RH850/U2A Starter Kit

R12QS0070ED0100

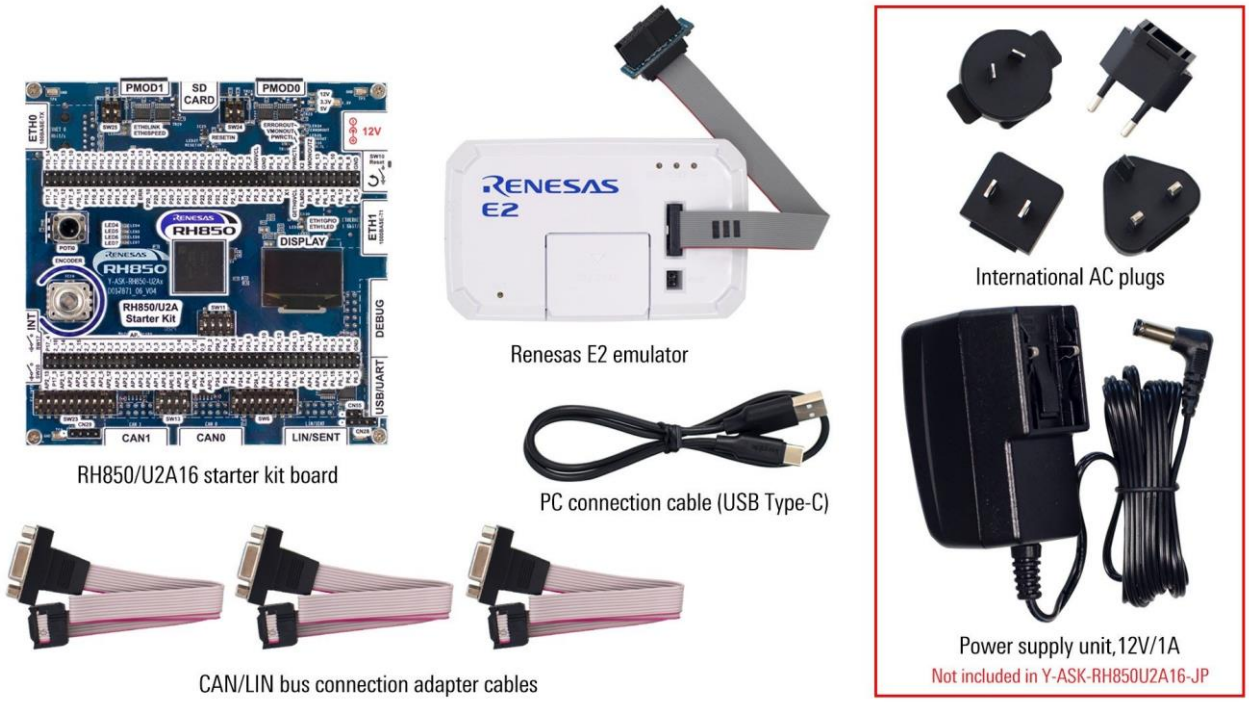


Figure 1 RH850/U2A Starter Kit Package Content

1. Tools

Note:

- Installation of the tool packages requires administrative rights on Windows™ machine.
- The E2 emulator must not be connected to the machine until the emulator software has been installed.

• Windows™ users may see “User Account Control” dialog box. If applicable, enter the administrator password and click <OK>.

• You will be able to install either Green Hills MULTI, IAR Embedded Workbench for RH850, or Renesas CS+ for CC IDE tools. If you already have a Kickstart-, evaluation- or fully-licensed-version of one of these tools it is unnecessary to re-install them. Skip to chapter *1.3 Installation of the Sample Software*

1.1 Installation of Green Hills MULTI and IAR Embedded Workbench for RH850

- GHS and IAR installation and licensing request procedures are explained in the RH850 Starter Kit License Information Document. Paper printout is included as part of the product package.

