Quick Start Guide

RX14T Group

MCK-RX14T Quick Start Guide

Renesas RX Family
RX100 Series

Renesas Electronics
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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.

Renesas RX Family

MCK-RX14T Quick Start Guide

Contents

Figure of contents

1. Introduction

This Quick Start Guide (QSG) describes the followings.

- Overview of the initial operation check firmware which has already been programmed into the CPU board.
- Steps to execute the initial operation check firmware.
- Instructions for using sample projects which supports the Motor Control Development Support Tool (Renesas Motor Workbench).

1.1 Presupposition and precautions of this document

1. Experience of using tools: This document assumes that the user has used terminal emulation program of Integrated Development Environment (IDE) such as e^2 studio before.
2. Knowledge about the development subject: This document assumes that the user has a basic knowledge to modify the sample project regarding MCU and embedded system.
3. Before using this product, wear an antistatic wrist strap. If you touch this product with static charge on your body, a device failure may occur or operation may become unstable
4. All screen shots provided in this document is for reference. Actual screen displays may differ depending on the software and development tool version which you use.
5. The onboard debugger circuit on this product is not isolated. *1 For evaluations of motor drive operation, please use the communication board (MC-COM) to connect to the PC and use the Renesas Motor Workbench development support tool. Because the communication board is equipped with an isolator, isolation between the PC and this product is ensured. Furthermore, Renesas Motor Workbench allows variables to be read and written without stopping the MCU, enabling safe evaluation and debugging of motor drive operation. *2

   *1 When using the onboard debugger or an external emulator, this product and the PC share a common GND. In that case, supplying external power to the inverter board or driving the motor may damage the board or the PC.
   *2 If the MCU is stopped by the debugger while the motor is running, the MOSFETs on the inverter board may remain ON (conducting state), which may result in damage to the motor or the inverter board.

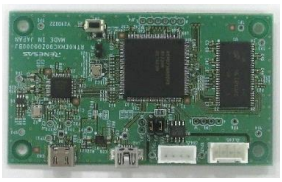
2. Product Contents

This kit consists of the following parts.

1. Inverter Board (RTK0EM0000B12020BJ) x1
2. CPU Board (RTK0EMXH30C00000BJ) x1
3. Communication Board (RTK0EMXC90Z00000BJ) x1
4. Brushless DC Motor (R42BLD30L3) x1
5. Communication Cable x1
6. USB Cable x1
7. Screw x12
8. Standoff x12

(1)Inverter Board

(2)CPU Board



(3)Communication Board

(4)Brushless DC Motor

(5)Communication Cable

(6)USB Cable

(7)Screw
(8)Standoff

Figure 2-1 Product contents

3. Initial Operation Check Firmware Overview

The initial operation check firmware, has already been programmed into the CPU board, allows you to start/stop the included brushless DC motor by MOONS',"R42BLD30L3"(hereinafter called "Motor") and change its speed and direction using the on-board switches and variable resistor (VR1).

Please note that the initial operation check firmware is not publicly available online as it is just for initial operation check. Therefore, after rewriting the CPU board program, please write the sample project available online as described in Chapter 5,and perform evaluation in accordance with the application note included with that sample project. If you change the operation method for the sample project to "Board UI", you can control the motor using the same operations as the initial operation check firmware.Please refer to the application note for instructions on changing to "Board UI".

3.1 Initial operation check firmware flow

Figure 3-1 shows the flow for the initial operation check firmware operation using the switch and variable resistor(VR1) on the board.

