

RX Family

QE for Display GUI Display Application Development Guide using Serial Connection LCD

Summary

QE for Display [RX,RA] is a plug-in for the e² studio integrated development environment with support for suitable Renesas RX microcontrollers and provides a graphical interface for display control to assist in the development of embedded systems incorporating display devices.

QE for Display [RX] 2.0.0 and later versions are capable of supporting emWin GUIs, which are based on a high-performance graphics library from SEGGER Microcontroller. QE for Display [RX] 2.1.0 and later versions are also capable of supporting GUIs created with Aeropoint® GUI for RX, which is GUI middleware from CRI Middleware. This enables selecting the GUI drawing tool that best suits your needs. In addition, QE for Display [RX,RA] 3.1.0 and later versions support serially connected LCDs, making it possible to display LCDs even on RX MCUs not equipped with a graphic LCD controller (GLCDC).

The emWin library is a high-reliability embedded GUI solution which has been adopted in various fields. It supports all kinds of displays, achieves high performance while minimizing the footprint in memory, and allows embedding of the GUIs in a great variety of systems. In addition, the emWin bundle incorporates AppWizard, which makes it easy to configure an excellent GUI through intuitive operations.

For Aeropoint GUI, the GUI design can be implemented by simply using PowerPoint® to configure the screen and set up the layout of GUI components to be seamlessly confirmed on the actual machine. Furthermore, the system employs an excellent subtractive color technology, which allows the drawing of fine images from 256-color (8-bit) image data, thus enabling the creation of GUIs to be run on larger displays even from microcontrollers with relatively little memory. Aeropoint GUI can be used by MCUs incorporating a GLCDC.

QE for Display [RX,RA] covers everything from the initial adjustment of the display to the creation of designs for screens. It can also be interlinked with various GUI development solutions to provide total support for the development of GUIs within short timeframes.

This application note describes procedures for displaying GUIs on a serially connected LCD using various tools interlinked with QE for Display. When using an MCU that incorporates GLCDC, refer to the RX Family QE for Display [RX] Application Note (R20AN0582).

Target Devices

All RX Family devices



Assumed Operating Environments

For the procedures described in this application note, operation in one of the following environments is assumed.

- Renesas Starter Kit for RX130-512KB
- Target Board for RX130
- Renesas Starter Kit for RX140
- Renesas Starter Kit for RX231
- Target Board for RX231
- Renesas Solution Starter Kit for RX23W
- Target Board for RX23W
- Target Board for RX23W module
- Renesas Starter Kit+ for RX64M
- Target Board for RX65N
- Renesas Starter Kit for RX660
- Target Board for RX660
- Renesas Starter Kit+ for RX671
- Target Board for RX671
- Renesas Starter Kit+ for RX71M

When you apply this application note with a different device or board, adjust the settings to be appropriate and thoroughly evaluate the results.



Contents

1.	Overview	
1.1	System Development Flow Using QE for Display [RX,RA]	5
2.	Operating Environment	.6
3.	Related Documents1	2
4.	Procedures for Execution1	3
4.1	Installing QE for Display [RX,RA]1	14
4.1.1	Installing QE for Display [RX,RA]1	14
4.1.2	2 Uninstalling QE for Display [RX,RA]1	16
4.2	Creating a New Project1	17
4.3	Making the Clock Settings	24
4.4	Setting the LCD According to the Workflow of QE for Display [RX,RA]2	25
4.4.1	Preparation	26
4.4.2	2 Create a GUI for an LCD	27
4.5	Building the Project	54
4.6	Connecting a Debugger and Executing the Program5	55
5.	Hardware5	59
5.1	Configuration of Hardware	59
5.2	Pin Functions	59
5.3	LCD Connections6	35
6.	Details of Settings6	57
6.1	From Execution to the End of Adjustment6	37
6.2	Usage Note Regarding Image Drawing Speed6	38
6.2.1	Usage Notes for Using JPEG Images with AppWizard6	38
6.3	Usage Note regarding the use of QE for Display[RX,RA] V3.1.06	39
6.3.1	Usage Notes for Using the "Kuongshun Electronic - MSP2807" LCD with Specific Evaluation Boards	s
	6	39
Rev	ision History7	' 1



1. Overview

QE for Display [RX,RA] is a tool that provides a graphical interface for display control.

The AppWizard GUI drawing tool allows you to design a GUI in a short time by combining prepared resources and settings without having to spend a long time for reading manuals or coding programs. These tools also allow the efficient implementation of detailed specifications in response to various demands using the API functions provided by the emWin library.

In addition, as shown in Figure 1.1, LCD Development Environment Structure, QE for Display [RX,RA] can also be used with the Smart Configurator, which simplifies embedding of the Renesas drivers, and Firmware Integration Technology (FIT), which provides drivers and middleware for the RX family. These tools can further simplify display control and the creation and display of GUIs.

This application note mainly concerns the use of the following FIT modules and the Smart Configurator that are provided with QE for Display [RX,RA], which serves as the nucleus.

• emWin Firmware Integration Technology (emWin FIT) module

The flowchart on the following page describes the basic procedure for developing systems with the use of QE for Display [RX,RA].



Figure 1.1 LCD Development Environment Structure



using Serial Connection LCD

1.1 System Development Flow Using QE for Display [RX,RA]

Figure 1.2, System Development Using QE for Display [RX,RA] shows the system development flow using QE for Display [RX,RA].



Figure 1.2 System Development Using QE for Display [RX,RA]



Board used

2. Operating Environment

The procedures described in this application note assume operations on one of the boards listed under "Assumed Operational Environments".

Item	Contents
Integrated development	Renesas Electronics
environment	e ² studio 2022-07
C compiler	Renesas Electronics
	C/C++ Compiler Package for RX Family V.3.04.00
	Compiler option
	-lang = C99

Conditions used in confirming operations on each of the boards are listed in the following table.

Required changes to the board, such as cutting or shorting patterns, are listed in "Board Settings." When no changes are indicated, the board can be used in factory default conditions.

Item	Contents	
MCU used	R5F51308ADFP (RX130 Group)	
Operating frequency	Main clock: 8 MHz	
	 PLL: 32 MHz (main clock x 1/2 x 8) 	
	 System clock (ICLK): 32 MHz (PLL x 1/1) 	
	• Peripheral module clock B (PCLKB): 32 MHz (PLL x 1/1)	
Endian	Little endian	
Emulator	E2 Lite	
Connection type	FINE	

Table 2.2 Conditions for Confirming Operation (RSK RX130)

Table 2.3 Conditions for Confirming Operation (Target Board RX130)

Item	Contents
MCU used	R5F51308ADFP (RX130 Group)
Operating frequency	HOCO clock: 32 MHz
	 System clock (ICLK): 32MHz (HOCO x 1/1)
	Peripheral module clock B (PCLKB): 32 MHz (HOCO x 1/1)
Endian	Little endian
Emulator	E2 OB (E2 emulator On Board)
Connection type	FINE
Board used	Target Board for RX130
	(Product No.: RTK5RX1300C0000BR)

Renesas Starter Kit for RX130-512KB (Product No.: RTK5051308Sxxxxxx)



Table 2.4	Conditions for Confirming Operation (RSK RX140)
-----------	---

Item	Contents
MCU used	R5F51406BDFN (RX140 Group)
Operating frequency	Main clock: 8 MHz
	• PLL: 48 MHz (main clock x 1/1 x 6)
	 System clock (ICLK): 48 MHz (PLL x 1/1)
	Peripheral module clock B (PCLKB): 24 MHz (PLL x 1/2)
Endian	Little endian
Emulator	E2 Lite
Connection type	FINE
Board used	Renesas Starter Kit for RX140
	(Product No.: RTK551406BS00000BE)

Table 2.5 Conditions for Confirming Operation (RSK RX231)

Item	Contents
MCU used	R5F52318ADFP (RX231 Group)
Operating frequency	Main clock: 8 MHz
	• PLL: 54MHz (main clock x 1/2 x 13.5)
	System clock (ICLK): 54 MHz (PLL x 1/1)
	Peripheral module clock B (PCLKB): 27 MHz (PLL x 1/2)
Endian	Little endian
Emulator	E2 Lite
Connection type	FINE
Board used	Renesas Starter Kit for RX231
	(Product No.: R0K505231S900BE)

Table 2.6	Conditions for Confirming Operation (Target Board RX231)
-----------	--

Item	Contents
MCU used	R5F52318ADFP (RX231 Group)
Operating frequency	HOCO clock: 32 MHz
	 System clock (ICLK): 32MHz (HOCO x 1/1)
	• Peripheral module clock B (PCLKB): 16 MHz (HOCO x 1/2)
Endian	Little endian
Emulator	E2 OB (E2 emulator On Board)
Connection type	FINE
Board used	Target Board for RX231
	(Product No.: RTK5RX2310C0000BR)



Table 2.7	Conditions for Confirming Operation (RSSK RX23W)
-----------	--

Item	Contents
MCU used	R5F523W8ADBL (RX23W Group)
Operating frequency	HOCO clock: 54 MHz
	 System clock (ICLK): 54 MHz (HOCO x 1/1)
	 Peripheral module clock B (PCLKB): 27 MHz (HOCO x 1/2)
Endian	Little endian
Emulator	E2 Lite
Connection type	FINE
Board used	Renesas Solution Starter Kit for RX23W
	(Product No.: RTK5523W8xxxxxxxx)

Table 2.8 Conditions for Confirming Operation (Target Board RX23W)

Item	Contents
MCU used	R5F523W8ADNG (RX23W Group)
Operating frequency	HOCO clock: 32 MHz
	 System clock (ICLK): 32MHz (HOCO x 1/1)
	• Peripheral module clock B (PCLKB): 16 MHz (HOCO x 1/2)
Endian	Little endian
Emulator	E2 OB (E2 emulator On Board)
Connection type	FINE
Board used	Target Board for RX23W
	(Product No.: RTK5RX23W0C00000BJ)

Table 2.9	Conditions for Confirming Operation (Target Board RX23W module)	ļ
-----------	---	---

Item	Contents
MCU used	R5F523W8CDLN (RX23W Group)
Operating frequency	HOCO clock: 32 MHz
	 System clock (ICLK): 32MHz (HOCO x 1/1)
	Peripheral module clock B (PCLKB): 16 MHz (HOCO x 1/2)
Endian	Little endian
Emulator	E2 OB (E2 emulator On Board)
Connection type	FINE
Board used	Target Board for RX23W module
	(Product No.: RTK5RX23W0C01000B)
Board settings	<pmod: cn2=""></pmod:>
(jumper/switch)	Cut SS2, short SO3
	Cut SS1 and SO2, short SO1
	(Use Type 2A)
	<others></others>
	Default settings



Table 2.10	Conditions for Confirming Operation (RSK RX64M)
------------	---

Item	Contents
MCU used	R5F564MLCDFC (RX64M Group)
Operating frequency	Main clock: 24 MHz
	• PLL: 240MHz (main clock x 1/1 x 10)
	 System clock (ICLK): 120 MHz (PLL x 1/2)
	• Peripheral module clock B (PCLKB): 60 MHz (PLL x 1/4)
Endian	Little endian
Emulator	E2 Lite
Connection type	JTAG / FINE
Board used	Renesas Starter Kit+ for RX64M
	(Product No.: R0K50564MSxxxxx)

Table 2.11 Conditions for Confirming Operation (Target Board RX65N)

Item	Contents
MCU used	R5F565NEDDFP (RX65N Group)
Operating frequency	HOCO clock: 16 MHz
	• System clock (ICLK): 16MHz (HOCO x 1/1)
	Peripheral module clock B (PCLKB): 4 MHz (HOCO x 1/4)
Endian	Little endian
Emulator	E2 OB (E2 emulator On Board)
Connection type	JTAG / FINE
Board used	Target Board for RX65N
	(Product No.: RTK5RX65N0C0000BR)

Table 2.12 Conditions for Confirming Operation (RSK RX660)

Item	Contents
MCU used	R5F56609HDFB (RX660 Group)
Operating frequency	Main clock: 24 MHz
	• PLL: 240MHz (main clock x 1/1 x 10)
	 System clock (ICLK): 120 MHz (PLL x 1/2)
	Peripheral module clock B (PCLKB): 60 MHz (PLL x 1/4)
Endian	Little endian
Emulator	E2 Lite
Connection type	JTAG / FINE
Board used	Renesas Starter Kit+ for RX64M
	(Product No.: R0K50564MSxxxxx)



Item	Contents
MCU used	R5F56609BDFP (RX660 Group)
Operating frequency	HOCO clock: 16 MHz
	• PLL: 240MHz (main clock x 1/1 x 15)
	 System clock (ICLK): 120MHz (PLL x 1/2)
	Peripheral module clock B (PCLKB): 60 MHz (PLL x 1/4)
Endian	Little endian
Emulator	E2 OB (E2 emulator On Board)
Connection type	FINE
Board used	Target Board for RX660
	(Product No.: RTK5RX6600C0000BJ)
Board settings	<operating voltage=""></operating>
(jumper/switch)	Mount header J3 (select 3.3V)
	Remove resistor R52
	<pmod: cn1=""></pmod:>
	Cut SS13, short SC1
	Cut SS14, short SC2
	(Use Type 2A)
	<others></others>
	Default settings

Table 2.13 Conditions for Confirming Operation (Target Board RX660)

Table 2.14 Conditions for Confirming Operation (RSK RX671)

Item	Contents
MCU used	R5F5671EHDFB (RX671 Group)
Operating frequency	Main clock: 24 MHz
	• PLL: 240MHz (main clock x 1/1 x 10)
	 System clock (ICLK): 120 MHz (PLL x 1/2)
	Peripheral module clock B (PCLKB): 60 MHz (PLL x 1/4)
Endian	Little endian
Emulator	E2 Lite
Connection type	JTAG / FINE
Board used	Renesas Starter Kit+ for RX671
	(Product No.: RTK55671EHS10000BE)



Item	Contents
MCU used	R5F5671EHDFP (RX671 Group)
Operating frequency	HOCO clock: 16 MHz
	• PLL: 240MHz (main clock x 1/1 x 15)
	 System clock (ICLK): 120MHz (PLL x 1/2)
	• Peripheral module clock B (PCLKB): 60 MHz (PLL x 1/4)
Endian	Little endian
Emulator	E2 OB (E2 emulator On Board)
Connection type	JTAG / FINE
Board used	Target Board for RX671
	(Product No.: RTK5RX6710C00000BJ)
Board settings	<pmod: cn1=""></pmod:>
(jumper/switch)	Cut SS13, short SC1
	Cut SS14, short SC2
	(Use Type 2A)
	<others></others>
	Default settings

Table 2.15 Conditions for Confirming Operation (Target Board RX671)

Table 2.16 Conditions for Confirming Operation (RSK RX71M)

Item	Contents
MCU used	R5F571MLCDFC (RX71M Group)
Operating frequency	Main clock: 24 MHz
	• PLL: 240MHz (main clock x 1/1 x 10)
	 System clock (ICLK): 240 MHz (PLL x 1/1)
	• Peripheral module clock B (PCLKB): 60 MHz (PLL x 1/4)
Endian	Little endian
Emulator	E2 Lite
Connection type	JTAG / FINE
Board used	Renesas Starter Kit+ for RX71M
	(Product No.: R0K50571MSxxxxx)



3. Related Documents

Also refer to the following documents which are related to this application note.

