Quick Start Guide

RA8T2 Group

MCK-RA8T2 Quick Start Guide

Renesas RA Family
RA8 Series

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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 RA Family

MCK-RA8T2 Quick Start Guide

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1. Introduction

This Quick Start Guide (QSG) describes the followings.

- Overview of the Quick Start Sample Project which has already been programmed into the CPU Board.
- Steps to execute the Quick Start Sample Project.
- Instructions for using sample projects which supports the Motor Control Development Support Tool

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.

2. Product Contents

This kit consists of the following parts.

1. Inverter Board (RTK0EM0000B12020BJ) x1
2. CPU Board (RTK0EMA6L0C00000BJ) 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

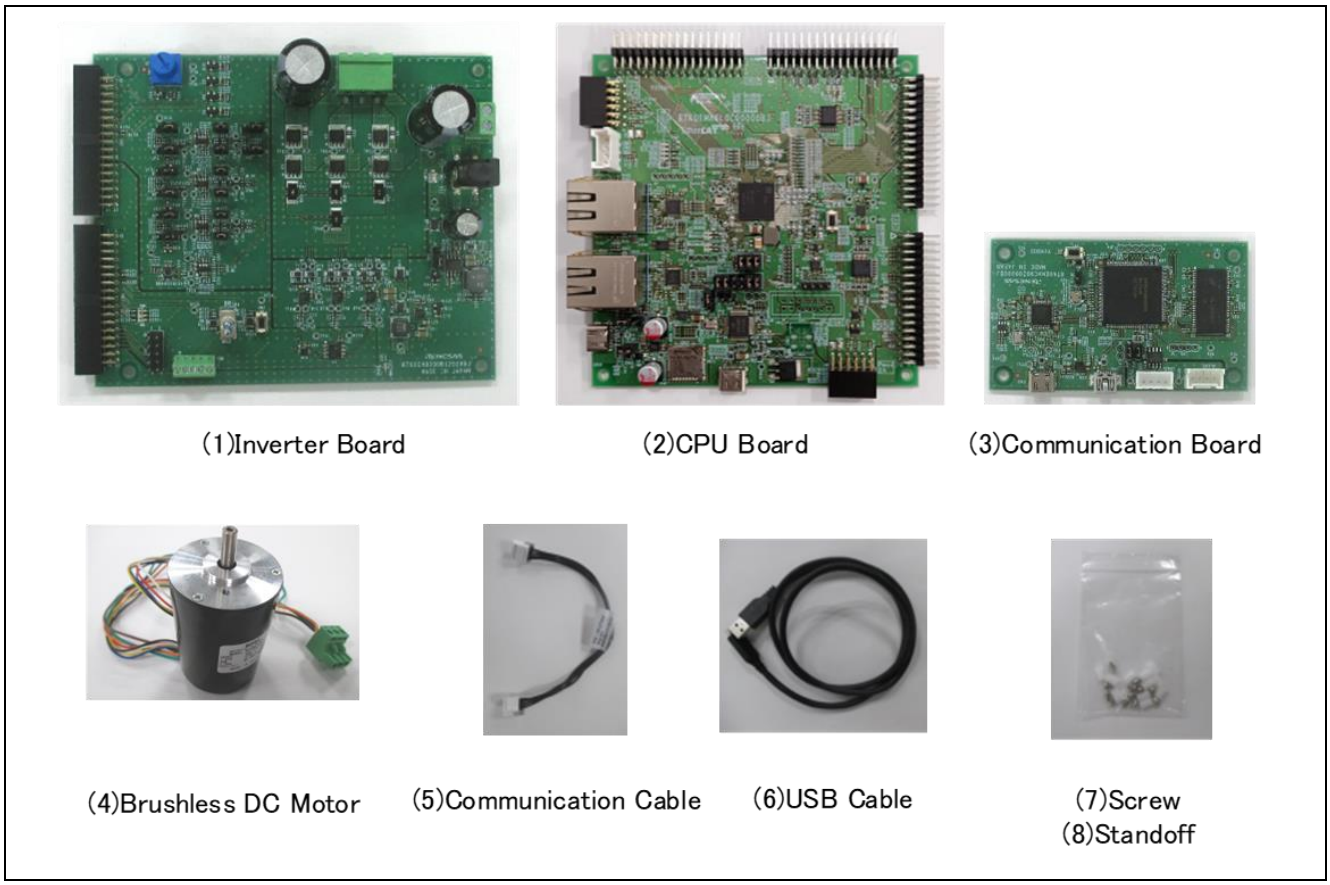


Figure 2-1 Product contents

3. Quick Start Sample Project Overview

In the Quick Start Sample Project, users can start/stop the rotation and change the rotation speed and direction of the supplied Brushless DC motor by MOONS',"R42BLD30L3"(hereinafter called "Motor") with the switch and the volume resistor(VR1). When connecting the communication board, users can also use Renesas Motor Workbench for operation.

3.1 Quick start sample project flow

Figure 3-1 shows the flow of the sample project operation using the switch and the volume resistor(VR1) on the board. For the flow of the operation using Renesas Motor Workbench, refer to the relevant software manual.

