

# RX65N Group

Cloud Kit for RX65N Microcontroller Group  
CK-RX65N v2  
Quick Start Guide

Renesas RX Family  
RX600 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.

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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.

## Renesas RX Family

**CK-RX65N v2**
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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 e<sup>2</sup> 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 e<sup>2</sup> 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

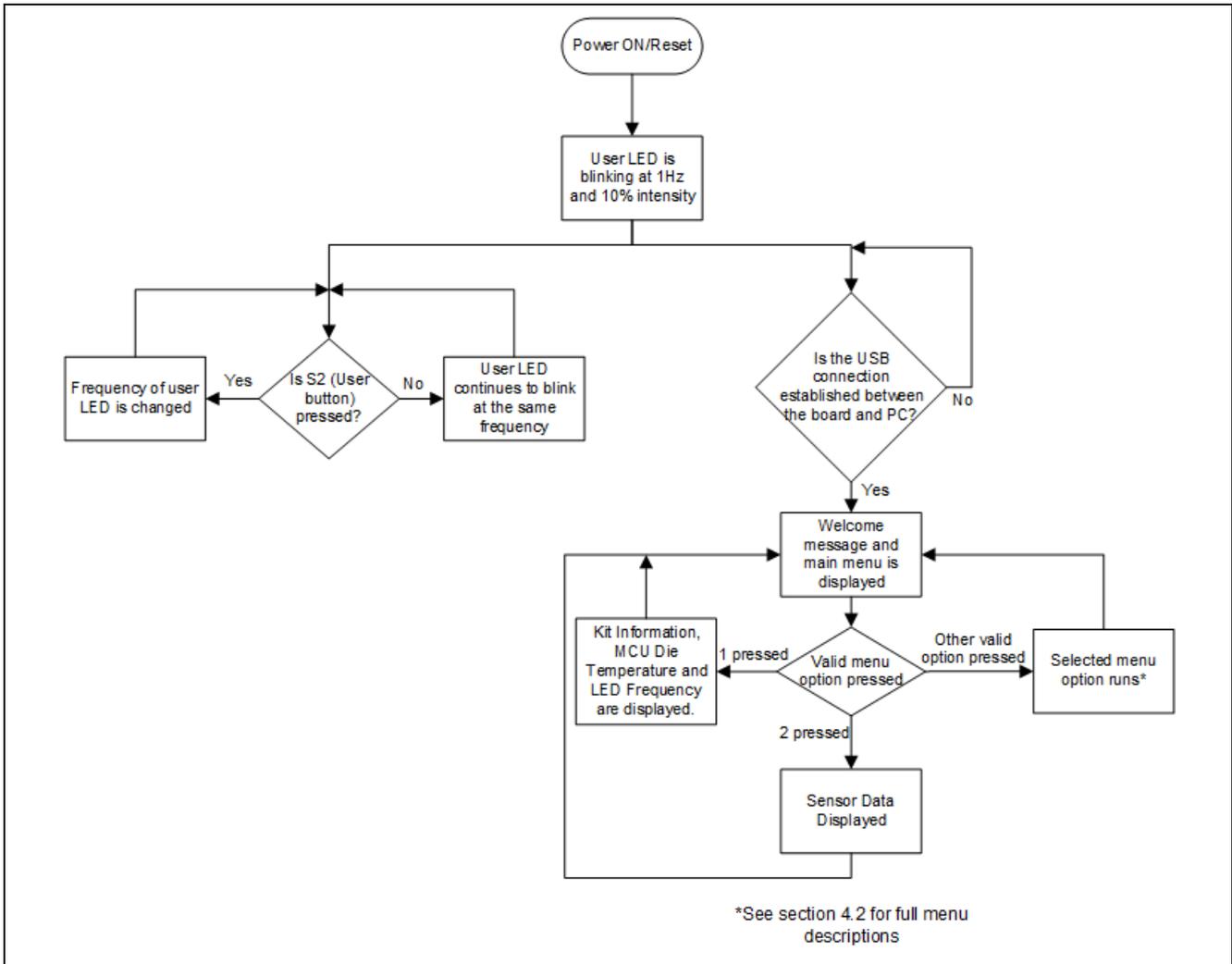


Figure 1. Quick Start Example Project Flow

### 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.

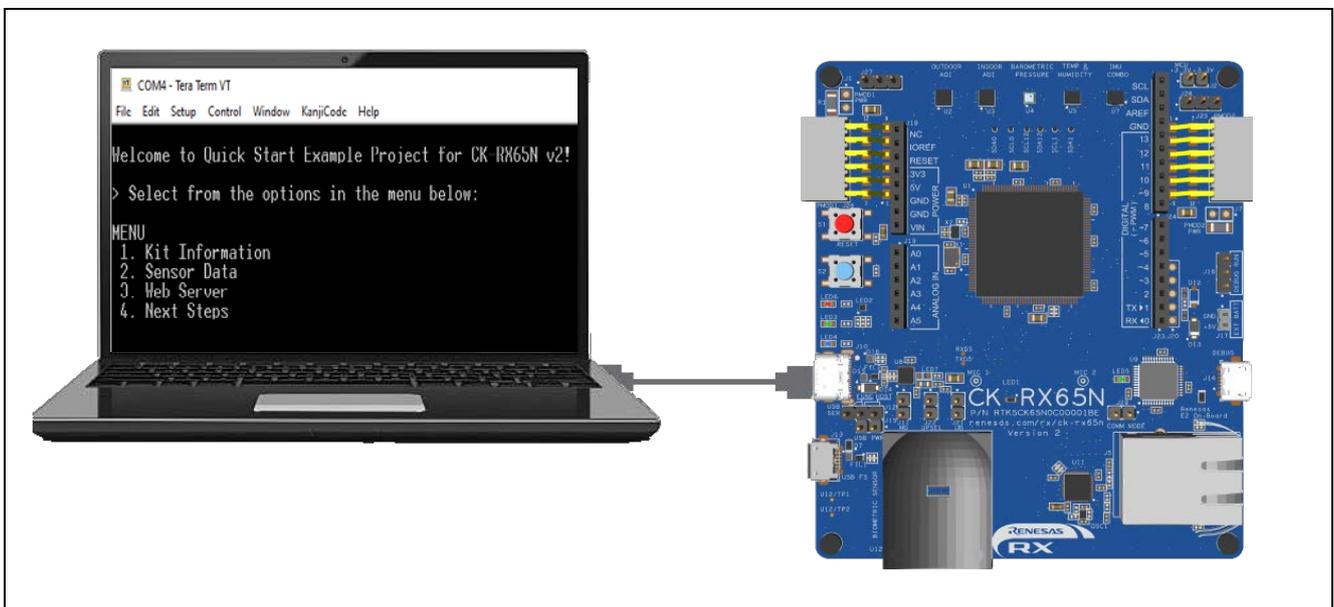


Figure 2. Connecting the CK-RX65N v2 Board to the Host PC via USB Serial Port

### 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.

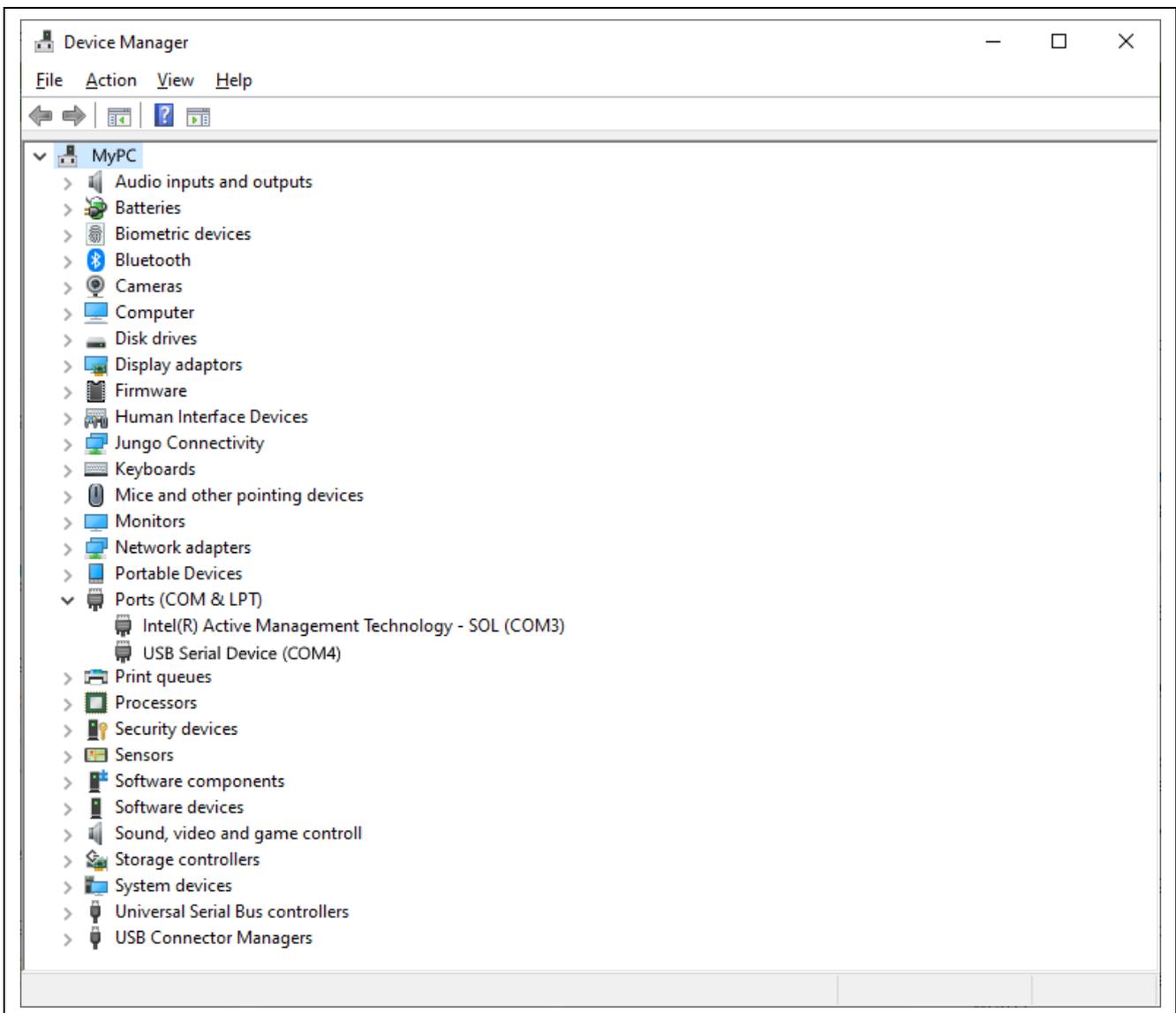
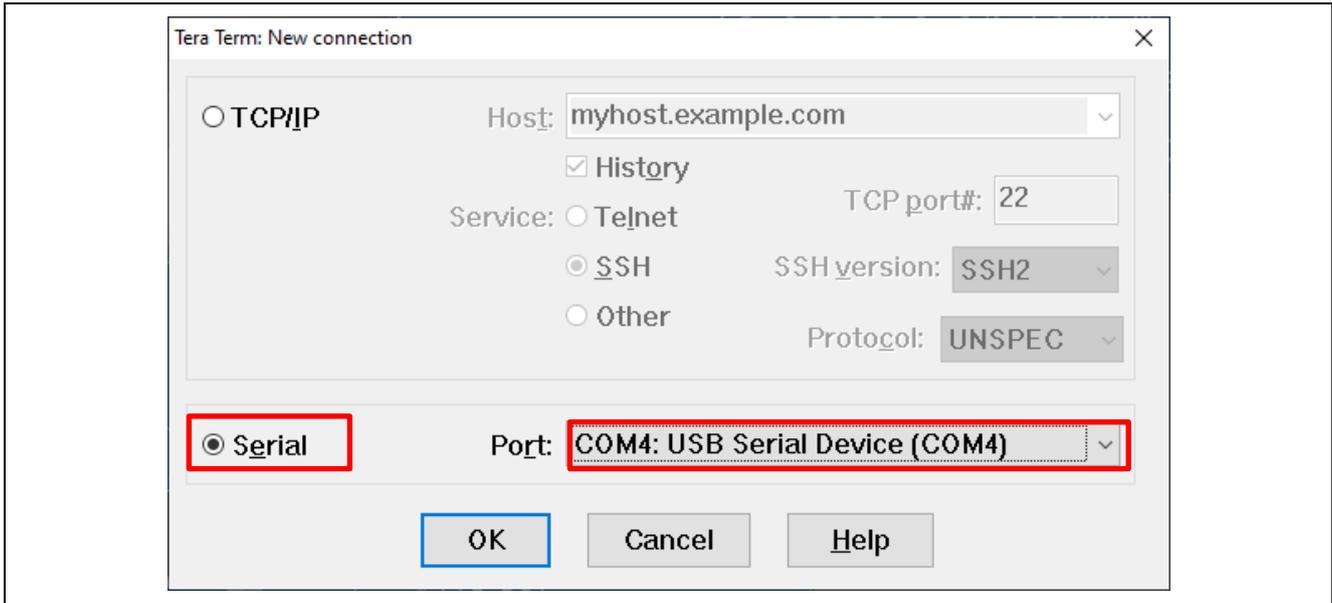