Table 3.1 Documents Related to FIT Modules

Document Title	Document No.
Firmware Integration Technology User's Manual	R01AN1833
RX Family Board Support Package Firmware Integration Technology Module	R01AN1685
RX Family emWin v.6.26g Module Firmware Integration Technology	R01AN6452

Table 3.2Document Related to Tools

Document Title	Document No.
Renesas e ² studio Smart Configurator User Guide	R20AN0451

Table 3.3 Documents Related to Boards

Document Title	Document No.
RX130 Group Renesas Starter Kit User's Manual	R20UT3921
RX130 Group Target Board for RX130 User's Manual	R20UT4169
RX140 Group Renesas Starter Kit for RX140 User's Manual	R20UT5026
RX231 Group Renesas Starter Kit User's Manual	R20UT3027
RX231 Group Target Board for RX231 User's Manual	R20UT4168
RX23W Group Renesas Solution Starter Kit for RX23W User's Manual	R20UT4446
RX23W Group Target Board for RX23W User's Manual	R20UT4634
RX23W Group Target Board for RX23W module User's Manual	R20UT4890
RX64M Group Renesas Starter Kit+ User's Manual For CubeSuite+	R20UT2590
RX65N Group Target Board for RX65N User's Manual	R20UT4167
RX660 Group Renesas Starter Kit for RX660 User's Manual	R20UT5017
RX660 Group Target Board for RX660 User's Manual	R20UT5068
RX671 Group Renesas Starter Kit+ for RX671 User's Manual	R20UT4879
RX671 Group Target Board for RX671 User's Manual	R20UT4894
RX71M Group Renesas Starter Kit+ User's Manual	R20UT3217

Table 3.4 Documents Related to Devices

Document Title	Document No.
RX130 Group User's Manual: Hardware	R01UH0560
RX140 Group User's Manual: Hardware	R01UH0905
RX230 Group, RX231 Group User's Manual: Hardware	R01UH0496
RX23W Group User's Manual: Hardware	R01UH0823
RX64M Group User's Manual: Hardware	R01UH0377
RX65N Group, RX651 Group User's Manual: Hardware	R01UH0590
RX660 Group User's Manual: Hardware	R01UH0937
RX671 Group User's Manual: Hardware	R01UH0899
RX71M Group User's Manual: Hardware	R01UH0493

Please use the latest versions that are available. Visit the Renesas Electronics Web site to check and obtain the latest versions.



4. Procedures for Execution

This chapter describes the procedures for creating a new project in the e² studio, using QE for Display [RX,RA] to set the LCD and emWin, designing the GUI, and displaying the resulting project.

The results of emWin, which enable the efficient creation of the GUI, are generated as FIT modules for embedding in the project using the Smart Configurator. Since the settings for emWin can be made from the GUI of QE for Display [RX,RA], the user can smoothly proceed with GUI development according to the workflow.

Before starting this project, be sure to make the jumper settings as stated in chapter 2, Operating Environment, as required.

Preparation

1. Installing QE for Display [RX,RA]

Procedure

- 2. Creating a new project
- 3. Making the clock settings
- 4. Making the emWin settings according to the workflow of QE for Display [RX,RA]
- 5. Building the project
- 6. Connecting a debugger and executing the program



4.1 Installing QE for Display [RX,RA]

Install QE for Display [RX,RA] in the e² studio integrated development environment. Use the following procedure to install this product.

4.1.1 Installing QE for Display [RX,RA]

4.1.1.1 Updating the e² studio using its installer

For updating the e² studio, refer to section 3, Updating Your Product, described in "[Upgraded to version] e² studio 2022-07" in Renesas Tool News (document No. R20TS0685EJ0100).

https://www.renesas.com/search/keyword-search.html#genre=document&g=r20ts0685

Select "QE for Display [RX,RA]" for "Additional Software" in the installer of the e² studio.

Note: Since this step is not possible in situations where an Internet connection is not available, update QE for Display [RX,RA] with the method described in section 4.1.1.3, Installing QE for Display [RX,RA] by downloading the installer from the Web site.





4.1.1.2 Installing QE for Display [RX,RA] using Renesas Software Installer of the e² studio

Refer to the following for how to install QE for Display [RX,RA].

- 1. Start the e² studio.
- 2. Select the "Renesas Software Installer" menu item from "Renesas Views" to open the "Renesas Software Installer" dialog box.
- 3. Select "Renesas QE" and click on the "Next" button.
- 4. Select the "QE for Display [RX,RA] (v3.1.0)" checkbox and click on the "Finish" button.
- 5. Confirm that the "Renesas QE for Display [RX,RA]" checkbox has been selected in the "Install" dialog box and click on the "Next" button.
- 6. Confirm that "Renesas QE for Display [RX,RA]" is selected as the target of installation and click on the "Next" button.
- 7. After confirming the license agreement, select the "I accept the terms of the license agreements" radio button if you agree with the license agreement, and click on the "Finish" button.
- 8. If the dialog box for the trust certificate is displayed, confirm the certificate and click on the "OK" button to continue installation.
- 9. Restart the e² studio by following the instructions on the screen.

10. Start this product from the "Renesas QE" menu under "Renesas Views" of the e² studio.

Note: Since this step is not possible in situations where an Internet connection is not available, download the installer of QE in a different environment and update QE for Display [RX,RA] with the method described in section 4.1.1.3, Installing QE for Display [RX,RA] by downloading the installer from the Web site.

4.1.1.3 Installing QE for Display [RX,RA] by downloading the installer from the Web site

Download QE from the following URL for installation.

• QE for Display V3.1.0: Development Assistance Tool for Display https://www.renesas.com/ge-display#downloads

Refer to the following for how to install QE for Display [RX,RA].

- 1. Start the e² studio.
- 2. Select the "Install New Software..." menu item from the "Help" menu to open the "Install" dialog box.
- 3. Click on the "Add..." button to open the "Add Repository" dialog box.
- 4. Click on the "Archive" button, select the zip file for installation in the dialog box for selecting a file that has opened, and click on the "Open" button.
- 5. Click on the "OK" button in the "Add Repository" dialog box.
- Expand the "Renesas QE" item shown in the "Install" dialog box, select the "Renesas QE for Display [RX,RA]" checkbox, and then click on the "Next" button.

*You can deselect the "Contact all update sites during install to find required software" checkbox to shorten the installation time.

- 7. Confirm that the target of installation is correctly selected and click on the "Next" button.
- 8. After confirming the license agreement, select the "I accept the terms of the license agreements" radio button if you agree with the license agreement, and click on the "Finish" button.
- 9. If the dialog box for the trust certificate is displayed, confirm the certificate and click on the "Accept selected" button to continue installation.
- 10. Restart the e² studio by following the instructions on the screen.
- 11. Start this product from the "Renesas QE" menu under "Renesas Views" of the e² studio.



4.1.2 Uninstalling QE for Display [RX,RA]

To uninstall QE for Display [RX,RA], follow the procedure below.

- 1. Start the e^2 studio.
- 2. From the "Help" menu, select the "About e² studio" menu item, click on the "Installation Details" button to open the "e² studio Installation Details" dialog box.
- 3. Select "Renesas QE for Display [RX,RA]" displayed on the "Installed Software" tabbed page and click on the "Uninstall..." button to open the "Uninstall" dialog box.
- 4. Confirm the displayed information and click on the "Finish" button.
- 5. Restart the e^2 studio by following the instructions on the screen.



4.2 Creating a New Project

Create a project with the e^2 studio.

1. Click on "File" -> "New", and then "C/C++ Project".

C File	workspace - e ² studio Edit Source Refactor Navigate	Search Project	: Renesas Views Run Window Help
	New Open File	Alt+Shift+N >	Renesas C/C++ Project > Makefile Project with Existing Code
<u>_</u>	Open Projects from File System Recent Files	>	C/C++ Project Create a new C or C++ project Project
	Close Editor Close All Editors	Ctrl+W Ctrl+Shift+W	Convert to a C/C++ Project (Adds C/C++ Nature) Source Folder
	Save Save As Save All	Ctrl+S	Folder C Source File Header File
43	Revert Move	Curtomitto	File from Template Class Code Generator
68	Rename Refresh Convert Line Delimiters To	F2 F5	Example Other Ctrl+N
4 24	Print	Ctrl+P	ts e projects from Renesas
4	Export Properties	Alt+Enter	💮 What's New
	Switch Workspace Restart	>	tion settings Find out what is ely contested preferences
	Exit Open an	existing file	Quick Start G Quickly getting f



2. Select "Renesas RX" -> "Renesas CC-RX C/C++ Executable Project" and click on "Next".

Templates for New C/C++ Project All GCC for Renesas RX C/C++ Executable Project
All GCC for Renesas RX C/C++ Executable Project
CMake Make Renesas Debug Renesas RA Renesas RZ Renesas RZ Renesas RZ Renesas RZ Renesas RZ Renesas CC-RX C/C++ Library Project A C/C++ Library Project for Renesas RX using the GCC for Renesas RX Toolchain. Renesas CC-RX C/C++ Executable Project A C/C++ Project for Renesas RX using the Renesas CCRX toolchain. Renesas CC-RX C/C++ Library Project A C/C++ Library Project for Renesas RX using the Renesas CCRX toolchain.



3. Enter the name of the project in the "Project name:" text box and click on "Next".

Project name:	QE_for_Display_RX140_RSK
Use default	
Location:	C:¥test_e2studio_env¥workspace¥QE_for_Display_RX140_RSK Browse
Choose file syst Working sets	Create Directory for Project em: default to working sets New
Working sets:	∽ Select



4. Select the board to be used from the "Target Board:" combo box. After selecting the target board, the selection from the "Target Device:" combo box is automatically made. If the name of the board to be used is not included in the selection list, download the Board Description File (BDF). Click on [Download additional boards...] and download the Board Description File for the

target board.

5. Confirm that the checkbox for "Create Hardware Debug Configuration" is selected and select the emulator to be used from the combo box below it. Click on "Next".

e	– 🗆 X
New Renesas CC-RX Executable Project Select toolchain, device & debug settings	
Toolchain Settings Language: C C++ Toolchain: Renesas CCRX v3.04.00 Manage Toolchains RTOS: None RTOS Version: Device Settings 	Configurations
Target Board: RSKRX140 Download additional boards Target Device: R5F51406BxFN Unlock Devices Endian: Little Project Type: Default	Create Hardware Debug Configuration E2 Lite (RX) Create Debug Configuration RX Simulator Create Release Configuration
? < Back N	ext > Finish Cancel

Table 4.1, Correspondence between Target Board, Target Device, and Emulator shows the Board Description File name, target device, and emulator selection corresponding to each target board.



Target Board	Target Device	Emulator	
RSKRX130-512KB	R5F51308AxFN	E2 Lite (RX)	
TargetBoardRX130	R5F51308AxFP	E2 Lite (RX)	
RSKRX140	R5F51406BxFN	E2 Lite (RX)	
RSKRX231	R5F52318AxFP	E2 Lite (RX)	
TargetBoardRX231	R5F52318AxFP	E2 Lite (RX)	
RSSKRX23W	R5F523W8AxBL	E2 Lite (RX)	
TargetBoardRX23W	R5F523W8AxNG	E2 Lite (RX)	
TargetBoardRX23Wmodule	R5F523W8CxLN	E2 Lite (RX)	
RSKRX64M	R5F564MLCxFC	E2 Lite (RX)	
TargetBoardRX65N	R5F565NEDxFP	E2 Lite (RX)	
RSKRX660	R5F56609HxFB	E2 Lite (RX)	
TargetBoardRX660	R5F56609BxFP	E2 Lite (RX)	
RSKRX671	R5F5671EHxFB	E2 Lite (RX)	
TargetBoardRX671	R5F5671EHxFP	E2 Lite (RX)	
RSKRX71M	R5F571MLCxFC	E2 Lite (RX)	

 Table 4.1
 Correspondence between Target Board, Target Device, and Emulator



- 6. Select the "Use Smart Configurator" checkbox.
- 7. Click on "Finish".

✓ Use Smart Configurator ✓ Use Peripheral Code Generator ✓

8. When the following message is displayed, click on "Open Perspective".

Open Associate	ed Perspective?		×
Open the	Smart Configurator perspective?		
Remember my	decision		
		Open Perspective	No



9. The project is created and the Smart Configurator is opened.





4.3 Making the Clock Settings

Make clock settings to suit the board to be used.

- 1. Select the "Clocks" tab of the Smart Configurator.
- 2. Set the clock according to the board to be used. When using a Board Description File, the default settings are adjusted according to the board; no changes are required.

When not using a Board Description File, set to values that meet the target usage environment.