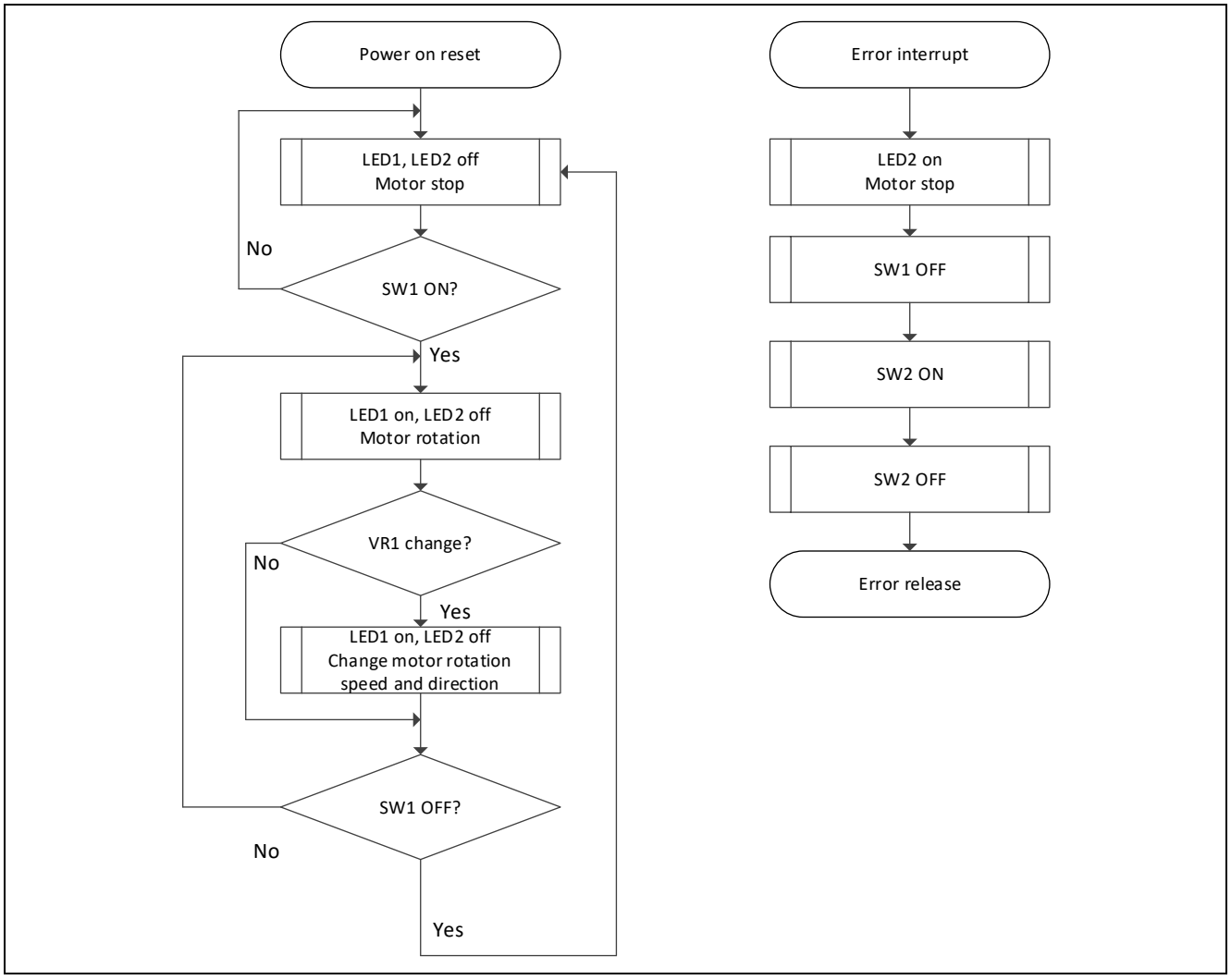


Figure 3-1 Quick start sample project flow

4. Execute the Quick Start Sample Project

This chapter describes the requirements and steps to turn on MCK-RA8T2 and execute the Quick Start Sample Project using the switch and the volume resistor(VR1) on the board. The software to control sensorless vector is written in RA8T2.

