RZ/N2L Group

Encoder I/F FA-CODER sample program

Summary

This document describes the RZ/N2L Encoder I/F FA-CODER® sample program package.

For FA-CODER® communication protocol specifications and encoder specifications, contact Tamagawa Seiki Co., Ltd.

Functionality Checked Device

RSK+RZN2L Board (RTK9RZN2L0C00000BE)

Contents

1. Package Contents

This package contains the following contents.

The Configuration Data included in this package supports up to 2 axes, but the sample program supports only 1 axis; to use if with 2 axes, modify the sample program to support 2 axes.

1.1 Software

- Source code

No.	Name	Version number
1	RZ/N2L FA-CODER sample program	1.3

1.2 Document

No.	Document name	Version	File name
1	RZ/N2L Group Encoder I/F FA-CODER Sample Program Release Note	1.30	(j) r11an0739jj0130-rzn2l.pdf (e) r11an0739ej0130-rzn2l.pdf (this document)
2	RZ/N2L Group FA-CODER Sample Program Application Note	1.20	(j) r11an0738jj0120-rzn2l-fa-coder.pdf (e) r11an0738ej0120-rzn2l-fa-coder.pdf

2. File Structure

The file structure and contents of this package are detailed below.

```
Top
├── r11an0739jj0130-rzn2l.pdf
├── r11an0739ej0130-rzn2l.pdf
└── workspace
    ├── Software
    │   ├── iccarm
    │   │   └── RZ_N2L_fac.zip : RZ/N2L FA-CODER sample program set (IAR)
    │   └── gcc
    │       └── RZ_N2L_fac.zip : RZ/N2L FA-CODER sample program set (e² studio)
    └── Documents
        ├── r11an0738jj0120-rzn2l-fa-coder.pdf
        └── r11an0738ej0120-rzn2l-fa-coder.pdf
```

The file structure of the RZ_N2L_fac.zip is shown below.

```
Top folder
├── configuration.xml                : FSP Configuration data
├── ( Environment File Depending on Build Tool )
└── src
    ├── hal_entry.c                  : FA-CODER sample program
    ├── fac_main.c                   : FA-CODER sample program
    ├── siochar.c                    : SCI_UART sample program
    ├── siorw.c                      : SCI_UART sample program
    ├── sio_char.h                   : SCI_UART sample program
    └── drv
        └── fac
            ├── iodefine_fac.h       : FAC register definition file
            ├── r_fac_rzt2.c         : FAC driver file
            ├── r_fac_rzt2_config.h  : FAC driver file
            ├── r_fac_rzt2_dat.h     : FAC driver file
            └── r_fac_rzt2_if.h      : FAC driver file
```

3. About FA-CODER Sample Program

This section contains information necessary to use the complete set of FA-CODER sample programs.

3.1 Software Information

3.1.1 Base OS

This sample program is OS-independent.

3.1.2 Memory Size

Memory size used by this sample program and FA-CODER driver is shown in following table. This table does not include memory size used by Flexible Software Package or C language libraries of the compiler, but for the SCI driver and DMAC driver portion which is used for the FA-CODER encoder interface.

Items		Memory Size	
		EWARM [kBytes]	e² studio [kBytes]
FA-CODER driver	Code	3.7	3.1
	Data (with initial value)	0.0	0.0
	Data (without initial value)	0.5	0.5
	Constant Data	0.1	0.1
SCI driver and DMAC driver for encoder interface *	Code	5.2	4.3
	Data (with initial value)	0.0	0.0
	Data (without initial value)	0.1	0.1
	Constant Data	0.1	0.1
Sample program	Code	4.3	4.9
	Data (with initial value)	0.0	0.0
	Data (without initial value)	0.6	0.6
	Constant Data	2.1	2.2

Note: This is the SCI driver and the DMAC driver which are automatically generated by the Flexible Software Package Smart Configurator. The SCI and the DMAC drivers are used for the FA-CODER encoder interface. It is called from inside of the FA-CODER driver.