3. When the clocks have been set, click on the "Generate Code" button 🚺 in the upper-right corner of the window.

CE_for_Display_RX140_RSK.scfg ×		- 8
Clocks configuration		Generate Code Generate Report
VCC: 3.3 (V) (Actual value: 3.3)		<u>ـ</u>
Main clock PLL circuit Oscillation source: Resonator Frequency: 8 Wait time: 6192 2048 (µs)	SCKCR (FCK[3:0]) x1 SCKCR (ICK[3:0]) x1	FlashiF clock (FCLK) 48 (MHz) System clock (ICLK) 48 (MHz)
✓ Sub-clock ∅ Frequency: 32.768	SCKCR (PCKB[3:0])	Peripheral module clock (PCLKB) 24 (MHz)
Oscillator drive capacity: Low CL	SCKCR (PCKD[3:0])	Peripheral module clock (PCLKD) 48 (MHz)
HOCO clock Frequency: 48 (MHz)	x 1/4	Low power timer clock (LPTCLK) 32 768 (kHz) *



4.4 Setting the LCD According to the Workflow of QE for Display [RX,RA]

Start QE for Display [RX,RA] and set the LCD in the order of "1. Preparation" and "3. GUI Creation on LCD" in the workflow view.

Start QE for Display [RX,RA].

1. Select "Renesas Views" -> "Renesas QE" -> "LCD Main RX,RA (QE)".

File Edit Navigate Search Project	Renesas Views Run Window	Help
🐔 🐞 🔳 🕸 Debug	C/C++	> K Hardwz 🗸 🔅 🗄 🕶 🔚 🐚 📎 ▾ 🐔 ▾ 🖥
	Code Generator	>
	Debug	>
Project Explorer 🗙	Partner OS	→ . <mark>scfg ×</mark>
E 🕏 1	Pin Configurator	> n
✓ ☑ QE_for_Display_RX140_RSK	Renesas QE	> 💭 LCD Main RX,RA (QE)
> 🔊 Includes	Smart Configurator	> 💭 Display Tuning RX (QE)
✓ ^{CD} / _C src_gen	Solution Toolkit	> 🞊 Measuring Current Consumption (QE)
QE_for_Display_RX140_RSK.c	Tracing	>
@ QE_for_Display_RX140_RSK.scfg	Carl Renesas Software Installer	w of the features provided by Smart Configurator.



4.4.1 Preparation

Make the settings for "1. Preparation" in the workflow view of QE for Display [RX,RA].

In "Selecting a project", select the target project. Once the project is selected, the entries for "Evaluation board", "LCD maker/Type", and "Model name/Size" are automatically displayed.
 If you are using a board other than one of those listed in Table 4.2, Correspondences between "Evaluation Board", "LCD maker/Type", and "Model name/Size", select "Custom" in the "LCD maker/Type" combo box and add the information on the LCD to be used in the "Edit Custom Display Data" dialog box. For details on how to add LCD information, refer to the explanation produced by clicking on the "Help" button.

Table 4.2 Correspondences between "Evaluation Board", "LCD maker/Type", and "Model name/Size"

LCD maker/Type	Model name/Size
ОКАҮА	RH128128T-1X44WN-B2 / 128x128
Kuongshun Electronic	MSP2807 / 320x240

1. Preparation 🗈	2. LCD adjustment	3. GUI creation on LCD
Selecting a project Select the project that has been created.	Installing the LCD controller Install GLCDC and specify PIN connection.	Installing the GUI drawing tool driver Install GUI drawing tool driver.
QE_for_Display_RX140_RSK <	Not needed How to add	Not added How to add
Selecting an evaluation board Select when using an evaluation board. No setting is required when using a custom board.	LCD display adjustment Adjust on the board to display on the LCD.	Initial setting of GUI drawing tool Configure settings to use GUI drawing tool.
Evaluation board RSKRX140 (V1.00)	Adjustment for display on LCD : TCON/LCD setting	GUI drawing tool setting :
Selecting a LCD Auto	ording to the selected project.	Generate file Select folder
Use serial connection (emWir Maker/Type : OKAYA	Graphic layer setting Adjust image quality / color : Image quality adjustment	Generate GUI Generate GUI to display on LCD. Start GUI drawing tool Setting
Model name/Size : RH128128T-1X44WN-B2	Generate file Select folder	Implementation Implement a program to display GUI in the main() function. Show sample code



4.4.2 Create a GUI for an LCD

The following shows the procedure for installing a GUI drawing tool using emWin.

rkflow Diagram		
1. Preparation 🗈	2. LCD adjustment	3. GUI creation on LCD
Selecting a project Select the project that has been created.	Installing the LCD controller Install GLCDC and specify PIN connection.	Installing the GUI drawing tool driver Install GUI drawing tool driver.
QE_for_Display_RX140_RSK <	Not needed How to add	d Not added How to add
Selecting an evaluation board Select when using an evaluation board. No setting is required when using a custom board. Evaluation board : RSKRX140 (V1.00)	LCD display adjustment Adjust on the board to display on the LCD. Adjustment for display on LCD :	Initial setting of GUI drawing tool Configure settings to use GUI drawing tool. GUI drawing tool setting :
How to Select Selecting a LCD If not in the list, select Custom from the combo box Select and add LCD information. Selecting a connection type :	TCON/LCD setting Timing adjustment Graphic layer setting	Info setting Generate file Select folder
Use serial connection (emWin) Maker/Type : OKAYA V	Adjust image quality / color :	Generate GUI Generate GUI to display on LCD. Start GUI drawing tool Setting
Model name/Size : RH128128T-1X44WN-B2 Selecting the GUI drawing tool Select a tool to generate a GUI to display on the LCD.	Generate file Select folde	Implementation Implement a program to display GUI in the main() function.
Use emWin		Show sample code



- 1. Select the "Components" tab of the Smart Configurator and click on the "Add component" icon.
- 2. In the "New Component" dialog box, select "Graphic Library with Graphical User Interface (r_emwin_rx)" (version 6.26.c.1.00 or a later version) and click on the "Finish" button.

		Component Selection				
	Select con	nponent from those available in list				
🛱 QE_for_Display_RX140_RSK.scfg 🗙	Category	All				~
Software component configuration 🥏	Function					~
	Filter					
Components 🚵 🛃 🎘 📄 🕀 🚦 Configure		· ^	a	-		^
	Compor		Short Name	Туре	Version	^
🐱 🔊		t Link Controller		Code Generator	1.9.0	
type filter text		API for RX100, RX200, RX600. and RX700.	r_flash_rx	Firmware Integration	4.81	
type inter text		memory Data Manager	r_datfrx_rx	Firmware Integration	2.01	
✓ ➢ Startup		12 Sensor Middleware	r_fs2012_rx	Firmware Integration	1.01	
V 🗁 Generic		ric system timer for RX MCUs using CMT	r svs time rx	Firmware Integration	1.01	
ar bsp		hic Library with Graphical User Interface	r_emwin_rx	Firmware Integration		
I_Dsp		p Scan Mode S12AD		Code Generator	1.12.0	
		0x Sensor Middleware	r_hs300x_rx	Firmware Integration	1.11	
		laster Mode		Code Generator	1.12.0	
		ave Mode		Code Generator	1.11.0	
	🕀 IIC Co	ommunication Driver Interface Middleware	r_comms_i2c_rx	Firmware Integration	1.20	\checkmark
	Show of	only latest version				
	Hide it	ems that have duplicated functionality				
	Descriptio					
		ency : r_cmt_rx version(s) 5.20				
	Depende emWin is	ency : r_cmt_rx version(s) 5.20 ency : r_gpio_rx version(s) 4.50 s designed to provide an efficient, processo ipplication that operates with a graphical di				
			spiay, it is compati	ore write single-task and n	nuntitask	~
		the latest FIT drivers and middleware				
	Configure	general settings				



3. If the graphic library is not displayed in the list of components in the "New Component" dialog box, click on "Download the latest FIT drivers and middleware".

Function All Function All Filter Short Name Type Version # 8-Bit Timer Code Generator 1.10.0 # 8-Bit Timer Code Generator 1.10.0 # Board Support Packages. r_s2_rx Firmware Integration 3.04 # Board Support Packages. r_bsp Firmware Integration 7.20 # Buses Code Generator 1.11.0 r_bsp Code Generator 1.11.0 # Dock frequency Accuracy Measurement Circuit Clock Synchronous Control Module for EEPRO r_eeprom_spi Firmware Integration 3.02 # Clock Synchronous Control Module for Serial r_flash_spi Firmware Integration 3.02 # Comparator Code Generator 1.9.0 Code Generator 1.9.0 # Compare Match Timer Code Generator 1.9.0 Code Generator 2.3.0 V Show only latest version Hide items that have duplicated functionality Dependency : r_cmt_rx version(s) 5.20 Pependency : r_optio_rx version(s) 4.50 Pependency : r_optio_rx version(s) 4.50 Pependency : r_optio_rx version(s) 4.50 Berry in Mare Britegingrabuse Stand and and and and	Software (omponent Component Selection			— C	
Function All Function All Filter Short Name Type Wersion Code Generator 1.10.0 # 8-Bit Timer Code Generator 1.10.0 # ADPCM compress/de-compress codec softwa r_s2_rx Firmware Integration 3.04 # Board Support Packages. r_bsp Firmware Integration 3.04 # Buses r_clock Frequency Accuracy Measurement Circuit Code Generator 1.11.0 Clock Frequency Accuracy Measurement Circuit Code Generator 1.11.0 Clock Synchronous Control Module for EEPRO r_eeprom_spi Firmware Integration 3.02 Clock Synchronous Control Module for Serial r_flash_spi Firmware Integration 3.02 # Comparator Code Generator 1.9.0 Code Generator 2.3.0 V Show only latest version Show only latest version Code Generator 2.3.0 V Mile items that have duplicated functionality Dependency : r_grio_rx version(s) 5.20 Code Generator 2.3.0 V Dependency : r_grio_rx version(s) 4.50 emWin is designed to provide an efficient, processor- and display controller-independent graphical	Select com	nponent from those available in list				
Function All Function All Filter Short Name Type Wersion Code Generator 1.10.0 # 8-Bit Timer Code Generator 1.10.0 # ADPCM compress/de-compress codec softwa r_s2_rx Firmware Integration 3.04 # Board Support Packages. r_bp Firmware Integration 3.04 # Buses Code Generator 1.11.0 # Clock Frequency Accuracy Measurement Circuit Code Generator 1.11.0 # Clock Synchronous Control Module for EEPRO r_eeprom_spi Firmware Integration 3.02 # Clock Synchronous Control Module for Serial r_flash_spi Firmware Integration 3.02 # Comparator Code Generator 1.90 Code Generator 2.30 V Show only latest version Show only latest version Code Generator 2.30 V Pependency: :r_cmt_rx version(s) 5.20 Code Generator 2.30 V Opendency: :r_cmt_rx version(s) 4.50 emWin is designed to provide an efficient, processor- and display controller-independent graphical user interface for any application that operates with a graphical display. It is compatible with single-task and multitask <td>Category</td> <td>۵۱</td> <td></td> <td></td> <td></td> <td>~</td>	Category	۵۱				~
Filter Components Short Name Type Version # 8-Bit Timer Code Generator 1.10.0 # ADPCM compress/de-compress codec softwa r_s2_rx Firmware Integration 3.04 # Board Support Packages. r_bp Firmware Integration 7.20 # Buses Code Generator 1.11.0 © Byte-based circular buffer library. r_byteq Firmware Integration 7.20 © Clock Frequency Accuracy Measurement Circuit Code Generator 1.11.0 © Clock Synchronous Control Module for EEPRO r_eeprom_spi Firmware Integration 3.02 © Clock Synchronous Control Module for Serial r_flash_spi Firmware Integration 3.02 © Compare Match Timer Code Generator 1.3.0 V © Show only latest version Code Generator 3.3.0 V Show only latest version(s) 5.20 Dependency : r_cmt_rx version(s) 5.20 Dependency : r_cmt_rx version(s) 5.20 Dependency : r_cmt_rx version(s) 5.20 Pendency : r_omy version(s) 4.30 Dependency : r_omy and efficient, processor- and display controller-independent graphical user interface for any application that operates with a graphical display. It is compatible with single-task and multitask<						
Components Short Name Type Version # 8-Bit Timer Code Generator 1.10.0 # ADPCM compress/de-compress codec softwa r_s2_rx Firmware Integration 3.04 # Board Support Packages. r_bsp Firmware Integration 7.20 # Buses Code Generator 1.11.0 # Byte-based circular buffer library. r_byteq Firmware Integration 7.20 # Clock Frequency Accuracy Measurement Circuit Code Generator 1.11.0 # Clock Synchronous Control Module for EEPRO r_eeprom_spi Firmware Integration 3.02 # Clock Synchronous Control Module for Serial r_flash_spi Firmware Integration 3.03 # CMT driver r_cmt_rx Firmware Integration 3.04 # Compare Match Timer Code Generator 1.90 Code Generator 1.9.0 Code Generator 1.9.0 # Show only latest version Mide items that have duplicated functionality Code Generator 2.3.0 V Dependency : r_cmt_rx version(s) 5.20 Dependency : r_cmt_rx version(s) 5.4.50 Generator and multitask V Dependency : r_cmt_rx version(s) 5.		All				·
# 8-Bit Timer Code Generator 1.10.0 # ADPCM compress/de-compress codec softwa r_s2_rx Firmware Integration 3.04 # Board Support Packages. r_bsp Firmware Integration 7.20 # Buses Code Generator 1.11.0 # Byte-based circular buffer library. r_byte Firmware Integration 2.00 # Clock Frequency Accuracy Measurement Circuit Code Generator 1.11.0 # Clock Synchronous Control Module for EEPRO r_eeprom_spi Firmware Integration 3.02 # Clock Synchronous Control Module for Serial r_flash_spi Firmware Integration 3.03 # CMT driver r_flash_spi Firmware Integration 5.20 Code Generator 1.9.0 Code Generator 2.3.0 ✓ Show only latest version Code Generator 2.3.0 ✓ ✓ Show only latest version(s) 5.20 Eescription Componenter of the operator of the operator	Filter					
	Compon	ents	Short Name	Туре	Version	^
	B-Bit	Timer		Code Generator	1.10.0	
# Board Support Packages. r_bsp Firmware Integration 7.20 # Buses Code Generator 1.11.0 # Byte-based circular buffer library. r_byteq Firmware Integration 2.00 # Clock Frequency Accuracy Measurement Circuit r_byteq Firmware Integration 2.00 # Clock Synchronous Control Module for EEPRO r_eeprom_spi Firmware Integration 3.02 # Clock Synchronous Control Module for Serial r_flash_spi Firmware Integration 3.03 # Comparator r_cmt_rx Firmware Integration 5.20 # Comparator Code Generator 1.9.0 v Show only latest version Code Generator 2.3.0 v Show only latest version V Some only latest version(s) 5.20 v Dependency : r_cmt_rx version(s) 5.20 Some only on provide an efficient, processor- and display controller-independent graphical user interface for any application that operates with a graphical display. It is compatible with single-task and multitask v Download the latest FIT drivers and middleware V Nontrol Some only controller-independent graphical user interface v		M compress/de-compress codec softwa	r_s2_rx	Firmware Integration		
	Board	d Support Packages.	r_bsp	Firmware Integration	7.20	
Image: Cook Frequency Accuracy Measurement Circuit Code Generator 1.11.0 Image: Cook Synchronous Control Module for EEPRO r_eeprom_spi Firmware Integration 3.02 Image: Cook Synchronous Control Module for Serial r_flash_spi Firmware Integration 3.03 Image: Cook Synchronous Control Module for Serial r_flash_spi Firmware Integration 3.03 Image: Cook Synchronous Control Module for Serial r_cmt_rx Firmware Integration 3.03 Image: Cook Synchronous Control Module for Serial r_cmt_rx Firmware Integration 5.20 Image: Cooparator Code Generator 1.3.0 V Code Generator 2.3.0 V Image: Cooparator Show only latest version Code Generator 2.3.0 V Image: Hide items that have duplicated functionality Dependency : r_cmt_rx version(s) 5.20 Show only latest version(s) 4.50 Show only latest opplication that operates with a graphical display. It is compatible with single-task and multitask Image: Im	🖶 Buses	5		Code Generator	1.11.0	
Elock Synchronous Control Module for EEPRO r_eeprom_spi Firmware Integration 3.02 Clock Synchronous Control Module for Serial r_flash_spi Firmware Integration 3.03 r_cmt_rx Firmware Integration 5.20 Code Generator 1.9.0 Code Generator 2.3.0 v Show only latest version Hide items that have duplicated functionality Description Dependency : r_cmt_rx version(s) 5.20 Dependency : r_cmt_rx version(s) 5.20 Dependency : r_cmt_rx version(s) 5.20 Dependency : r_goio_rx version(s) 5.20 Dependency : r_goio_rx version(s) 4.50 emWin is designed to provide an efficient, processor- and display controller-independent graphical user interface for any application that operates with a graphical display. It is compatible with single-task and multitask Lownload the latest FIT drivers and middleware	🖶 Byte-	based circular buffer library.	r_byteq	Firmware Integration	2.00	
Clock Synchronous Control Module for Serial r_flash_spi Firmware Integration 3.03 CMT driver r_flash_spi Firmware Integration 3.03 CMT driver	🖶 Clock	Frequency Accuracy Measurement Circuit		Code Generator	1.11.0	
Image: CMT driver r_cmt_rx Firmware Integration 5.20 Image: Comparator Code Generator 1.9.0 Image: Compare Match Timer Code Generator 2.3.0 Image: Show only latest version Image: Code Generator 2.3.0 Image: Hide items that have duplicated functionality Description Image: Dependency : r_cmt_rx version(s) 5.20 Image: Code Generator Image: Code Generator Image: Dependency : r_gpio_rx version(s) 4.50 Image: Code Generator Image: Code Generator Image: Code Generator Image: Dependency : r_gpio_rx version(s) 4.50 Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Imag	E Clock	Synchronous Control Module for EEPRO	r_eeprom_spi	Firmware Integration	3.02	
Image: Comparator Code Generator 1.9.0 Image: Compare Match Timer Code Generator 2.3.0 Image: Show only latest version Image: Code Generator 2.3.0 Image: Hide items that have duplicated functionality Image: Code Generator 2.3.0 Image: Dependency : r_cmt_rx version(s) 5.20 Image: Code Generator Image: Code Generator Image: Dependency : r_cmt_rx version(s) 5.20 Image: Code Generator Image: Code Generator Image: Dependency : r_cmt_rx version(s) 5.20 Image: Code Generator Image: Code Generator Image: Dependency : r_cmt_rx version(s) 4.50 Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code Generator Image: Code	E Clock	Synchronous Control Module for Serial	r_flash_spi	Firmware Integration	3.03	
Image: Compare Match Timer Code Generator 2.3.0 Show only latest version Image: Show only latest version Image: Show only latest version Hide items that have duplicated functionality Description Image: Show only latest version(s) 5.20 Dependency : r_cmt_rx version(s) 5.20 Image: Show only latest version(s) 4.50 Image: Show only latest version(s) 4.50 emWin is designed to provide an efficient, processor- and display controller-independent graphical user interface for any application that operates with a graphical display. It is compatible with single-task and multitask Image: Show only latest show on the lates			r_cmt_rx	Firmware Integration	5.20	
Show only latest version Hide items that have duplicated functionality Description Dependency: r_cmt_rx version(s) 5.20 Dependency: r_gpio_rx version(s) 4.50 emWin is designed to provide an efficient, processor- and display controller-independent graphical user interface for any application that operates with a graphical display. It is compatible with single-task and multitask Download the latest FIT drivers and middleware					1.9.0	
Hide items that have duplicated functionality Description Dependency : r_cmt_rx version(s) 5.20 Dependency : r_gpio_rx version(s) 4.50 emWin is designed to provide an efficient, processor- and display controller-independent graphical user interface for any application that operates with a graphical display. It is compatible with single-task and multitask Download the latest FIT drivers and middleware	🖶 Comp	pare Match Timer		Code Generator	2.3.0	~
	Hide it Descriptio Depende Depende emWin is for any a Download	ens that have duplicated functionality in incy : r_cmt_rx version(s) 5.20 incy : r_gpio_rx version(s) 4.50 is designed to provide an efficient, processo pplication that operates with a graphical di i the latest FIT drivers and middleware				face v