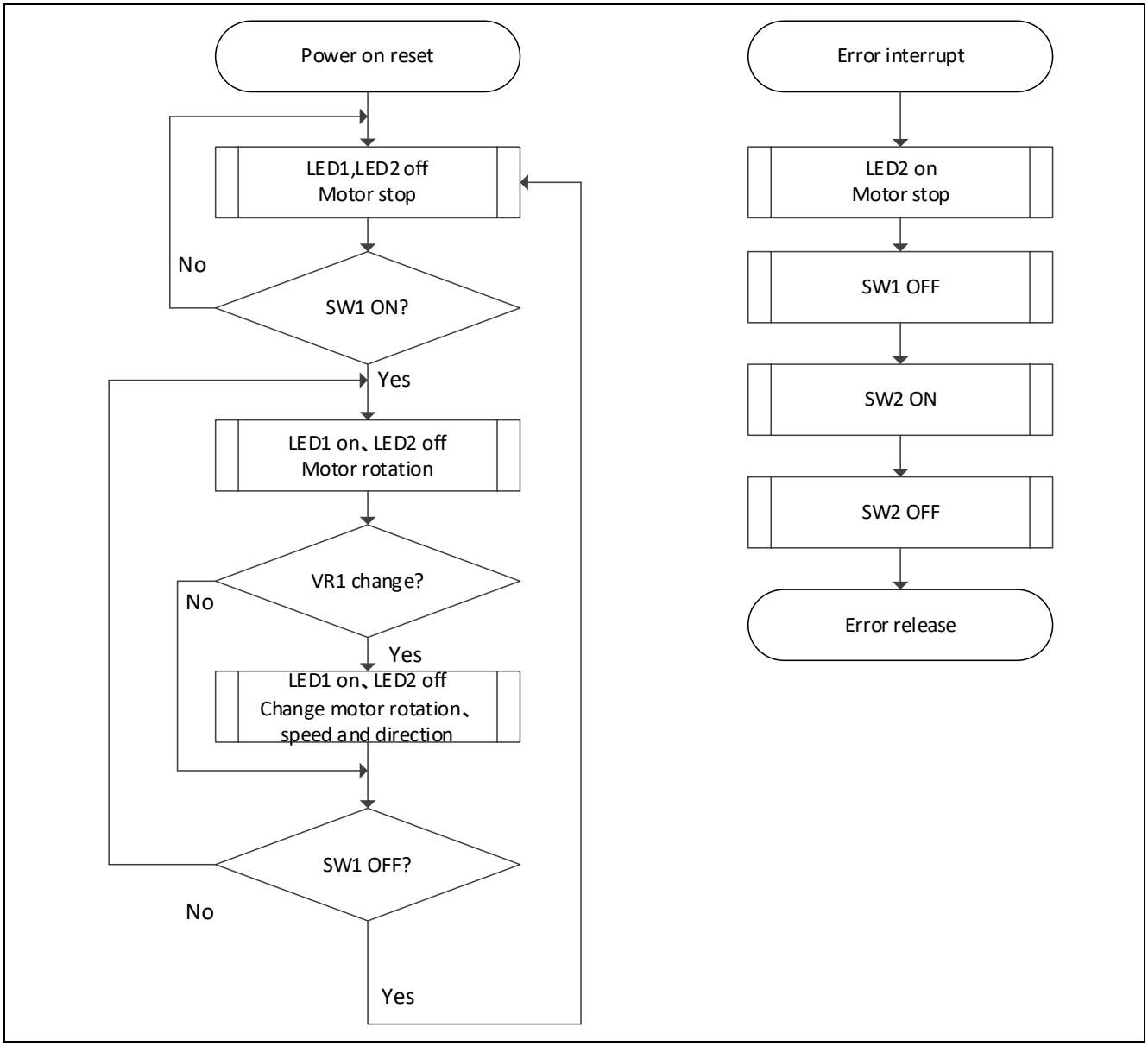


Figure 3-1 Initial operation check firmware flow

4. Execute the Initial Operation Check Firmware

This chapter describes the requirements and steps to turn on MCK-RX14T and execute the initial operation check firmware using the switch and the variable resistor(VR1) on the board.

4.1 Connect the board and supply power

4.1.1 Jumper pin setting

(1) Inverter Board

Check that the short jumpers are set as following. (Factory default setting)

JP1 : 2-3pin

JP8, JP11 : 1-2pin

JP2, JP3, JP4, JP6, JP12, JP13 : 2-3pin

JP5, JP7, JP9, JP10, JP14, JP15 : 1-2pin

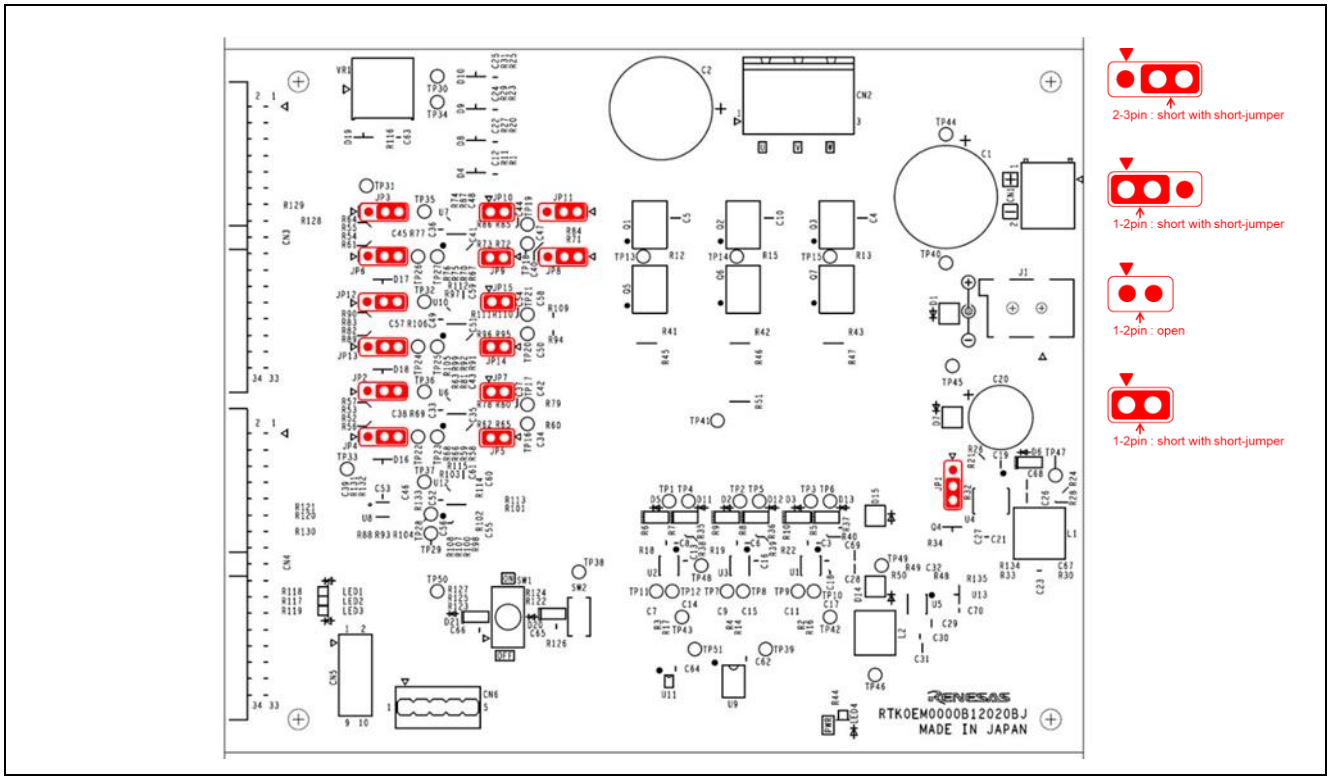


Figure 4-1 Jumper pin setting of Inverter Board

(2) CPU Board

Check that the short jumpers are set as following. (Factory default setting)

