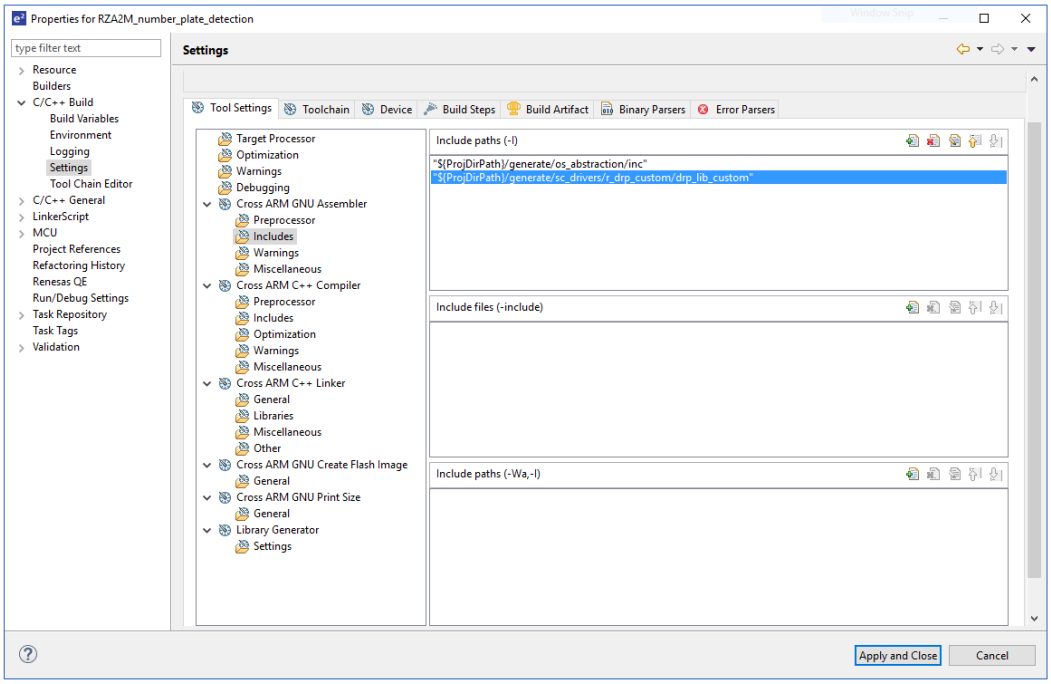

Figure 3 Assembler include setting

For gcc header files please Include the following paths within the C++ Compiler include menu:

${ProjDirPath}/generate/sc_drivers/r_drp_custom/drp_lib_custom/ r_drp_<libraryName>/inc

Figure 4 shows the entries for the above listed r_drp_<libraryName> libs as example:

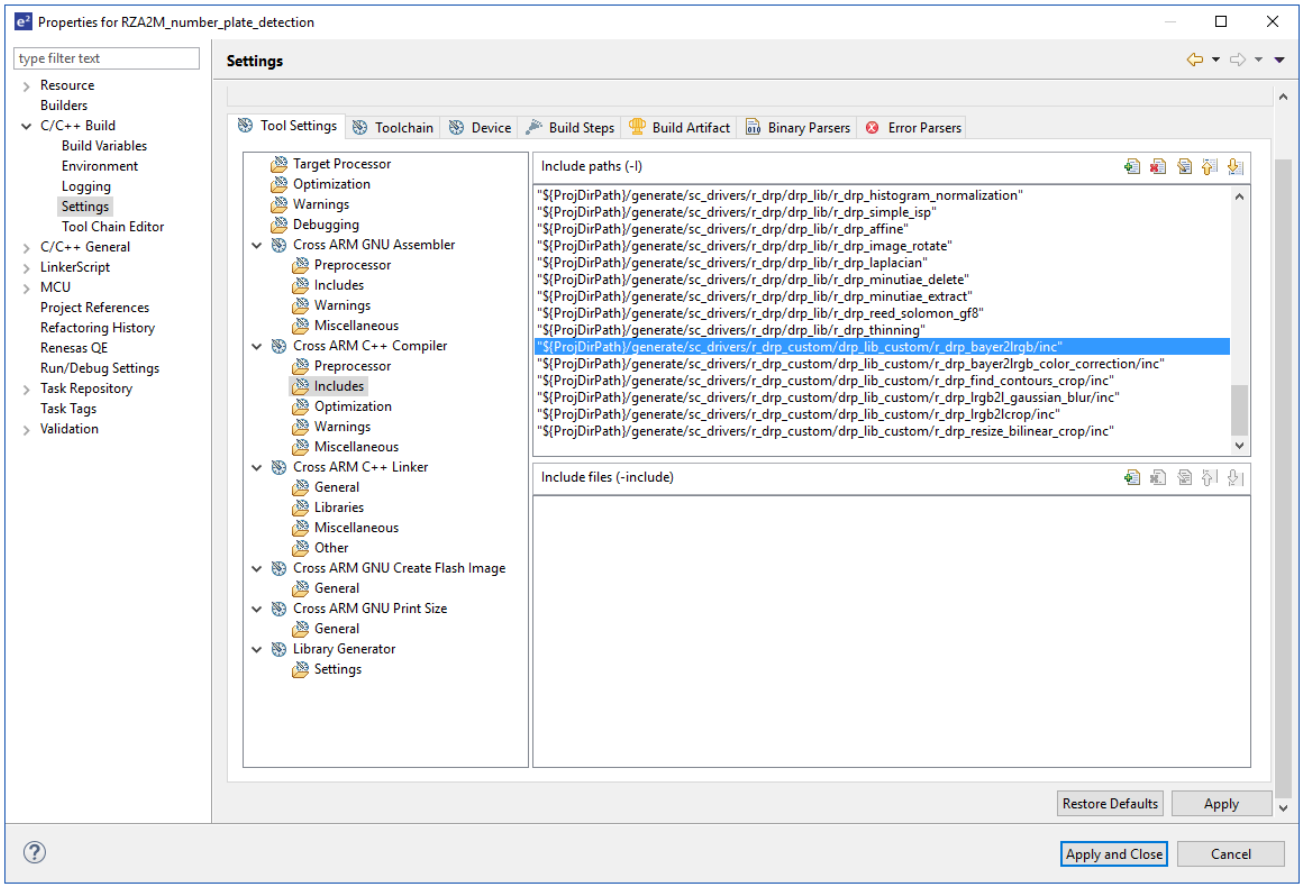

Figure 4 Include paths for header files

With the above settings the integration/activation within e^2 studio is done.

5. Using the DRP Custom Library

To use this library, it is necessary to initialize the DRP, load configuration data, etc. Also, since the parameters are different for each configuration data, set the parameters based on the specification of the configuration data to be used.

The library will be referenced by an include of the r_drp_< libraryName >_x[_t<tileNum>].h file

Drp lib load example:

```
#include "r_drp_bayer2lrgb_color_correction_x_t6.h"
```

The header file already defines the following reference:

>> extern unsigned char g_drp_lib_bayer2lrgb_color_correction_t6[]; <<

The r_DK2_Load can directly use "g_drp_lib_bayer2lrgb_color_correction_t6[]" definition

// usage example

```
/***************************************/
/* load DRP Library bayer2lrgb_color_correction */
/***************************************/
ret_val = R_DK2_Load(&g_drp_lib_bayer2lrgb_color_correction_t6[0],
                     R_DK2_TILE_0,
                     _DK2_TILE_PATTERN_6, NULL, &cb_drp_finish, &drp_lib_id[0]);
DRP_DRV_ASSERT(ret_val);
```

Each custom library has a documentation for parameter description and a short usage example. Please refer to this for further details. The custom libraries are an add on to the DRP libraries and implementing special functionality.

6. Reference Documents

User's Manual: Hardware

RZ/A2M Group User's Manual: Hardware (R01UH0746)

(Download the latest version of the update or news from the Renesas Electronics website.)

User's Manual: Software

RZ/A2M Group DRP Driver User's Manual (R01US0355)

(Download the latest version of the update or news from the Renesas Electronics website.)

RZ/A2M Group 2D Barcode Sample Program Application Note (R01AN4503)

(Download the latest version of the update or news from the Renesas Electronics website.)

User's Manual: Development environment

For the Renesas Electronics integrated development environment (e^2 studio), visit the Renesas Electronics website to download the latest version.

Technical Update/Technical News

(Download the latest version of the update or news from the Renesas Electronics website.)

Revision History	RZ/A2M Group DRP Custom Library User's Manual

Rev.	Date	Description	
		Page	Summary
1.00	Oct 1, 2019	—	First Edition issued

RZ/A2M Group DRP Custom Library User’s Manual

Publication Date: Rev.1.00 Oct. 1, 2019

Published by: Renesas Electronics Corporation

RZ/A2M Group

Renesas Electronics Corporation