- 4. In the "FIT Module Download" dialog box, remove the check against "Show RX Driver Package only" and select "RX Family emWin v6.26 module".
- 5. Click on "Download".

Sele	ect the FIT modules for download					R [≥] ¶
	Title	Document No.	Rev.	Issue date	^	Select All
	RX Family RX Driver Package Ver.1.32	R01AN6013EJ0132	Rev.1.32	2021-09-22		Deselect All
	RX Family RX Driver Package Ver. 1.33	R01AN6073EJ0133	Rev.1.33	2022-01-06		Desciect All
	RX Family RX Driver Package Ver. 1.34	R01AN6323EJ0134	Rev.1.34	2022-04-13		
	RX Family RX Driver Package Ver.1.36	R01AN6515EJ0136	Rev.1.36	2022-07-26		
	RX Family SCI Module Using Firmware Integration T	R01AN1815EJ0440	Rev.4.40	2022-03-31		
	RX Family Sensor I2C Communication Middleware	R01AN5895EJ0122	Rev.1.22	2022-08-31		
	RX Family Simple I2C Module Using Firmware Integ	R01AN1691EJ0250	Rev.2.50	2021-12-31		
	RX Family ZMOD4410, ZMOD4450 and ZMOD4510	R01AN6046EJ0130	Rev.1.30	2022-08-31		
\checkmark	RX Family emWin v6.26 module Using Firmware Int	R01AN6452EJ0100	Rev.1.00	2022-09-07		
Filte	ered:	\mathbf{i}			¥	
L	Show RX Driver Package only					
Мо	dule Folder Path:					
	C:¥Users¥ ¥.eclipse¥com.renesas.platform_do	wnload¥FITModules				Browse

6. Read the description in the "End User License Agreement (Sample Code)" dialog box. If you agree, click on "Accept".



7. When "Graphic Library with Graphical User Interface (r_emwin_rx)" is displayed in the list of components, select it and click on the "Finish" button.

Software (omponent Component Selection			—	×
	nponent from those available in list				
Category	All				~
Function					~
Filter					
Compon	ients ^	Short Name	Туре	Version	^
	t Link Controller		Code Generator	1.9.0	
	API for RX100, RX200, RX600. and RX700.	r_flash_rx	Firmware Integration	4.81	
	memory Data Manager	r_datfrx_rx	Firmware Integration	2.01	
1 T	12 Sensor Middleware ric system timer for RX MCUs using CMT	r_fs2012_rx	Firmware Integration Firmware Integration	1.01 1.01	
	hic Library with Graphical User Interface	r_emwin_rx	Firmware Integration		1
	p Scan Mode S12AD	I_CIIWIII_IX	Code Generator	1.12.0	
	0x Sensor Middleware	r_hs300x_rx	Firmware Integration	1.11	
HI2C M	laster Mode		Code Generator	1.12.0	
HI2C SI	ave Mode		Code Generator	1.11.0	
🗄 IIC Co	mmunication Driver Interface Middleware	r_comms_i2c_rx	Firmware Integration	1.20	~
Hide ite Descriptio Depende Depende emWin is	only latest version ems that have duplicated functionality on ency : r_cmt_nx version(s) 5.20 ency : r_gpio_nx version(s) 4.50 s designed to provide an efficient, processo pplication that operates with a graphical di				face v
Download	the latest FIT drivers and middleware				
	general settings				
?		< Back	Next > Finish	Ca	incel



using Serial Connection LCD

8. Components that have a dependency on the added component will be automatically added. However, a component that has not been added or a component with a version that differs from the required one will lead to an error message or a warning.

In such cases, add the required component or update the version.

The following example shows a warning issued regarding the component version of [r_cmt_rx] and [r_gpio_rx].





Update the component to the required version (r_cmt_rx).

9. Right-click on the component for r_cmt_rx and select "Change version".

*QE_for_Display_RX140_RSK.scfg × Software component configuration	tion
Components $\bowtie \bowtie \bowtie \bowtie $	Configure
type filter text ↓ Startup ↓ Startup ↓ Serric ↓ Serric ↓ O Ports ↓ O Ports ↓ O Ports ↓ Middleware ↓ Serric ↓ Serric ↓ Change version ↓ Serric ↓ Serri	Property

- 10. Confirm "Available versions" in the "Change Version" dialog box and click on "Next".
- 11. Confirm "Setting Overview" and click on "Finish".

sion Selection lect available version mponent name: r_cmt_rx	Setting Overview The following settings will be added or removed
nponent name: r_cmt_rx	
	Setting Statu
rrent version: 5.00	There are no differences
ailable versions: 5.20	
	<
Sack Next > Finish Cancel	Ca

12. When the confirmation message is displayed in the "Change Version" dialog box, click on "Yes".

Confirm to change version and proceed to generate code Yes No	Change V	Version X
	A Con	



13. When the confirmation message is displayed in the "Code Generation" dialog box, click on "Proceed". Any other errors or warnings should also be dealt with in the same manner.



14. The error and warnings regarding the dependencies of components have now been resolved.





Set the LCD connection method to be used in emWin.

When using an RSK board (RSK RX130, RSK RX140, RSK RX231, RSSK RX23W, RSK RX64M, RSK RX660, RSK RX671, or RSK RX71M), the LCD display manufactured by OKAYA & Co., Ltd. is selected by the default. If you are using an OKAYA display, configure the emWin settings according to steps 15, 16, and 17 below.

When using a Target Board (Target Board RX130, Target Board RX231, Target Board RX23W, Target Board RX23W module, Target Board RX65N, Target Board RX660, or Target Board RX671), the LCD display manufactured by Kuongshun Electronic Ltd. is selected as by default. If you are using the Kuongshun Electronic display, configure the emWin settings according to steps 15, 18, and 19 below.

Steps 20 and beyond apply to both displays.

- 15. Select "r_emwin_rx" from the components.
- 16.Set the [LCD interface] value to [LCD_IF_SCI_SPI].

Software component configurat	ion	Generate Code	Generate Repo
Components $\succeq \ \ \ \ \ \ \ \ \ \ \ \ \ $	Configure		0
ت ت	Property	Value	^
type filter text	✓ ∰ Configurations		
V 🔂 Startup	✓		
V 🔁 Generic	# Work area size for GUI	20480	
r_bsp	# Horizontal LCD size	480	
V > Drivers	# Vertical LCD size	272	
✓ → I/O Ports	# Color depth	16 bit per pixel	
Pr_gpio_rx	# LCD orientation	ORIENTATION_0	
✓ (⇒ Communications	✓		
Pr_sci_rx	# LCD interface	LCD IF SCI SPI	
V > Timers	GLCDC Interface Setting		
💁 r_cmt_rx	# Number of buffers	2	
V 🏳 Middleware	# Start address of the frame buffer 1	0x00800000	
V 🕞 Generic	# Start address of the frame buffer 2	0x00840000	
Pr_byteq	# Start address of the frame buffer 3	0x0000000	×
✓ Graphics	<		>
r_emwin_rx	Macro definition: EMWIN_LCD_IF Select LCD interface. This setting is enabled when the configuration generated Please select from below setting.	by Smart Configurator is used.	^
~	LCD_IF_GLCDC = Use GLCDC FIT module		~



QE for Display GUI Display Application Development Guide

Include

using Serial Connection LCD

17. When selecting a board in the creation of a project, setting [LCD interface] to [LCD_IF_SCI_SPI] also adds the related FITs (r_sci_rx and r_byteq).

Select $[r_sci_rx]$ from Components and set the following.

- (1) Use SSPI mode :
- (2) Byte value to transmit while clocking in data in SSPI mode : 0x00
- (3) Include software support for channel6 (SCI channel number to be used) :
- (4) SCI6 (SCI channel number to be used) :

Include

Check "include" for all pins excluding CTS




For (3) and (4), select the SCI channel that corresponds to the board specifications.

Evaluation Board	SCI Channel Number
RSKRX130-512KB	6
RSKRX140	6
RSKRX231	8
RSSKRX23W	12
RSKRX64M	6
RSKRX660	6
RSKRX671	6
RSKRX71M	6

For Kuongshun Electronic manufactured display:

The display manufactured by Kuongshun is equipped with an LCD as well as a touch function. The channels used for the LCD connection and touch function are as follows.

