

QE for Display [RX] Application Note

Summary

QE for Display [RX] 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 by using Aeropoint® GUI for RX, which is GUI middleware from CRI Middleware. This enables selecting the GUI drawing tool that best suits your needs.

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.

Earlier versions of QE for Display [RX] (up to V1.1.0) consisted of the display adjustment facilities provided for the graphics LCD controller (GLCDC) which is in several RX-family products and sample programs that were added to QE for Display [RX] to ease the adjustment of displays in user project.

QE for Display [RX] 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 the procedures for development with the use of QE for Display and tools with which its operation can be interlinked.

Target Devices

- RX65N and RX651 groups (ROM capacity: 1.5 MB to 2 MB)
- RX72N group
- RX72M group
- RX66N group

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

- Renesas Starter Kit+ for RX72N
- Renesas Envision KIT RPBRX72N
- Renesas Starter Kit+ for RX65N-2MB
- Renesas Envision KIT RPBRX65N

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



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1. Overview

As shown in Figure 1-1, the GLCDC has multiple blocks, so simply checking the display attributes requires an understanding of the GLCDC specifications and a large number of settings. However, QE for Display [RX] makes it possible to prepare an environment in which the connection of the display device can be checked in a short time without needing a full understanding of the GLCDC specifications. QE for Display [RX] is a tool that provides a graphical interface for display control and a facility for adjusting the timing in real time with the display device connected. After timing adjustment, a header file containing the corresponding information for display control is output. Settings for the GLCDC are then made on the basis of this header file.

The AppWizard GUI drawing tool or PowerPoint allows you to design an interactive 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 by using the API functions provided by the emWin library or Aeropoint GUI.

QE for Display [RX] 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], which serves as the nucleus.

- Firmware Integration Technology (GLCDC FIT) module for the graphics LCD controller
- emWin Firmware Integration Technology (emWin FIT) module
- Aeropoint GUI Firmware Integration Technology (Aeropoint GUI FIT) module

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



Figure 1-1 Block Configuration of the GLCDC



1.1 Flow of System Development with QE for Display [RX]

Figure 1-2 shows a flow of system development with the use of QE for Display [RX].



Figure 1-2 System Development by Using QE for Display [RX]



2. Operating Environment

The procedures described in this application note assume operation on the Renesas Starter Kit+ for RX72N (RSK RX72N), the Renesas Envision Kit RPBRX72N (Envision RX72N), the Renesas Starter Kit+ for RX65N-2MB (RSK RX65N) and the Renesas Envision Kit RPBRX65N (Envision RX65N). Table 2-1 shows the development environment for this application note.

Item	Contents	
Integrated development	Renesas Electronics	
environment	e ² studio 2021-04	
C compiler	Renesas Electronics	
	C/C++ Compiler Package for RX Family V.3.02.00	
	Compiler option	
	-lang = C99	

Table 2-2 to Table 2-5 list the conditions used in confirming operations on each of the boards.

Table 2-2	Conditions for Confirming Operation (RSK RX72N)
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ltem	Contents
MCU used	R5F572NNDDBD (RX72N Group)
Operating frequency	Main clock: 24 MHz
	• PLL: 240 MHz (main clock x 1/1 x 10)
	 System clock (ICLK): 240 MHz (PLL x 1/1)
	 Peripheral module clock A (PCLKA): 120 MHz (PLL x 1/2)
	 Peripheral module clock B (PCLKB): 60 MHz (PLL x 1/4)
	 LCD panel clock (LCD_CLK): 10 MHz (PLL x 1/24)
Endian	Little endian or big endian
Emulator	E2 Lite
Connection type	JTAG or FINE
Board used	Renesas Starter Kit+ for RX72N
	(product No.: RTK5572NNxxxxxxx)



Table 2-3 Conditions for Confirming Operation (Envision RX72N)

Item	Contents
MCU used	R5F572NNHDFB (RX72N Group)
Operating frequency	Main clock: 16 MHz
	 PLL: 240 MHz (main clock x 1/1 x 15)
	 System clock (ICLK): 240 MHz (PLL x 1/1)
	 Peripheral module clock A (PCLKA): 120 MHz (PLL x 1/2)
	 Peripheral module clock B (PCLKB): 60 MHz (PLL x 1/4)
	 LCD panel clock (LCD_CLK): 10 MHz (PLL x 1/24)
Endian	Little endian or big endian
Emulator	E2 OB (E2 emulator On Board)
Connection type	FINE
Board used	Renesas Envision KIT RPBRX72N
	(product No.: RTK5RX72N0CxxxxxBJ)
Board settings	<sw1></sw1>
(jumper/switch)	Pin 1: don't care
	Pin 2: OFF
	(The debugger is used.)
	<others></others>
	Default settings

Table 2-4 Conditions for Confirming Operation (RSK RX65N)

Item	Contents
MCU used	R5F565NEDDFC (RX65N Group)
Operating frequency	Main clock: 24 MHz
	• PLL: 240 MHz (main clock x 1/1 x 10)
	System clock (ICLK): 120 MHz (PLL x 1/2)
	Peripheral module clock A (PCLKA): 120 MHz (PLL x 1/2)
	Peripheral module clock B (PCLKB): 60 MHz (PLL x 1/4)
	LCD panel clock (LCD_CLK): 10 MHz (PLL x 1/24)
Endian	Little endian or big endian
Emulator	E2 Lite
Connection type	JTAG or FINE
Board used	Renesas Starter Kit+ for RX65N-2MB
	(product No.: RTK50565Nxxxxxxx)
Board settings	<sw4></sw4>
(jumper/switch)	Pin 3: OFF
	Pin 4: ON
	(The LCD is used.)
	<others></others>
	Default settings



Table 2-5 Conditions for Confirming Operation (Envision RX65N)

Item	Contents
MCU used	R5F565NEDDFB (RX65N Group)
Operating frequency	Main clock: 12 MHz
	• PLL: 240 MHz (main clock x 1/1 x 20)
	 System clock (ICLK): 120 MHz (PLL x 1/2)
	 Peripheral module clock A (PCLKA): 120 MHz (PLL x 1/2)
	 Peripheral module clock B (PCLKB): 60 MHz (PLL x 1/4)
	 LCD panel clock (LCD_CLK): 10 MHz (PLL x 1/24)
Endian	Little endian or big endian
Emulator	E2 OB (E2 emulator On Board)
Connection type	JTAG or FINE
Board used	Renesas Envision KIT RPBRX65N
	(product No.: RTK5RX65N2CxxxxBR)
Board settings	<sw1></sw1>
(jumper/switch)	Pin 1: ON
	Pin 2: OFF
	(The debugger is used.)
	<sw4></sw4>
	Pin 1: OFF
	Pin 2: don't care
	(The debugger is used.)
	<others></others>
	Default settings



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 Graphic LCD Controller Module Using Firmware Integration Technology	R01AN3609
RX Family emWin v.6.14g module Using Firmware Integration Technology	R01AN5533
RX Family Aeropoint Module Firmware Integration Technology	R01AN5793

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.
RX65N Group Renesas Starter Kit+ for RX65N-2MB User's Manual	R20UT3888
RX65N Group RX65N Envision Kit User's Manual	R01UH0761
RX72N Group Renesas Starter Kit+ for RX72N User's Manual	R20UT4443
RX72N Group RX72N Envision Kit User's Manual	R20UT4788

Table 3-4 Documents Related to Devices

Document Title	Document No.
RX65N Group, RX651 Group User's Manual: Hardware	R01UH0590
RX72N Group User's Manual: Hardware	R01UH0824

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] to adjust the display in real-time, designing the GUI, and displaying the resulting project.

The results of adjusting the display produced by the GLCDC and of emWin or Aeropoint GUI which enables the efficient creation of the GUI, are generated as FIT modules for embedding in the project by using the Smart Configurator. Since the settings for GLCDC and emWin or Aeropoint GUI can be made from the GUI of QE for Display [RX], the user can smoothly proceed with GUI development according to the workflow.

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

For the usage of QE for Display [RX], refer to chapter 6, Using QE for Display [RX].

Preparation

1. Installing QE for Display [RX]

Procedure

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



4.1 Installing QE for Display [RX]

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

4.1.1 Installing QE for Display [RX]

4.1.1.1 Updating the e² studio by using its installer

For updating the e² studio, refer to section 3, Updating Your Product, described in "[Upgraded to version] e² studio 2021-04" in Renesas Tool News (document No. R20TS0685EJ0100).

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

Select "QE for Display [RX]" 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] with the method described in section 4.1.1.3, Installing QE for Display [RX] by downloading the installer from the Web site.

Welcome	Renesas QE (1) Renesas Toolchains & Utilities (0) GCC Toolchains & Utilities (0)
Device Families Extra Features Customise Features Additional Software Licenses Shortcuts Summary Installing	Renesas QE QE for Capacitive Touch[RX] 1.1.0 Tools to assist in the configuration, tuning, and monitoring of touch interfaces QE for Display[RX] 2.1.0 Tools to assist with timing settings or the image quality of displays (for use with display controllers from Renesas) QE for TCP/IP (Technical Preview Edition) 1.0.1 Tools for checking communications problems originating in TCP/IP. (RX family from Renesas running the M3S-T4-Tiny TCP/IP protocol stack.) QE for USB (Technical Preview Edition) 1.2.1 Tools for solving problems at the beginning of USB system development
Results	QE for UART (Technical Preview Edition) 1.0.0 Tools for initial settings of UART communications and the debugging of communications p <



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

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

- 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] (v2.1.0)" checkbox and click on the "Finish" button.
- 5. Confirm that the "Renesas QE for Display[RX]" checkbox has been selected in the "Install" dialog box and click on the "Next" button.
- 6. Confirm that "Renesas QE for Display[RX]" 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] with the method described in section 4.1.1.3, Installing QE for Display [RX] by downloading the installer from the Web site.