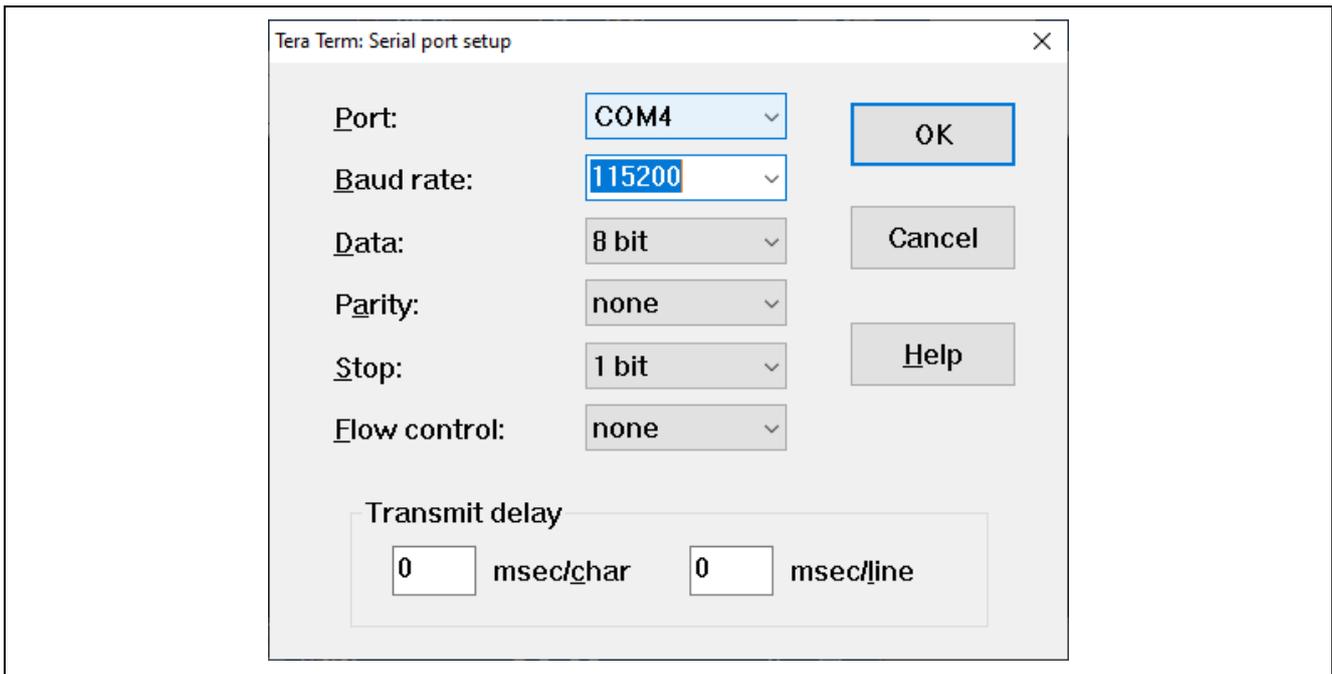
Figure 3. USB Serial Device in Windows Device Manager