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

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

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

JP8, JP11 : 1-2pin

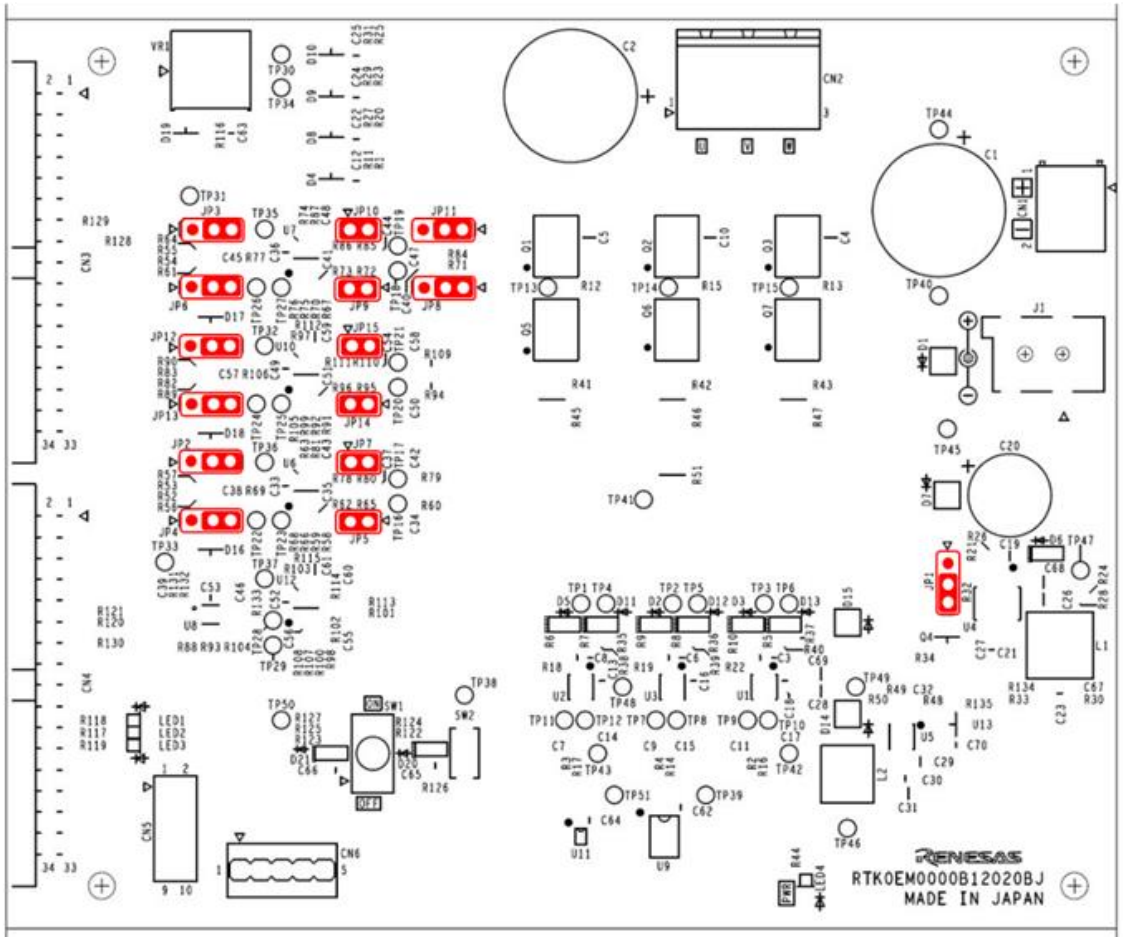


Figure 4-1 Jumper pin setting of Inverter Board

(2) CPU Board

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

JP1 :1-2pin,3-4pin,5-6pin

JP2 :1-2pin,3-4pin,9-10pin,11-12pin

JP4 :1-2pin

JP6 :1-2pin

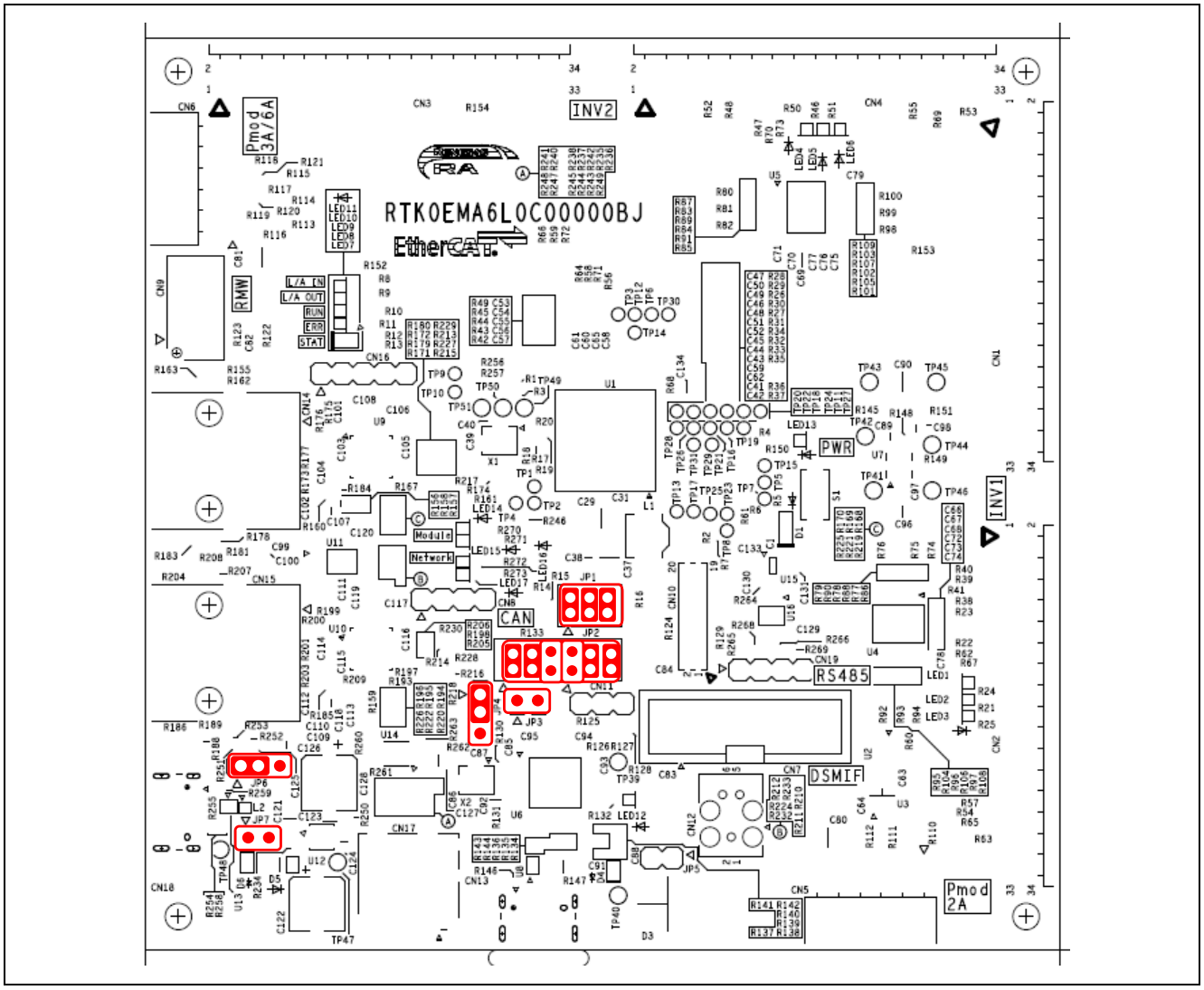


Figure 4-2 Jumper pin setting of CPU Board

(3) Communication Board

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