JP1,JP2,JP3,JP4,JP5,JP6,JP7,JP10 : 1-2pin

JP8 : 1-2pin

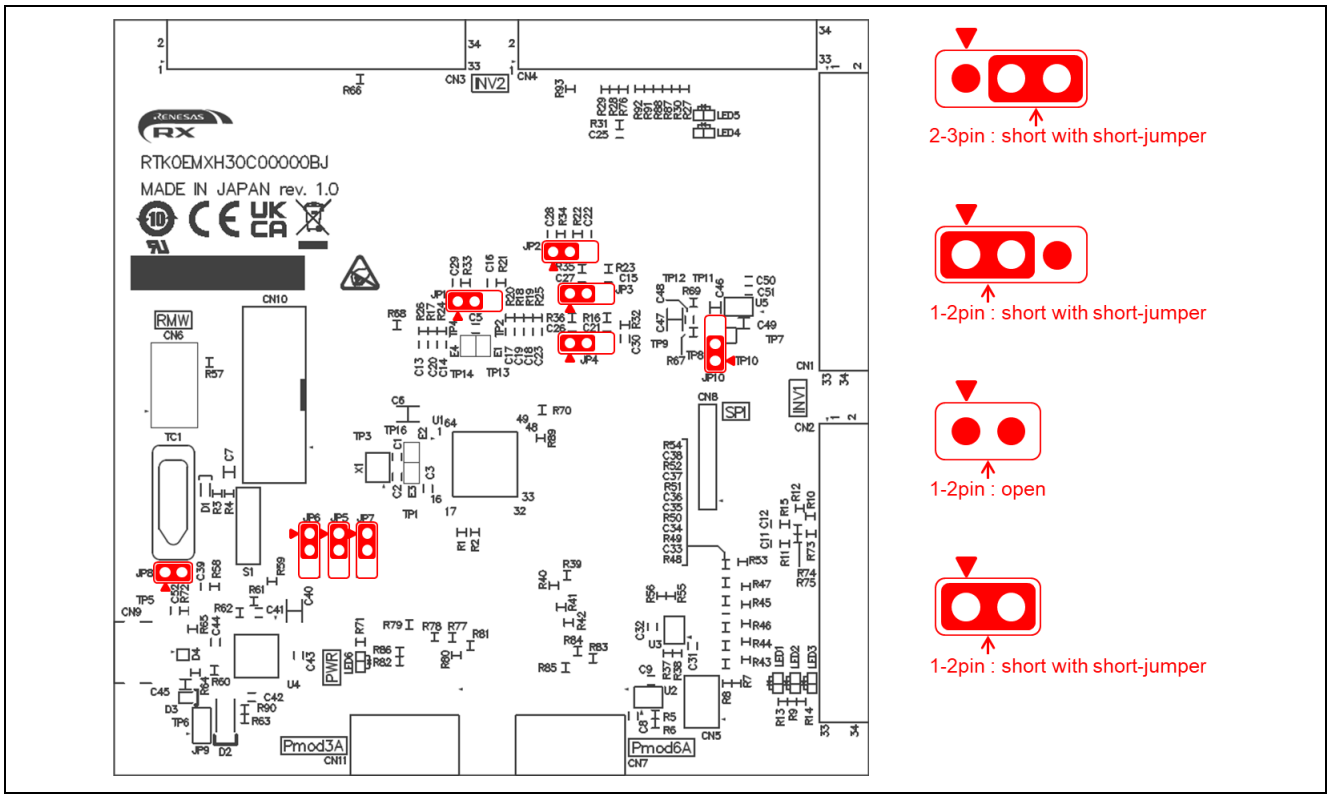


Figure 4-2 Jumper pin setting of CPU Board

(3) Communication Board

Check that the short jumpers are set as following. (Factory default setting)

JP2,JP3 : 1-2pin

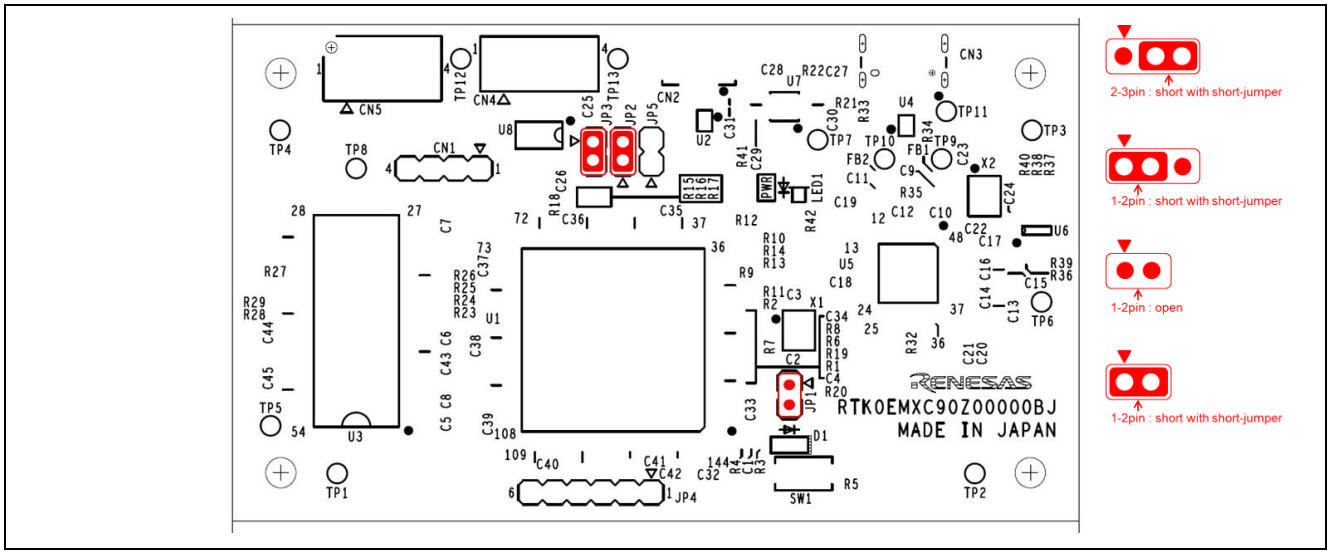


Figure 4-3 Jumper pin setting of Communication Board

4.1.2 Connect the motor and the board

Connect the supplied inverter board, CPU board and motor following Figure 4-4. Also, turn off SW1 on the inverter board and set VR1 to around the center. The motor is equipped with a Hall sensor signal cable, but since the Hall sensor signal is not used for initial operation check firmware, it does not need to be connected.