Table 4.4	Display Interface and Channel Number
-----------	--------------------------------------

Evaluation Board	LCD Conne	ection	Touch Fund	Touch Function		
	Interface	Channel Number	Interface	Channel Number		
TargetBoardRX130	RSPI	0	SCI_SPI	1		
TargetBoardRX231	RSPI	0	SCI_SPI	0		
TargetBoardRX23W	SCI_SPI	1	SCI_SPI	5		
TargetBoardRX23Wmodule	SCI_SPI	1	SCI_SPI	12		
TargetBoardRX65N	RSPI	0	RSPI	1		
TargetBoardRX660	SCI_SPI	5	SCI_SPI	0		
TargetBoardRX671	SCI_SPI	5	SCI_SPI	0		

The RX231 Target Board is used in the following example to describe the setting procedures. For boards that use SCI_SPI for LCD connection, use the same settings as described in steps 19 (4) to (7). For boards that use RSPI for the touch function, use the same settings as described in steps 19 (1) to (3).



18. Set the [LCD interface] value to [LCD_IF_RSPI] and the [Touch interface] value to [TOUCH_IF_SCI_SPI].

As setting values and channel numbers vary according to each board, refer to Table 4.4, Display Interface and Channel Number for details.

Components 🚵 🛃 🎝 🗜 🕂	킄 Configure		í
ت 🕫	Property	Value	^
type filter text	V 🏶 Configurations		
V 🗁 Startup	V 🏶 Basic Setting		
V 🔁 Generic	# Work area size for GUI	20480	
r_bsp	# Horizontal LCD size	480	
V > Drivers	# Vertical LCD size	272	
V Drivers	# Color depth	16 bit per pixel	
	# LCD orientation	ORIENTATION_0	
Communications	✓		
r_rspi_rx	✓ # LCD interface	LCD_IF_RSPI	
V > Timers	V 🏶 GLCDC Interface Setting		
r_cmt_rx	# Number of buffers	2	
V > Middleware	# Start address of the frame buffer 1	0x00800000	
✓ → Graphics	# Start address of the frame buffer 2	0x00840000	
r_emwin_rx	# Start address of the frame buffer 3	0x0000000	~
U_COMMIT_IX	<		>
Dverview Board Clocks System C	This setting is enabled when the configuration generated by Please select from below setting. LCD_IF_GLCDC = Use GLCDC FIT module LCD_IF_GLCDC = Use GLCDC FIT module CONFIT and the Set FIT module	y Smart Configurator is used.	~
Dverview Board Clocks System C	Please select from below setting. LCD_IF_GLCDC = Use GLCDC FIT module	y Smart Configurator is used.	~
Dverview Board Clocks System C	Please select from below setting. LCD_IF_GLCDC = Use GLCDC FIT module	Value	~
t 7	Please select from below setting. LCD_IF_GLCDC = Use GLCDC FIT module LCD_IF_DSDL_Use DSDL_FIT module imponents Pins Interrupts		~
ype filter text	Please select from below setting. LCD_IF_GLCDC = Use GLCDC FIT module LCD_IF_DEDIUse DSDLFIT escatule imponents Pins Interrupts Property	Value	×
ype filter text ∽ 🔑 Startup	Please select from below setting, LCD_IF_GLCDC = Use GLCDC FIT module icomponents Pins Interrupts Property # Chip Select Pin	Value	~ ^
ype filter text	Please select from below setting, LCD_IF_GLCDC = Use GLCDC FIT module components Pins Interrupts Property	Value GPIO_PORT_B_PIN_1	~ ^
ype filter text ✓ 🎒 Startup ✓ 🍰 Generic 💣 r_bsp	Please select from below setting, LCD_IF_GLCDC = Use GLCDC FIT module components Pins Interrupts Property	Value GPIO_PORT_B_PIN_1 Vise Touch function	~
ype filter text ✓ 🍋 Startup ✓ 🚔 Generic 💣 r_bsp ✓ 🗁 Drivers	Please select from below setting, LCD_IF_GLCDC = Use GLCDC FIT module LCD_IF_GEDLes_DSDLFIT_module mponents_Pins_Interrupts Property # Chip Select Pin © Select Touch Interface # Use Touch function ♥ # Touch interface	Value GPIO_PORT_B_PIN_1 Vise Touch function	~
ype filter text ✓ ഈ Startup ✓ ഈ Generic ♀ ♂ r_bsp ✓ ៚ Drivers ✓ ៚ I/O Ports	Please select from below setting. LCD_IF_GLCDC = Use GLCDC FIT module LCD_IF_DEDL_Use GLCDC FIT module COUPE PROLETT as a duit mponents Pins Interrupts Property # Chip Select Pin \$ Select Touch Interface # Use Touch Interface \$ Select Touch Interface \$ Touch Interface Setting # Touch Interface Channel number # Slave address	Value GPIO_PORT_B_PIN_1 Use Touch function TOUCH_IF_SCI_SPI 0 0 0x00000038	
ype filter text ✓ ⇔ Startup ✓ ⇔ Generic	Please select from below setting. LCD_IF_GLCDC = Use GLCDC FIT module LCD_IF_DEDL_Use SGLCDC FIT module COMPONENTS Pins Interrupts Property # Chip Select Pin © Select Touch Interface # Use Touch Interface © Select Touch Interface Setting # Touch Interface channel number	Value GPIO_PORT_B_PIN_1 Use Touch function TOUCH_IF_SCI_SPI 0 0 0x00000038	×
ype filter text ✓ Startup ✓ Startup ✓ Generic	Please select from below setting. LCD_IF_GLCDC = Use GLCDC FIT module LCD_IF_DEDL_Use GLCDC FIT module COUPE PROLETT as a duit mponents Pins Interrupts Property # Chip Select Pin \$ Select Touch Interface # Use Touch Interface \$ Select Touch Interface \$ Touch Interface Setting # Touch Interface Channel number # Slave address	Value GPIO_PORT_B_PIN_1 Use Touch function TOUCH_IF_SCI_SPI 0 0 0x00000038	~
ype filter text ✓ Startup ✓ Seneric ✓ Conseries ✓ Drivers ✓ Communications ♥ Communications ♥ r_rspi_rx	Please select from below setting. LCD_IF_GLCDC = Use GLCDC FIT module LCD_IF_DEDL_Use DSUFIT_reached imponents Pins Interrupts Property # Chip Select Pin V @ Select Touch Interface # Use Touch Interface V @ Touch Interface V @ Touch Interface # Touch Interface Setting # Touch Interface channel number # Slave address # Communication baud rate of touch interface	Value GPIO_PORT_B_PIN_1 Image: Touch function TOUCH_IF_SCI_SPI 0 0x00000038 r 1000000	~
ype filter text ✓ Startup ✓ Startup ✓ Generic ✓ Trbsp ✓ Drivers ✓ Drivers ✓ Drivers ✓ Communications ♥ r_rspi_rx ♥ r_sci_rx	Please select from below setting. LCD_IF_GLODC = Use GLODC FIT module LCD_IF_GEDL_Use DSDLFIT_reacted iomponents Pins Interrupts Property # Chip Select Pin V @ Select Touch Interface # Use Touch Interface # Touch interface Setting # Touch interface channel number # Slave address # Communication baud rate of touch interface # Use Multi-Touch function	Value GPIO_PORT_B_PIN_1 Value GPIO_PORT_B_PIN_1 Use Touch function TOUCH_IF_SCI_SPI 0 0 0 0 0 0 0 0 0 0 0 0 0	
ype filter text ✓ Startup ✓ Startup ✓ Generic ✓ r_bsp ✓ Drivers ✓ Divers ✓ Communications ♥ r_gpio_rx ✓ Communications ♥ r_rspi_rx ♥ r_sci_rx ♥ Timers	Please select from below setting. LCD_IF_GLCDC = Use GLCDC FIT module LCD_IF_GEDUse DSD_IFT_reached iomponents Pins Interrupts Property # Chip Select Pin V @ Select Touch Interface # Use Touch Interface V @ Touch Interface Setting # Touch Interface Setting # Touch Interface channel number # Slave address # Communication baud rate of touch interface # Use Multi-Touch function # Maximum number of touchpoints	Value GPIO_PORT_B_PIN_1 Value GPIO_PORT_B_PIN_1 Use Touch function TOUCH_IF_SCI_SPI 0 0 0 0 0 0 0 0 0 0 0 0 0	
ype filter text ✓ Startup ✓ Generic ✓ r_bsp ✓ Drivers ✓ Drivers ✓ Drivers ✓ Drivers ✓ Drivers ✓ Communications © r_rspi_rx © Communications © r_rspi_rx ♥ Communications © r_rspi_rx ♥ Communications © r_rspi_rx ♥ Communications © r_rspi_rx	Please select from below setting. LCD_IF_GLCDC = Use GLCDC FIT module LCD_IF_GEDUse DSD_FIT_module iomponents Property # Chip Select Pin V @ Select Touch Interface # Use Touch Interface # Touch Interface Setting # Touch Interface Setting # Slave address # Communication baud rate of touch interface # Use Multi-Touch function # Maximum number of touchpoints	Value GPIO_PORT_B_PIN_1 Vise Touch function TOUCH_IF_SCI_SPI 0 0 0 0 0 0 0 0 0 0 0 0 0	
ype filter text ✓ ▷ Startup ✓ ▷ Generic ⇒ ☐ r_bsp ✓ ▷ Drivers ✓ ▷ Drivers ✓ ▷ Communications ⊕ r_rspi_rx ♥ ▷ Communications ⊕ r_rsci_rx ✓ ▷ Timers ⊕ r_cmt_rx ✓ ▷ Middleware	Please select from below setting. LCD_IF_GLCDC = Use GLCDC FIT module LCD_IF_GEDUse DEDLFTT_module components Property # Chip Select Pin V @ Select Touch Interface # Use Touch Interface # Touch Interface Setting # Touch Interface Setting # Touch Interface channel number # Slave address # Communication baud rate of touch interface # Use Touch Interface Pin Setting # Use Touch Interface Pin Setting # Use Touch Interface Pin Setting	Value GPIO_PORT_B_PIN_1 Value GPIO_PORT_B_PIN_1 Value TOUCH_IF_SCI_SPI 0 0 0 0 0 0 0 0 0 0 0 0 0	
ype filter text	Please select from below setting. LCD_IF_GLCDC = Use GLCDC FIT module LCD_IF_BCDL_Use SGLCDC FIT module ICD_IF_BCDL_Use Touch Interface Fit module ICD_IF_BCDL_Use Touch IC Reset Pin ICD_IF_BCDL_Use Touch IC Reset Pin	Value GPIO_PORT_B_PIN_1 Vuse Touch function TOUCH_IF_SCI_SPI 0 0 0 0 0 0 0 0 0 0 0 0 0	



0x00

Used

19.When a board is selected in the creation of a project, setting [LCD_IF_RSPI] and [TOUCH_IF_SCI_SPI] also adds the related FITs (r_rspi_rx and r_sci_rx).

RSPI setting:

Select [r_rspi_rx] from Components and set the following.

- (1) Dummy data of reception :
- (2) RSPI channel 0 (RSPI channel for LCD connection) : Used
- (3) RSPI0 (RSPI channels for LCD connection) :





SCI_SPI setting:

Select [r_sci_rx] from Components and set the following.

- (4) Use SSPI mode :
- (5) Byte value to transmit while clocking in data in SSPI mode :
- (6) Include software support for channel0 (SCI channel for touch function) :
- (7) SCI0 (SCI channels for touch function) :

Include 0x00 Include Check "Used" for all pins excluding CTS





QE for Display GUI Display Application Development Guide using Serial Connection LCD

20. When the pins have been set, click on the "Generate Code" button 🔞 in the upper-right corner of the window. The code is generated according to the settings.

The [r_bsp] Heap size shows an error, but this can be ignored for serial connections.

🔅 QE_for_Display_RX140_RSK.scfg 🗙				
Software component confi	gurati	on	Generate Code Gener	ate Report
Components 🔛 🛃 🎘 🗎 🕂	₩ *	Configure		i
	•	Property	Value	^
type filter text		✓		
🗸 📴 Startup	~	# User stack setting	2 stacks	
V 🕞 Generic		# User stack size	0x400	
r_bsp		# Interrupt stack size	0x100	
V > Drivers		# Heap size	🔇 0x400	
✓ → I/O Ports		# Initializes C input and output library functions	Enable	
Pr_gpio_rx		# Enable user stdio charget function	Use BSP charget() function	
✓ ➢ Communications		# User stdio charget function name	my_sw_charget_function	

21. After code generation is finished, "Added" is displayed immediately below "Installing the GUI drawing tool driver".

📮 Console 🗙		3	3. GUI creation on LCD
Smart Configurat	tor Output		
	<pre>ile generated:src\smc gen\r byteq\doc\ja\r01an1683jj0200-rx-apl.pdf</pre>	~	Installing the GUI drawing tool driver
	ile generated:src\smc gen\r byteq\readme.txt		Install GUI drawing tool driver.
	ile generated: <u>src\smc gen\r byteq\r byteq if.h</u>		
	<pre>ile generated:src\smc gen\r byteq\src\r byteq.c</pre>		Added How to add
	<pre>ile generated:src\smc gen\r byteq\src\r byteq private.h</pre>		
	<pre>ile generated:src\smc gen\r config\r byteq config.h</pre>		Initial setting of GUI drawing tool
	<pre>ile generated:src\smc gen\r pincfg\r pinset.h</pre>		Configure settings to use GUI drawing tool.
	ile generated:src\smc gen\r pincfg\Pin.c		
M0000002: C	ode generation is successful:(:\test e2studio env\workspace\QE for Display RX140 RS		GUI drawing tool setting :
		~	
<	>		Info setting



Make the initial settings for the GUI drawing tool.

22. Clicking on the "Info setting" button displays the "emWin setting" dialog box.

23. Values are set according to the information on the board selected in the project. [LCD interface channel number] must match the channel specified as [Include] by the [r_sci_rx] component and the channel specified as [Used] by the [r_rspi_rx] component in the Smart Configurator.