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



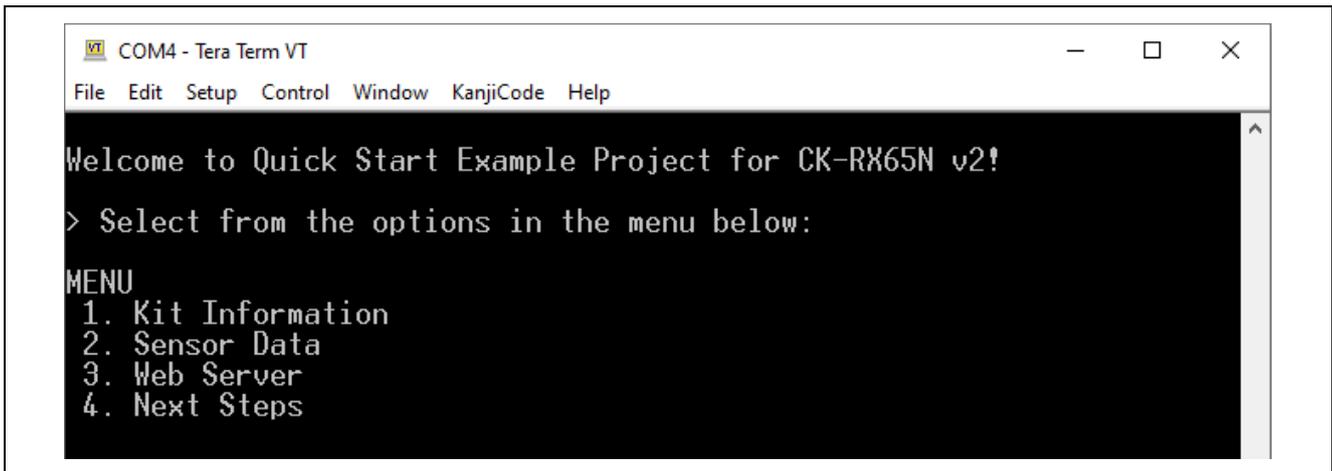
**Figure 4. Selecting the Serial Port on Tera Term**

- 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.



**Figure 5. Select Communication Settings**

- Complete the connection. The 'welcome and main menu' screen will be displayed. Please try to press reset button if the screen is not showing anything.



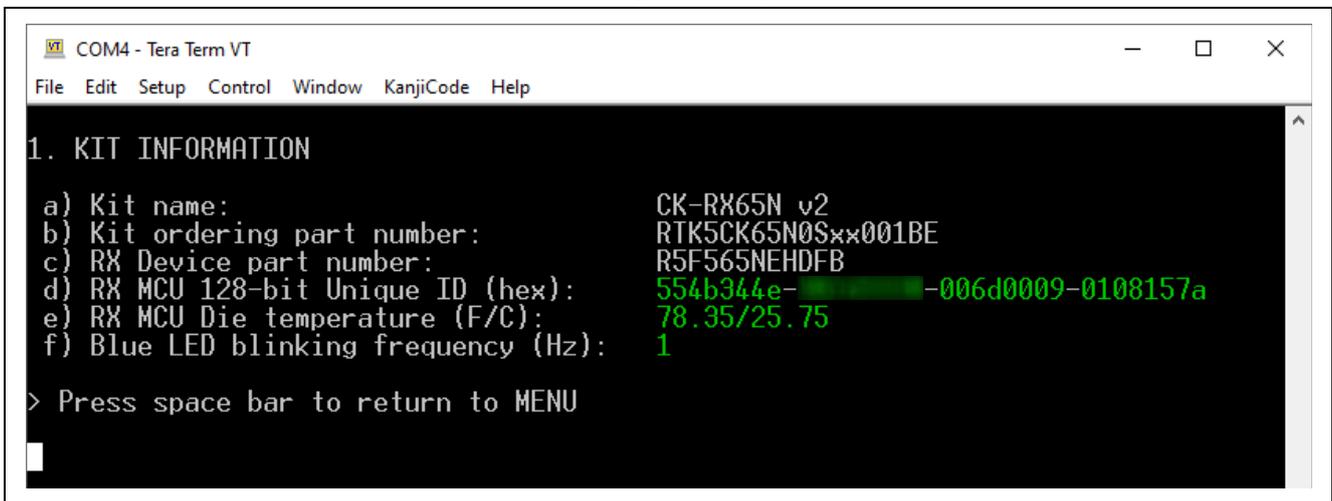
```
COM4 - Tera Term VT
File Edit Setup Control Window KanjiCode Help

Welcome to Quick Start Example Project for CK-RX65N v2!
> Select from the options in the menu below:

MENU
1. Kit Information
2. Sensor Data
3. Web Server
4. Next Steps
```

Figure 6. Welcome and Main Menu

- Press **1** to display the **Kit Information** including the kit name, part number, MCU ID, MCU die temperature, and the user LED's current blinking frequency.



```
COM4 - Tera Term VT
File Edit Setup Control Window KanjiCode Help

1. KIT INFORMATION
a) Kit name: CK-RX65N v2
b) Kit ordering part number: RTK5CK65N0Sxx001BE
c) RX Device part number: R5F565NEHDFB
d) RX MCU 128-bit Unique ID (hex): 554b344e-██████████-006d0009-0108157a
e) RX MCU Die temperature (F/C): 78.35/25.75
f) Blue LED blinking frequency (Hz): 1

> Press space bar to return to MENU
```

Figure 7. Kit Information

- Press **space** to return to the 'welcome and main menu' screen.

- 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.