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

Download QE from the following URL for installation.

• QE for Display V2.1.0: Development Assistance Tool for Display <u>https://www.renesas.com/qe-display#downloads</u>

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

- 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.
- 6. Expand the "Renesas QE" item shown in the "Install" dialog box, select the "Renesas QE for Display[RX]" 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]

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

- 1. Start the e² 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]" 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 e² studio by following the instructions on the screen.



Г

4.2 Creating a New Project

Create a project with the e^2 studio.

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

ile ile	vorkspace - e ² studio Edit Source Refactor Navigate	Search Project	t Renesas Views Run Window Help
	New	Alt+Shift+N >	
2	Open File Open Projects from File System Recent Files	>	C/C++ Project Project Convert to a C/C++ Project (Adds C/C++ Nature)
	Close Editor Close All Editors	Ctrl+W Ctrl+Shift+W	Source Folder Folder
	Save Save As Save All Revert	Ctrl+S Ctrl+Shift+S	 Source File Header File File from Template Class
10 m	Move Rename Refresh	F2 F5	Code Generator Example Other Ctrl+N
1	Convert Line Delimiters To Print Import	> Ctrl+P	configuration settings E's most fiercely contested preferences
5	Export Properties	Alt+Enter	tisting file m the filesystem
	Switch Workspace Restart Exit	>	



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

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



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

New Renesas CC-RX Executable Project New Renesas CC-RX Executable Project Project name: QE_for_Display_RX65N_Envision Image: Orginal Content of the system: C'ttest_e2studio_env/workspace/QE_for_Display_RX65N_Envision Image: Orginal Content of the system: default Working sets New Image: Working sets: New Select Select	9	
✓ Use default location Location: C:\test_e2studio_env\workspace\QE_for_Display_RX65N_Envision ✓ Create Directory for Project Choose file system: default Working sets ▲ Add project to working sets New		Ď
Location: C:\test_e2studio_env\workspace\QE_for_Display_RX65N_Envision Browse ✓ Create Directory for Project Choose file system: default Vorking sets Working sets New	Project name: QE_for_Display_RX65N_Envision	
	Location: C:\test_e2studio_env\workspace\QE_for_Display_RX65N_Envision Create Directory for Project Choose file system: default Working sets Add project to working sets	Ne <u>w</u>



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 board to be used in patients are exclusive advantaged in a board description file (DE)

If the board to be used is not among the available selections, downloading a board description file (BDF) is required when the Smart Configurator is set after the project has been created.

In such cases, select "Custom" for "Target Board:" and select the MCU to be used from "Target Device:".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".

 Table 4-1
 Correspondence between Target Board, Target Device, and Emulator

Target Board	Target Device	Emulator
EnvisionRX65N	R5F565NEDxFB	E2 Lite (RX)
RSKRX65N-2MB	R5F565NEDxFC	E2 Lite (RX)
EnvisionRX72N	R5F572NNHxFB	E2 Lite (RX)
RSKRX72N	R5F572NNDxBD	E2 Lite (RX)

Ö	– 🗆 X
New Renesas CC-RX Executable Project Select toolchain, device & debug settings	
Toolchain Settings Language: • C O C++ Toolchain: Renesas CCRX Toolchain Version: v3.02.00 Manage Toolchains RTOS: None RTOS Version:	
Device Settings Target Board: EnvisionRX65N Target Device: R5F565NEDxFB Unlock Devices Endian: Little Project Type: Default	Configurations Create Hardware Debug Configuration E2 Lite (RX) Create Debug Configuration RX Simulator Create Release Configuration
? < <u>B</u> ack Ne	xt >Einish Cancel



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

New Renesas CC-RX Executable Project	-	
Select Coding Assistant settings	4	
Use Peripheral Code Generator Download FIT Modules Smart Configurator is a single User Interface that combines the functionalities of Code Generator and Configurator which imports, configures and generates different types of drivers and middleware mod Smart Configurator encompasses unified clock configuration view, interrupt configuration view and profigurator view. Hardware resources conflict in peripheral modules, interrupts and pins occurred in different types of middleware modules will be notified. (Smart Configurator is available only for the supported devices)	ules. pin	
MCU Hardware		
< Back	Cancel	

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





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

Project Explorer 🛛 🗖 🗖		- 8
E 🔄 🏹 🖇 V 👺 QE_for_Display_RX65N_Envision	Overview information	🔁 🖻
> 🔊 Includes > 🔑 src	← General Information	?
 QE_for_Display_RX65N_Envi QE_for_Display_RX65N_Envi 		
	Board	
	Allow board and device selection	
	Clocks Applie Allow clock configuration Device Components Device Allow software component selection and configuration Device Pins Allow general pin configuration and pin configuration for selected software component	Aiddleware RTOS
۲	Interrupt Allow general interrupt configuration and interrupt configuration for selected software component Overview Board Clocks Components Pins Interrupts	~



4.3 Making the Board, Clock, and Heap Size Settings

If the name of the board which is to be used for creating a project is not among those available for selection, download the board description file (BDF) by using the Smart Configurator and set the board.

1. Select the "Board" tab of the Smart Configurator and click on "Download more boards...".

@ QE_for_Display_RX65N_Envision.scfg ⊠	
Device selection	👸 🚔
Device selection	è 4
Board: Custom User Board Device: R5F565NEHxFB Download more boards	
Overview Board Clocks Components Pins Interrupts	



2. Select the board description file for the board to be used and click on "Download".

	d Description File Download act the board description files for download					Ľ
	Title RX Cloud Kit for RX65N Board Description File Renesas Starter Kit+ for RX65N-2MB Board De Target Board for RX65N Board Description File Envision Kit for RX65N Board Description File Renesas Starter Kit+ for RX65N-1MB Board De	escrip	Document No. RBDF0021XJ0100 RBDF0001XJ0103 RBDF0016XJ0100 RBDF0015XJ0100 RBDF0003XJ0100	Rev. Rev.1.00 Rev.1.03 Rev.1.00 Rev.1.00 Rev.1.00	Issue date 2019-08-18 2019-05-25 2019-03-25 2019-03-25 2018-10-22	Select All Deselect All
Mo	dule Folder Path: C:\Users\ .eclipse\com.renesas.platfo	orm_dow	nload\Boards			Browse

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

8	End User License Agreement(Sample Code)	×
		~
	END USER LICENSE AGREEMENT	^
	This End User License Agreement (this "EULA") is between you, on behalf of yourself and the company or other entity on whose behalf you are acting (together, "you" and "your") and Renesas Electronics Corporation, a Japanese corporation, with a principal place of business at 6-2 Otemachi 2-chome, Chiyoda-Ku, Tokyo, Japan ("Renesas") and is effective from the date on which you click "I AGREE." In consideration of the mutual promises and covenants herein, you and Renesas hereby agree as follows:	1
	1. Definitions.	
	 1.1."Open Source Code" means certain free or open source software and other components incorporated into or bundled with the Software which is subject to the Open Source Terms. 1.2. "Open Source Terms" means the terms and conditions that are applicable to a given piece of Open Source Code. 1.3. "Software" means, collectively, the software in source code, binary or library form, 	∨ ree



4. Select the board. Click on the "Browse" button for "Board:".

Device selection I and I
Board: Custom User Board ~ Device: R5F565NEHxFB
Device: R5F565NEHxFB



5. Select the board to be used from "Target Board:" in the "Refactoring" dialog box and click on "Next".

Refactoring					_ D	×
Change Devic Select the new	e device for QE_for_Dis	play_RX65N_Envi	sion			2
Current Devices Custom	R5F565NEHxFB_DUA	L				
Target Board:	EnvisionRX65N				additional bo	~
Target Device:	R5F565NEDxFB			Download		
					<u>Unlock De</u>	vices
?		< <u>B</u> ack	<u>N</u> ext >	<u>F</u> inish	Cano	el:



6. Confirm the statement in the dialog box and click on "Next".

Refactoring
Change Device Review the information provided in the list below. Click 'Next >' to view the next item or 'Finish'.
Found problems 🔱 🏠
(a) This change cannot be undone. Please make sure you backup this project before continuing.
No context information available
< Back Next > Einish Cancel



7. Similarly confirm the statement and click on "Finish".

Refactoring -	
Change Device The following changes are necessary to perform the refactoring.	
Changes to be performed ✓ ✓	₽ 0 7 -
No preview available	¥
(?) < <u>B</u> ack <u>N</u> ext > <u>F</u> inish	Cancel

8. The board has now been selected.

Device selection	🕲 🖨
Device selection	è 2
Board: EnvisionRX65N (V1.00) V	
Device: R5F565NEDxFB Download more boards	
Download more boards	
Overview Board Clocks Components Pins Interrupts	



Make clock settings to suit the board to be used.

- 1. Select the "Clocks" tab of the Smart Configurator.
- Set the clock to be suitable for the board to be used. The signal at the PLL operating frequency is the clock source for the LCD panel. Here, suppose that the main clock is to be the clock source and set "Frequency Division" and "Frequency Multiplication" for the PLL circuit so that the PLL operating frequency will be 240 MHz.