When using the Kuongshun Electronic LCD display, the values are already set in the [Touch settings] section.

For details, refer to the explanation produced by clicking on the "Help" button.

Confirm the settings and click on the "OK" button to close the dialog box.

	Board settings		
	LCD width	128	
	LCD height	128	
	LCD settings		
	Driver IC	ST7715	
	LCD connection interface	SCI_SPI ↔	
	LCD interface channel number	6	
	LCD interface bit rate	1000000	
	LCD rotation	ORIENTATION_0 ~	
3. GUI creation on LCD	Color depth per pixel	16bits \checkmark	
· · · · · · · · · · · · · · · · · · ·	Pin settings		
Installing the GUI drawing tool driver	LCD reset pin	Port: E v Bit: 4 v	
	LCD backlight pin	Port: C 🗸 Bit: 6 🗸	
Added How to add	LCD data / command pin	Port: C 🗸 Bit: 7 🗸	
Initial setting of GUI drawing tool	LCD CS pin	Port: B 🗸 Bit: 2 🗸	Interface
Configure settings to use GUI drawing tool.	LCD touch IC reset pin	Port: 0 💛 Bit: 0 🗸	Interface
GUI drawing tool setting :	LCD touch IC CS pin	Port: 0 🗸 Bit: 0 🗸	
	Memory settings		
Info setting	Use cache	Not Use 🗸 🗸	
Generate file	Maximum memory size used in GUI	20480	
	Touch settings		[LCD connection interface]
	Touch function	Not Use 🗸 🗸	Set the serial interface used for LCD connection.
Generate GUI	Touch connection interface	SCI_SPI ~	
Generate GUI to display on LCD.	Touch interface channel number	0	
Start GUI drawing tool Setting	Touch interface bit rate	1000000	
	Slave address of touch panel	0x38	
Implementation	Multi-touch function	Not Use 🗸	
Implement a program to display GUI in the main() function.	Maximum number of touch panel points	10	
Show sample code			



using Serial Connection LCD

LCD height 200 LCD settings Driver IC LUB441 LCD connection interface RPI LCD interface channel number 0 CCD interface bit rate 100000 LCD interface bit rate 100000 COD rotation 0RIENTATION 0 COD rotation 0Port 0 w Bit 2 CICD Spin 0Port A w Bit 4 CICD Spin 0Port 0 w Bit 5 CICD Spin 0Port A w Bit 4 CICD Spin 0Port 0 w Bit 5 CICD Spin 0Port 0 w Bit	Board settings LCD width	240	
Driver IC ILD set in interface ILD connection interface Interface channel number LCD interface channel number LCD interface channel number LCD interface bit rate LCD rotation Color depth per pixel Diver I Color depth per pixel Diver I Di	LCD height	320	
LCD interface channel number 0 LCD interface bit rate 100000 LCD rotation ORIENTATION_0 Color depth per pixel 1bbits Pin settings CLCD rotation Port CLCD seet pin Port CLCD souch IC reset pin Port CLCD touch IC CS pin Port Memory settings Value Use cache Not Use Maximum memory size used in GUI 20480 Cluch settings Touch settings Value Touch interface SC_SPI Touch interface bit rate 1000000 Save address of touch panel 0:38 Muti-touch function Not Use		ILI9341	
LCD interface bit rate LCD rotation Color depth per pixel Pin settings CLCD roset pin Port 1 × Bit 7 × CLCD backlight pin Port C × Bit 2 × CLCD backlight pin Port C × Bit 3 × CLCD Spin Port A × Bit 4 * CLCD Spin Port A × Bit 4 * CLCD touch IC CS pin Port 0 × Bit 5 × CLCD touch IC CS pin Port 0 × Bit 5 × Maximum memory size used in GUI Zouch settings Touch settings Touch function Touch interface SCLSPI Touch interface bit rate Touch interface bit rate Touch interface bit rate Touch interface bit rate Save address of touch panel Muti-touch function Not Use Ver Save address of touch panel Muti-touch function Not Use Not Use	LCD connection interface		
LCD rotation Color depth per pixel Pin settings LCD backlight pin Port: Port:<	LCD interface channel number	0	
Color depth per pixel Pin settings ① LCD backlight pin Port ① 、 Bit ⑦ ③ LCD backlight pin Port ② 、 Bit ③ ③ LCD backlight pin Port ② 、 Bit ③ ③ LCD backlight pin Port ③ 、 Bit ④ ③ LCD backlight pin Port ③ 、 Bit ④ ③ LCD backlight pin Port ③ 、 Bit ④ ③ LCD backlight pin Port ④ 、 Bit ⑤ ③ LCD backlight pin Port ④ 、 Bit ⑤ ③ LCD backlight pin Port ⑥ 、 Bit ⑤ ③ LCD backlight pin Port ⑥ 、 Bit ⑤ ③ LCD backlight pin Port ⑥ 、 Bit ⑤ ③ LCD backlight pin Port ⑧ ● Port ⑧ Bit ⑤ ③ LCD backlight @ ③ LCD backlight @ ① LCD backlight @ ① LCD backlight @ ③ LCD backlight @ ① Lob backlight			
CLCD reset pin Port CLCD backlight pin Port C LCD backlight pin Port C LCD data / command pin Port C LCD touch IC reset pin Port C LCD touch IC reset pin Port Port Bit C LCD touch IC CS pin Port C LCD touch IC CS pin Port D LCD touch IC CS pin Port Variance Not Use Interface Interface Interface Settings Touch settings Touch settings Touch settings Touch onnection interface SCLSPI Touch interface bit rate 1000000 Slave address of touch panel Not Use National Not Use<	LCD rotation		
LCD reset pin Port LCD backlight pin Port LCD backlight pin Port LCD data / command pin Port Port Bit LCD command pin Port LCD touch IC reset pin Port Port Bit LCD touch IC reset pin Port Port Bit Itemory settings Use cache Not Use Touch settings Value Touch settings Sugarant Touch interface SCI_SPI Touch interface bit rate 1000000 Slave address of touch panel X38 Muti-touch function Vse	Color depth per pixel	16bits \vee	
I LCD data / command pin Port: C Bit: 3 I LCD CS pin Port: A Bit: 4 I LCD touch IC reset pin Port: 0 Bit: 0 I LCD touch IC CS pin Port: 0 Bit: 5 Memory settings Use cache Maximum memory size used in GUI 20480 Touch settings Touch function Use Slave address of touch panel Muti-touch function Not Use I LCD connection interface SCI_SPI Touch interface bit rate 1000000 Slave address of touch panel Not Use Not Use	LCD reset pin		
I LCD CS pin Port A I LCD touch IC reset pin Port I I LCD touch IC CS pin Not Use Use cache Not Use Maximum memory size used in GUI 20480 Touch settings Image: Connection interface] Touch settings Image: Connection interface] Touch interface channel number Image: Connection Interface I Touch interface bit rate Image: Connection			
LCD touch IC reset pin Port Port Port Bit Port Duch settings Incometion interface] Touch settings Incometion Touch interface bit rate Incomot Slave address of touch panel Ox38 Multi-touch function Not Use			
I LCD touch IC CS pin Port o Bit s Memory settings Use cache Maximum memory size used in GUI 20480 Touch settings Touch function Use SILSPI Value SIAve address of touch panel Not Use			Interface
Memory settings Not Use Use cache Not Use Maximum memory size used in GUI 20480 Touch settings Image: Comparison of the serial interface] Touch settings Scl_SPI Touch interface bit rate 1000000 Slave address of touch panel 38 Multi-touch function Not Use			
Use cache Not Use Maximum memory size used in GUI 20480 Touch settings Touch function Use Touch settings Touch connection interface SCL_SPI Touch interface channel number 0 Touch interface bit rate 1000000 Slave address of touch panel 0x38 Multi-touch function Not Use	LCD touch IC CS pin	Port: 0 V Bit: 5 V	
Maximum memory size used in GUI 20480 Touch settings Touch function Use Touch settings Touch interface SCI_SPI Touch interface bit rate 0 Touch interface bit rate 1000000 Slave address of touch panel 0x38 Multi-touch function Not Use			
Touch settings Touch function Use Touch function interface SCI_SPI Touch interface channel number 0 Touch interface bit rate 1000000 Slave address of touch panel Multi-touch function			
Set the serial interface used for LCD connection. Touch function Use Touch connection interface SCI_SPI Touch interface channel number 0 Touch interface bit rate 1000000 Slave address of touch panel 0x38 Multi-touch function Not Use	Maximum memory size used in GUI	20480	
Touch interface channel number 0 Touch interface bit rate 1000000 Slave address of touch panel 0x38 Multi-touch function Not Use	-	Use 🗸	
Touch interface bit rate 1000000 Slave address of touch panel 0x38 Multi-touch function Not Use	Touch connection interface	SCI_SPI ~	
Slave address of touch panel 0x38 Multi-touch function Not Use	Touch interface channel number	0	
Multi-touch function Not Use	Touch interface bit rate	1000000	
	Slave address of touch panel	0x38	
Maximum number of touch panel points	Multi-touch function	Not Use \vee	
	Maximum number of touch panel points	10	



24.A header file reflecting the initial settings for the GUI drawing tool is output.

Click on the "Generate file" button to output qe_emwin_config.h. It is output to src immediately under the project folder by default. The output destination folder can be changed by selecting the "Select folder" checkbox.

The path for including the output header files is also automatically added.

Project Explorer 🗙 📄 🛱 🏹 🖇 🗖 🗖	💭 LCD Main RX,RA (QE) $ imes $		
✓ Ge_for_Display_RX140_RSK >	Workflow Diagram		
> hµ includes ✓ 29 src	1. Preparation	2. LCD adjustment	3. GUI creation on LCD
> 🍃 smc_gen h qe_emwin_config.h > k QE_for_Display_RX140_RSK.c	Selecting a project Select the project that has been created.	Installing the LCD controller Install GLCDC and specify PIN connection.	Installing the GUI drawing tool driver Install GUI drawing tool driver.
> C QE_tor_Display_tx140_tot.c	OE_for_Display_RX140_RSK V	Not needed How to add	Added How to add
 QE_for_Display_RX140_RSK.scfg QE_for_Display_RX140_RSK HardwareDebug.lau 	Selecting an evaluation board Select when using an evaluation board. No setting is required when using a custom board.	LCD display adjustment Adjust on the board to display on the LCD.	Initial setting of GUI drawing tool Configure settings to use GUI drawing tool.
	Evaluation board : RSKRX140 (V1.00)	Aujustment for display on LCD :	GUI drawing tool setting :
	How to Select Selecting a LCD If not in the list, select Custom from the combo box Select and add LCD information.	TCON/LCD setting	Info setting Generate file Select folder
	Selecting a connection type : Use serial connection (emWin)	Graphic layer setting	Generate GUI Generate GUI to display on LCD.
	Maker/Type : OKAYA V Model name/Size :	Adjust image quality / color : Image quality adjustment	Start GUI drawing tool Setting
	RH 128128T-1X44WN-B2 Select a tool to generate a GUI to display on the LCD. Use emWin	Generate file Select folder	Implementation Implement a program to display GUI in the main() runction. Show sample code
< >			



Install AppWizard, which is to be used to create the GUI.

25. Click on the "Setting" button under "Generate GUI" to open the "AppWizard settings" dialog box.

26.Click on the "Installing AppWizard" button to install AppWizard by following the instructions of the AppWizard setup wizard that is displayed.





using Serial Connection LCD

27. After having installed AppWizard, the state indicator of the "AppWizard settings" dialog box is changed to "AppWizard is installed". Click on the "OK" button to close the "AppWizard settings" dialog box.

AppWizard settings				×
AppWizard is installed				
AppWizard installation folder:	C:#Program Files (x86)#SEGGER#AppWizard_V128c_626c#bin			
If AppWizard is not found:				
-Click on the following button to install AppWizard if you have not installed it already.				
-If you have already installed AppWizard, specify the path to where it has been installed.				
Installing AppWizard				
		OK	Help	

28. The "Start GUI drawing tool" button is now active. Click on this button to start AppWizard.

3. GUI creation on LCD	File Edit Project Resource Help Add objects	Editor Properties	
Installing the GUI drawing tool driver Install GUI drawing tool driver. Added How to add		Q 0	
Initial setting of GUI drawing tool Configure settings to use GUI drawing tool. GUI drawing tool setting : Info setting	Screen Box Button Image Abc Text Silder Rotary Switch Hierarchic tree		
Generate file	Object Id		
Generate GUI Generate GUI to display on LCD. Start GUI drawing tool Setting		Interactions (9) (1) (1) (1) (1) (1) (1) (1) (1) (1) (1	
Implementation Implement a program to display GUI in the main() function. Show sample code	Text Fonts Images Lists	3	

Note: The usage of AppWizard may differ from the way which is described in this application note due to changes to the specifications. For the usage of AppWizard, refer to its help system.



using Serial Connection LCD

29. When AppWizard is started, the "aw" project folder of AppWizard is automatically created immediately under the project. This folder contains Resource, Simulation, and Source folders and the project file for AppWizard (aw.AppWizard).



- 30. Screen size and other properties are automatically set in the AppWizard project.
 - The setting values can be confirmed in the "Edit project properties" dialog box which is opened from the "Edit Options" item of the "Project" menu.

4 AppWizard V1.28c_6.26c - aw		
File Edit Project Resource Help		
Add objet Edit Options		
Play F5		
Start Simulation F6		
Start Spy F7		
Screen Open containing folder		
🔏 Edit project properties		×
C BSP		
Selected BSP: None		Select BSP
Color scheme and display options		
Display size x:	128	\$
Display size y:	128	÷
Color format:	16 Bit, GUICC_565	
Enable Multibuffering:		



31. Create a GUI with AppWizard.

Start by adding a screen. Clicking on the "Screen" button adds "Screen ID_SCREEN_00". Multiple screens can be set and this allows switching between their displays.