JP2,JP3 : 1-2pin

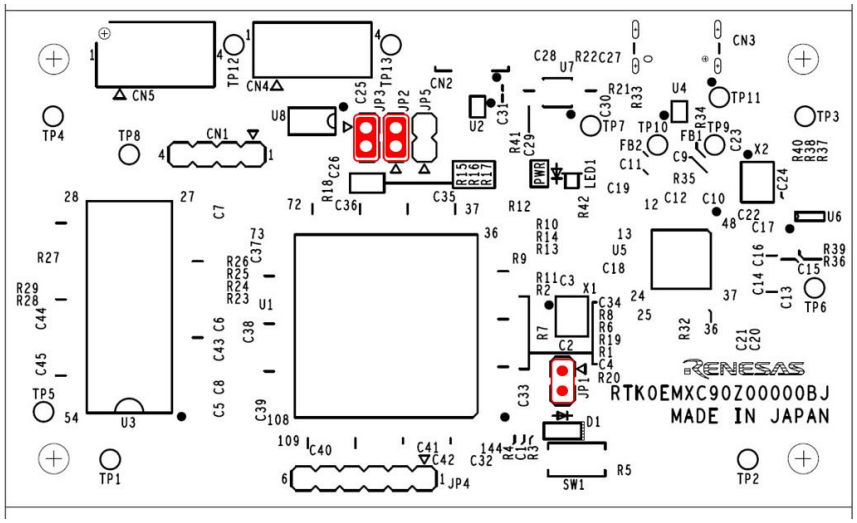


Figure 4-3 Jumper pin setting of Communication Board

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 the switch（SW1) on the inverter board and set the volume resistor (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 quick start operation, it does not need to be connected.

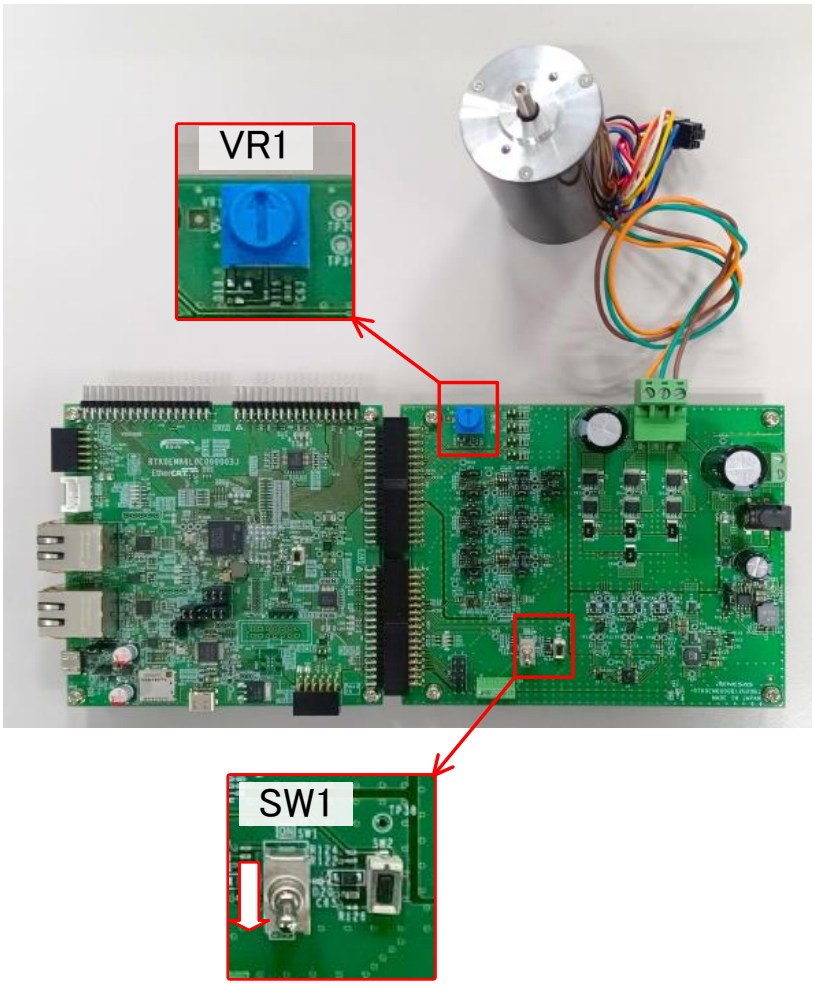


Figure 4-4 Hardware configuration

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 (CN13). In the Quick Start, 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.