1.2 Installation of Renesas CS+

- Ensure no other instance of CS+ is running.
- Please use the link to download Renesas CS+ for CC V8.11.00 or later. It will re-direct you as shown in *Figure 2 Renesas CS+ for CC V8.11.00*
- CS+ for CC V8.11.00 | Renesas

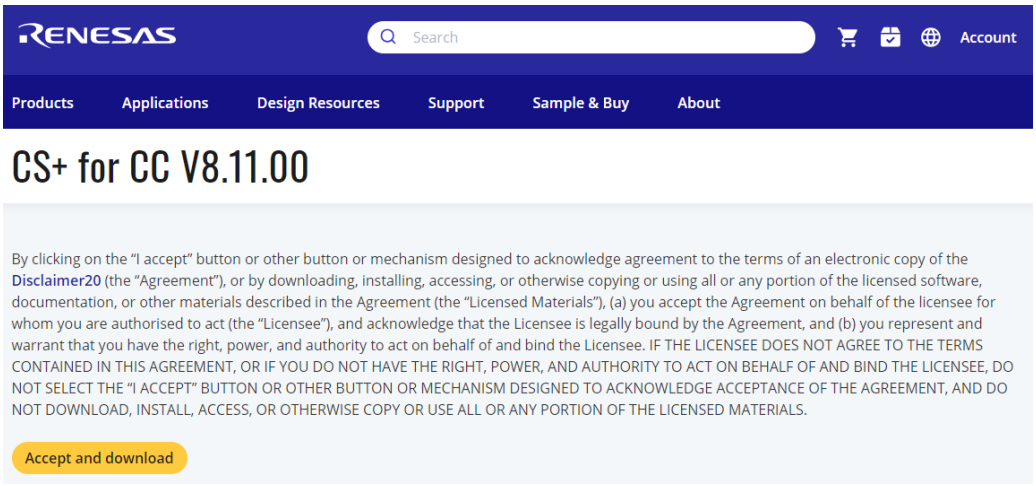


Figure 2 Renesas CS+ for CC V8.11.00

License

- Refer to the Compiler Licenses details for working with the Renesas CS+ at Compiler Licenses
- Evaluation Edition of the licenses can as well be attained which works as the Professional editions during a trial period of 60 days from the day the first build is executed after installing an evaluation edition.
- Please refer to the *Figure 3 Evaluation Edition Compiler Licenses* below for a quick highlight

Figure 3 Evaluation Edition Compiler Licenses

1.3 Installation of the Sample Software

- Sample Code for the RH850/U2A will be distributed via Renesas website. It can be downloaded from: http://www.renesas.com/y-ask-rh850u2a
- Note: To avoid possible problems please choose a directory without any blank characters or country specific characters in its name or path! Please use only letters, numbers, and the characters '- ','+', and '_'.

1.4 Installation of ancillary Tools and Documentation

- If you do not have “Renesas Flash Programmer” installed, then please download the necessary package preferable for your operating system from Renesas Flash Programmer (Programming GUI) | Renesas
- Follow the on-screen instructions to install the latest version. Earlier versions may not have the necessary device support.
- The documentation can be downloaded from Y-ASK-RH850U2A - RH850/U2A Starter Kits | Renesas

2. Board Configuration

Before using the starter kit with a sample application, please configure the jumpers and switches being used in *Table 1 Switches* below.