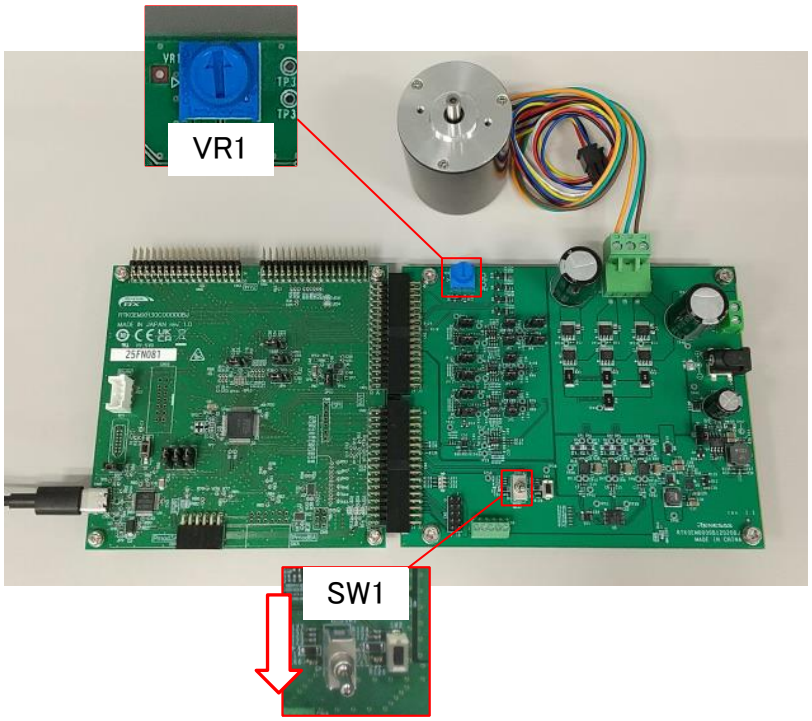


Figure 4-4 Hardware configuration

4.1.3 Supply Power

There are two ways to supply power: from the terminals on the inverter board (CN1 or J1) or from the USB connector on the CPU board (CN9). In the initial operation check, power is supplied from the USB connector on the CPU board. For the USB power supply, please use a USB adapter capable of outputting 1A or more.

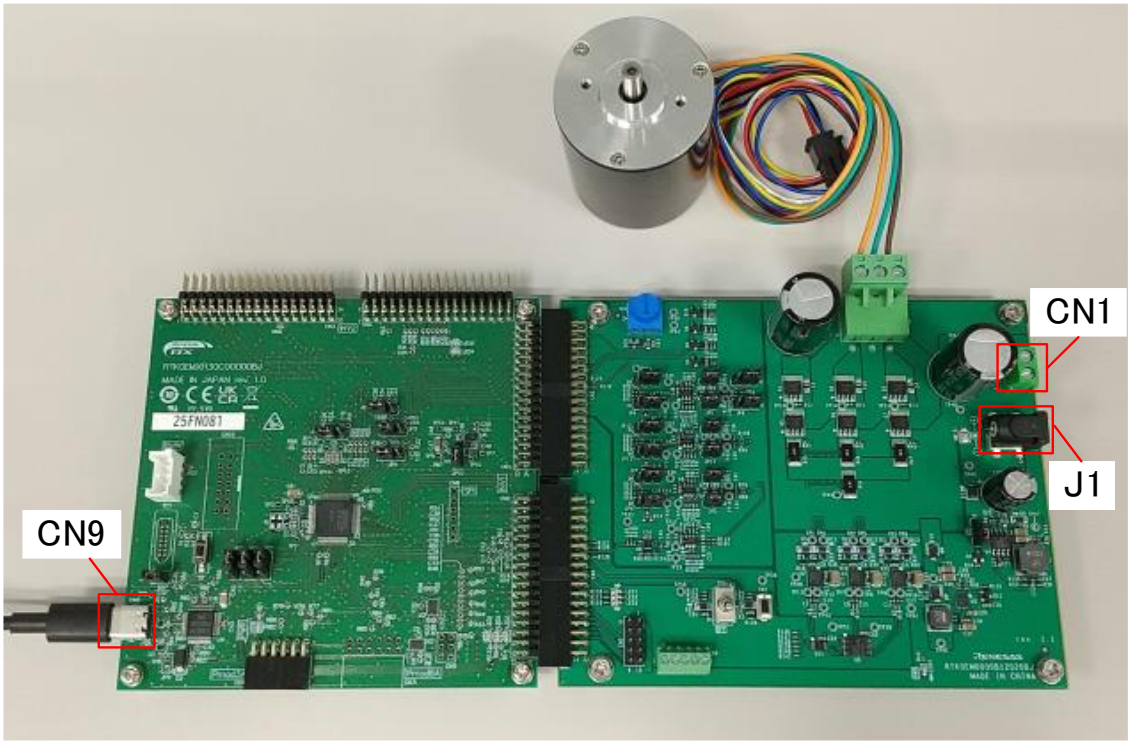


Figure 4-5 Power Supply

4.2 Execute the initial operation check firmware

Follow the below steps to execute the initial operation check firmware.

1. After turning on power supply or executing reset, LED1 and LED2 on the inverter board are both off and the motor stopped.
2. IF the switch (SW1) on the inverter board is turned on, the motor starts to rotate. When it is turned off, the motor stops. If the motor rotates normally, LED1 on the inverter board is ON. However, if LED2 on the inverter board is ON, error is occurring.
3. In order to change the direction of rotation of the motor, use the variable resistor (VR1) on the inverter board.
   - Turn the variable resistor (VR1) right : the motor rotates clockwise
   - Turn the variable resistor (VR1) left : The motor rotates counterclockwise
4. If error occurs, LED2 on the inverter board is ON, and the motor rotation stops. To recover from the error state, turn off the switch (SW1) on the inverter board and push the push switch (SW2) once.
5. In order to quit the operation, make sure that the motor has stopped rotating and disconnect the USB cable from the USB connector (CN9) on the CPU board.