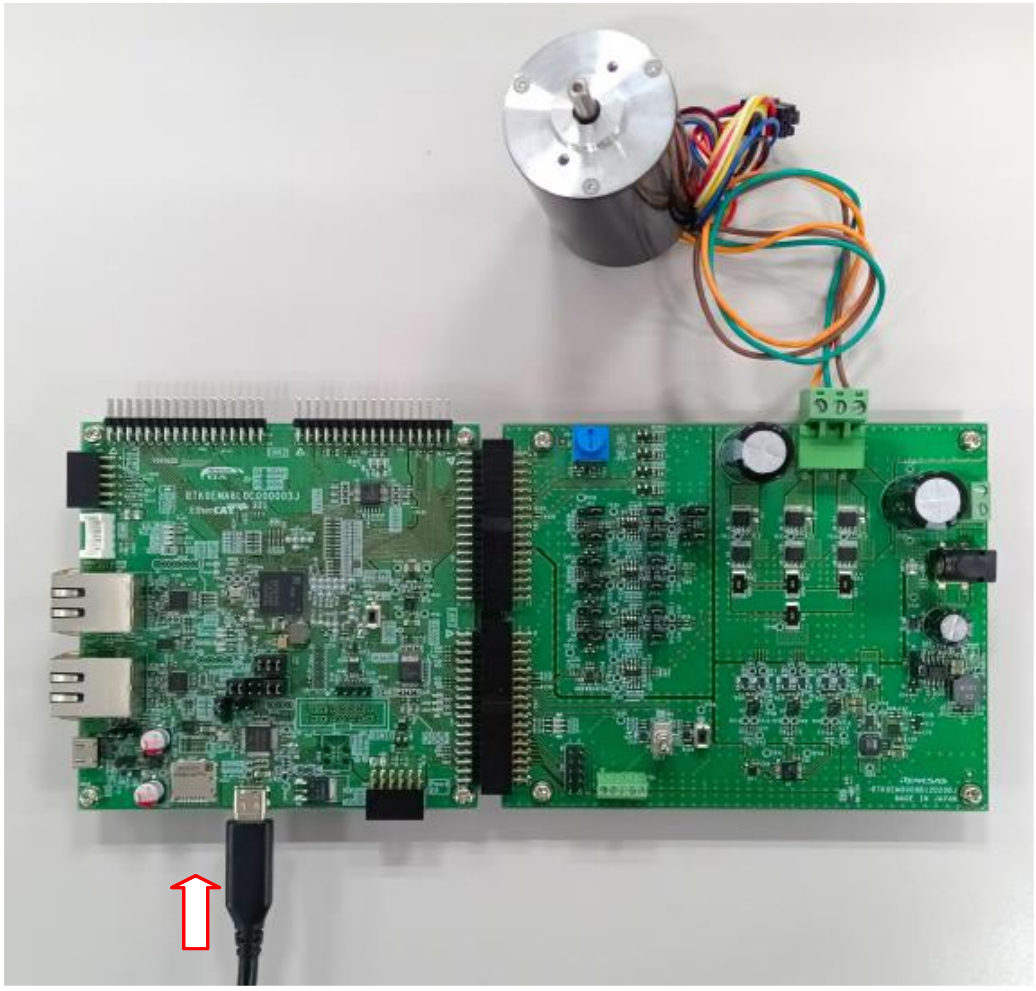


Figure 4-5 Power Supply

4.2 Execute the quick start sample project

Follow the below steps to execute the quick start sample project.

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, and 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 volume 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 (CN13) on the CPU board.

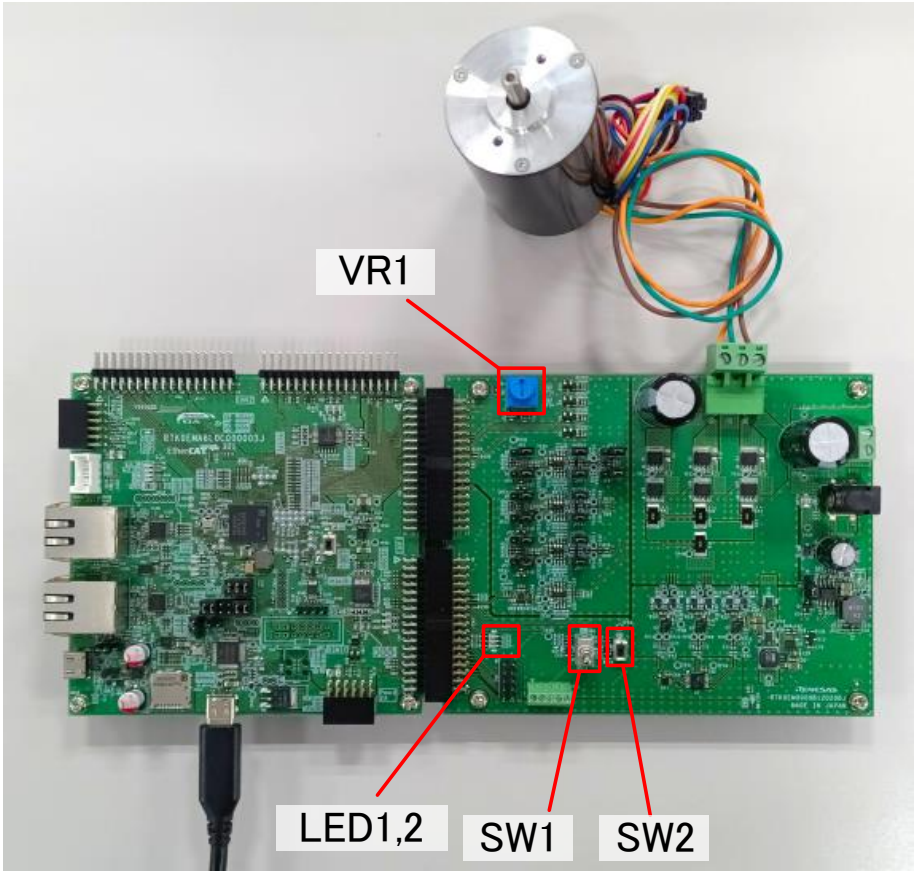


Figure 4-6 Operating State

5. How to Write Sample Project into the CPU Board

In this product, sample projects can be written using the on-board debugger circuit (J-Link-OB) on the CPU board. This section describes the writing method using the integrated development environment e^2 studio is explained, and the images used are different from the actual ones.

(1) Connect CPU board to PC

Connect CN13 on 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 project name is for reference only.