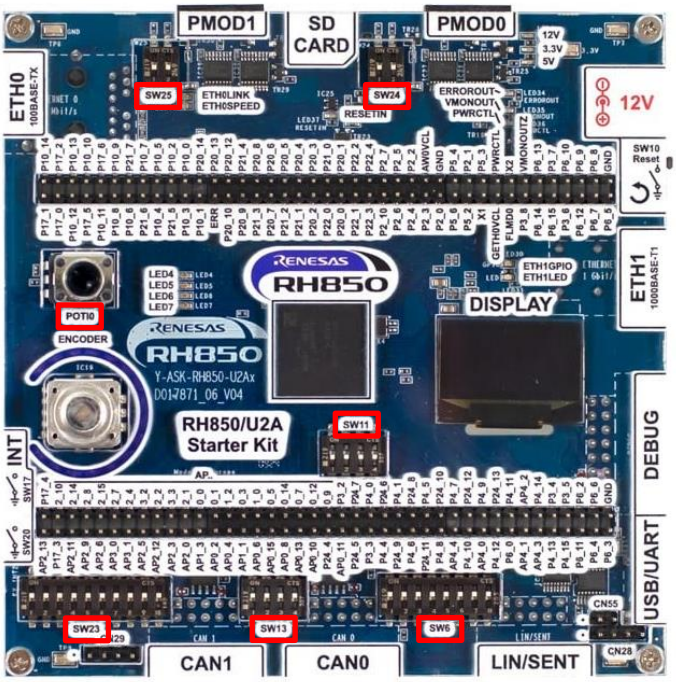


Figure 4 RH850/U2A Starter Kit Board Top View

Peripheral/Function	Enable Switch	Configuration Switch
LIN	SW23[6] = ON	SW6[1] = ON
USB/UART	SW23[9] = ON	
CAN0	SW23[4] = ON	SW13[1,2] = ON
CAN1	SW23[3] = ON	SW13[3,4] = ON
10BASE-T/100BASE-TX Ethernet	SW23[7] = ON	
ENC_LED_CSI_OE	SW23[8] = ON	
POTI0		Always ON
User LEDs	SW23[2] = ON	
Operating Mode		SW11[1,2,3,4] = OFF Normal Operating Mode
100/1000BASE-T1 Ethernet	SW23[10] = ON	
EXT INT 1&2	SW23[1] = ON	
PMOD0		SW24[1] = ON(3A)/OFF(6A) SW24[2] = ON(3A/6A)/OFF(2A)
PMOD1		SW25[1] = ON(3A)/OFF(6A) SW25[2] = ON(3A/6A)/OFF(2A)

Table 1 Switches

For an overview of switches and connectors please refer to Appendix A.

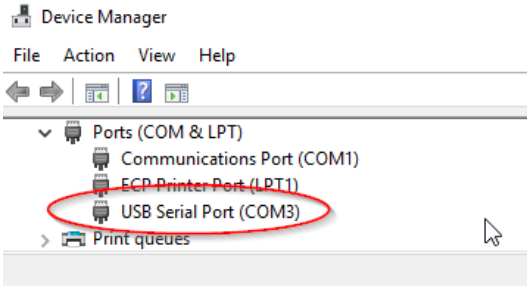
3. Power Supply Configuration

The starter kit uses an external power supply of 12V and generates all required voltages using a Renesas dual standard buck regulator IC ISL78208 for all the digital circuitry on the device and on the board. No manual configuration is necessary. After connecting the external power supply, the green LEDs LED1 12V, LED2 3.3V and LED3 5V light up. RESET-LED LED29 will remain lighted as long as you press the RESET button.

Figure 5 External Power Supply

4. Terminal Connection

After jumper configuration and power supply connection is completed, please connect the USB/UART port with a free USB port of your PC. The first time the starter kit is connected to a PC, a FTDI USB serial port device is detected, and the necessary USB driver is installed by the Windows™ operating system automatically. After the successful driver-installation a USB serial port is listed in the Windows™ device manager:



Please keep the COM-port number in mind for the configuration of the terminal program. You can use your preferred terminal program, one possibility is e.g., Tera Term.

Please use the default-standard serial terminal settings. The Speed should be kept as 9600.

Figure 6 Detecting & Setting Terminal Connection

5. Debug Connection

- Connect the Renesas E2 emulator to the connector marked ‘CN7’ on the board using the ribbon cable and adapter.
- *Figure 7 20-Pin to 14-Pin Conversion Adapter for the Renesas E2 Emulator* shows adapter for the E2 Emulator. It is important to note that switch SW1 on the Renesas E2 target connector must be set to position 1 (labelled “Other”. These are not printed on some versions of the conversion adapter) for RH850 or RX MCUs or in position 3 (labelled “RL78”. These are not printed on some versions of the conversion adapter) for RL78 MCUs.
- Connect the Renesas E2 emulator module to a spare USB port of your PC. The green ‘ACT’ LED on the E2 Emulator will illuminate.