Table 4-2 Setting Clocks

Evaluation Board	Frequency of the Main Clock	PLL Operating Frequency	Division and Multiplication to Obtain the PLL Frequency from the Main Clock
RSK RX72N	24 MHz	240 MHz	1/1 x 10
Envision RX72N	16 MHz	240 MHz	1/1 x 15
RSK RX65N	24 MHz	240 MHz	1/1 x 10
Envision RX65N	12 MHz	240 MHz	1/1 x 20





Specify the size of the heap to be used by the emWin FIT module or Aeropoint GUI FIT module in creating the GUI.

- 1. Select the "Components" tab and "r_bsp" as the component.
- Specify the required size for "Heap size". An emWin FIT module usually requires from several tens to 100 KB. Here, start by specifying "0x4000". For an Aeropoint GUI FIT module, start by specifying "0x400" as the default size. Increase the size as required.

ftware component con	figuration		ا 🚺
omponents 🍦 📄 🕀 🛟 🔻	Configure		0
te 😎	Property	Value	^
type filter text	✓ @ Configurations		
✓	# Startup select	Enable (use BSP startup)	
✓ → Generic	# User stack setting	2 stacks	
r_bsp	# User stack size	0x1000	
1,050	# Interrupt stack size	0x400	
	# Heap size	0x4000	
	# Initializes C input and output library functions	Enable	
	# Enable user stdio charget function	Use BSP charget() function	
	# User stdio charget function name	my_sw_charget_function	
	# Enable user stdio charput function	Use BSP charput() function	
	# User stdio charput function name	my_sw_charput_function	
	# Processor Mode	Stay in Supervisor mode	~
	< "		>
	Macro definition: BSP_CFG_HEAP_BYTES Heap size		^
	NOTE: This setting is available only when using CCRX and GN	JC.	



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

Start QE for Display [RX] and set the LCD in the order of "1. Preparation", "2. LCD Adjustment", and "3. GUI Creation on LCD" in the workflow view.

Start QE for Display [RX].

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

workspace - QE_for_Display_RX65N_En	vision/QE_for_Display_RX65N_Env	ision.scfg - e² studio
File Edit Navigate Search Project	Renesas Views Run Window	Help
🐔 🐐 🔳 掾 Debug	C/C++	🔹 📝 🕶 👘 😳 🕶 🖓 🕶 🕞
	Code Generator	
· · · · · · · · · · · · · · · ·	Debug	>
Project Explorer 🛛 🗖 🗖	Partner OS	> fg 🖾
🖻 🕏 🍸 🕴	Pin Configurator	>
> 👺 QE_for_Display_RX65N_Envision	Renesas QE	> 💭 LCD Main RX (QE)
	Smart Configurator	> 💭 Display Tuning RX (QE)
	Solution Toolkit	> 🞊 Measuring Current Consumption (QE)
	Tracing	>
	3 Renesas Software Installer	
	Allow board and device select	ion



4.4.1 Preparation

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

 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 the board other than one of those listed in Table 4-3, 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.

Table 4-3	Correspondences between "Evaluation Board", "LCD maker/Type", and "Model name/Size"
	our spondences between Evaluation board ; Eob maker rype ; and moder name/oize

Evaluation Board	LCD maker/Type	Model name/Size
RSKRX72N (V1.01)	Newhaven Display International, Inc.	NHD-4.3-480272EF-ATXL#-CTP
EnvisionRX72N (V1.02)	EastRising	ER-TFT043-3
RSKRX65N-2MB(1.03)	Newhaven Display International, Inc.	NHD-4.3-480272EF-ATXL#-CTP)
EnvisionRX65N (V1.00)	EastRising	ER-TFT043-3

2. Select "Use emWin" or "Use Aeropoint GUI" under "Selecting the GUI drawing tool".

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_RX65N_Envision <	Not added How to add	Not needed How to add
	LCD display adjustment Adjust on the board to display on the LCD. Adjustment for display on LCD : TCONUCCE string ally displayed to the selected project. Graphic layer setting Adjust image quality / color : Image quality adjustment	Initial setting of GUI drawing tool. Configure settings to use GUI drawing tool. GUI drawing tool setting : Info setting Generate file Select folder Generate GUI Generate GUI to display on LCD. Start GUI drawing tool Setting
Selecting the GUI drawing tool Select a tool to generate a GUI to display on the LCD. Not Use	Generate file Select folder Select emWin or Aeropoint GUI. Selecting the GUI drawing tool Select a tool to generate a GUI to display on the LCD. Use Aeropoint GUI	Implementation Implement a program to display GUI in the main() function. Show sample code



4.4.2 LCD Adjustment

Install the LCD controller by using the Smart Configurator.





- 1. Select the "Components" tab of the Smart Configurator and click on the "Add component" icon.
- 2. In the "New Component" dialog box, select "Graphics LCD Controller Module (r_glcdc_rx)" (version 1.50 or a later version) and click on the "Finish" button.

	1	Software Component Selection Select component from those available in list			
-					
🐡 *QE_for_Display_RX65N_Envision.	scfg 🖾	Category All			~
Coffuero component con	figuration	Function All			\sim
Software component con	riguration	Filter			
Components $\downarrow^a_Z \square \boxdot \Rightarrow$	Configure	Components	Туре	Version	
		Hash API for RX100, RX200, RX600. and RX700. (r_flash_rx)	Firmware Integration Te	4.50	
U	Property	Flash memory Data Manager (r_datfrx_rx)	Firmware Integration Te	2.01	
type filter text	v @ G	H Generic system timer for RX MCUs using CMT module. (r	Firmware Integration Te	1.01	
gpentertext	#	GLCDC configuration driver (r_simple_glcdc_config_rx)	Firmware Integration Te	0.81	
🗸 🗁 Startup		Graphic Library with Graphical User Interface (r_emwin_rx)	Firmware Integration Te	6.14.g.1.30	
🗸 🗁 Generic	#	Graphic Library with One-Stop Developent Solution (r_a		1.00	
📝 r bsp	#	Graphics LCD Controller Module. (r_glcdc_rx)	Firmware Integration Te	1.50	
	#	Group Scan Mode S12AD	Code Generator	1.9.2	
	#	12C Master Mode	Code Generator	1.9.1	
	#	L2C Slave Mode	Code Generator	1.8.3	\checkmark
	#	Show only latest version			
	#	Hide items that have duplicated functionality			
	#	Description			
	#	Dependency : r_bsp version(s) 5.20, 5.50, 5.52, 5.61			~
	#	The GLCDC FIT module provides the method to output image	data read from memory to t	he LCD panel.	
	#				
	<				~
	Macro de	Download more software components			
	Heap size	Configure general settings			
	NOTE: Th				



3. If the LCD controller module is not displayed in the list of components in the "New Component" dialog box, click on "Download more software components".



- 4. In the "FIT Module Download" dialog box, remove the check against "Show RX Driver Package only" and select "RX Family Graphic LCD Controller Module" (Rev. 1.50 or a later revision).
- 5. Click on "Download".

Sele	ct the FIT modules for download					
	Title	Document No.	Rev.	Issue date	^	Select All
	RX Family CAN API Using Firmware Integration Te	R01AN2472EU0500	Rev.5.00	2021-04-01		Deselect All
	RX Family MPC Module Using Firmware Integratio	R01AN1724EJ0380	Rev.3.80	2021-04-01		Deselect All
	RX Family GPIO Module Using Firmware Integratio	R01AN1721EJ0390	Rev.3.90	2021-04-01		
	RX Family emWin v.6.14g module Using Firmware	R01AN5533EJ0130	Rev.1.30	2021-03-31		
	RX Family Aeropoint module Using Firmware Integ	R01AN5793EJ0100	Rev.1.00	2021-03-31		
\checkmark	RX Family Graphic LCD Controller Module Using Fi	R01AN3609EJ0150	Rev.1.50	2021-03-09		
	RX Family ADC Module Using Firmware Integratio	R01AN1666EJ0470	Rev.4.70	2021-03-01		
	RX Family Board Support Package Module Using Fi	R01AN1685EJ0563	Rev.5.63	2021-01-29		
	RX family TSIP (Trusted Secure IP) Module Firmwar	R20AN0548EJ0111	Rev.1.11	2020-12-31		
	RX Family Clock Synchronous Control Module for	R01AN2325F10302	Rev.3.02	2020-12-20	~	
Filte	ered:	\mathbf{i}				
	Show RX Driver Package only					
Мо	dule Folder Path:					
	C:\Users\ \.eclipse\com.renesas.platform_dow	nload\FITModules				Browse

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

End User License Agreement(Sample Code)	×
END USER LICENSE AGREEMENT This End User License Agreement (this "EULA") is between you, on behalf of yourself and the company or other entity on whose behalf you are acting (together, "you" and "your") and Renesas Electronics Corporation, a Japanese corporation, with a principal place of business at 6-2 Otemachi 2-chome, Chiyoda-Ku, Tokyo, Japan ("Renesas") and is effective from the date on which you click "I AGREE." In consideration of the mutual promises and covenants herein, you and Renesas hereby agree as follows:	^
 Definitions. 1.1. "Open Source Code" means certain free or open source software and other components incorporated into or bundled with the Software which is subject to the Open Source Terms. 1.2. "Open Source Terms" means the terms and conditions that are applicable to a given piece of Open Source Code. 1.3. "Software" means, collectively, the software in source code, binary or library form, and the software in source code. 	∨ ree



7. When "Graphics LCD Controller Module (r_glcdc_rx)" is displayed in the list of components, select it and click on the "Finish" button.