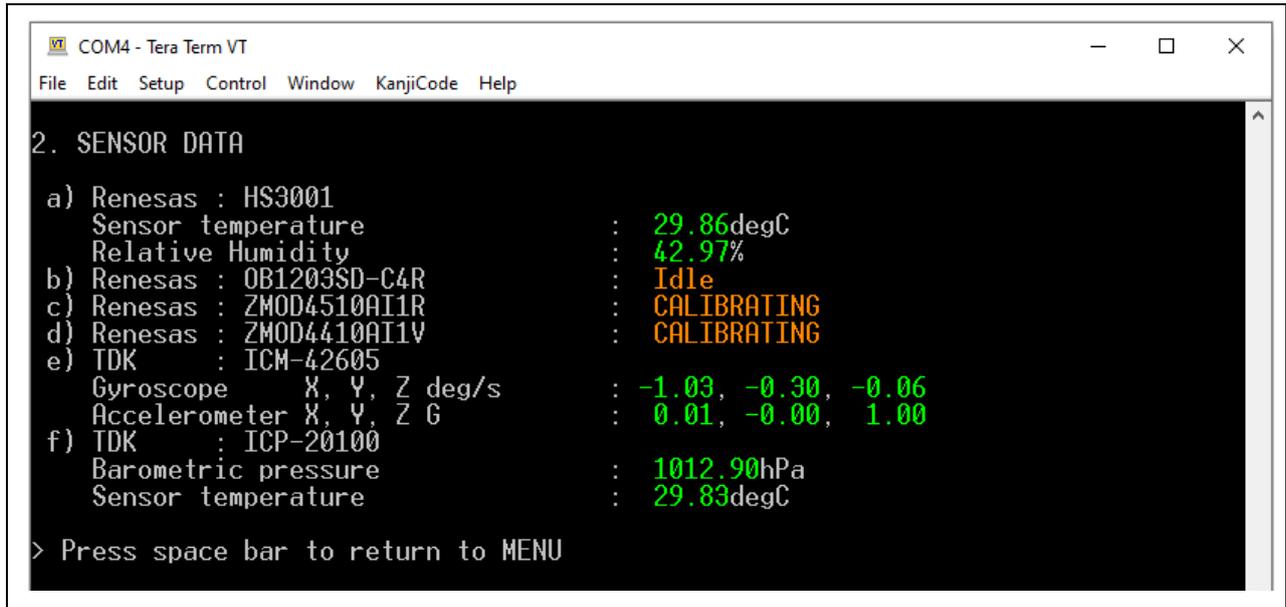


Figure 8. Loading Sensor List

- 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.
- The following figure shows the output when all data is available.

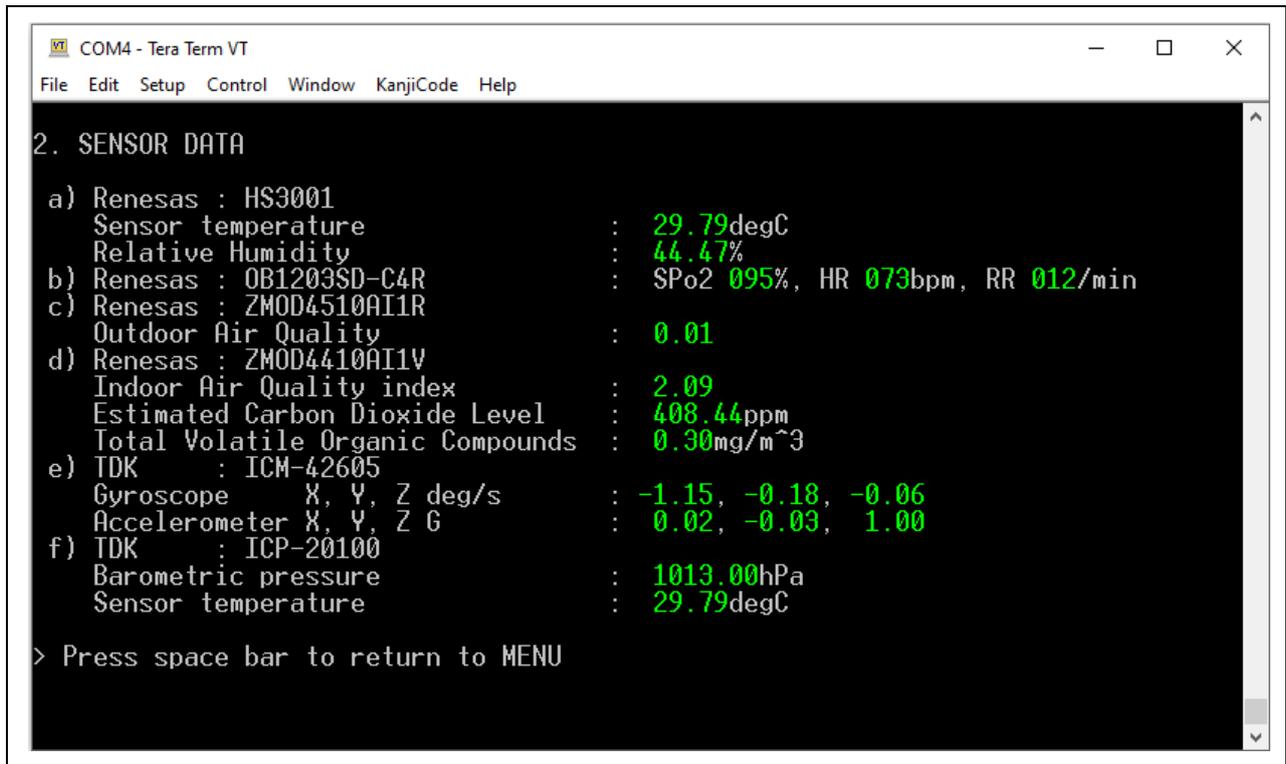
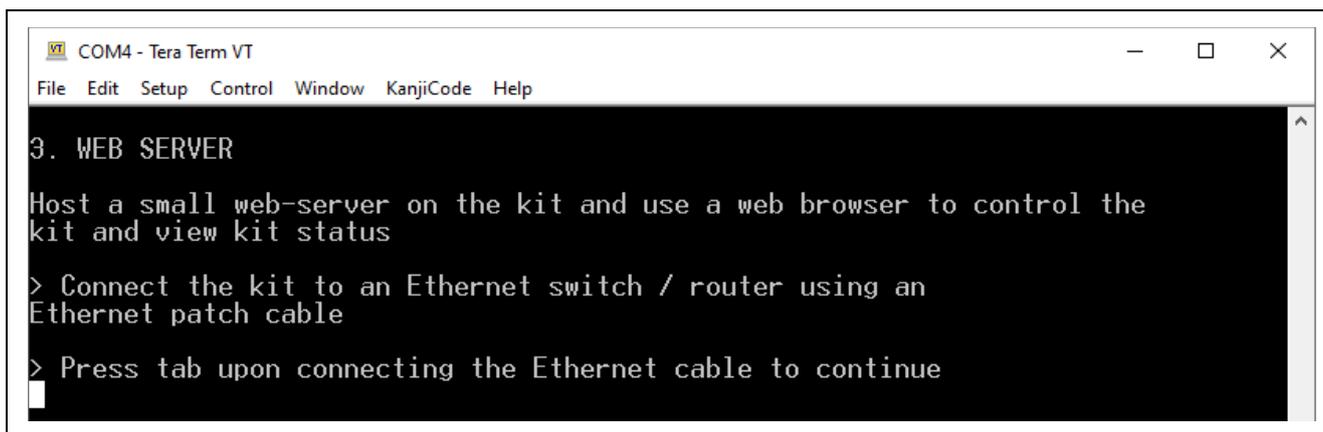