Figure 8 Renesas E2 Emulator

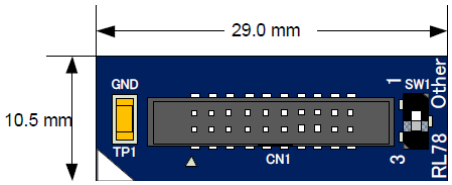


Figure 7 20-Pin to 14-Pin Conversion Adapter for the Renesas E2 Emulator

The first time the E2 is used, the ‘Found New Hardware’ wizard will appear. Please follow the steps below to install the drivers. Please note that administrator privileges are required for a Windows™ machine. “Device driver software installed successfully” pop-up will appear in the Windows™ toolbar and installation will complete.

Note: If the driver is not detected automatically, it can be found at E2 emulator [RTE0T00020KCE00000R] | Renesas. The Windows driver signing dialog may be displayed. Please accept the driver to continue.

6. Using Green Hills MULTI

Green Hills MULTI integrates various tools such as compiler, assembler, debugger, and editor into a common graphical user interface. To learn more on how to use MULTI, open the user manual via the help menu of the Green Hills MULTI IDE.

- Launch MULTI by executing <GHS INSTALL DIRECTORY>\multi_xxx\multi.exe
- The first time this is launched no license will be detected; please refer to RH850 Starter Kit License Information Document about the procedure.
- Upon receipt of the license email, follow the instructions to install the license and re-launch MULTI.
- In MULTI launcher, launch the Project Manager, Open the project “Y-ASK-RH850U2A16-GHS.gpj” for U2A16 device or “Y-ASK-RH850U2A6-GHS.gpj” for U2A6 device located at http://www.renesas.com/y-ask-rh850u2a.
- Select the ‘Build’ button to build the project.
- To download and debug, select the ‘Debug’ button. The ‘MULTI Debugger’ window will open.
- Now, execute the ‘MCA_Project.rc’ and press enter.
- Continue running the program by pressing