	Component Selection nponent from those available in list		Ð	
Category	All			~
Function	All			~
Filter				
Compon	ents ^	Туре	Version	^
	API for RX100, RX200, RX600. and RX700. (r_flash_rx)	Firmware Integration Te	4.50	
	memory Data Manager (r_datfrx_rx)	Firmware Integration Te	2.01	
	ric system timer for RX MCUs using CMT module. (r	Firmware Integration Te	1.01	
🖶 GLCD	C configuration driver (r_simple_glcdc_config_rx)	Firmware Integration Te	0.81	
🖶 Graph	nic Library with Graphical User Interface (r_emwin_rx)	Firmware Integration Te	6.14.g.1.30	
🖶 Graph	nic Library with One-Stop Developent Solution (r_a	Firmware Integration Te	1.00	
· · · · ·	nics LCD Controller Module. (r_glcdc_rx)	Firmware Integration Te	1.50]
	p Scan Mode S12AD	Code Generator	1.9.2	
	laster Mode	Code Generator	1.9.1	
12C SI	ave Mode	Code Generator	1.8.3	~
Show of	only latest version			
🗹 Hide it	ems that have duplicated functionality			
Descriptio	n			
	ncy : r_bsp version(s) 5.20, 5.50, 5.52, 5.61 DC FIT module provides the method to output image (data read from memory to th	ne LCD panel.	^
Download	I more software components			
<u>Configure</u>	general settings			
?	< Back Ne	xt > Einish	Cancel	



8. If you selected a board when creating the project, pins for use by the GLCDC are also set in response to adding the component for the GLCDC. You can confirm the settings of pins by selecting "Graphic - LCD controller" on the "Pins" tabbed page. If you are using a custom board, make the settings of pins on this tabbed page.



9. Click on the "Generate Code" button 词 in the upper-right corner of the Smart Configurator window. The code is generated according to the settings.

After code generation is finished, "Added" is displayed immediately below "Installing the LCD controller".

		2. LCD adjustment	
📃 Console 🔀	🖹 🛃 🔛 🚽 🗉 🖛	Installing the LCD Controller Install GLCDC and specify PIN connection.	
Smart Configurator Output			
M04000001: File generated:src\smc	gen\r pincfg\r pinset.h	Added How to	add
M05000012: File generated:src\smc	gen\r pincfg\Pin.h		
M05000012: File generated: src\smc	gen\r pincfg\Pin.c	LCD display adjustment	
M06000002: File generated: <u>src\smc</u>		Adjust on the board to display on the LCD.	
M06000002: File generated: <u>src\smc</u>		Adjustment for display on LCD :	
	<u>gen\r_config\r_bsp_interrupt_config.h</u>	Adjustment for display on ECD .	
M00000002: Code generation is suc		TCON/LCD setting	
M03000004: File modified: <u>src\smc</u>	gen\r config\r bsp config.h	×	
<		> Timing adjustment	

After that, adjust the LCD.

Clicking on the "TCON/LCD setting", "Timing adjustment", "Graphic layer setting", and "Image quality adjustment" buttons opens the "Display Tuning RX (QE)" views of QE for Display [RX] which correspond to each button and allows changing of the settings. In addition, clicking on the "Start Display Adjustment" button in each "Display Tuning RX (QE)" view allows adjustment of the display with real-time confirmation on the actual display.

For details, refer to the help system entries for the "Display Tuning RX (QE)" views.






If you are using any of the following boards, default values are set on the "Timing Adjustment" tabbed page according to the specifications of the LCD panel incorporated in the given board. Since the values are set when the "Display Tuning RX (QE)" view is opened, be sure to open this view even if changes to the default settings are not required.

- RX72N RSK
- RX65N RSK
- RX72N Envision Kit
- RX65N Envision Kit

💭 Display Tuning RX (QE) 🔀	🖾 ୶ 📔 🖏 😋 🛄
Start Display Adjustment	
Maker/Type : EastRising	V Model Name/Size : ER-TFT043-3
Block Image TCON/LCD Setting	Timing Adjustment Graphic Layer Setting Image Quality Adjustment
Timing Adjustment	
PLL Circuit Frequency [MHz]:	240.000000 Panel Clock Frequency[MHz] : 10.000000 V Auto Adjustment
	HTP
VPW 1	
VBP 7 VPW	
VDP 272	И И И И И И И И И И И И И И И И И И И
VFP 8	
VTP 288 💼	
HPW 14 HBI	P 75
Defe	Value Typical Difference esh Rate [Hz] 59.5 59.5 0.0
	al Frequency [kHz] 17.1 17.1 0.0



The following values are automatically set when the panel clock frequency is 10 MHz in the RSK RX72N, RSK RX65N, Envision RX72N, or Envision RX65N.

Table 4-4	Example of Timing Settings when the Panel Clock Frequency is 10 MHz (for RSK RX72N
a	nd RSK RX65N)

Connected Device	Item	Value
NHD-4.3-480272EF-ATXL#-CTP	VPW	10
	VBP	2
	VDP	272
	VFP	2
	VTP	286
	HPW	41
	HBP	29
	HDP	480
	HFP	34
	HTP	584

Table 4-5Example of Timing Settings when the Panel Clock Frequency is 10 MHz (for Envision
RX72N and Envision RX65N)

Connected Device	Item	Value
ER-TFT043-3	VPW	1
	VBP	7
	VDP	272
	VFP	8
	VTP	288
	HPW	14
	HBP	75
	HDP	480
	HFP	15
	HTP	584

If you are using a custom board, set the values on the "Timing Adjustment" tabbed page such that no errors appear in the display.

Here, modify the values so that values for the horizontal frequency that are in error produce normal results after having modifying the value for the panel clock frequency.



10. Click on "Timing adjustment".

11. The "Display Tuning RX (QE)" view of QE for Display [RX] opens. If a value has an error, an error mark **4** is displayed. Modify the value so this error mark disappears.





QE for Display [RX] Application Note

RX Family

12. If you are using e² studio 2021-01 or an earlier version for the development environment, confirm that the value of "PLL Circuit Frequency [MHz]" matches the setting for the clock in the Smart Configurator. If you are using e² studio 2021-01 or a later version, you need not confirm the value of "PLL Circuit Frequency [MHz]" since that value is automatically obtained by the Smart Configurator.

After that, adjust the value of "Panel Clock Frequency [MHz]", which is displayed in red to indicate that it is in error.

Here, select "10.000000", which is the nearest available value to the 9.0 MHz panel clock frequency for the LCD, from the combo box.

💭 *Display Tuning RX (QE) 🛛	🖾 < 📓 🖏 🖍 🛄 🖇 🗁 🗖
Start Display Adjustment 🛛 🕕	e ² studio 2021-01 or an earlier version
Maker/Type : EastRising	✓ Model Name/Size: ER-TFT043-3 ✓
Block Image TCON/LCD Setting Timing Ad	djustment Graphic Layer Setting Image Quality Adjustment
Timing Adjustment	
PLL Circuit Frequency [MHz]: 240.00000	0 Panel Clock Frequency[MHz] : 9.000000 V Auto Adjustment
VPW 1	
🚅 *Display Tuning RX (QE) 🛛	🖾 📢 🔝 😪 🖓 🕐 🛄 🕴 🖓
Start Display Adjustment 🕕	Î.
Maker/Type : EastRising	V Model Name/Size : ER-TFT043-3 V
	ljustment Graphic Layer Setting Image Quality Adjustment
Timing Adjustment	0 Panel Clock Frequency[MHz] : 10.000000 V Auto Adjustment
PEE circuit requercy [winz]. 240.0000	
VPW 1	
💭 *Display Tuning RX (QE) 🛛	🖾 < 🔄 🖓 🗘 🗖 🗧
Start Display Adjustment 🛛 \rm 😈	e ² studio 2021-01 or a later version
Maker/Type : EastRising	✓ Model Name/Size : ER-TFT043-3 ✓
	ijustment Graphic Layer Setting Image Quality Adjustment
Timing Adjustment	
PLL Circuit Frequency [MHz]: 240.00000	0 Panel Clock Frequency[MHz] : 9.000000 V Auto Adjustment
VPW 1	
🖵 *Display Tuning RX (QE) 🛛	si 🕶 📢 💽 🖏 🕐 🛄 🖇 🖓
Start Display Adjustment 🛛 🕕	^
Maker/Type : EastRising	✓ Model Name/Size : ER-TFT043-3 ✓
	djustment Graphic Layer Setting Image Quality Adjustment
Timing Adjustment	
PLL Circuit Frequency [MHz]: 240.00000	00 Panel Clock Frequency[MHz] : 10.000000 V Auto Adjustment
VPW 1 🜩	



13. Setting the value of the panel clock frequency to 10.0 MHz makes the value of "Horizontal Frequency [kHz]" incorrect, so it is displayed in red.

Hovering the mouse cursor over the erroneous value (the value of "Horizontal Frequency [kHz]") displayed in red produces a display of the range of specifiable values.

Hovering the mouse cursor over the label ("Horizontal Frequency [kHz]") for the erroneous value produces a display of a description of how to eliminate the error.





14. Clicking on the "Auto Adjustment" button to the right of "Panel Clock Frequency [MHz]" automatically sets each value so that the refresh rate and the horizontal frequency are within the range of specifiable values at the specified panel clock frequency.

Once there are no errors, the "Auto Adjustment" button becomes inactive.





The settings of the LCD can be adjusted by the GUIs for the display adjustment facilities while confirming the results on the actual display. The following shows an example of the adjustment of brightness from the "Image Quality Adjustment" tabbed page.

- 15. Build a project with reference to section 4.5, Building the Project.
- 16.Make the settings for the debugger and connect the board with reference to section 4.6, Connecting a Debugger and Executing the Program.
- 17. Click on the "Start Display Adjustment" button.