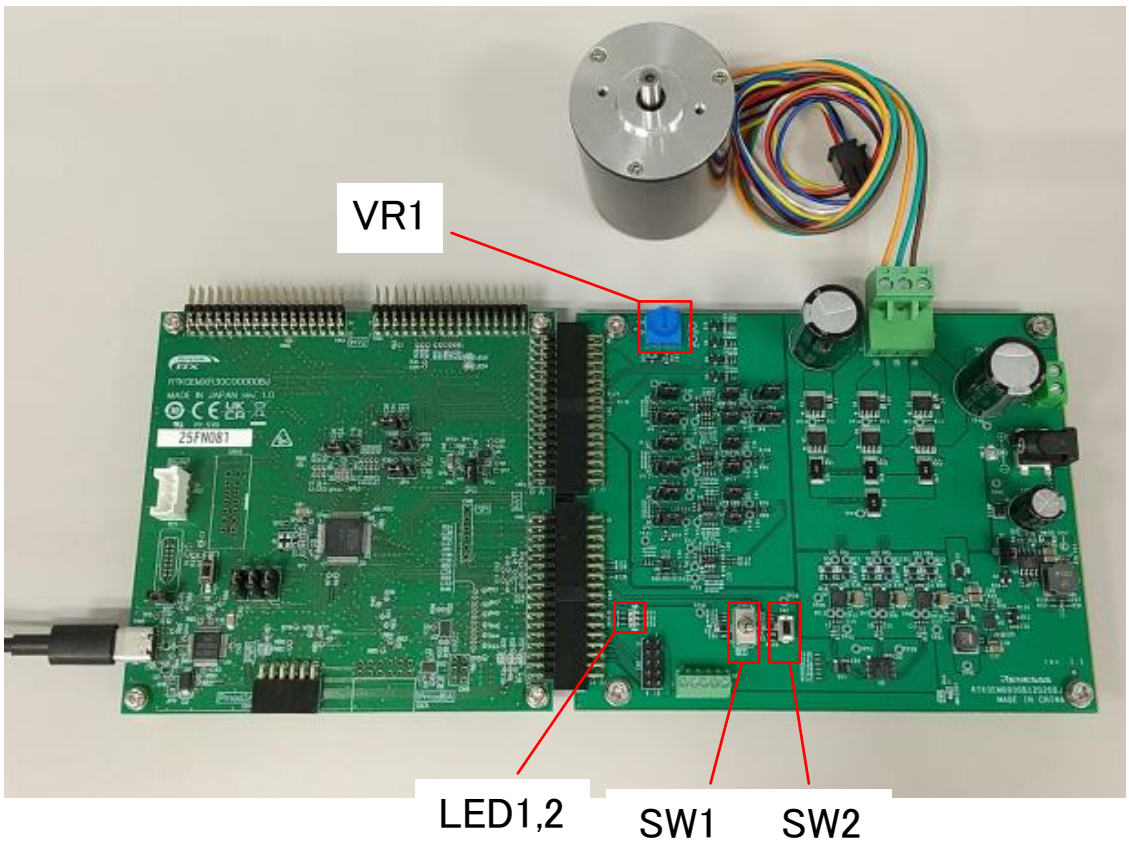


Figure 4-6 Operating State

5. How to Write Sample Project into the CPU Board

In this product, sample projects can be written using the on-board debugger circuit (E2OB) on the CPU board. This section describes the writing method using the integrated development environment e^2 studio.

(1) Connect CPU board to PC

When you write a program, open (remove) JP8 and connect the CPU board to the PC using the USB cable included in this product.

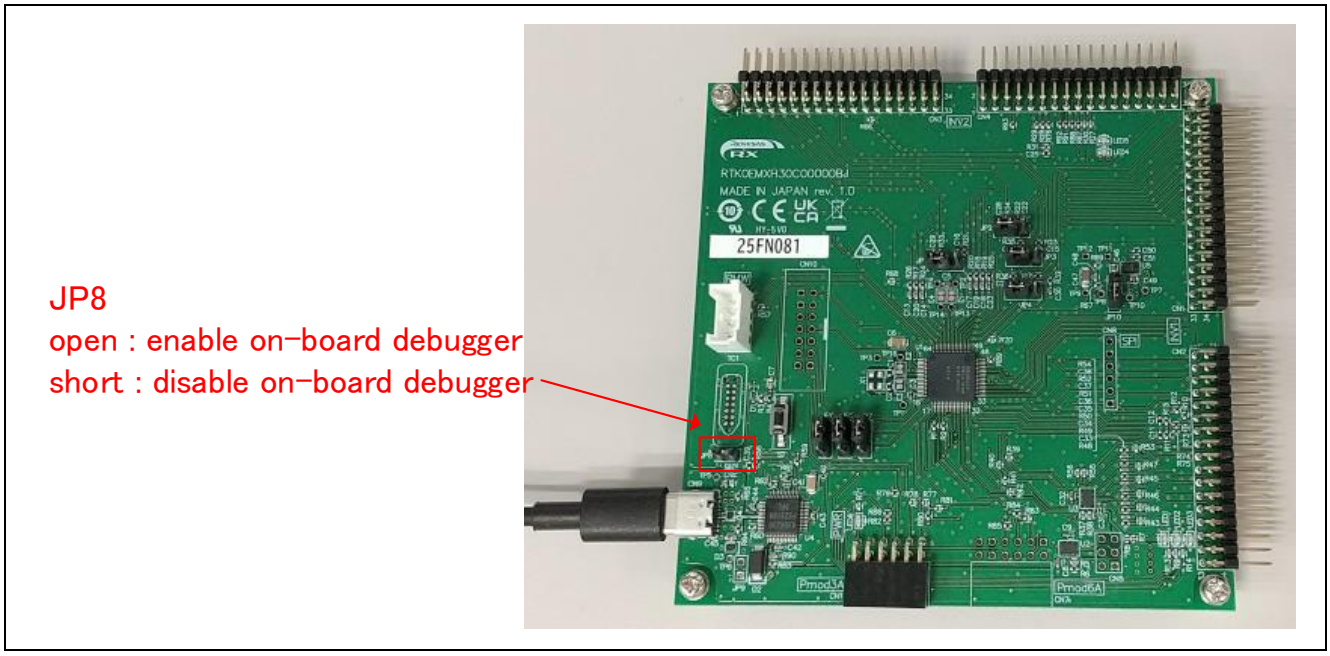


Figure 5-1 Connecting to PC

(2) Launch e² studio and import sample project

Import the sample project (for e² studio) into e² studio. The screen shots shown are from the RX26T project for reference.