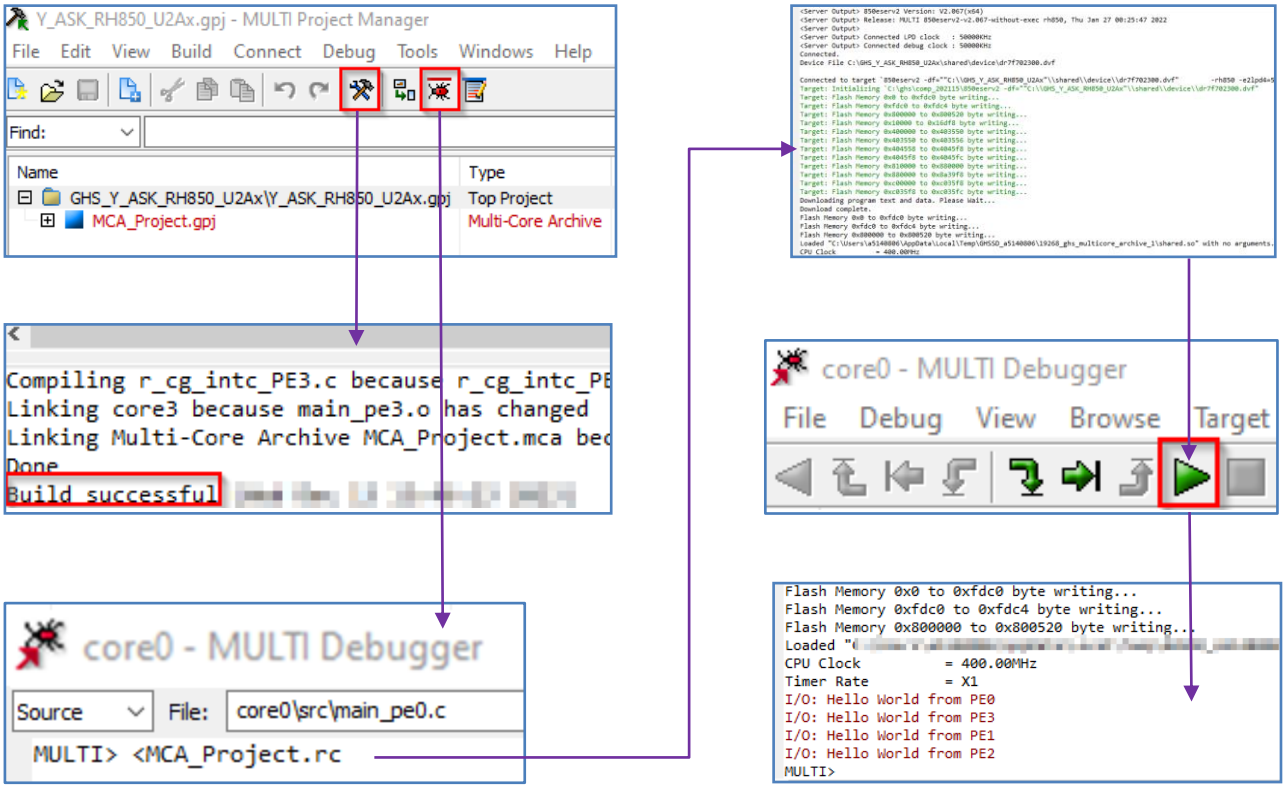


Figure 9 Green Hills MULTI Build and Debug Flow

7. Using IAR Embedded Workbench for RH850

IAR Embedded Workbench for RH850 (EWRH850) integrates various tools such as compiler, assembler, linker, debugger, and editor into a common graphical user interface. For further information on how to use EWRH850, open the user manual installed on your computer (Start Menu > IAR Embedded Workbench for Renesas RH850 Vx.xx > Release Notes)

- Launch EW from the Start Menu. (Start Menu > IAR EW for Renesas RH850).
- Please refer to RH850 Starter Kit License Information Document about the licensing procedure.
- Open the workspace “Y-ASK-RH850U2A16-IAR.eww” for U2A16 device or “Y-ASK-RH850U2A6-IAR.eww” for U2A6 device located at http://www.renesas.com/y-ask-rh850u2a . If not displayed automatically change file type to 'Workspace Files (*.eww)'.
- Click the ‘Download & Debug' button , this builds the project and starts the debugger.
- Use the 'Go' button to run the project.
- To stop the debugger, use the ‘Stop’ button .
- After finishing the debug session simply disconnect the Renesas E2 Emulator.
- For more details on the IAR tools, please refer to their documentation.

8. Using Renesas CS+

CS+ combines various tools such as the C Compiler Package for RH850 Family [CC-RH], debugger, and editor into a common graphical user interface.

- Launch CS+ for CC from the Start Menu. (Start Menu > Renesas Electronics CS+ > CS+ for CC).
- Open the project “Y-ASK-RH850U2A16-CCRH.mtpj” for U2A16 device or “Y-ASK-RH850U2A6-CCRH.mtpj” for U2A6 device located at http://www.renesas.com/y-ask-rh850u2a . If not displayed automatically change file type to 'Project Files (*.mtpj)'.
- Click the ‘Download & Debug' button , this builds the project and starts the debugger.
- Use the 'Go' button to run the project.
- To stop the debugger, use the ‘Stop’ button .
- After finishing the debug session simply disconnect the Renesas E2 Emulator.
- For more details on the CS+ tools, please refer to the Help menu.

9. Next Step

After you have completed this quick start procedure, please review the documentation available on the product website (see chapter 10 “Support”). The sample code project contains all you need to get started developing your own projects. The software tools provided are evaluation versions and have limitations that are described in tool vendor’s documentation. To purchase fully functional versions, please contact your Renesas sales office.

10. Support

To access the online resources and find the latest updates of the sample code or documentation please visit our website http://www.renesas.com/y-ask-rh850u2a or scan the code to the right:

In case of questions, please feel free to contact the technical support team:
device_support.rh850-eu@lm.renesas.com

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11. Appendix A

The following tables provide an overview of all switches and connectors.