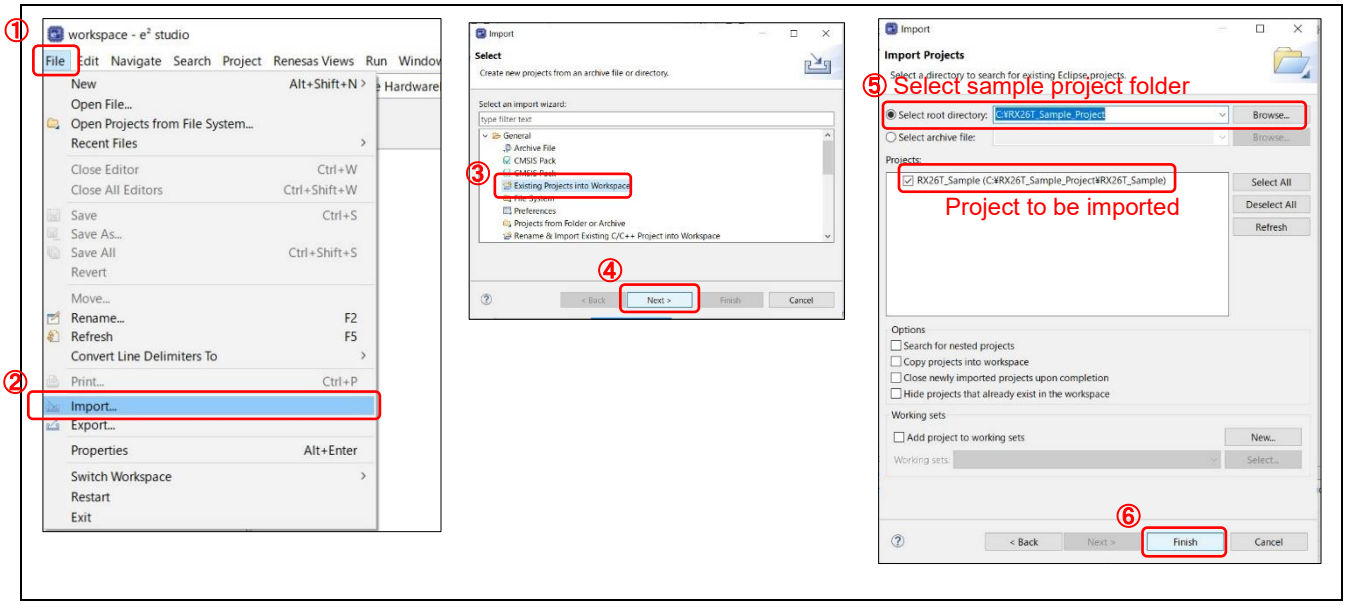


Figure 5-2 Import project

(3) Configure Toolchain

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

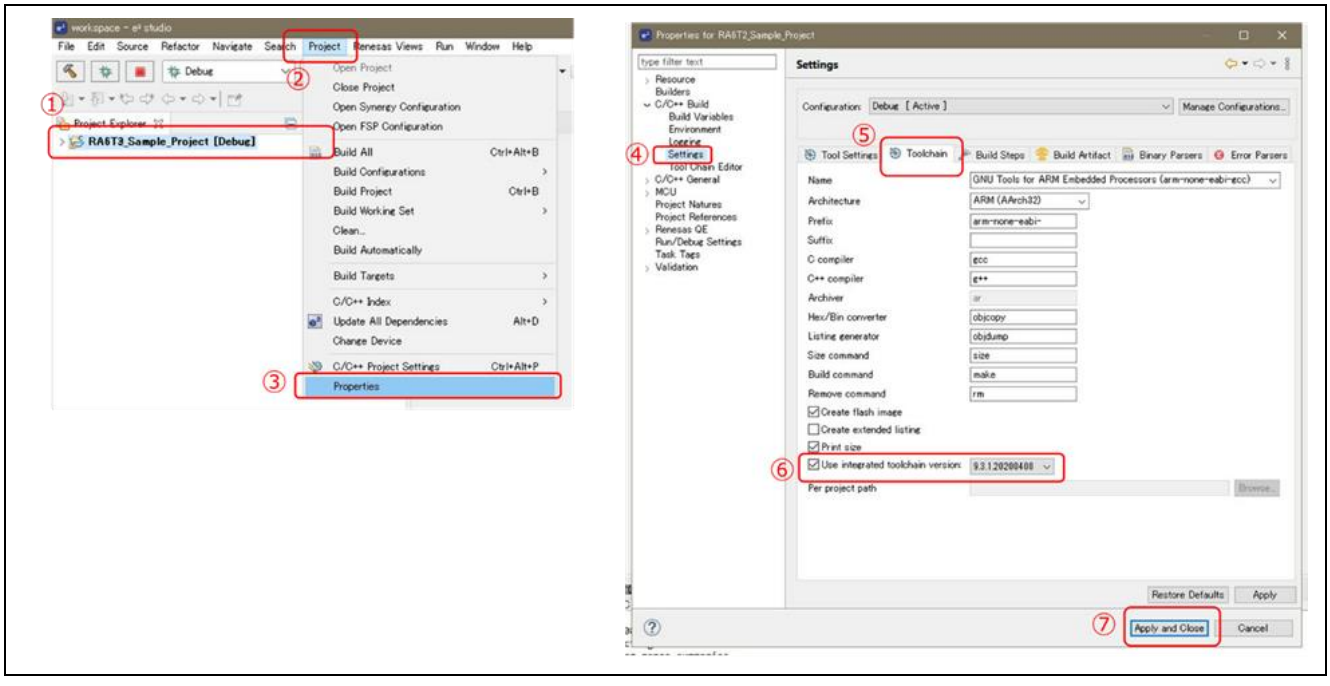


Figure 5-3 Toolchain configuration

(4) Build project