3.2 Hardware Information

3.2.1 Device

RZ/N2L

3.2.2 Target Board

(1) Board Name

RSK+RZN2L (RTK9RZN2L0C00000BE)

(2) Setting of Target Board

The target board configuration is as follows.

SW4-1: ON, SW4-2: OFF, SW4-3: ON

SW4-4: ON

SW4-7: OFF

(3) Used Pins of the Target Board

The correspondence between the pin used as the encoder I/F and the pin header of the target board is as follows.

Channel	Pin Name	Pin Header	Input/Output	Description
FACODER0	TXD3	JA3-A #44	output	Request output pin
	DE3	JA3-A #8	output	Drive/receive control pin
	RXD3	JA3-A #10	input	Input data reception pin
FACODER1	TXD4	J26 #4	output	Request output pin
	DE4	J26 #3	output	Drive/receive control pin
	RXD4	J26 #2	input	Input data reception pin

3.3 Procedures on Development Environments

3.3.1 Preparation before Executing the Sample Program

This sample program communicates with a PC. The USB connection terminal on the target board is CN16.

The terminal software of the host PC is set as shown in the following table.

Function	Setting
Communication method	Asynchronous Serial transmit/receive
send / receiving order	LSB first
Transfer rate	19200 bps
Character length	8 bits
Stop bit length	1 bit
Parity function	None
Hardware flow control	None

3.3.2 EWARM from IAR Systems

(1) Build Environment

IAR Embedded Workbench for ARM v9.32.2

RENESAS RZ/N2L Flexible Software Package v1.3.0

(2) Execution Environment ICE

IAR I-jet

(3) Build Procedure for Sample Programs

The build procedure for the sample program is as follows.

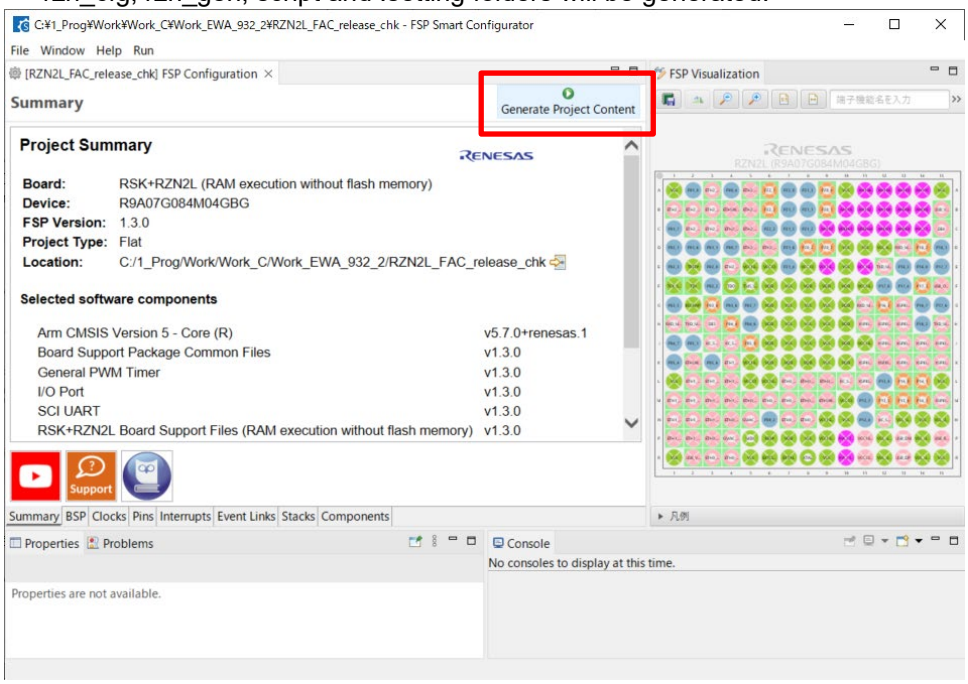
1 Copy the extracted source files to the desired location.
2 Activate EWARM.
3 Select [File] menu -> [Open Workspace].
4 Open the extracted source file RZ_N2L_fac.eww.
5 Start the FSP Smart Configurator from the [Tools] menu of the EWARM IDE. *

Note: The following procedure adds the activation of the FSP Smart Configurator to the [Tools] menu of the EWARM IDE. Select [Tools] menu -> [Tool Configuration] in the EWARM IDE. Select the [New] button, specify a table string in each field, and press [OK].