Connector	Function	Remark
SW6	8-position DIP switch to enable LIN and SENT signal output to connector CN44	Refer to RH850/U2A starter Kit User's Manual chapter 6.11
SW10	Reset switch	Refer to RH850/U2A starter kit User's Manual chapter 6.2
SW11	4-position DIP switch to select RH850/U2A operation mode	Refer to RH850/U2A starter kit User's Manual chapter 6.1
SW13	4-position DIP switch to enable load on CAN outputs	Refer to RH850/U2A starter kit User's Manual chapter 6.10
SW17	Switches for external interrupt signals	Refer to RH850/U2A starter kit User's Manual chapter 6.4
SW20		
SW23	10-position DIP switch to enable various functions	Refer to RH850/U2A starter kit User's Manual chapter 6.3
SW24	2-position DIP switch to configure PMOD0	Refer to RH850/U2A starter kit User's Manual chapter 6.16
SW25	2-position DIP switch to configure PMOD1	

Table 2 Overview Switches

Connector	Function	Remark
CN1	+12.0 V external power supply	Refer to RH850/U2A starter kit User's Manual chapter 3.1
CN2	USB-C connector for UART1	Refer to RH850/U2A starter kit User's Manual chapter 6.13
CN7	Debug and programming interface	Refer to RH850/U2A starter kit User's Manual chapter 5
CN8	Ethernet interface ETH1	Refer to RH850/U2A starter kit User's Manual chapter 6.14
CN10	Ethernet interface ETH0	
CN28	LIN / SENT monitor connector	Refer to RH850/U2A starter kit User's Manual chapter 6.11
CN29	CAN0 / CAN1 monitor connector	Refer to RH850/U2A starter kit User's Manual chapter 6.10
CN35	Device port connectors	Refer to RH850/U2A starter kit User's Manual chapter 9.8
CN36		
CN37		
CN38		
CN39		
CN40		
CN44	LIN / SENT interface connector	Refer to RH850/U2A starter kit User's Manual chapter 6.11
CN46	CAN0 interface connector	Refer to RH850/U2A starter kit User's Manual chapter 6.10
CN47	CAN1 interface connector	
CN55	UART1 monitor connector	Refer to RH850/U2A starter kit User's Manual chapter 6.13
CN57	MicroSD card interface	Refer to RH850/U2A starter kit User's Manual chapter 6.15

Table 3 Overview Connectors

12. Appendix B

The menu program can be seen upon successful build and flash of the target as shown in *Figure 10 Menu Program.*

- Note: Make sure that SW23[9] is ON.
- Note: Refer to the Chapter *Terminal Connection* for the setting target and host communication.

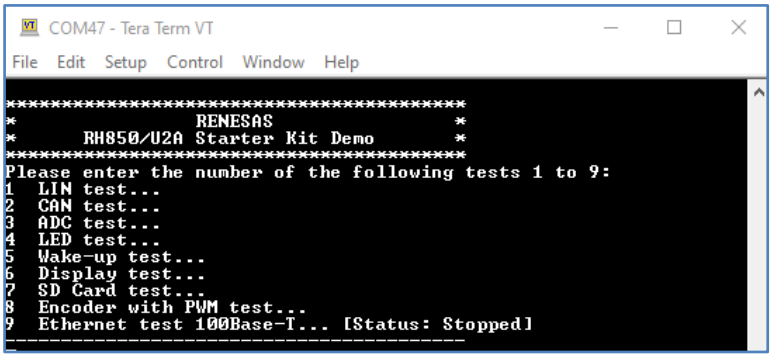

Figure 10 Menu Program

- Please ensure that the board is configured to minimal settings as per the *Table 1 Switches*
- The user can enter the numbers from 1 to 9 based on the application to be executed.
- The result of the test will be prompted on the terminal. In case of failure the necessary board configuration should be followed as depicted in Chapter *Board Configuration.*
- LIN, ADC, LED, Wake-up, Display and Encoder test do not require any extra hardware/cable attachment to execute their respective application test other than switch settings.
- CAN test requires the physical connection between CN46: CAN0 and CN47: CAN1. This can be achieved using the provided cables and gender changer along with package as shown in the *Figure 11 CAN0 and CAN1 connection adapter cables and methodology*.

Figure 11 CAN0 and CAN1 connection adapter cables and methodology.