QE for Display GUI Display Application Development Guide using Serial Connection LCD

32. After that, add an image. Clicking on the "Image" button adds "Image ID_IMAGE_00". The position and size are adjusted in "Editor" or "Properties". In this case, use "Editor" to expand the image to fill the LCD screen.





using Serial Connection LCD

33.Set an image. Open "Set bitmap" in "Properties" and click on the rectangle below the label. Select a desired image from "Select image for mode <>" and click on "Select". For the image format to be specified, also refer to section 6.2, Usage Note Regarding Image Drawing Speed.





34. Clicking on the "Start play mode" button located at the upper right confirms the operation of the created GUI in the preview. Clicking on the "Esc" button closes the preview.





35. Output code from AppWizard.

Select the "Export & Save" item from the "File" menu of AppWizard.

Code is output in the "Source" and "Resource" folders under the "aw" project folder of AppWizard. The "Source" and "Resource" folders are automatically specified as the target folders for building.





36. Include code for displaying the created GUI in the main() function.

Click on the "Show sample code" button in the lower part of "3. GUI Creation on LCD" of QE for Display [RX,RA].

After clicking on the "Copy to the clipboard" button in the "Show sample code" dialog box, click on the "OK" button to close it.

3. GUI creation on I	LCD 💽	Include the sample code in the main() function.	
S. GOI creation on I Installing the GUI drawin Install GUI drawing tool driver.	and a second	*This sample program display the GUI created by AppWizard on the LCD. *Please add this sample code in the main() function. * * NOTE: THIS IS A TYPICAL EXAMPLE	^
Initial setting of GUI dra Configure settings to use GUI draw GUI drawing tool setting Info setting Generate file	awing tool.	<pre>#include "Generated/Resource.h" void main(void) { // your codes APPW_X_Setup(); APPW_Init(APPW_PROJECT_PATH); APPW_CreateRoot(APPW_INITIAL_SCREEN, WM_HBKWIN); while (1) { while (GUI_Exec 1()) { APPW_Exec(); } } }</pre>	
Generate GUI Generate GUI to display on LCD. Start GUI drawing tool	Setting	APPW_Exec(); GUI_Delay(5); } }	~
Implementation Implement a program to display G function. Show sample code	in the main()	< Copy to the clipboard	>

37. Paste the copied code under the user code within the main() function.

☑ QE_for_Display_Rλ	(140 RSK.c. ×
	* FILE : QE_for_Display_RX140_RSK.c.
10	<pre>#include "r smc entry.h"</pre>
11	<pre>#include "Generated/Resource.h'</pre>
12	
	<pre>void main(void);</pre>
14	
	<pre>void main(void) {</pre>
16	// your codes
17	APPW X Setup();
18	APPW Init(APPW PROJECT PATH);
19	APPW CreateRoot(APPW INITIAL SCREEN, WM HBKWIN);
20 😑	
21 😑	
22	APPW Exec();
23	}
24	APPW_Exec();
25	GUI_Delay(5);
26	UDI_DETAY(S);
27	I
<u> </u>	1



4.5 Building the Project

Build the project and make the load module according to the following procedure.

- 1. Click on the project you want to build (e.g. QE_for_Display_RX140_RSK HardwareDebug).
- 2. Click on "Build".



3. When the "Console" panel displays 'Build complete.', the build operation is complete.





4.6 Connecting a Debugger and Executing the Program

- 1. Click on the project you want to debug (e.g. QE_for_Display_RX140_RSK HardwareDebug).
- 2. Click on "Debug Configurations" from the "Run" menu item.

workspace - QE_for_Display_RX140_RSK/src/QE_for_D	visplay_RX140_RSK.c - (e² stuc	dio		
File Edit Source Refactor Navigate Search Pro	ject Renesas Views	Run	Window Help		
🌾 🔳 🗱 Debug 🗸 💽	QE_for_Display_RX140_		Renesas Debug Tools	>	s - 🗟
		Q,	Run	Ctrl+F11	
Project Explorer 🗙 📄 🛱 🍸 🖇 🗖 🗖	QE_for_Display_R	椮	Debug	F11	
QE_for_Display_RX140_RSK [HardwareDebug]	1		Run History	>	******
> 🖓 Binaries	2	0	Run As	>	
> 🔊 Includes	3		Run Configurations		0_RSK.c
> 😕 aw/Resource	5		Debug History	>	
> 🔁 aw/Source	6		, , , , , , , , , , , , , , , , , , ,		
V 🔁 src	8	夺	Debug As	>	
> 🔁 smc_gen	9		Debug Configurations		******
> h) qe_emwin_config.h > c) QE_for_Display_RX140_RSK.c	10	Q.	External Tools	>	1
> 🗁 HardwareDebug	11 12	_			1



RX Family

QE for Display GUI Display Application Development Guide

using Serial Connection LCD

- 3. Select the "Connection Settings" tab on the "Debugger" tabbed page of the "Debug Configurations" dialog box.
- Configure the following values according to the target usage environment. [Main Clock Source] [EXTAL Frequency[MHz]] [Connection Type] [Power Target From The Emulator (MAX 200mA)]

Debug Configurations		—	
reate, manage, and run configur	ations		Ť
Image: Second Structure	Name: QE_for_Display_RX140_RSK HardwareDebug Main Debugger Startup Common Source Debug hardware: E2 Lite (RX) Target Device: RSF51406 GDB Settings Connection Settings Debug Tool Settings V Clock Main Clock Source Extal Frequency[MHz] Operating Frequency [MHz] Permit Clock Source Change On Writing Internal Flash Memory V Connection with Target Board Emulator Connection Type JTag Clock Frequency[MHz] Fine Baud Rate[Mbps] Hot Plug V Power Power Target From The Emulator (MAX 200mA) Supply Voltage (V) V CPU Operating Mode Register Setting Mode pin Change startup bank Content on the function of the function	EXTAL 8 48.000 Yes (Auto) Fine 6.00 1.50 No Yes 3.3 Single Chip Single-chip mode No	
K Stress		Revert	Apply
?		Debug	Close



5. When the following message is displayed, click on "Switch".



6. When downloading of the load module is completed, the "Debug" perspective opens.

In E fast Sure fatter Nange Such Paget Mane Nange	💽 workspace - QE_for_Display_RX140_RSK/src/smc_gen/r_bsp/mcu/all	esetprg.c - e² studio				-	□ × □	
Control of the c	File Edit Source Refactor Navigate Search Project Renesas	íews Run Window Help						
Image: State Stat	🐔 🎋 🔳 🎋 Debug 🗸 💽 QE_for_Display.	1X 140_RSK Hardwa 🗸 🌸 🗄 🐨 🖌 📓 🥘 🛛 👻 🦓 🗸 📓 🖓 🍬 📓 🦄 🕨 💷 🛤 🕴 🗴 🖡 🛤 🖉 🐭 🛤 🕬 🕱 🧔 🕫 💵 🕴 🐯	} • (∿ - ★ III	• 💷 🕯 🖏	2 🕺 🖀 🌶	3	
<pre>vi do complex PMA Disk Hudeworkhole (Revers GD Hude PMA (Finder GD Links Finder GD Links PMA (Finder GD Links</pre>								
<pre>C Ctyc.Dubys.RNS.LT[]core:0</pre>			•	(x)=V × •	🖢 В 🍋 Р 🍕 Е	👴 E 😤 P 📘	1 - 0	
The set of 1 (second (core () Cargo () Second () Seco		202 fffc0000 R BSP_POR_FUNCTION(R_BSP_STARTUP_FUNCTION)	^			約 🍕 🗉	📑 🖻 🖇	
<pre>ProveCok Base PC0 arrestory GARD of Microson Prove Cok Base PC0 arrestory GARD of Microson Prove Cok Base PC0 arrestory GARD of Microson Prove Cok Base PC0 arrestory GARD of Microson PC Cok Base PC0 arrestory Cok PC0 PC0 PC0 PC0 PC0 PC0 PC0 PC0 PC0 PC0</pre>	∽ 🔗 Thread #1 1 (single core) [core: 0] (Suspended : Signal : SIG	204 /* Stack pointers are setup prior to calling this function - see comments above */		Name	Туре	Value	^	
C 3.854 V Suppended	PowerON_Reset_PC() at resetprg.c:202 0xfffc0000 pl rx-elf-gdb -rx-force-v2 (7.8.2)	<pre>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>></pre>	h ett v					
C 3.854 V Suppended								
	Suspended	E to Dipolar, RX140, RSX HardwareDebug [Breesas (DB Hardware Debugging] [pid: 5] USF Vcc USF Vcc USF Bus Power 4.91455 V inished target connection B0: 62341 arget connection status - OK arget connection status - OK			} , 		<u>9</u> + □ □ ^	
	🗠 🔟 🗢 🕽							



7. Click on "Resume" on the tool bar. The program is executed and breaks at the beginning of the main function.



8. After a break occurs at the beginning of the main function, click on "Resume" again on the toolbar.

File Edit Source Refactor Navigate Search Project Renesas	sas Views Run Window Help
🐔 🗱 🔳 🗱 Debug 🗸 💽 QE_for_Display_	lay_RX140_RSK Hardwz 🗸 🎄 🗄 📩 🕶 🔚 🐚 📎 🖛 🗞 🖛 🗟 🗄 🏪 🤅 🚺 🔳 🕺 🕉 🧟 . 🤉 🖬
🍅 🕭 🖋 - 🗾 🖗 - 将 - 🏷 😅 📑	
🎋 Debug 🗙 📄 🖻 🖻 🗖	QE_for_Display_RX140_RSK.c × resetprg.c
 ✓ CP_for_Display_RX140_RSK. HardwareDebug [Renesas GDB Hardw ✓ PC_for_Display_RX140_RSK.x [1] [cores: 0] ✓ PThread #1 1 (single core) [core: 0] (Suspended : Breakpoint ■ main() at QE_for_Display_RX140_RSK.c:17 0xfffc65c1 P rx-elf-gdb -rx-force-v2 (7.8.2) P Renesas GDB server (Host) 	2 * 2 * ETLE DE for Display DY140 DSV c

9. When the setting of the display device is done correctly, the following screen will be displayed on the LCD panel.





5. Hardware

5.1 Configuration of Hardware

Table 5.1, LCD Panel Used in the Sample shows the LCD panel used in this application note.

Table 5.1 LCD Panel Used in the Sample

Information on the LCD Panel Product
Manufacturer: OKAYA Co.
Part number: RH128128T-1X44WN-B2
Display size:128 x 128
Manufacturer: Kuongshun Electronic Co.
Part number: MSP2807
Display size:320 x 240
Built-in touch controller

5.2 Pin Functions

Set the pin functions according to the product you are using. Pin functions are automatically set using the Smart Configurator and QE for Display [RX,RA].



Table 5.2	Pins and Functions to be Used (RSK RX130)
-----------	---

Connected Device	Pin Name	Input/Output	Description
RH128128T-	PB2	Output	LCD CS pin
1X44WN-B2	PB1/ SMOSI6	Input/output	LCD data output pin
	PB0/ SMISO6	Input/output	LCD data input pin
	PB3/ SCK6	Input/output	LCD clock pin
	PD0	-	-
	P17	Output	LCD reset pin
	PC2	Output	LCD data / command pin
	PC3	Output	LCD backlight pin

Table 5.3	Pins and Functions to be Used (Target Board RX130)
-----------	--

Connected Device	Pin Name	Input/Output	Description
RH128128T-	PA4 / SSLA0	Output	LCD CS pin
1X44WN-B2	PA6 / MOSIA	Input/output	LCD data output pin
	PA7/ MISOA	Input/output	LCD data input pin
	PA5/ RSPCKA	Input/output	LCD clock pin
	P15	-	-
	P17	Output	LCD reset pin
	PC3	Output	LCD data / command pin
	PC2	Output	LCD backlight pin
	P27 / SCK1	Input/output	LCD touch function clock pin
	PJ3	Output	LCD touch IC CS pin
	P26 / TXD1	Output	LCD touch function data input pin
	P30 / RXD1	Input	LCD touch function data output pin

Table 5.4 Pins and Functions to be Used (RSK RX140)

Connected Device	Pin Name	Input/Output	Description
RH128128T-	PB2	Output	LCD CS pin
1X44WN-B2	PB1/ SMOSI6	Input/output	LCD data output pin
	PB0/ SMISO6	Input/output	LCD data input pin
	PB3/ SCK6	Input/output	LCD clock pin
	P31	-	-
	PE4	Output	LCD reset pin
	PC7	Output	LCD data / command pin
	PC6	Output	LCD backlight pin



Table 5.5	Pins and Functions to be Used (RSK RX231)
-----------	---

Connected Device	Pin Name	Input/Output	Description
RH128128T-	P33	Output	LCD CS pin
1X44WN-B2	PC7/ SMOSI8	Input/output	LCD data output pin
	PC6/ SMISO8	Input/output	LCD data input pin
	PC5/ SCK8	Input/output	LCD clock pin
	PE6	-	-
	PE7	Output	LCD reset pin
	PE3	Output	LCD data / command pin
	PE4	Output	LCD backlight pin

Table 5.6 Pins and Functions to be Used (Target Board RX231)

Connected Device	Pin Name	Input/Output	Description
RH128128T-	PA4 / SSLA0	Output	LCD CS pin
1X44WN-B2	PA6 / MOSIA	Input/output	LCD data output pin
	PA7/ MISOA	Input/output	LCD data input pin
	PA5/ RSPCKA	Input/output	LCD clock pin
	P15	-	-
	P17	Output	LCD reset pin
	PC3	Output	LCD data / command pin
	PC2	Output	LCD backlight pin
	P22 / SCK0	Input/output	LCD touch function clock pin
	P05	Output	LCD touch IC CS pin
	P20 / TXD0	Output	LCD touch function data input pin
	P21 / RXD0	Input	LCD touch function data output pin

Table 5.7	Pins and Functions to be Used (RSSK RX23W)
-----------	--

Connected Device	Pin Name	Input/Output	Description
RH128128T-	PE3	Output	LCD CS pin
1X44WN-B2	PE1/SMOSI12	Input/output	LCD data output pin
	PE2/SMISO12	Input/output	LCD data input pin
	PE0/ SCK12	Input/output	LCD clock pin
	PB1	-	-
	PB3	Output	LCD reset pin
	P03	Output	LCD data / command pin
	PJ3	Output	LCD backlight pin