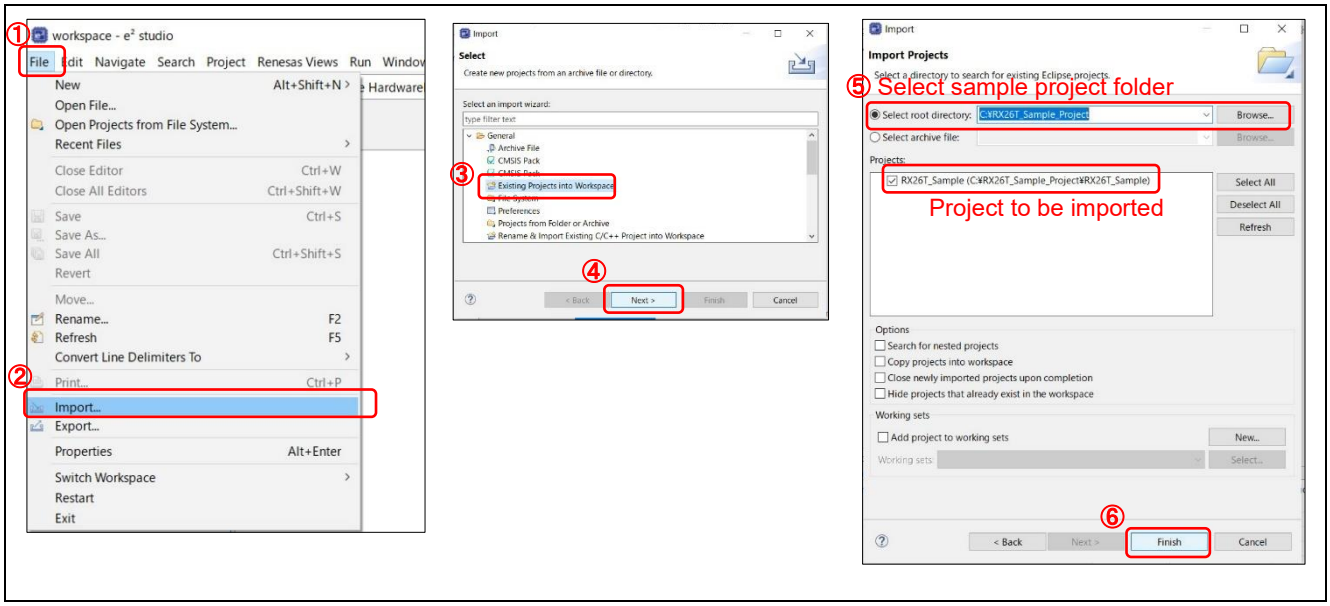


Figure 5-2 Import project

(3) Configure Toolchain

Click the property of the project and configure the toolchain for your environment. The toolchains and versions you can select depend on the installed toolchain in your e² studio.