- The SD Card test requires insertion of a physical card owing to the HW detect switch functionality. The result of this hot-pluggable test will be printed for certain devices else thrown an error.
  Note: The SD card interface does not work with all available SD cards. The functionality must be checked case-by-case.

- Ethernet test 100Base-T requires the physical ethernet cable connection from target to the host. Note: If Dynamic Host Configuration Protocol (DHCP) is not there, then it takes some time to retrieve the information after starting the test “9”.
    - Case 1: Normal Router which has the DHCP.
        - If you press "9" you will see in the prompt which IP is assigned to the device.
        - Open Browser: **http://**<your assigned IPv4 address from previous step>**:8080**
        - You should be able to see the sample webpage interface.
    - Case 2: Direct connection to the PC without using DHCP.
        - As DHCP is not available on direct connection, the device will configure the default IP address programmed as per the file: "***r_ethernet_ip_config.h***".
            - Default IPv4 address: 192.168.10.35
        - Make sure that the PC ethernet IPv4 address is configured for the same subnetwork "192.168.10.xxx".
            - For example: 192.168.10.195
        - If you press "9" you will see in the prompt which IP is assigned to the device along with necessary information as shown in *Figure 12 Ethernet Test 9 Result***.**

```
9  100Base-T Ethernet information ...
   starting I/F ...
Hostname:       RH850_DEMO
MAC Address:    12:34:56:78:9a:bc
IP Address:     192.168.10.35
Netmask:        255.255.255.00
Gateway:        192.168.10.01
DHCP:           On
```

Figure 12 Ethernet Test 9 Result

- Open Browser: http://192.168.10.35:8080
- You should be able to see *Figure 13 Sample Webpage Interface*

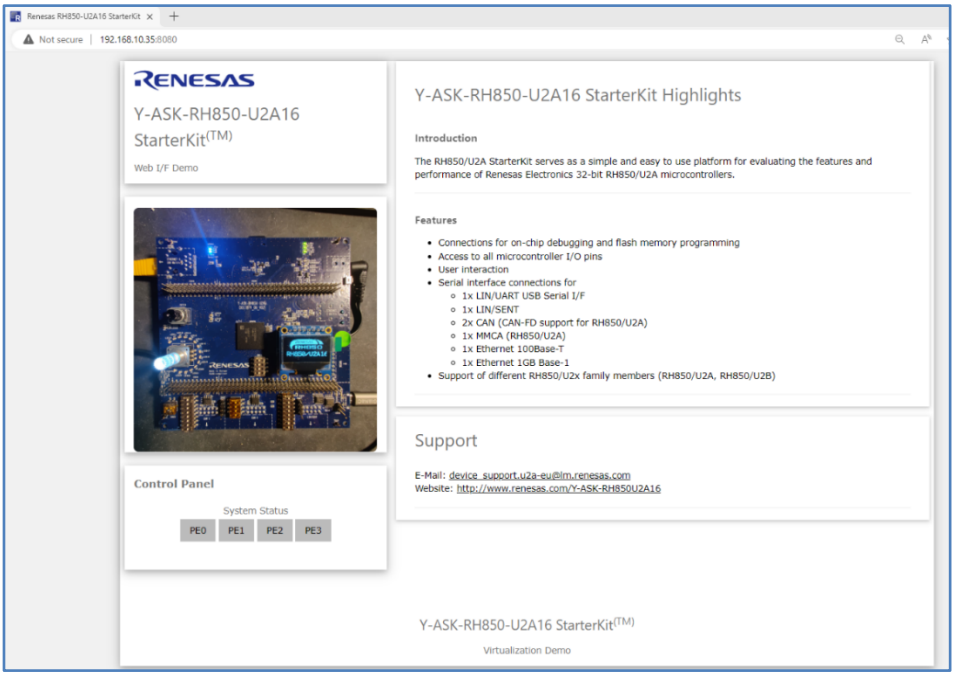

Figure 13 Sample Webpage Interface

13. Appendix C

Revision History

Rev.	Date	Description	
		Page	Summary
Rev.1.00	May 23, 2024	-	First edition

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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(Rev.5.0-1 October 2020)

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