Field	String
Menu text	RZ Smart Configurator
command	$RASC_EXE_PATH$
argument	--compiler IAR configuration.xml
Initial directory	$PROJ_DIR$

String for the command is variable holding the path of the Smart Configurator execution file, rasc.exe. You can also start the FSP Smart Configurator directly from the command prompt by specifying the folder where it is installed.

6 In the FSP Configuration pane of the Smart Configurator, click Generate Project Content. The rzn, rzn_cfg, rzn_gen, script and .setting folders will be generated.



7 When project generation is complete, close the Smart Configurator.

8 Select [Rebuild All] from the [Project] menu of EWARM.
The file Debug\Exe\RZ_N2L_fac.out is generated.

(4) Sample Program Execution Procedure

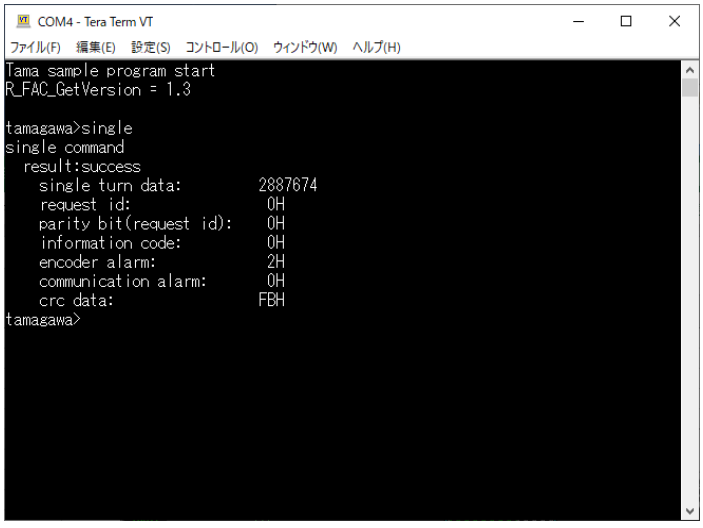
After executing the "build procedure", connect the target board and debugger correctly, and perform the following operations.

1 Select [Project] menu -> [Download and Execute].

2 Select [Debug] menu -> [Execute].

(5) Execution Result of the Sample Program

Run the sample program and enter commands in the terminal software window. For commands, see 4.11.7 console commands in the RZ/N2L Group FA-CODER Sample Program Application Note.