💭 Display Tuning RX (QE) 🛛	🖼 📢 📴 🛱 🍋 📃
Start Display Adjustment	^
Maker/Type: EastRising V Mod	el Name/Size : ER-TFT043-3
Block Image TCON/LCD Setting Timing Adjustment Graphic Layer S	Setting Image Quality Adjustment
Timing Adjustment	
PLL Circuit Frequency [MHz]: 240.000000 Panel Clock Frequency	[MHz] : 10.000000 🗸 Auto Adjustment

- 18. In the "Select a Program" dialog box, click on the "Start adjustment" button after selecting either of the following:
- "Use the dedicated adjustment program.": when setting up the state of the GLCDC for the LCD panel has not been completed
- "Use user program.": when setting up the state of the GLCDC for the LCD panel has been completed If the board has not been connected to the debugger, clicking on "Start adjustment" starts the connection.

Execute a program you will be using to produce a display on the screen and adjust the position and image quality by confirming the display on the screen on the actual board. Select the program for producing a display on the screen. Use the dedicated adjustment program. Use user program. * Before starting adjustment, confirm that the created project has been built and the call of the main() function is possible. * If you are using the user program, confirm drawing on the LCD as well as the above items. GLCDC pin setting The pins used in GLCDC are assigned to the following ports. Function Port number LCD_CLK PB5
The pins used in GLCDC are assigned to the following ports. Function Port number LCD_CLK PB5
The pins used in GLCDC are assigned to the following ports. Function Port number LCD_CLK PB5
Function Port number
LCD_CLK PB5
LCD_TCON0 PB4
LCD_TCON2 PB2
LCD_TCON3 PB1
LCD_DATA0 PB0
٢ >



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

🛐 Conf	irm Perspective Switch	×
2	This kind of launch is configured to open the Debug perspective when it suspends. This Debug perspective supports application debugging by providing views for displaying the debug stack, variables and breakpoints. Switch to this perspective?	
<u>R</u> em	ember my decision <u>S</u> witch <u>N</u> o	

20. When the board is connected to the debugger and adjustment of the display is started, the "Start Display Adjustment" button is replaced by the "Finish Display Adjustment" button and the message "Display adjustment is ready." appears in the console of QE for Display. When the console of QE for Display is not displayed, click on the "Display Selected Console" icon (

💭 Display Tuning RX (QE) 🛛	🔜 🕶 🔋 🖳 🔁
Finish Display Adjustment	Please tune the display. Do not restart or reset the program.
Maker/Type : EastRising	V Model Name/Size : ER-TFT043-3
Block Image TCON/LCD Setting Timing	Adjustment Graphic Layer Setting Image Quality Adjustment
Timing Adjustment	
PLL Circuit Frequency [MHz]: 240.00	0000 Panel Clock Frequency[MHz] : 10.000000 V Auto Adjustment
VPW 1 -	
🗐 Console 🐹 🖹 Problems 🆓 Smart Browser 🐐 Debug	
QE for Display Prepare for display adjustment.	1 FSP
Connecting to the debugger.	2 QE for Display
Executing user program. A dedicated adjustment program is being prepared.	3 QE_for_Display_RX65N_Envision HardwareDebug [Renesas GDB Hardware Debugging] gdb traces 4 QE_for_Display_RX65N_Envision HardwareDebug [Renesas GDB Hardware Debugging]
Display adjustment is ready.	4 QE_for_Display_RX65N_Envision HardwareDebug [Renesas GDB Hardware Debugging]



21.Select the "Image Quality Adjustment" tabbed page in the "Display Tuning RX (QE)" view, then select "Brightness" from the menu to the left.

💭 Display Tuning RX (QE)	8 🔜 🖬 📢 🖪 😭 🖓 🖓
Finish Display Adjus	Istment Please tune the display. Do not restart or reset the program.
Maker/Type : EastRising	Model Name/Size : ER-TFT043-3
Calibration Route Setting Brightness	
Contrast Gamma correction Dither process	Quick Setting :
	Custom : BRTG[9:0] (Green) 512 BRTB[9:0] (Blue) 512 BRTR[9:0] (Red) 512 512 ST2

22.Modify the value for the gauge of "Quick Setting:" or the values of "Custom:" and click on the "Set the Register" icon ().

The values are set in the registers and can be confirmed on the display of the connected board. Repeat modification of the values and settings of the registers until the display is as expected. The display can be confirmed by showing an image. For details on displaying an image, refer to section 6.7, Image-Downloading Facility.

💭 Display Tuning RX (QE)	x 📢 🖓 😭 🖓 🖓 🖄 🖓
Finish Display Adjus	tment Please tune the display. Do not restart or reset the program.
Maker/Type : EastRising	V Model Name/Size : ER-TFT043-3 V
Block Image TCON/LCD Se Calibration Route Setting Brightness Contrast Gamma correction Dither process	etting Timing Adjustment Graphic Layer Setting Image Quality Adjustment Brightness 0 1023 Quick Setting : 750 1023
	Custom : BRTG[9:0] (Green) 750

23. After you have finished adjusting the values, click on the "Finish Display Adjustment" button.

💭 Display Tuning RX (QE) 🛛	🛃 « 🗟 😭	
Finish Display Adjustment	Please tune the display. Do not restart or reset the program.	^
Maker/Type : EastRising	V Model Name/Size : ER-TFT043-3	~
Block Image TCON/LCD Setting Timing	g Adjustment Graphic Layer Setting Image Quality Adjustment	
Calibration Route Setting Brightness Brightness		
Contrast Gamma correction		



24. The board is disconnected from the debugger and the "Start Display Adjustment" button is restored to replace the "Finish Display Adjustment".

The message "Tuning finished." appears in the console of QE for Display.

🖳 Display Tuning RX (QE) 🔀		- 🐼 📢	N	6 🗇	000	
Start Display Adjustment						^
Maker/Type : EastRising	Model Name/Size : ER-TFT04	13-3			\sim	
Block Image TCON/LCD Setting Timing Adjustment Grap	nic Layer Setting Image Quality A	djustment				
Calibration Route Setting Brightness Contrast Gamma correction						
📃 Console 🔀 👔 Problems 👒 Smart I	Browser 🔺 Debug					
QE for Display						
Prepare for display adjustment. Connecting to the debugger. Executing user program.						
A dedicated adjustment program is Display adjustment is ready.	being prepared.					
Tuning finished.						
*						



25. Header files reflecting the results of adjusting the display are then output.

Click on the "Generate file" button to output r_image_config.h and r_lcd_timing.h. They are output to src immediately under the project folder by default. The output destination folder can be changed by selecting the "Select folder" checkbox.

💭 LCD Main RX (QE) 🔀 陷 Project Explorer 🛛 🖻 🕏 🍸 🕴 Workflow Diagram 2. LCD adjustment 1. Preparation > 🐰 Binaries > 🗊 Includes Selecting a project Installing the LCD Controller 🗸 🔁 src > 📂 smc_gen Added How to add QE_for_Display_RX65N_Envision \sim C QE_for_Display_RX65N_Envision.c h r_image_config.h Selecting an evaluation board LCD display adjustment h r_lcd_timing.h > 📂 HardwareDebug Evaluation board : EnvisionRX65N (V1.00) Adjustment for display on LCD : > 🗁 trash TCON/LCD setting How to Select @ QE_for_Display_RX65N_Envision.scfc QE_for_Display_RX65N_Envision Har Selecting a LCD Timing adjustment Custom from the combo box d LCD in Graphic layer setting Maker/Type EastRising Adjust image quality / color : Model name/Size : Image quality adjustment ER-TFT043-3 Selecting the GUI drawing tool e LCD. Generate file Use emWin Select folder \sim

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

Note: If the GUI drawing tool is changed from emWin to Aeropoint GUI or vice versa after the LCD controller (GLCDC FIT module) has been installed as described in section 4.4.2, LCD Adjustment, a warning message will be displayed to prompt output of the file again since the settings of the GLCDC FIT module differ between emWin and Aeropoint GUI.

In such cases, reflect the changes of the settings of the GLCDC FIT module as shown below.

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_RX65N_Envision <a> 	Added 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. Evaluation board : EnvisionRX65N (V1.00) How to Select Selecting a LCD If not in the list, select Custom from the combo box Select and add LCD information. Maker/Type : EastRising Model name/Size : ER-TFT043-3	LCD display adjustment Adjust on the board to display on the LCD. Adjustment for display on LCD : TCON/LCD setting Timing adjustment Graphic layer setting Adjust image quality / color : Image quality adjustment	Initial setting of GUI drawing tool Configure settings to use GUI drawing tool. GUI drawing tool setting : Info setting Generate file Select folder Generate GUI Generate GUI to display on LCD. Start GUI drawing tool Setting
Selecting the GUI drawing tool Select a tool to generate a GUI to display on the LC Use Aeropoint GUI	Generate file	Implementation Implement a program to display GUI in the main() function. Show sample code



The settings of the GLCDC FIT module for emWin or Aeropoint GUI are reflected when the "Display Tuning RX (QE)" view is opened. Open this view by clicking on a button such as "TCON/LCD setting".

After that, click on the "Generate file" button to output the file again. After the file has been output, the changed settings are reflected and the warning message disappears.





4.4.3 Using emWin to Create a GUI for an LCD

This section describes how to install the GUI drawing tool when "Use emWin" is selected for "Selecting the GUI drawing tool".

For the method when "Use Aeropoint GUI" is selected, refer to section 4.4.4, Using Aeropoint GUI to Create a GUI for an LCD.