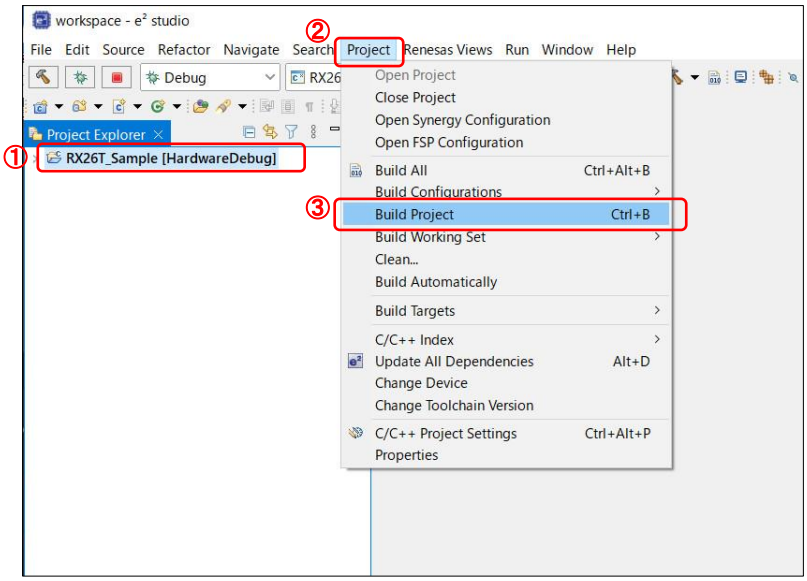


Figure 5-4 Build project

(5) Write the project into CPU board

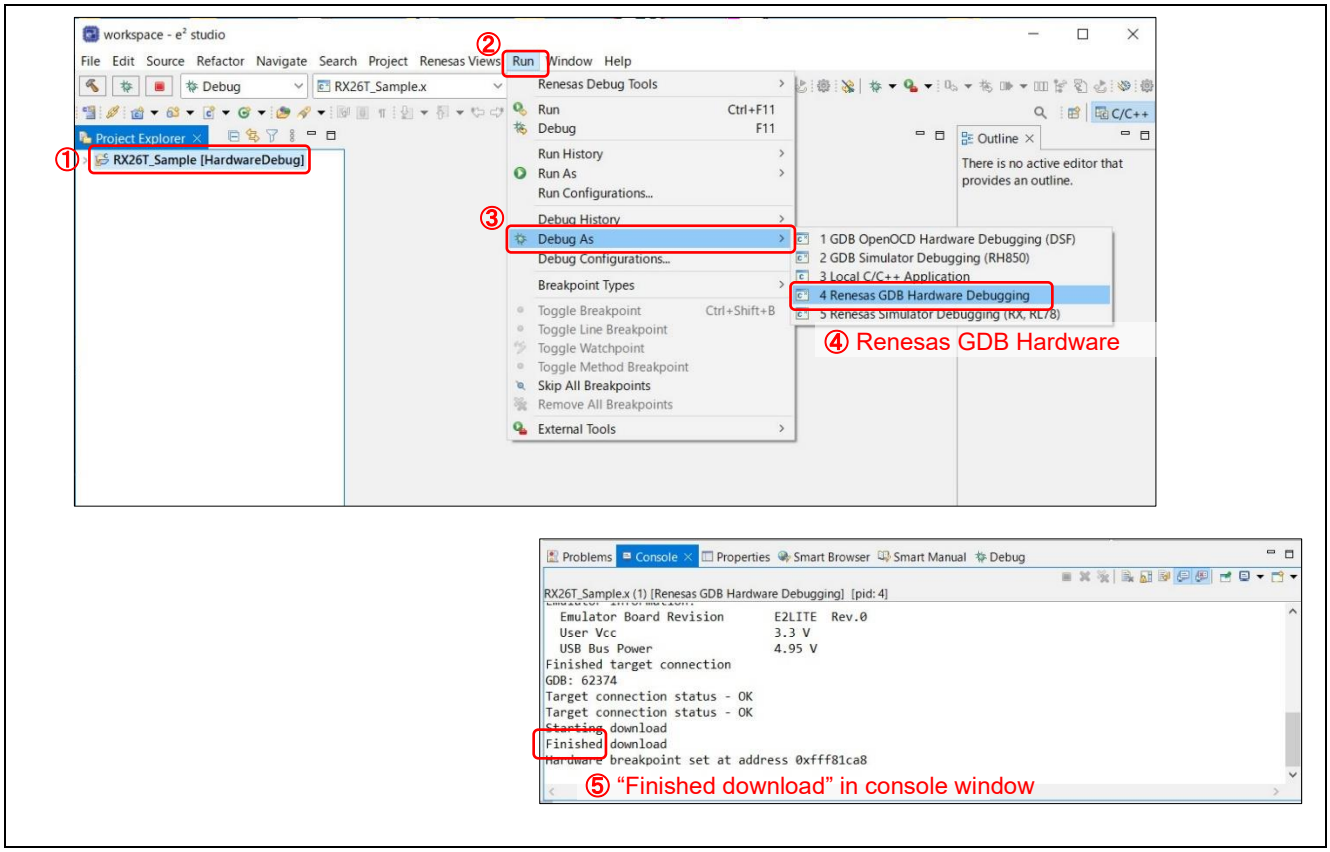


Figure 5-5 Flash programming

(6) Disconnect CPU board from PC

Click disconnect and detach USB cable from the CPU board.