3.3.3 e² studio from RENESAS

(1) Build Environment

RENESAS e² studio 2023-07

GNU ARM Embedded Toolchain 12.2.1.arm-12-24

RENESAS RZ/N2L Flexible Software Package v1.3.0

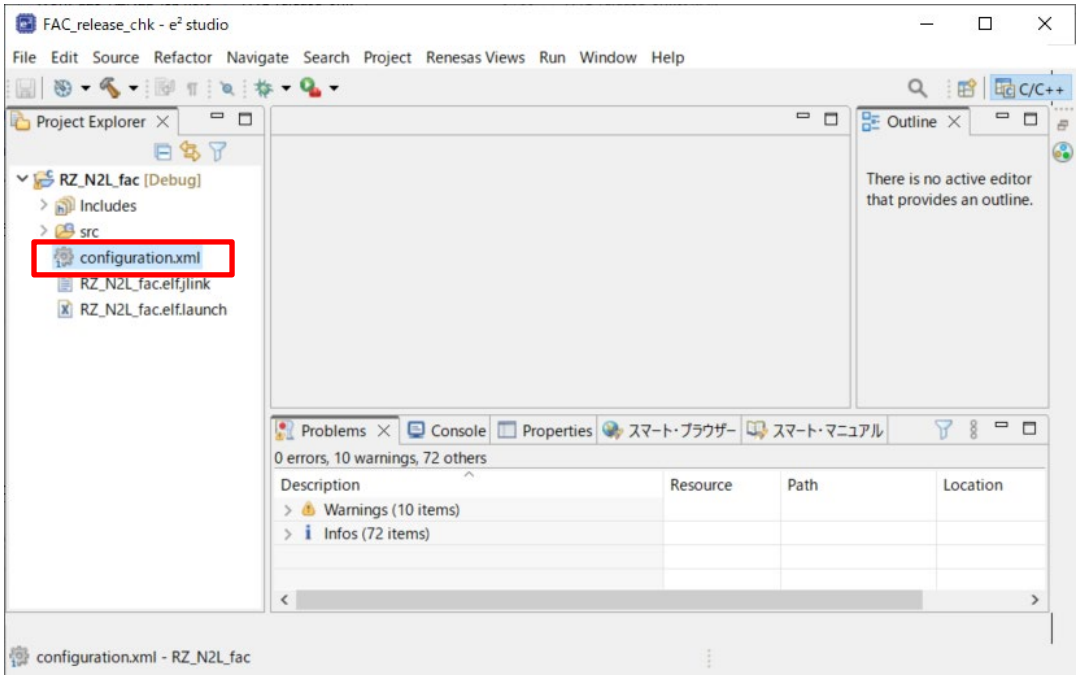
(2) Execution Environment ICE

SEGGER J-Link

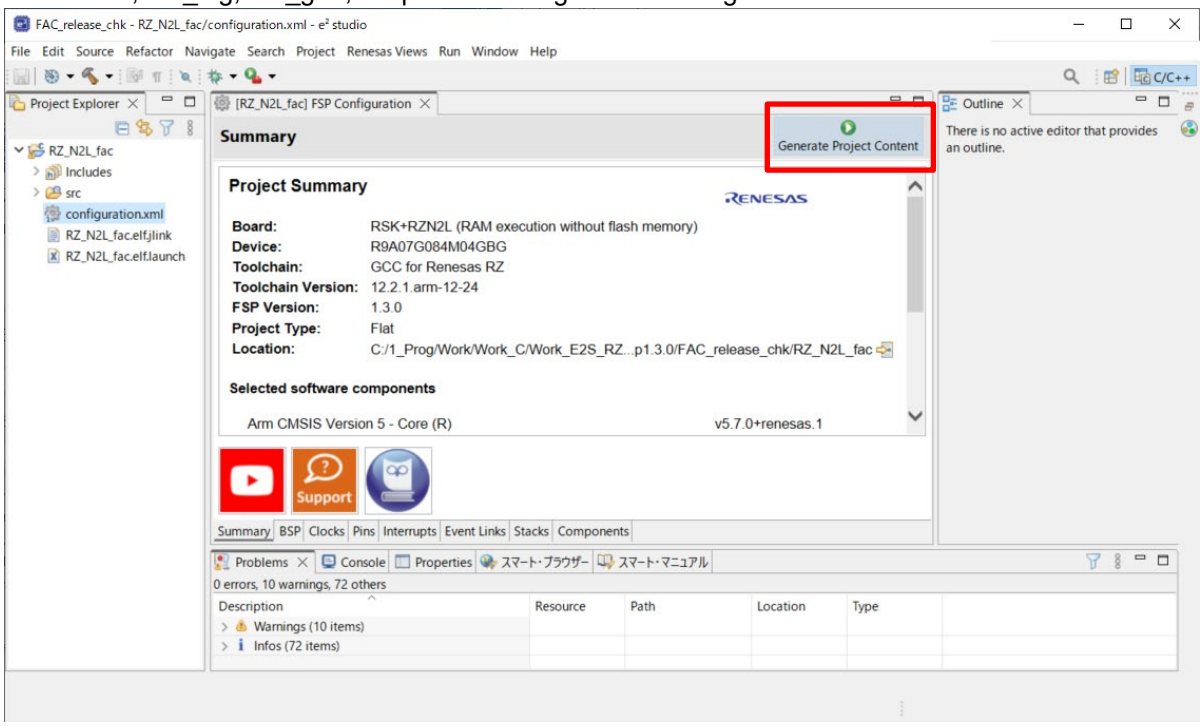
(3) Build Procedure of the Sample Program

The procedure for building the sample program is as follows.