Figure 9. Sensor List with All Data

- Press **space** to return to the 'welcome and main menu' screen.

- 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.



```
COM4 - Tera Term VT
File Edit Setup Control Window KanjiCode Help

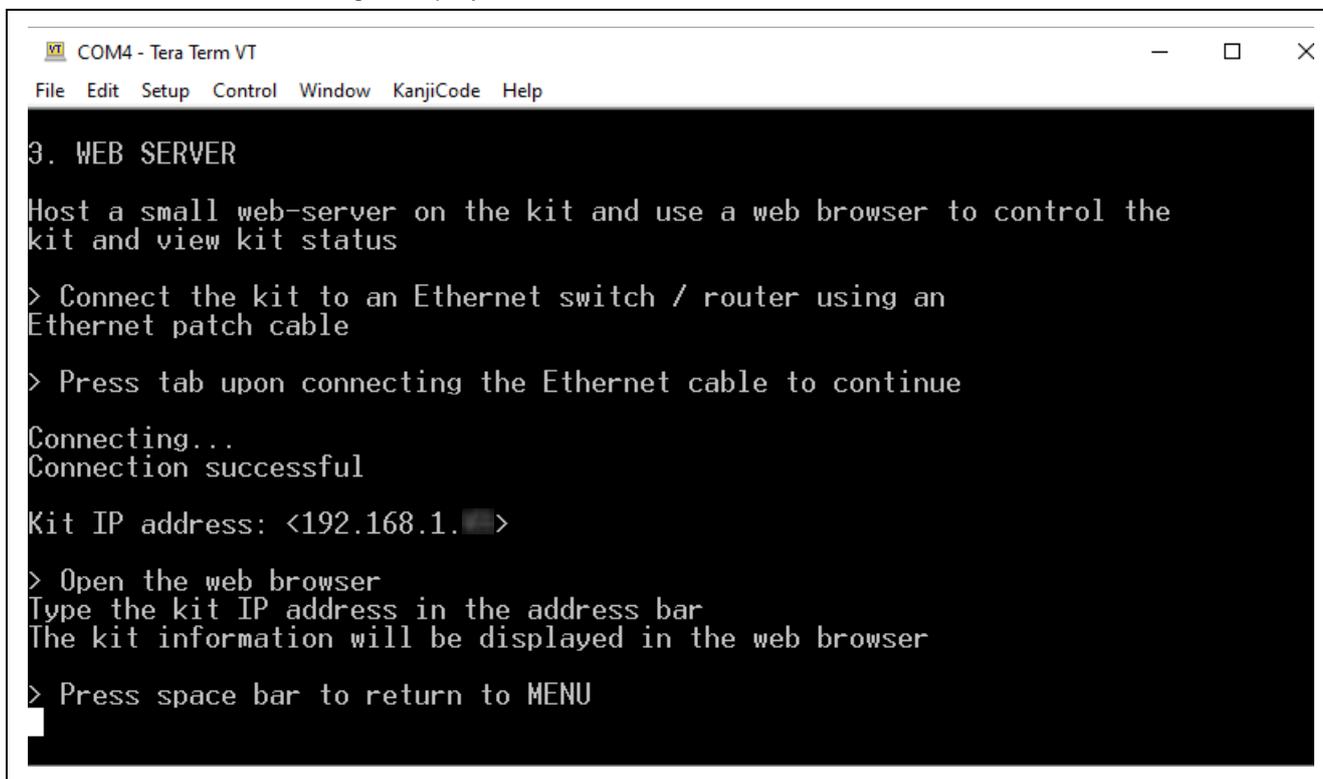
3. WEB SERVER
Host a small web-server on the kit and use a web browser to control the
kit and view kit status

> Connect the kit to an Ethernet switch / router using an
Ethernet patch cable

> Press tab upon connecting the Ethernet cable to continue
```