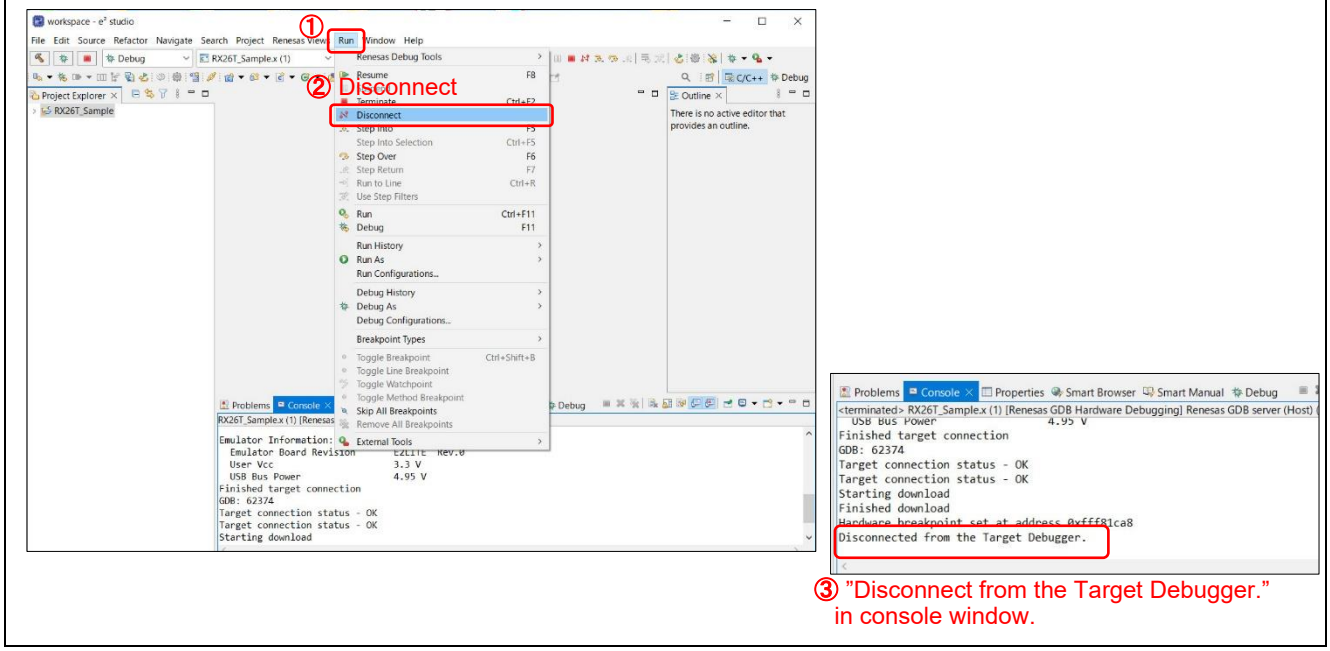


Figure 5-6 Disconnect CPU board

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 CN9 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.

(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.

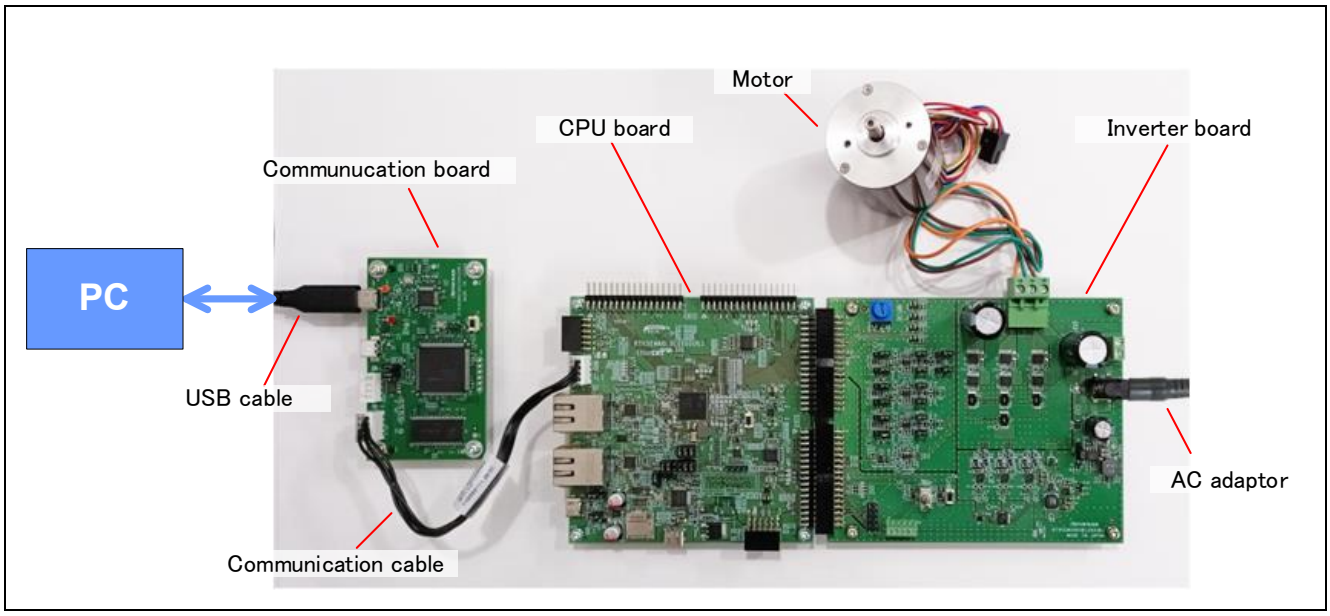


Figure 6-1 Hardware Configuration

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 RA MCU's various functions. These sample projects can be used as good reference materials to start application development. The sample projects for the RA 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 RA family MCU and its kit, visit the below Web site.

· RA Product Information renesas.com/ra

· Renesas Support renesas.com/support

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