Table 5.8	Pins and Functions to be Used (Target Board RX23W)
	This and Tanotions to be osed (Target Deard TAZOTT)

Connected Device	Pin Name	Input/Output	Description
RH128128T-	P31	Output	LCD CS pin
1X44WN-B2	P26 / SMOSI1	Input/output	LCD data output pin
	P30/ SMISO1	Input/output	LCD data input pin
	P27/ SCK1	Input/output	LCD clock pin
	PB1	-	-
	PD3	Output	LCD reset pin
	P05	Output	LCD data / command pin
	PB7	Output	LCD backlight pin
	PC4 / SCK5	Input/output	LCD touch function clock pin
	P41	Output	LCD touch IC CS pin
	PC3 / TXD5	Output	LCD touch function data input pin
	PC2 / RXD5	Input	LCD touch function data output pin

Table 5.9	Pins and Functions to be Used (Target Board RX23W module)
Table 5.9	Fills and Functions to be used (Target Board KA25W module)

Connected Device	Pin Name	Input/Output	Description
RH128128T-	P31	Output	LCD CS pin
1X44WN-B2	P26 / SMOSI1	Input/output	LCD data output pin
	P30/ SMISO1	Input/output	LCD data input pin
	P27/ SCK1	Input/output	LCD clock pin
	PB1	-	-
	PD3	Output	LCD reset pin
	PC3	Output	LCD data / command pin
	PC2	Output	LCD backlight pin
	PE0 / SCK12	Input/output	LCD touch function clock pin
	P05	Output	LCD touch IC CS pin
	PE1 / TXD12	Output	LCD touch function data input pin
	PE2 / RXD12	Input	LCD touch function data output pin

Table 5.10Pins and Functions to be Used (RSK RX64M)

Connected Device	Pin Name	Input/Output	Description
RH128128T-	P45	Output	LCD CS pin
1X44WN-B2	P00/ SMOSI6	Input/output	LCD data output pin
	P01/ SMISO6	Input/output	LCD data input pin
	P02/ SCK6	Input/output	LCD clock pin
	P20	-	-
	P21	Output	LCD reset pin
	P46	Output	LCD data / command pin
	P47	Output	LCD backlight pin



Connected Device	Pin Name	Input/Output	Description
RH128128T-	PA4 / SSLA0-B	Output	LCD CS pin
1X44WN-B2	PA6 / MOSIA-B	Input/output	LCD data output pin
	PA7/ MISOA-B	Input/output	LCD data input pin
	PA5/ RSPCKA-B	Input/output	LCD clock pin
	P15	-	-
	P17	Output	LCD reset pin
	PC3	Output	LCD data / command pin
	PC2	Output	LCD backlight pin
	PE5 / RSPCKB-B	Input/output	LCD touch function clock pin
	P05	Output	LCD touch IC CS pin
	PE6 / MOSIB-B	Input/output	LCD touch function data input pin
	PE7 / MISOB-B	Input/output	LCD touch function data output pin

Table 5.12 Pins and Functions to be Used (RSK RX660)

Connected Device	Pin Name	Input/Output	Description
RH128128T-	PJ3	Output	LCD CS pin
1X44WN-B2	P00/ SMOSI6	Input/output	LCD data output pin
	P01/ SMISO6	Input/output	LCD data input pin
	P02/ SCK6	Input/output	LCD clock pin
	P56	-	-
	PL0	Output	LCD reset pin
	P71	Output	LCD data / command pin
	P72	Output	LCD backlight pin

Table 5.13	Pins and Functions to be Used (Target Board RX660)
------------	--

Connected Device	Pin Name	Input/Output	Description
RH128128T-	PC0	Output	LCD CS pin
1X44WN-B2	PC3 / SMOSI5	Input/output	LCD data output pin
	PC2 / SMISO5	Input/output	LCD data input pin
	PC1 / SCK5	Input/output	LCD clock pin
	PB0	-	-
	PB1	Output	LCD reset pin
	PB7	Output	LCD data / command pin
	PB6	Output	LCD backlight pin
	P34 / SCK0	Input/output	LCD touch function clock pin
	P06	Output	LCD touch IC CS pin
	P32 / TXD0	Output	LCD touch function data input pin
	P33 / RXD0	Input	LCD touch function data output pin



Table 5.14	Pins and Functions to be Used (RSK RX671)
------------	---

Connected Device	Pin Name	Input/Output	Description
RH128128T-	PJ3	Output	LCD CS pin
1X44WN-B2	P00/ SMOSI6	Input/output	LCD data output pin
	P01/ SMISO6	Input/output	LCD data input pin
	P02/SCK6	Input/output	LCD clock pin
	P56	-	-
	P74	Output	LCD reset pin
	P71	Output	LCD data / command pin
	P72	Output	LCD backlight pin

Table 5.15	Pins and Functions to be Used (Target Board RX671)
------------	--

Connected Device	Pin Name	Input/Output	Description
RH128128T-	PC0	Output	LCD CS pin
1X44WN-B2	PC3 / SMOSI5	Input/output	LCD data output pin
	PC2 / SMISO5	Input/output	LCD data input pin
	PC1 / SCK5	Input/output	LCD clock pin
	PB0	-	-
	PB1	Output	LCD reset pin
	PB7	Output	LCD data / command pin
	PB6	Output	LCD backlight pin
	P22 / SCK0	Input/output	LCD touch function clock pin
	P05	Output	LCD touch IC CS pin
	P20 / TXD0	Output	LCD touch function data input pin
	P21 / RXD0	Input	LCD touch function data output pin

Table 5.16 Pins and Functions to be Used (RSK RX71M)

Connected Device	Pin Name	Input/Output	Description
RH128128T-	P45	Output	LCD CS pin
1X44WN-B2	P00/ SMOSI6	Input/output	LCD data output pin
	P01/ SMISO6	Input/output	LCD data input pin
	P02/ SCK6	Input/output	LCD clock pin
	P20	-	-
	P21	Output	LCD reset pin
	P46	Output	LCD data / command pin
	P47	Output	LCD backlight pin



5.3 LCD Connections

Board and LCD connections are listed below.

• RH128128T-1X44WN-B2 (manufactured by OKAYA)

The default setting when using an RSK board is the RH128128T-1X44WN-B2 LCD.

This LCD is equipped with a Pmod connector and should be connected to the board's Pmod1 pin (Pmod2 for RSSK RX23W).

MSP2807 (manufactured by Kuongshun Electronic)

The default setting when using a Target Board is the MSP2807 LCD. Connect the LCD using the pins as indicated below.

 Table 5.17
 LCD Connection Pins

MSP2807	Board Pin
VCC	Pmod1-6
GND	Pmod1-11
CS	Pmod1-1
RESET	Pmod1-8
DC/RS	Pmod1-9
SDI(MOSI)	Pmod1-2
SCK	Pmod1-4
LED	Pmod1-10
SDO(MISO)	Pmod1-3

 Table 5.18
 Touch Function Connection Pins (Target Board RX130)

MSP2807	MCU Pin (Port)
T_CLK	21 (P27)
T_CS	4 (PJ3)
T_DIN	22 (P26)
T_DO	20 (P30)
T_IRQ	-

MSP2807	MCU Pin (Port)
T_CLK	26 (P22)
T_CS	100 (P05)
T_DIN	28 (P20)
T_DO	27 (P21)
T_IRQ	-



Table 5.20	Touch Function Connection Pins (Target Board RX23W)
------------	---

MSP2807	MCU Pin (Port)
T_CLK	26 (PC4)
T_CS	51 (P41)
T_DIN	27 (PC3)
T_DO	29 (PC2)
T_IRQ	-

Table 5.21 Touch Function Connection Pins (Target Board RX23W module)

MSP2807	MCU Pin (Port)
T_CLK	22 (PE0)
T_CS	64 (P05)
T_DIN	21 (PE1)
T_DO	56 (PE2)
T_IRQ	-

Table 5.22 Touch Function Connection Pins (Target Board RX65N)

MSP2807	MCU Pin (Port)
T_CLK	73 (PE5)
T_CS	100 (P05)
T_DIN	72 (PE6)
T_DO	71 (PE7)
T_IRQ	-

Table 5.23	Touch Function Connection Pin (Target Board RX660)
------------	--

MSP2807	MCU Pin (Port)
T_CLK	16 (P34)
T_CS	1 (P06)
T_DIN	18 (P32)
T_DO	17 (P33)
T_IRQ	-

Table 5.24	Touch Function Connection Pins (Target Board RX671)
------------	---

MSP2807	MCU Pin (Port)
T_CLK	26 (P22)
T_CS	100 (P05)
T_DIN	28 (P20)
T_DO	27 (P21)
T_IRQ	-



6. Details of Settings

This chapter gives supplementary explanations and notes for each of the procedures described in section 1.1, System Development Flow Using QE for Display [RX,RA], System Development Flow Using QE for Display [RX,RA].

6.1 From Execution to the End of Adjustment

After the program has been created, start the debugger and execute the program. If the initial screen is not correctly displayed, the settings are not correct. Check the values adjusted by QE for Display [RX,RA] and the settings of parameters of the r_sci_rx FIT module.



6.2 Usage Note Regarding Image Drawing Speed

This chapter describes points for caution on the image drawing speed.

6.2.1 Usage Notes for Using JPEG Images with AppWizard

Since there is no JPEG decoder in the hardware for the RX family, the drawing speed will be slow when JPEG images are used. Therefore, the use of JPEG images is not recommended. However, JPEG images can be converted to the bitmap format and used without slowing down the drawing speed. This can also be a way of saving memory.

To convert the JPEG format to the bitmap format, expand "Set bitmap" in "Properties" and select any image in a JPEG format. AppWizard will automatically convert the image from JPEG to the bitmap format.

If the JPEG image is not displayed on the LCD, this can be resolved by adjusting the stack size or heap size.



Figure 6.1 Expanding "Set bitmap" and Selecting a JPEG Image



6.3 Usage Note regarding the use of QE for Display[RX,RA] V3.1.0

This chapter describes points for caution on the use of QE for Display[RX,RA] V3.1.0.

6.3.1 Usage Notes for Using the "Kuongshun Electronic - MSP2807" LCD with Specific Evaluation Boards

When selecting the specific board in the [Target Board:] field during project creation and selecting the "Kuongshun Electronic -MSP2807" LCD in the [LCD Main RX,RA (QE)] view, the incorrect display size is set in the [emWin setting] dialog.

Correct: 240 (Width) × 320 (Height)

Incorrect: 280 (Width) × 320 (Height)

The specific boards are as follows

- 1. Renesas Starter Kit / Renesas Solution Starter Kit listed in the "Chapter 2 Operating Environment"
- 2. Evaluation Boards not listed in the "Chapter 2 Operating Environment"
- 3. No evaluation board

Select "Custom..." in the [Maker / Type:] combo box and create a "Kuongshun Electronic -MSP2807" LCD as a custom display.

Set the following values for LCD information.

- 1. Display Size (Width): 240
- 2. Display Size (Height): 320
- 3. Driver IC: ILI9341

1. Preparation					
Selecting a project Select the project that has been created.			Edit Custom Displa	Edit Custom Display Data	🛱 Edit Custom Display Data
QE_for_Display_RX140_RSK	\sim				
Selecting an evaluation board Select when using an evaluation board. No setting is required when using a custom board.				Model Name/Size : MSP2807	
Evaluation board : RSKRX140 (V1.00) How to Select			Parameter Display Size(Width)		and a first of the second s
Selecting a LCD If not in the list, select Custom from the combo box Select and add LCD information.			Display Size(Height)		
Selecting a connection type : Use serial connection (emWin)	~	/	Driver IC : IL	Driver IC : IL19341	Driver IC : ILI9341
Maker/Type : OKAYA			URL:	URL:	URL:
OKAYA OKAYA Kuongshun Electronic				ОК	OK Cancel
Custom					
Selecting the GUI drawing tool Select a tool to generate a GUI to display on the LCD).				
Use emWin					





Revision History

		Description	
Rev.	Date	Page	Summary
1.00	Oct.3.22	-	First edition issued.
1.10	Oct.31.22	Page 69	Added usage note.



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 is supplied until the 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.

Notice

- Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
- 2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
- 3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
- 4. You shall be responsible for determining what licenses are required from any third parties, and obtaining such licenses for the lawful import, export, manufacture, sales, utilization, distribution or other disposal of any products incorporating Renesas Electronics products, if required.
- 5. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
- Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The intended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.
 - "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.

"High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.

Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user's manual or other Renesas Electronics document.

- 7. No semiconductor product is absolutely secure. Notwithstanding any security measures or features that may be implemented in Renesas Electronics hardware or software products, Renesas Electronics shall have absolutely no liability arising out of any vulnerability or security breach, including but not limited to any unauthorized access to or use of a Renesas Electronics product or a system that uses a Renesas Electronics product. RENESAS ELECTRONICS DOES NOT WARRANT OR GUARANTEE THAT RENESAS ELECTRONICS PRODUCTS, OR ANY SYSTEMS CREATED USING RENESAS ELECTRONICS PRODUCTS WILL BE INVULNERABLE OR FREE FROM CORRUPTION, ATTACK, VIRUSES, INTERFERENCE, HACKING, DATA LOSS OR THEFT, OR OTHER SECURITY INTRUSION ("Vulnerability Issues"). RENESAS ELECTRONICS DISCLAIMS ANY AND ALL RESPONSIBILITY OR LIABILITY ARISING FROM OR RELATED TO ANY VULNERABILITY ISSUES. FURTHERMORE, TO THE EXTENT PERMITTED BY APPLICABLE LAW, RENESAS ELECTRONICS DISCLAIMS ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THIS DOCUMENT AND ANY RELATED OR ACCOMPANYING SOFTWARE OR HARDWARE, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE.
- 8. When using Renesas Electronics products, refer to the latest product information (data sheets, user's manuals, application notes, "General Notes for Handling and Using Semiconductor Devices" in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
- 9. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
- 10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
- 11. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
- 12. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
- This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
 Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas
- Electronics products. (Note1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries
- (Note2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

(Rev.5.0-1 October 2020)

Corporate Headquarters

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

www.renesas.com

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

Contact information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit: www.renesas.com/contact/.