1. Preparation	2. LCD adjustment		3. GUI creation on I	LCD
selecting a project elect the project that has been created.	Installing the LCD controller Install GLCDC and specify PIN connection.		Installing the GUI drawing Install GUI drawing tool driver.	ig tool driver
QE_for_Display_RX65N_Envision <	Added	ow 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. Evaluation board : EnvisionRX65N (V1.00) How to Select Selecting a LCD If not in the list, select Custom from the combo box Select and add LCD information. Maker/Type : EastRising	LCD display adjustment Adjust on the board to display on the LCD. Adjustment for display on LCD : TCON/LCD setting Timing adjustment Graphic layer setting	Ņ	Initial setting of GUI dra Configure settings to use GUI draw GUI drawing tool setting Info setting Generate file Generate GUI Generate GUI to display on LCD.	ving tool.
Model name/Size : ER-TFT043-3	Adjust image quality / color : Image quality adjustment		Start GUI drawing tool	Setting
Selecting the GUI drawing tool Select a tool to generate a GUI to display on the LCD.	Generate file	ect folder	Implementation Implement a program to display Gl function. Show sample code	UI in the main()



- 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 6.14.g.1.30 or a later version) and click on the "Finish" button.

	Software Component Selection Select component from those available in list		
			-
🕸 *QE_for_Display_RX65N_Envision.scfg 🛛	Category All		· · · · · · · · · · · · · · · · · · ·
CL_IOI_DISplay_IOCOIA_EIMISIONISCIG 🗠			
Software component configuration	Function All		``````````````````````````````````````
	Filter		
Components ↓ª □ □ □ → Compure	Components	Туре	Version ^
		Code Generator	
🕲 🍯 🖉 Dreparty	Group Scan Mode S12AD Graphics LCD Controller Module. (r glcdc rx)		1.9.2 1.50
Property	Graphic Library with One-Stop Developent Solution (r_a	Firmware Integration Te Firmware Integration Te	
type filter text 🗸 🏶 Ca	Graphic Library with One-Stop Developent Solution (r_a		
V 🕞 Startup #	GLCDC configuration driver (r_simple_glcdc_config_rx)	Firmware Integration Te	
	Generic system timer for RX MCUs using CMT module. (r	2	
	Flash memory Data Manager (r datfrx rx)	Firmware Integration Te	
💣 r_bsp 🗰 #	Flash API for RX100, RX200, RX600, and RX700, (r flash rx)		
#	File driver for HTTP Server and FTP Server (r t4 file drive		1.02
	Event Link Controller	Code Generator	1.6.1
#		<u> </u>	~
#	Show only latest version		
#	Hide items that have duplicated functionality		
#	Description		
#	Dependency : r_cmt_rx version(s) 4.40		^
#	Dependency : r_dmaca_rx version(s) 2.40 Dependency : r_drw2d_rx version(s) 1.10		
	Dependency : r_glcdc_rx version(s) 1.40		
	Download more software components		
Macro de	Configure general settings		
Heap size			
NOTE: Th			



3. If the graphic library is not displayed in the list of components in the "New Component" dialog box, click on "Download more software components".

📴 New Co	mponent				×
Software	Component Selection				
Select con	ponent from those available	in list		1	
Category	All				\sim
					*
Function	All				\sim
Filter					
	. ^		-		^
Compor			Туре	Version	-
8-Bit		h.l. (Code Generator	1.7.0	
	Socket API to TCP/IP(T4) Mod M compress/de-compress co		Firmware Integration Te Firmware Integration Te	1.32 3.04	
	I Support Packages. (r_bsp)	odec software library (Firmware Integration Te		
Buse			Code Generator	1.8.2	
	based circular buffer library. ((r. bytea)	Firmware Integration Te	1.80	
	API for the RX64M, RX65N, R		Firmware Integration Te		
	Frequency Accuracy Measur		Code Generator	1.8.1	
	Synchronous Control Modul		Firmware Integration Te	3.01	
	Synchronous Control Modul	le for Serial Flash mem	Firmware Integration Te	3.02	
Show (only latest version				Ť
	ems that have duplicated fun	ectionality			
Descriptio		ictionality			
· · ·		1. (1. 6 . 1. 4)	C Li a Liut (Th	(D)	
	vare component generates tv prise two 8-bit counter chan			IK) module	
		····, ···· , ····			
					\sim
<u>Download</u>	more software components				
Configure	general settings				
?					
0		< <u>B</u> ack <u>N</u> ex	<t> <u>F</u>inish</t>	Cance	21



- 4. In the "FIT Module Download" dialog box, remove the check against "Show RX Driver Package only" and select "RX Family emWin v6.14 module" (Rev.1.30 or a later version).
- 5. Click on "Download".

FIT I	Module Download					
Sele	ect the FIT modules for download					Ľ
	Title	Document No.	Rev.	Issue date	^	Select All
	RX Family CAN API Using Firmware Integration Te	R01AN2472EU0500	Rev.5.00	2021-04-01		Deselect All
	RX Family MPC Module Using Firmware Integratio	R01AN1724EJ0380	Rev.3.80	2021-04-01		Descreet An
	RX Family GPIO Module Using Firmware Integratio	R01AN1721EJ0390	Rev.3.90	2021-04-01		
	RX Family emWin v.6.14g module Using Firmware	R01AN5533EJ0130	Rev.1.30	2021-03-31		
	RX Family Aeropoint module Using Nerware Integ	R01AN5793EJ0100	Rev.1.00	2021-03-31		
	RX Family Graphic LCD Controller Module Using Fi	R01AN3609EJ0150	Rev.1.50	2021-03-09		
	RX Family ADC Module Using Firmware Integratio	R01AN1666EJ0470	Rev.4.70	2021-03-01		
	RX Family Board Support Package Module Using Fi	R01AN1685EJ0563	Rev.5.63	2021-01-29		
	RX family TSIP (Trusted Secure IP) Module Firmwar	R28AN0548EJ0111	Rev.1.11	2020-12-31		
	RX Family Clock Synchronous Control Module for	R01AN/225F10302	Rev.3.02	2020-12-20	~	
	ered: Show RX Driver Package only					
Mo	dule Folder Path:		\sim			
	C:\Users\ \.eclipse\com.renesas.platform_dow	nload\FITModules				Browse
	,					

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

🛐 End Use	ser License Agreement(Sample Code)	×
yourse "you" with a Japan consid	END USER LICENSE AGREEMENT End User License Agreement (this "EULA") is between you, on behalf of self and the company or other entity on whose behalf you are acting (together, " and "your") and Renesas Electronics Corporation, a Japanese corporation, a principal place of business at 6-2 Otemachi 2-chome, Chiyoda-Ku, Tokyo, n ("Renesas") and is effective from the date on which you click "I AGREE." In ideration of the mutual promises and covenants herein, you and Renesas by agree as follows:	^
1.1."O compo Source 1.2."O piece o	finitions. Open Source Code" means certain free or open source software and other onents incorporated into or bundled with the Software which is subject to the Open ce Terms. Open Source Terms" means the terms and conditions that are applicable to a given of Open Source Code. Software" means, collectively, the software in source code, binary or library form, Marce Disagr	V



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.

🙆 New Co	mponent		-		×
Software	Component Selection				-
	ponent from those availab	le in list			
Category	All				~
Function	All				~
Filter					
Compor	ents		Туре	Version	^
	Scan Mode S12AD		Code Generator	1.9.2	
	nics LCD Controller Module	. (r_glcdc_rx)	Firmware Integration Te	1.50	
Grap	nic Library with One-Stop D	evelopent Solution (r. a	Firmware Integration Te	1.00	
S			Firmware Integration Te		0
	C configuration driver (r_si		Firmware Integration Ie		
	•	•	Firmware Integration Te	1.01	
	memory Data Manager (r_c		Firmware Integration Te Firmware Integration Te		
	river for HTTP Server and FI		-	1.02	
	Link Controller		Code Generator	1.6.1	_
Show (nly latest version				*
	ems that have duplicated fu	inctionality			
Descriptio		anctionality			
· · · · ·	ncy : r_cmt_rx version(s) 4.4	40			^
Depende	ncy : r_dmaca_rx version(s)	2.40			
	ncy : r_drw2d_rx version(s) ncy : r_glcdc_rx version(s)				~
	more software component				¥
	general settings	<u>15</u>			
configure	general settings				
?		< <u>B</u> ack <u>N</u> e	xt > <u>F</u> inish	Cano	cel



8. Components the added component having dependencies with is 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 shows the error message for a component that has not been added (r_drw2d_rx) and warning messages regarding the version of a component (r_bsp).

-	-			
compone 🎼 🔁 🕇 🕇	Configur			
ت ن	Prope			
type filter text	-			
🗸 🗁 Startup				
🗸 🗁 Generic				
💱 r_bsp				
✓				
🗸 📂 DMA				
🐕 r_dmaca_rx				
Pr_dmaca_rx ✓ ⇒ I/O Ports				
✓ 🕞 I/O Ports				
✓ ➢ I/O Ports Sr_gpio_rx				
 ✓				
 ✓ ⇒ I/O Ports [®] r_gpio_rx ✓ ⇒ Communications [©] r_sci_iic_rx 		Sconfiguration Problems 🔀	T	000
 ✓ → I/O Ports Program Communications Provide a communication for the second sec	<	1 error, 3 warnings, 0 others	Ţ	000
 ✓ → I/O Ports ☆ r_gpio_rx ✓ → Communications ☆ r_sci_iic_rx ✓ → Graphics ✓ r_glcdc_rx 	<		Туре	000
 ✓ → I/O Ports P-gpio_rx ✓ → Communications P-sci_iic_rx ✓ → Graphics ✓ r_glcdc_rx ✓ → Timers 	<	1 error, 3 warnings, 0 others		000
 > [/O Ports P.gpio_rx Communications r_sci_iic_rx Graphics r_glcdc_rx Fimers r_cmt_rx 	¢	1 error, 3 warnings, 0 others Description		000
 > [/O Ports P-gpio_rx Communications r_sci_iic_rx Graphics r_glcdc_rx Fimers r_cmt_rx Middleware 	¢	1 error, 3 warnings, 0 others Description V S Dependency (4 items)	Туре	000



Add the required component (r_drw2d_rx).