Figure 10. Web Server

- Connect the Ethernet cable and press **tab**.
- The CK-RX65N v2 as supplied, is configured to use DHCP for IP address resolution. Upon successful connection, the following is displayed.



```
COM4 - Tera Term VT
File Edit Setup Control Window KanjiCode Help

3. WEB SERVER
Host a small web-server on the kit and use a web browser to control the
kit and view kit status

> Connect the kit to an Ethernet switch / router using an
Ethernet patch cable

> Press tab upon connecting the Ethernet cable to continue

Connecting...
Connection successful

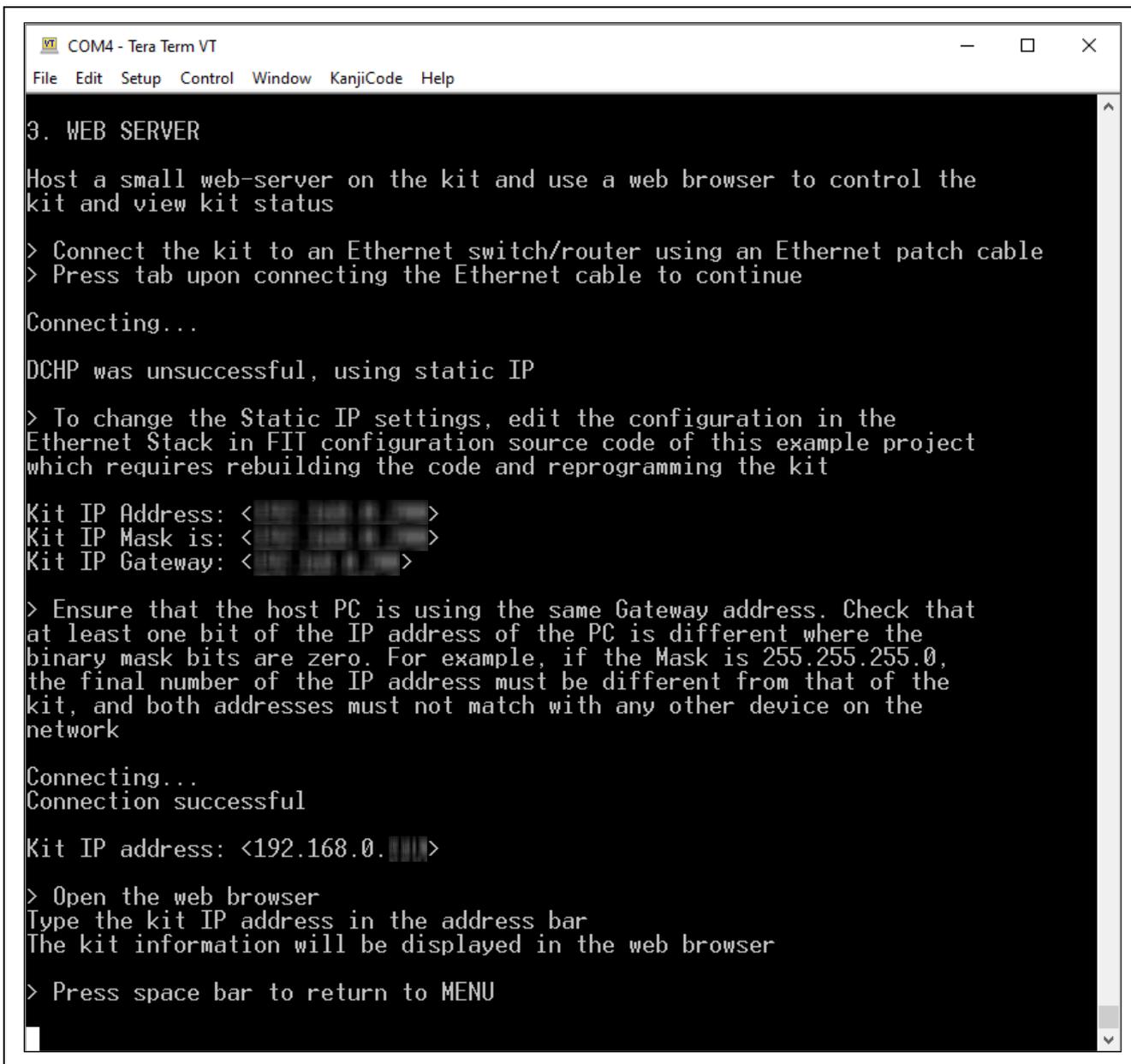
Kit IP address: <192.168.1.███>

> Open the web browser
Type the kit IP address in the address bar
The kit information will be displayed in the web browser

> Press space bar to return to MENU
```

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.



```
COM4 - Tera Term VT
File Edit Setup Control Window KanjiCode Help

3. WEB SERVER
Host a small web-server on the kit and use a web browser to control the
kit and view kit status

> Connect the kit to an Ethernet switch/router using an Ethernet patch cable
> Press tab upon connecting the Ethernet cable to continue

Connecting...

DHCP was unsuccessful, using static IP

> To change the Static IP settings, edit the configuration in the
Ethernet Stack in FIT configuration source code of this example project
which requires rebuilding the code and reprogramming the kit

Kit IP Address: <192.168.0.100>
Kit IP Mask is: <255.255.255.0>
Kit IP Gateway: <192.168.0.100>

> Ensure that the host PC is using the same Gateway address. Check that
at least one bit of the IP address of the PC is different where the
binary mask bits are zero. For example, if the Mask is 255.255.255.0,
the final number of the IP address must be different from that of the
kit, and both addresses must not match with any other device on the
network

Connecting...
Connection successful

Kit IP address: <192.168.0.100>

> Open the web browser
Type the kit IP address in the address bar
The kit information will be displayed in the web browser

> Press space bar to return to MENU
```

Figure 12. Using Static IP

Note: If desired, the user may configure DHCP/static IP and MAC address using the project configuration (see section 0). Save the configuration and re-build, download the project to see the effects of the changes.