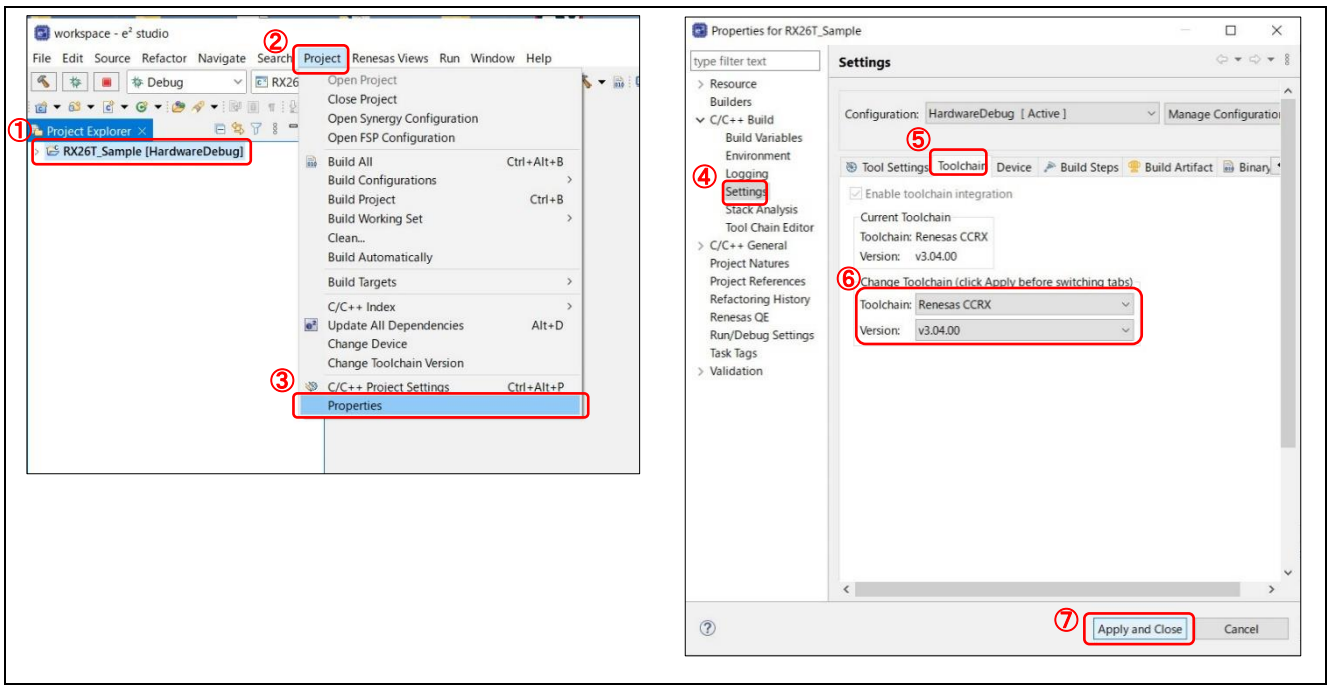


Figure 5-3 Toolchain configuration

(4) Build project

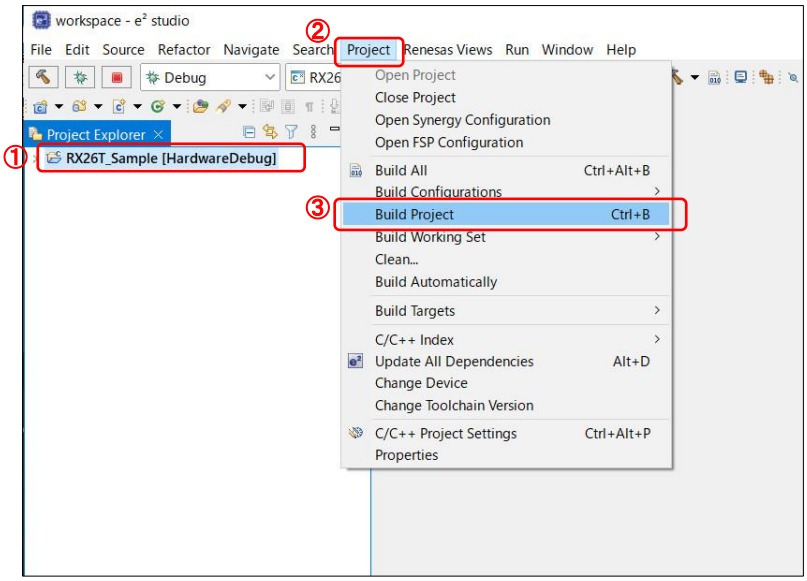


Figure 5-4 Build project

(5) Write the project into CPU board

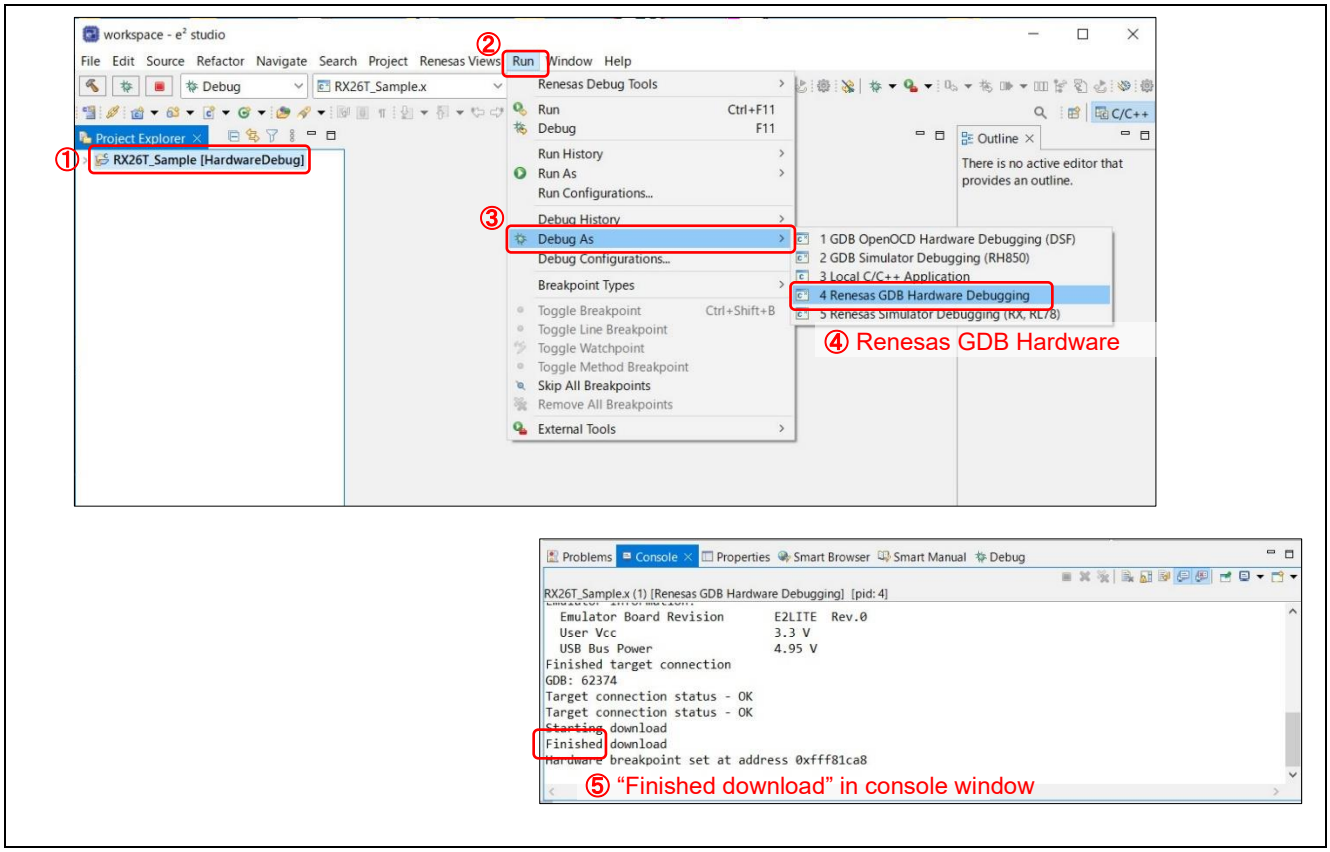


Figure 5-5 Flash programming

(6) Disconnect CPU board from PC

Click disconnect and detach USB cable from the CPU board.