- 9. Select the "Components" tab and click on the "Add component" icon.
- 10. In the "New Component" dialog box, select "Drawing 2D engine driver for RX MCUs (r_drw2d_rx)" and click on the "Finish" button.

If the component is not in the list of components in the "New Component" dialog box, click on "Download more software components".

			Component Selection		4	
		Select com	ponent from those available in list			-
齡 *QE_for_Display_RX65N_Envision	usefa 🕾	Category	All			~
		Function	All			~
Software component cor	nfiguratio	Filter				
Compone 🎼 🔁 🕀 🖶	Configur	Compon	~	Туре	Version	^
🔪 🐱	Prope		Link Controller net Driver. (r. ether. rx)	Code Generator	1.6.1	
type filter text	@		het Driver, (r_ether_rx) Iriver (r dtc rx)	Firmware Integration Te Firmware Integration Te	1.20 3.50	
type inter text	.984		r for LCD attached each RSK. (r st7735 lcd driver rx)		1.00	
🗸 🗁 Startup			ng 2D engine driver for RX MCUs (r_drw2d_rx)	Firmware Integration Te		
🗸 🗁 Generic			C driver (r_dmaca_rx)	Firmware Integration Te	2.50	1
💕 r_bsp			Controller	Code Generator	1.6.2	
✓			-time Compensation Counter	Code Generator	1.8.1	
V 🕞 DMA			Transfer Controller	Code Generator	1.8.2	
🐕 r_dmaca_rx			Operation Circuit	Code Generator	1.8.2	
V 🕞 I/O Ports			nly latest version			¥
🖈 r_gpio_rx			· · · · · · · · · · · · · · · · · · ·			
✓ → Communications		Descriptio	ems that have duplicated functionality			
💕 r_sci_iic_rx						_
✓			ncies : None 2D engine(DRW2D) driver for RX MCUs			^
💣 r_glcdc_rx						
V 🕞 Timers	<					\sim
😰 r cmt rx	-	Download	more software components			
✓ 🔂 Middleware		Configure	general settings			
✓ ⊕ Generic						
r_emwin_rx						



Update the component to the required version (r_bsp_rx).

11. Right-click on the component for r_bsp and select "Change version".

*QE_for_Display_RX65N_Envision.s Software component conf		
v i DMA Services Ren	Configure Property	
V 🕞 I/O Ports	et to default io vnload and import sample projects io tio tio tio tio tio tio tio	

12.Confirm "Available versions" in the "Change Version" dialog box and click on "Next". 13.Confirm "Setting Overview" and click on "Finish".

Change Version	– 🗆 X	Change Version	$ \Box$ >
/ersion Selection		Setting Overview	
Select available version		The following settings will be added or removed	
Component name: r_bsp		Setting	Status
Current version: 5.50		There are no differences	
Available versions: 5.52	~		
		<	
? < <u>Back</u> <u>Next</u> >	Einish Cancel	? < <u>Back</u> <u>N</u> ext >	<u>F</u> inish Cancel

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

Confirm to change version and proceed to generate code
<u>Y</u> es <u>N</u> o



15. When the confirmation message is displayed in the "Code Generation" dialog box, click on "Yes".



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

Compone $\downarrow_Z^a \models \clubsuit \clubsuit$	Configure		(i)
type filter text	Property	Value	
 ✓ Generic Y _bsp ✓ B Drivers ✓ B DMA 			
 [™] r_dmaca_rx 			
P:_sci_iic_rx ✓ Graphics r_glcdc_rx / Timers	<		>
 ♥ r_cmt_rx ✓ ఊ Middleware ✓ ఊ Generic 			^
💣 r_drw2d_rx			



Set the IIC channel which is to be used with emWin.

- 17.Select "r_sci_iic_rx" from the components.
- 18. Change the setting for the IIC channel which is to be used with emWin. Specify the value of "MCU supported channels for CHn" of the channel to be used as "Supported".

Table 4-6 IIC Channel Numbers to be Used (Initial Values)

Evaluation Board	IIC Channel Number
RSK RX72N	11
Envision RX72N	6
RSK RX65N	7
Envision RX65N	6





19. When a board is selected in the creation of a project, setting the IIC channel to be used with emWin also sets the pins for use with the channel. Select "Serial communications interface" on the "Pins" tabbed page to confirm the settings of the pins. Set the pins here if you are using a custom board.

Hardware Res 🕕 📄 🎝 🛃	Pin Functio	n	સ	🔢 🔛 🗠 🖂
Type filter text	type filter	text (* = any str		All ~
🗸 🦓 8-bit timer 🔥 🔨	Enabled	Function	Assignment	Pin Number
TMR0		SSCL5	Not assigned	Not assigne
TMR1		SSCL6	P01/TMCl0/RXD6/SMISO6/SSCL6/IRQ9/AN	1 / 7
TMR2		SSCL7	Not assigned	Not assigne
TMR3		SSCL8	Not assigned	Not assigne
Compare match timer \		SSCL9	Not assigned	Not assigne
CMTW0		SSCL10	Not assigned	Not assigne
		SSCL11	Not assigned	Not assigne
✓ ₩ Serial communications SCI0		SSCL12	Not assigned	Not assigne
SCI1		SSDA0	Not assigned	Not assigne
SCI2		SSDA1	Not assigned	Not assigne
SCI3		SSDA2	Not assigned	Not assigne
SCI4		SSDA3	Not assigned	Not assigne
SCI5		SSDA4	Not assigned	Not assigne
SCI6		SSDA5	Not assigned	Not assigne
SCI7	\checkmark	SSDA6	POO/TMRIO/TXD6/SMOSI6/SSDA6/IRQ8/AN	
		SSDA7	Not assigned	Not assigne

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

		3.	. GUI creation on LCD	
⊒ Console 🛛	🗟 📑 🖻 📑 🚍 🔻 I		talling the GUI drawing tool driver	
mart Configurator Output		Insta	all GUI drawing tool driver.	
05000012: File generated:src\smc gen\r pincfg\	Pin.h	^ L.	How to a	
05000012: File generated: <u>src\smc gen\r pincfg\</u>		Add	ded How to a	aa
06000002: File generated: <u>src\smc gen\general\r</u>	smc interrupt.c			
06000002: File generated: <u>src\smc gen\general\r</u>			itial setting of GUI drawing tool	
06000002: File generated:src\smc gen\r config\	r bsp interrupt config.h	Cor	nfigure settings to use emWin.	
00000002: Code generation is successful			Il drowing tool patting :	
03000004: File modified: <u>src\smc gen\r co</u> nfig\r	bsp config.h	GU	JI drawing tool setting :	
		¥	Info setting	
C		>	into 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.

For "Maximum memory size used in GUI", "81920 bytes" (80 * 1024) is set by default. However, if you create a graphical GUI, 102400 bytes (100 * 1024) or more are usually required.

For "IIC channel number", the channel number must match that specified as "Supported" by the "r_sci_iic_rx" component in the Smart Configurator.

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.

	📵 emWin setting		:
	Board settings Board	RX65N_ENVISION_KIT	
	LCD width	480	
	LCD height	272 ORIENTATION_0	DRIENTATION_CW
	LCD settings LCD rotation	ORIENTATION_0	
3. GUI creation on LCD	Color depth per pixel	16bits A	\triangleright
Installing the GUI drawing tool driver Install GUI drawing tool driver.	Pin settings ✓ LCD reset pin	Port 6 Bit 3	
Added How to add	 ✓ LCD backlight pin ✓ LCD touch IC reset pin 	Port: 6 Bit 6 Port: 0 V Bit 7 V	1
Initial setting of GUI drawing tool Configure settings to use GUI drawing tool.	Memory settings Address of frame buffer 1		4
GUI drawing tool setting :	Address of frame buffer 1 Address of frame buffer 2 Maximum memory size used in GUI		DRIENTATION_CCW
Generate file Select folder	Touch setting Slave address of touch panel	0x38	
Generate GUI Generate GUI to displey on LCD. Start GUI drawing tool Setting	Multi-touch setting Multi-touch function Maximum number of touch panel points	[LCD rotation] Not Use 10	
Implementation Implement a program to display GUI in the main() function.	Communication channel IIC channel number	6	
Show sample code		ОК	ancel <u>H</u> elp



QE for Display [RX] Application Note

RX Family

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.





25. If the address of the frame buffer which has been set in the "emWin setting" dialog box overlaps with section addresses, the section address must be changed.

If the default value has been set, since the address of frame buffer 2 (0x00000100) means that the buffer overlaps with addresses of the SU and subsequent sections (from 0x00000004) in the RX65N RSK and RX65N Envision, the section address must be changed. However, it does not require changing in the RX72N RSK and RX72N Envision.

