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Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
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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.
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Precautions

This Cloud Kit is only intended for use in a laboratory environment under ambient temperature and humidity conditions. A safe separation distance should be used between this and any sensitive equipment. Its use outside the laboratory, classroom, study area, or similar such area invalidates conformity with the protection requirements of the Electromagnetic Compatibility Directive and could lead to prosecution.

The product generates, uses, and can radiate radio frequency energy and may cause harmful interference to radio communications. There is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off or on, you are encouraged to try to correct the interference by one or more of the following measures:

• Ensure attached cables do not lie across the equipment.
• Reorient the receiving antenna.
• Increase the distance between the equipment and the receiver.
• Connect the equipment into an outlet on a circuit different from that which the receiver is connected.
• Power down the equipment when not in use.
• Consult the dealer or an experienced radio/TV technician for help.

Note: It is recommended that wherever possible shielded interface cables are used.

The product is potentially susceptible to certain EMC phenomena. To mitigate against them it is recommended that the following measures be undertaken:

• The user is advised that mobile phones should not be used within 10 m of the product when in use.
• The user is advised to take ESD precautions when handling the equipment.

The Cloud Kit does not represent an ideal reference design for an end product and does not fulfill the regulatory standards for an end product.
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1. **Introduction**

This Quick Start Guide (QSG) provides:

- An overview of the Quick Start example project that the CK-RX65N v2 board comes pre-programmed with.
- Instructions for running the Quick Start example project.
- Instructions for importing, modifying, and building the Quick Start example project using Flexible Integration Technology (FIT) and e² studio Integrated Development Environment (IDE).

1.1 **Assumptions and Advisory Notes**

1. **Tool experience**: It is assumed that the user has prior experience working with IDEs such as e² studio and terminal emulation programs such as Tera Term.

2. **Subject knowledge**: It is assumed that the user has basic knowledge about microcontrollers, embedded systems, and FIT to modify the example project described in this document.

3. **Default jumper settings**: Prior to running the Quick Start example project or programming the CK-RX65N v2 board, default jumper settings must be used. Refer to the CK-RX65N v2 user’s manual for the default jumper settings.

4. **Screenshots**: The screen shots provided throughout this document are for reference. The actual screen content may differ depending on the version of software and development tools used.
2. Overview of the Quick Start Example Project

The Quick Start example project allows the user to change the frequency of the on-board user LED4 (blue) using the user button (S2). The supported frequencies are 1 Hz, 5 Hz, and 10 Hz.

When the CK-RX65N v2 board running the Quick Start example project is connected to a host PC via USB as a Full Speed CDC Device, the kit information, MCU die temperature, and user LED blinking frequency are displayed on a terminal console.

2.1 Quick Start Example Project Flow

![Quick Start Example Project Flow Diagram]

*Figure 1. Quick Start Example Project Flow*
3. Running the Quick Start Example Project

This section lists the requirements and instructions to power up the CK-RX65N v2 board and run the Quick Start example project.

Hardware Requirements

- CK-RX65N v2 board
- USB C device cable
- Ethernet cable
- A PC with at least 1 USB port
- A router with at least 1 available full duplex Ethernet port*

* The PHY implemented on the Cloud Kit does not support half-duplex operation.

Software Requirements

- Windows® 10 operating system
- USB Serial Drivers (included in Windows 10)
- Tera Term (or similar) terminal console application

3.1 Connecting and Powering Up the CK-RX65N v2 Board

1. Check that:
   A. J12 is set to link pins 2-3
   B. J15 link is closed
   C. J16 is set to link pins 2-3 (RUN)

2. Connect J10 on the CK-RX65N v2 board to USB port on the host PC using the USB C cable supplied.

3. Power LED (LED1) on the CK-RX65N v2 board lights up white, indicating that the CK-RX65N v2 board is powered on.

Note: If the CK-RX65N v2 board is not powered through the Debug port (J14) the current available to the board may be limited to 100 mA.

Figure 2. Connecting the CK-RX65N v2 Board to the Host PC via USB Serial Port
3.2 Running the Quick Start Example Project

To run the Quick Start example project, use the following instructions:

1. On power up or RESET, the four user LEDs will take on the following states:
   - LED2 RGB – Off
   - LED3 Green – Steady, full intensity
   - LED4 Blue – Blinking at 1 Hz frequency
   - LED6 Red – Off

   Note: The debug LED (LED5) will blink or light up green; this can be ignored for now.