- 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.

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CK-RX65N Resources    RX Forum    Help & Support    Cloud Solutions

Welcome

# CK-RX65N v2

## Cloud Kit for RX65N MCU Group

Quick Start Example Project

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### Introduction

This embedded web server is running on the RX65N MCU and is implemented using Firmware Integration Technology (FIT), FreeRTOS+TCP, and open source Webio. This web server demonstrates how users can easily create a professional, user-friendly, and platform-independent user interface for products/applications that require remote control and monitoring.

#### Display Console

Device ID	MCU Temperature (F): 78.35
554b344e - 302d3330	MCU Temperature (C): 25.75
006d0009 - 0108157a	Blue LED Attributes
	Frequency (Hz): 1



#### Control Panel

S2 User Switch 2

#### Instructions

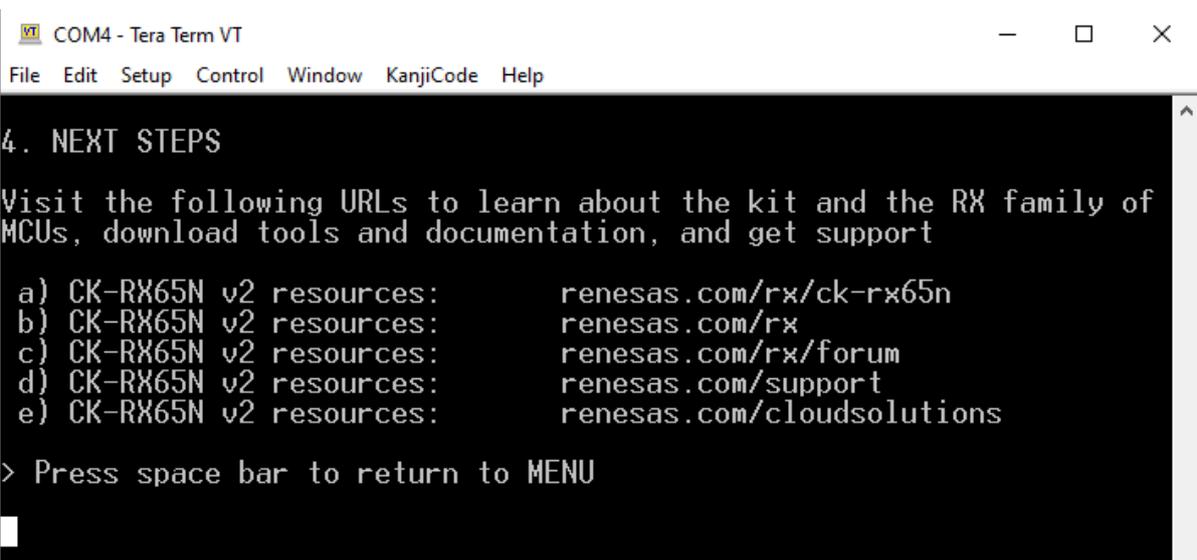
- Press the physical user button S2 on the CK-RX65N v2 board. The blue user LED's frequency will change. The intensity and/or frequency will refresh in the Display Console. This demonstrates the communication from the server to the client.
- Press the software user button S2 on the web server Control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

- 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**.



```
COM4 - Tera Term VT
File Edit Setup Control Window KanjiCode Help

4. NEXT STEPS

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

a) CK-RX65N v2 resources:      renesas.com/rx/ck-rx65n
b) CK-RX65N v2 resources:      renesas.com/rx
c) CK-RX65N v2 resources:      renesas.com/rx/forum
d) CK-RX65N v2 resources:      renesas.com/support
e) CK-RX65N v2 resources:      renesas.com/cloudsolutions

> Press space bar to return to MENU
```

**Figure 14. Next Steps**

21. Press **space** to return to the 'welcome and main menu' screen.

#### 4. Next Steps

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](https://renesas.com/rx/ck-rx65n)

#### 5. 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.

CK-RX65N Resources	<a href="https://renesas.com/rx/ck-rx65n">renesas.com/rx/ck-rx65n</a>
Cloud Application Notes	<a href="https://renesas.com/cloudsolutions">renesas.com/cloudsolutions</a>
RX Cloud Solution Portal	<a href="https://renesas.com/rx/cloudsolutions">renesas.com/rx/cloudsolutions</a>
RX Product Support Forum	<a href="https://renesas.com/rx/forum">renesas.com/rx/forum</a>
RX Product Information	<a href="https://renesas.com/rx">renesas.com/rx</a>
Renesas Support	<a href="https://renesas.com/support">renesas.com/support</a>

**Revision History**

Rev.	Date	Description	
		Page	Summary
1.00	Oct.02.23	—	Initial release
1.01	Oct.18.24	—	Removed section 4 'Customizing the Quick Start Example Project'

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