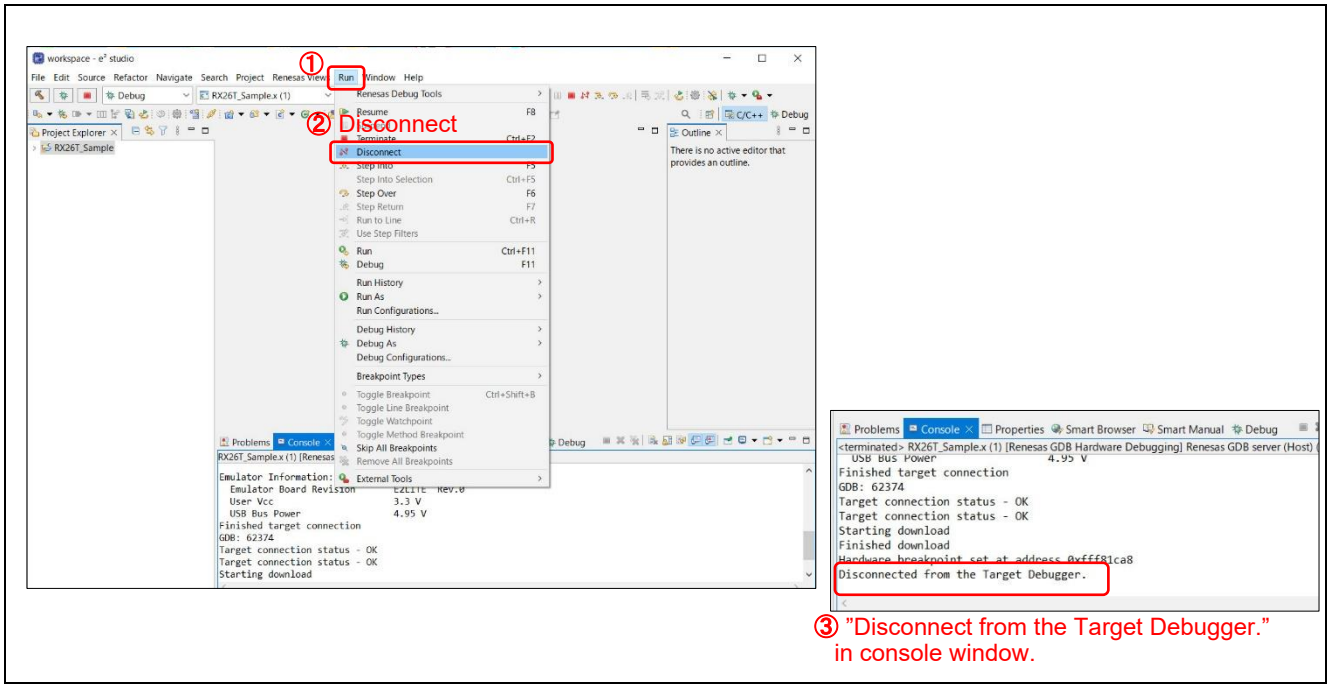


Figure 5-6 Disconnect CPU board

6. Hardware Setup for Motor Control Development Support Tool

By downloading and writing a sample project that is compatible with the Renesas Motor Workbench, a motor control development support tool, to the CPU board, you can control motor using Renesas Motor Workbench. This chapter explains how to setup the hardware. For details on how to actually control the motor using Renesas Motor Workbench, please refer to the application note attached to the downloaded sample project and the manual of Renesas Motor Workbench.

Connect this product to your PC as shown below.

(1) Connect the inverter board and CPU board

Connect CN3,CN4 on the inverter board and CN1,CN2 on the CPU board. Connect CN2 on the inverter board with the Motor's cable.

(2) Connect the communication board and CPU board with communication cable

Connect CN5 on the communication board and CN6 on the CPU board with the communication cable included in this product.

(3) Connect the USB cable

Connect the USB Type-C connector CN3 on the communication board to your PC with the USB cable included with this product.

(4) Supply power

Supply DC12~48V to J1 or CN1 on the inverter board. In this section, power is supplied to J1 using an AC adapter. Note the polarity of the power supply. J1 is center positive.

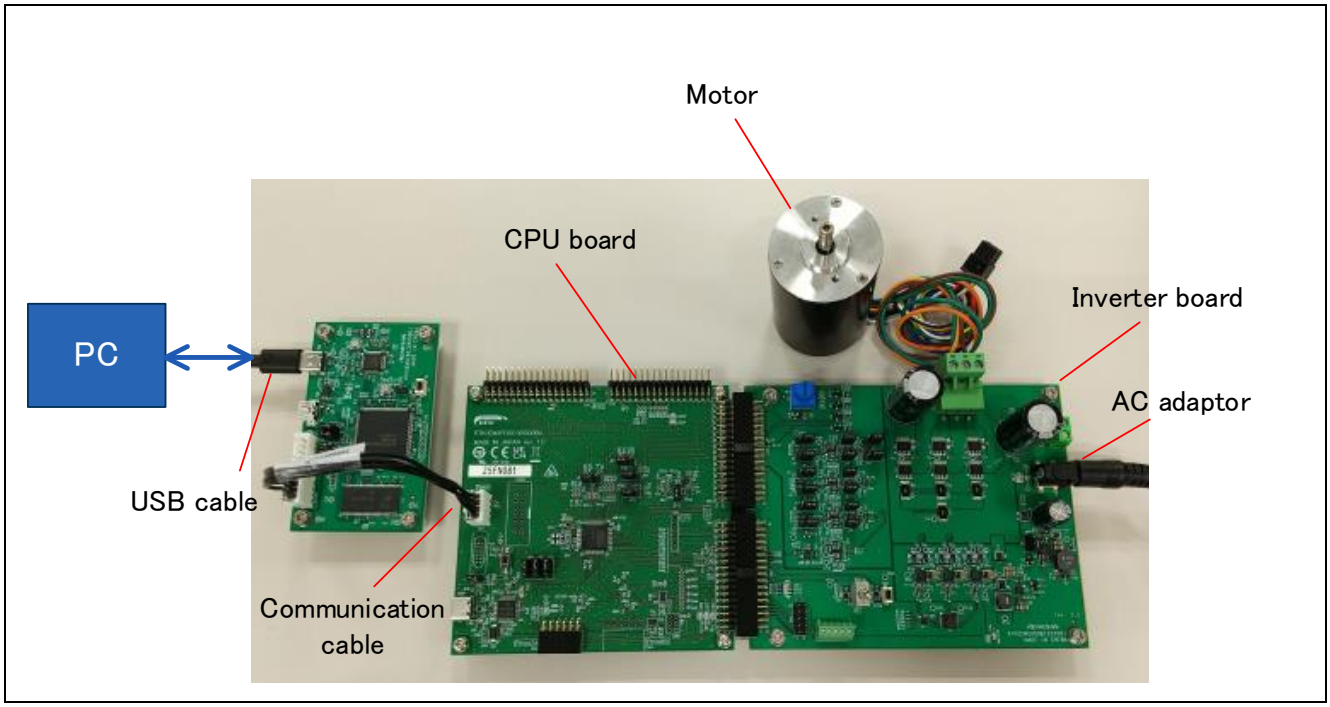


Figure 6-1 Hardware Configuration

7. Others

1. As for more details about this product, refer to the user's manual, design information and application notes which are available in its web page.
2. Renesas provides some sample projects to conduct demonstration for RX MCU's various functions. These sample projects can be used as good reference materials to start application development. The sample projects for the RX kit are available in the Renesas Website.
   All sample projects provide project file. In order to enable to write them into this product, after these files are downloaded, the project needs to be built using corresponding tool chain.

8. Website and Support

In order to learn, download tools and documents, apply technical support for RX family MCU and its kit, visit the below Web site.

・RX Product Information renesas.com/rx

・Renesas Support renesas.com/support

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