2. Press the user button (S2) on the CK-RX65N v2 board to change the blinking frequency of the user LED4 (blue). With every press of the first user button (S2), the frequency will switch from 1 Hz to 5 Hz to 10 Hz and cycle back.

3. On the host PC, open Windows Device Manager. Expand Ports (COM & LPT), locate USB Serial Device (COMxx) and note down the COM port number for reference in the next step.

   Note: USB Serial Device drivers are required to communicate between the CK-RX65N v2 board and the terminal application on the host PC.

---

Figure 3. USB Serial Device in Windows Device Manager

---
4. Open Tera Term, select **Serial** and **COMxx: USB Serial Device (COMxx)** and click **OK**.

![Tera Term: New connection](image)

**Figure 4.** Selecting the Serial Port on Tera Term

5. Using the **Setup** menu pull-down, select **Serial port...** and ensure that the Baud rate is set to 115200, data is set to 8 bit, parity is set to none, and stop is set to 1 bit, as shown below.

![Tera Term: Serial port setup](image)

**Figure 5.** Select Communication Settings
6. Complete the connection. The ‘welcome and main menu’ screen will be displayed. Please try to press \textbf{reset button} if the screen is not showing anything.

![Welcome and Main Menu](image)

\textbf{Figure 6. Welcome and Main Menu}

7. Press 1 to display the \textbf{Kit Information} including the kit name, part number, MCU ID, MCU die temperature, and the user LED’s current blinking frequency.

![Kit Information](image)

\textbf{Figure 7. Kit Information}

8. Press \textit{space} to return to the ‘welcome and main menu’ screen.
9. Press 2 to display the **Sensor Data**. It will display a list of all of the on board sensors along with their readings. Some of these sensors may take some time to provide data, the data will be output as soon as it is available.

![Figure 8. Loading Sensor List](image)

10. Some sensors like ZMOD4510 require longer periods of training time when the kit is powered the first time. These sensors will show **CALIBRATING** until they are ready to provide valid data.
11. The following figure shows the output when all data is available.

![Figure 9. Sensor List with All Data](image)

12. Press **space** to return to the ‘welcome and main menu’ screen.
13. Press 3 to display the **Web Server**. This application hosts a web server on the CK-RX65N v2 kit showing communication with the host PC as a remote client.

![Web Server Figure 10](image)

**Figure 10. Web Server**

14. Connect the Ethernet cable and press **tab**.

15. The CK-RX65N v2 as supplied, is configured to use DHCP for IP address resolution. Upon successful connection, the following is displayed.

![DHCP Figure 11](image)

**Figure 11. Using DHCP**
16. If the DHCP fails to resolve a route or the DHCP server has been disabled, the application uses the static IP defined in the project. The following should be displayed.

![Image]

**Figure 12. Using Static IP**

Note: If desired, the user may configure DHCP/static IP and MAC address using the project configuration (see section 4.4). Save the configuration and re-build, download the project to see the effects of the changes.
17. Once a successful network connection is established, open the web browser on the host PC. Type the IP address of the CK-RX65N v2 kit as shown in the Tera Term window in the address bar of the web browser. The following should be displayed in the web browser.

![Display Console](image)

**Device ID**
- 554b344e - 302d3330
- 006d0009 - 0108157a

**MCU Temperature (F):** 78.35
**MCU Temperature (C):** 25.75
**Blue LED Attributes**
- Frequency (Hz): 1

![Control Panel](image)

**User Switch 2**

**Instructions**
1. Press the physical user button S2 on the CK-RX65N v2 board. The blue user LED's frequency will change. The intensity and/or frequency will refresh in the Display Console. This demonstrates the communication from the server to the client.

2. Press the software user button S2 on the web server Control Panel. The blue user LED's frequency will change. The intensity and/or frequency will refresh in the Display Console. This demonstrates the communication from the client to the server.

Please refer to the CK-RX65N v2 Quick Start Guide and Quick Start Example Project source code for more details.

**Figure 13. Browser View**

18. Pressing the software user switch S2 on the web page control panel adjusts the flash frequency of the LED4 (blue).
19. In Tera Term, press space to return to the ‘welcome and main menu’ screen.
20. Press 4 to display Next Steps.