1. Copy the expanded source file to any location.
2. After launching e² studio and moving to the workspace, click the [File] menu ->[Import] and select Existing project to workspace and click [Next].
3. On the project import screen, select the folder where the sample program was expanded as the root directory.
4. Select a project, check Copy Project to Workspace, and click [Finish].
5. Double-click the configuration.xml in the Project Explorer pane of e² studio to open it.



6 Click Generate Project Content in the FSP Configuration pane of e² studio.
The rzn, rzn_cfg, rzn_gen, script and .settings folders are generated.



7 Select [Project] menu -> [Build All].
The file Debug\RZ_N2L_fac.elf is generated.

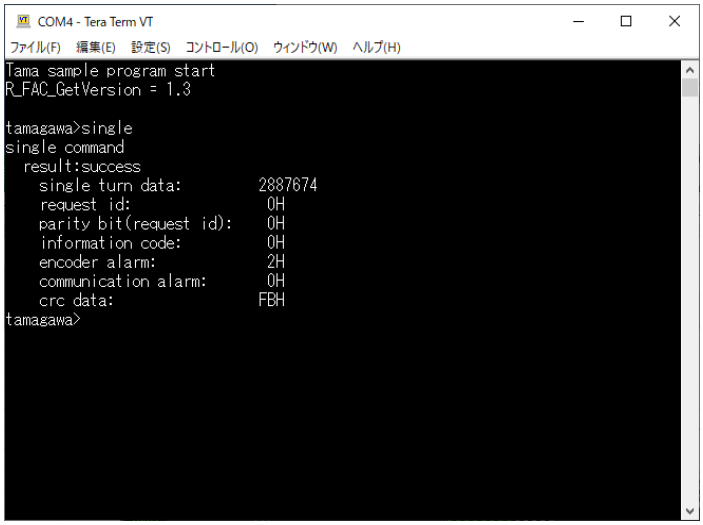
(4) Execution Procedure of the Sample Program

After executing the "build procedure", connect the target board and debugger correctly, and perform the following operations.

1 Select [Run] menu -> [Debug As] -> [Renesas GDB Hardware Debugging].
2 Click [Debug] to start downloading to internal RAM.
3 Click [Run] menu -> [Resume] to run the sample program.

(5) Execution Result of the Sample Program

Run the sample program and enter commands in the terminal software window. For commands, see 4.11.7 console commands in the RZ/N2L Group FA-CODER Sample Program Application Note.



Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Mar 31.23	-	First Edition issued
1.10	May 31.23	1, 4 2, 3	Appended section 3.1.2 for memory size information. Updated the release note version number.
1.20	Jun.30.23	2, 3	Update the application note and release note version number. Update sample program version to 1.1. (Encoder driver opening function is revised to support bit rate 5 Mbps.)
1.21	Sep.15.23	2, 3	Update the release note version number. Update sample program version to 1.2. (Correct register initialization for sending request.)
1.30	Mar.01.24	2, 3 3 4 1, 5 5 6 to 9	Update the application note and release note version number. Update sample program version to 1.3. (It supports elctimer command emulating ELC by using CPU and DMA. Changes SCI channels used for encoder interface. Corrects response without connecting encoder to return error information.) Update file structure. (RZ/N2L Pin Configuration data is removed from zip file.) Update memory size information. Update board name description. Update board setting and pins information by changing used SCI channels. Update build environment for FSP v1.3.0. Replace figures.

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. 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.
8. Differences between products

   Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of 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.

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