![Figure 14. Next Steps](image)

21. Press space to return to the ‘welcome and main menu’ screen.

4. **Customizing the Quick Start Example Project**

This section lists the requirements and instructions for customizing the Quick Start example project.

**Hardware Requirements**
- CK-RX65N v2 board
- Micro USB device cable
- USB C device cable
- Ethernet cable
- A PC with at least 2 USB ports
- A router with at least 1 available full duplex Ethernet port*
  * The PHY implemented on the Cloud Kit does not support half-duplex operation.

**Software Requirements**
- Windows® 10 operating system
- e² studio IDE
- E2OB USB drivers
- Quick Start example project

4.1 **Downloading and Installing Software and Development Tools**

Before the Quick Start example project can be modified, it is necessary to download and install software and development tools on the host PC.

The E2OB USB drivers, and e² studio are bundled in a downloadable e² studio installer available on the Renesas website at renesas.com/e2studio. New users are recommended to use the Quick Install option provided in the installation wizard, to minimize the amount of manual configuration needed.

There is no need to download and install software, development tools, and drivers separately.
4.2 Downloading and Importing the Quick Start Example Project

1. Download and extract the Quick Start example project to a local directory on the host PC.
   - The Quick Start example project (source code and project files) is available in the CK-RX65N v2 Example Projects Bundle that is available in the Downloads tab of CK-RX65N v2 webpage at renesas.com/rx/ck-rx65n
   - Download and extract the example projects bundle (xxxxxxxxxxxxxxxx-ck-rx65n-v2-exampleprojects.zip) to a local directory on the host PC.
   - Browse to the Quick Start example project at xxxxxxxxxxxxx-ck-rx65n-v2-exampleprojects\ck_rx65n-v2\quickstart\quickstart_ck_rx65n-v2_ep

2. Launch e² studio.

3. Browse to the Workspace where the project file is to be imported. Enter the name in the Workspace dialog box to create a new workspace.

4. Click Launch.

   ![Figure 15. Creating a New Workspace](image)

   ![Figure 16. Launching the Workspace](image)
5. Click **Import** from the **File** drop-down menu.

![Figure 17. Importing the Project](image1.png)

6. In the **Import** dialog box, select **General**, and then select **Existing Projects into Workspace**.

![Figure 18. Importing Existing Projects into the Workspace](image2.png)
7. Click Next.

![Figure 19. Clicking Next to Import Existing Projects into the Workspace](image)

8. Click **Select root directory** and click **Browse** to go to the location of the Quick Start example project folder.

![Figure 20. Selecting the Root Directory](image)
9. Select the Quick Start example project and click **Finish**.

![Import Projects](image)

**Figure 21.** Finishing Importing the Quick Start Example Project
4.3 Modifying, Generating, and Building the Quick Start Example Project

This section provides instructions to modify the Quick Start example project. The Quick Start example project can be modified by editing the source code and reconfiguring the properties of the MCU peripherals, pins, clocks, interrupts, and so forth.

Note: The specific modifications that can be performed to the Quick Start example project are not prescribed in this QSG. User discretion is advised while modifying the Quick Start example project.

1. Once the Quick Start example project is imported, click the `quickstart_ck_rx65n_v2_ep.scfg` file to open the configurator. The configurator provides an easy to use interface to configure the properties of the MCU peripherals.

Figure 22. Opening the Configurator

2. For example, in the Components tab of the configurator, the user can click to select a module to modify its configuration settings, as required. Figure 24 illustrates modifying the IRQ configuration.

Note: To access the component properties, the view must be set to Smart Configurator. Using the Open Perspective button, if necessary.

Figure 23. Open Perspective
3. After the desired modifications are made, click **Generate Code**.

4. Modify the source files in the `/src` folder as needed and save the changes.

5. Build the project by clicking the build icon.

6. A successful build produces an output as follows.
4.4 DHCP and Static IP settings

To modify the Ethernet based sample to enable/disable DHCP modify the file `src/frtos_config/FreeRTOSIPConfig.h` and set `ipconfigUSE_DHCP` as either 1 or 0 to enable or disable.

```
/* if ipconfigUSE_DHCP is 1 then FreeRTOS+TCP will attempt to retrieve an IP
   address, netmask, DNS server address and gateway address from a DHCP server. If
   ipconfigUSE_DHCP is 0 then FreeRTOS+TCP will use a static IP address. The
   stack will revert to using the static IP address even when ipconfigUSE_DHCP is
   set to 1 if a valid configuration cannot be obtained from a DHCP server for any
   reason. The static configuration used is that passed into the stack by the
   FreeRTOS_Init() function call. */
#define ipconfigUSE_DHCP 1
#define ipconfigDHCP_REGISTER_HOSTNAME 1
#define ipconfigDHCP_USES_UNICAST 1
#define ipconfigDHCP_SEND_DISCOVER_AFTER_AUTO_IP 1
```

![Figure 28. DHCP Setting in FreeRTOS_Kernel Component](image)

If DHCP is disabled, set the static IP address, net-mask and gateway address, to suit your local network.

In `quickstart_ck_rx65n_v2_ep.scfg`, go to the components tab and select `freeRTOS_Kernel`. In that section, you can change the MAC address, IP address, and netmask as shown in the following figure.

![Figure 29. Changing the MAC, IP, and netmask](image)

4.5 Setting Up Debug Connection between the CK-RX65N v2 board and Host PC

To program the modified Quick Start example project on to the CK-RX65N v2 board, a debug connection is necessary between the CK-RX65N v2 board and host PC.

1. Set Jumper J16 to connect pin 1 and pin 2
2. Connect the USB cable to micro-B USB debug port (J14) and USB C USB serial port (J10) of the CK-RX65N v2 board.
3. Verify that the debug LED (LED5) stops blinking and lights up green indicating that the E2OB drivers are detected by the CK-RX65N v2 board.

![Figure 30. Connecting the CK-RX65N v2 Board to the Host PC via USB Debug Port](image)
4.6 Downloading and Running the Modified Quick Start Example Project

1. In e² studio, click the drop-down menu for the debug icon, select **Debug Configurations** option.

![Figure 31. Selecting the Debug Option](image)

2. In the dialog, on the left-hand pane, expand the **Renesas GDB Hardware Debugging** and select the built image to debug. In this case, the **quickstart_ck_rx65n_v2_ep Hardware Debug**.

![Figure 32. Selecting the Debug Image](image)

3. Check Jumper J16 to connect pin 1 and pin 2.

4. Click on Debug button.
4.7 Firewall Dialog
1. A firewall warning may be displayed for ‘e2-server-gdb.exe’. Check the ‘Private networks, such as my home or work network’ box and click ‘Allow access’.
2. A user account control dialog may be displayed. Enter the administrator password and click Yes.
3. A “Confirm Perspective Switch” dialog box may appear. Click Switch.

![Figure 33. Opening the Debug Perspective](image)

4. Press F8 or click Resume icon to begin executing the project.

![Figure 34. Executing the Project](image)

5. The modified Quick Start example project is programmed into the CK-RX65N v2 board and is running. The project can be paused, stopped, or resumed using the debug controls.
5. Next Steps

1. To learn more about the CK-RX65N v2 kit, refer to the CK-RX65N v2 user’s manual and design package available in the Documents and Download tabs respectively of the CK-RX65N v2 webpage at renesas.com/rx/ck-rx65n

2. Renesas provides several example projects that demonstrate different capabilities of the RX MCUs. These example projects can serve as a good starting point for users to develop custom applications. Example projects (source code and project files) for CK-RX65N v2 kit are available in the CK-RX65N v2 Example Projects Bundle. The example projects bundle is available in the Downloads tab of CK-RX65N v2 webpage.
   - Download and extract the example projects bundle (xxxxxxxxxxxxxxxxx-ck-rx65n-v2-exampleprojects.zip) to a local directory on the host PC.
   - Refer to the list of all example projects (xxxxxxxxxxxxxxxxx-ck-rx65n-v2-exampleprojects.pdf) available inside the example projects bundle.
   - Browse to the desired example project (for example: adc_ck_rx65n_v2_ep) in the example projects bundle (xxxxxxxxxxxxxxxxx-ck-rx65n-v2-exampleprojects\ck_rx65n_v2\adc\adc_ck_rx65n_v2_ep)
   - If needed RX Driver Package can be downloaded separately from the RDP repository on GitHub at: github.com/renesas/rx-driver-package
   - The archived versions of the source code of the example projects are available the example project repository.

6. Website and Support

Visit the following URLs to learn about the kit and the RX family of microcontrollers, download tools and documentation, and get support.

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## Revision History

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<td>Oct.02.23</td>
<td>—</td>
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