		Address	Section Name	
		0x0000004	SU	
			SI	
			B_1	
emWin setting			R_1	
			B_2	
oard settings			R_2	
oard	RX65N_ENVISION_KIT		В	Add Section
			R	New Overlay
2D width	480	0xFFE00000	C_1	Remove Section
CD height	272		C_2	
, , , , , , , , , , , , , , , , , , ,	1		C	Move Up
D settings			C\$*	Move Down
CD rotation	ORIENTATION_0		D*	
-las danth	16bits ~		W*	
olor depth	TODITS		L	
n settings			P*	
LCD reset pin	Port: 6 Bit: 3	0xFFFFF80	EXCEPTVECT	
i coreset pin		0xFFFFFFFC	RESETVECT	
LCD backlight pin	Port: 6 Bit: 6			
LCD touch IC reset pin	Port: 0 v Bit: 7 v			
LCD touch ic reset pin		Override Linke	er Script	
lemory settings				Browse
ddress of frame buffer 1	0x00800000			
dress of frame buffer 2	0x00000100	Imp	ort Export Re-Apply	
ximum memory size used in GUI	81920			OK Cancel

 Table 4-7
 Addresses of Frame Buffers (Initial Values)

Evaluation Board	Address of Frame Buffer 1	Address of Frame Buffer 2
RSK RX72N	0x00800000	0x00840000
Envision RX72N		
RSK RX65N	0x00800000	0x0000100
Envision RX65N		

Table 4-8	Examples of the Change of	Addresses of the SU and	Subsequent Sections
-----------	---------------------------	-------------------------	---------------------

Evaluation Board	Address of Section
RSK RX72N	0x00000004 (initial value)
Envision RX72N	
RSK RX65N	0x00840000
Envision RX65N	



26. Select "Properties" under the "Project" menu to open the "Properties" window.

Select "Settings" in the "Properties" window then "Section" in the "Tool Settings" tabbed page. Click on the "Browse" button for "Section (-start)".





27. Change the section address so that the addresses do not overlap with those of the frame buffer. Here, it is changed from "0x00000004" to "0x00840000". Click on the "OK" button.



28. Change the compiler options to make the drawing engine work properly.

Select "Settings" in the "Properties" window then "Object" on the "Tool Settings" tabbed page. Select the "Allocates const qualified variables to 4-byte boundary alignment sections (-nostuff=C)" checkbox. Click on the "Apply and Close" button for "Settings" in the "Properties" window.





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

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

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





31. 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.



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

3. GUI creation on LCD		Elle Edit Pro Add o bjects				– Gilkor Proporties	o x
Installing the GUI drawing too Install GUI drawing tool driver.	<u>l driver</u>			-~	\sim°		
Added	How to add	Screen	Box	Button			
Initial setting of GUI drawing Configure settings to use GUI drawing too		Text	Slider	Rotary	Switch		
GUI drawing tool setting :							
Info setting			Window	QRCode	Gauge		
Generate file	Select folder	Keyboard					
Generate GUI Generate GUI to display on LCD.		Hierarchic tree				Trinacióne D ± T	
Start GUI drawing tool	Setting					v/- Est (Enitter Skinal Job Receiver Comment	
Implementation							
Implement a program to display GUI in the function.	ə main()	Text	}	Fonts	T:		
Show sample code		Images	3	Variables	(x)		

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.



33. 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).



34. In the AppWizard project, the board to be used, display size, and color depth per pixel have automatically been specified.

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.

🌉 AppWizard V1.06a_6.14a - aw		
File Edit Project Resource Help		
Add objec Edit Options Play F5 Screen Box Button Image		
Edit project properties	×	
Display size x: 480 🛟		
Display size y: 272 🛟		
Color format: 16 Bit, GUICC_M565		
Selected BSP: None	Select BSP	
Show text from SD-card: 💻 🚛		
Enable bi-directional text:		
Enable Thai support:		
	Ok Cancel	



35.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.





36. 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.





37.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 8.4, Points for Caution on the Image Drawing Speed.





38.Add a button. Clicking on the "Button" button adds "Button ID_BUTTON_00". The position and size are adjusted in "Editor" or "Properties".





39. Set images to indicate when the button is and is not being pressed. Expand "Set bitmaps" in "Properties" and click on the square under "Unpressed". Select a desired image from "Select image for mode <Unpressed>" and click on "Select".




40. The selected image is set as "Unpressed". Set the image for "Pressed" in the similar way.

AppWizard V1.06a_6.14a - aw Eile Edit <u>P</u> roject <u>R</u> esource <u>H</u> elp		– 🗆 X
Add objects	Editor Q 1:1 O	Properties 14 D_BUTTON_00 Position: 215 111 Size: 50 50
Screen Box Button Image Abc Image Text Slider Rotary Switch		
Edit Window GRCode Gauge		
Keyboard Hierarchic tree		Top: Width: Left: 111 Right: 50 \$ 215 \$ Bottom: 480 \$ Height: 272 \$ 50 \$
Diject Id Object Id ▼ Screen D_SCREEN_00 Imase D_MAGE_00 Button D_BUTTON_00	Interactions	Set text colors Set background colors Set bitmaps Unpressed Pressed Disabled
Text Fonts Tt Images Variables		Set bitmap alignment Set auto repeat Set toggle mode Set text Set text Set text alignment
		▶ Set font

41. After having set images for both the "Unpressed" and "Pressed" states, set the bitmap format applied to the image. Click on "Images".

Steps 41 to 43 are not necessary if you are using AppWizard V1.08_6.14d or a later version. If this is the case, go to step 44. For details, refer to 8.4.2, Setting the Bitmap Format in AppWizard.

AppWizard V1.06a_6.14a - aw		– 0 ×
Eile Edit Project Resource Help Add objects	Editor	Properties
		14 D_BUTTON.00 A Position: 215 111 Size: 50 50
Screen Box Button Image		
Text Slider Rotary Switch		
Edit Window QRCode Gauge		
Keyboard	Interactions	Image: Top: Image: Width: Left: III C Right: 50 € 215 © Bottom: 0 © Height: 50 €
Hierarchic tree		0
Cbject 13	+/- Edit [Emitter Signal Job Receiver Comment +	Set text colors Set background colors Set bitmaps X
		Unpressed Pressed Disabled
Text Fonts Tt Images Variables		
		Set bitmap alignment Set auto repeat Set togela mode



42. Click on the item in the "Format" column of an image entry and select the bitmap format. Select "True color with alpha, RB swap, alpha inverted" for the bitmap format of the button and "High color (565), RB swap" for that of the image.

Image	Name	Width	Height	Stock	Prj.	Ref	Format		Add
	Button_round_basic_color_green_0_40.png	40	40		•		Auto		Cleanup
\bigcirc	Button_round_basic_color_green_1_40.png	40	40		•		uto	■ .	
	Simple_blue_green_gradient_480x272.jpg	480	272		•		Auto		
								Apply	C <u>l</u> ose
AppV	Vizard	?	×						
Please se	elect desired bitmap format:								
True es	olor with alpha, RB swap, alpha	inverte	BI 🔻						
mue cu			_						



43. After having set the bitmap formats for all images, click on "Apply".

Image	Name	Width	Height	Stock	Prj.	Ref	Format	A <u>d</u> d
	Button_round_basic_color_green_0_40.png	40	40		•		True color with alpha, RB swap, alpha inverted	Cleanup
	Button_round_basic_color_green_1_40 png	40	40		•		True color with alpha, RB swap, alpha inverted	
	Simple_blue_green_gradient_480x272.jpg	480	272		•		High color (565), RB swap	
							•	



44. Clicking on the "Start play mode" button located at the upper right confirms the operation of the created GUI in the preview. By clicking on the button in the preview, you can confirm that the image changes according to the settings made for "Unpressed" and "Pressed". Clicking on the "Esc" button closes the preview.





45. 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.





46. 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].

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

	Show sample code	×
3. GUI creation on LCD	Sample code of main() function:	
Installing the GUI drawing tool driver Install GUI drawing tool driver.	 ************************************	^
Added How to add	"NOTE: THIS IS A TYPICAL EARWIPLE	
Initial setting of GUI drawing tool Configure settings to use emWin. GUI drawing tool setting : Info setting Generate file	<pre>#include "Generated/Resource.h" void main(void) { // your codes APPW_C_Stup(); APPW_DPW_PROJECT_PATH); APPW_CreateRoot(APPW_INITIAL_SCREEN, WM_HBKWIN); while (1) { while (GUI_Exec1()) { APPW_Exec(); } } </pre>	
Generate GUI Generate GUI to display on LCD. Start GUI drawing tool Setting	APPW_Exec(); GUI_Delay(S); } }	Ū
Implementation Implement a program to display AUI in the main() function.	< Copy to the clipboard	>
Show sample code	ОК	<u>H</u> elp

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





4.4.4 Using Aeropoint GUI to Create a GUI for an LCD

This section describes how to install the GUI drawing tool when "Use Aeropoint GUI" is selected for "Selecting the GUI drawing tool".

For the method when "Use emWin" is selected, refer to section 4.4.3, Using emWin to Create a GUI for an LCD.

1. Preparation	2. LCD adjustment		3. GUI creation on I	LCD
electing a project elect the project that has been created.	Installing the LCD control Install GLCDC and specify PIN conne		Installing the GUI drawing Install GUI drawing tool driver.	ng tool driver
QE_for_Display_RX65N_Envision	Added	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. Evaluation board : EnvisionRX65N (V1.00) How to Select Selecting a LCD If not in the list, select Custom from the combo box Select and add LCD information. Maker/Type :	LCD display adjustment Adjust on the beard to display on the Adjustment for display on TCON/LCD setting Timing adjustment Graphic layer setting		Initial setting of GUI dra Configure settings to use GUI draw GUI drawing tool setting Info setting Generate file	wing tool.
EastRising V Model name/Size : ER-TFT043-3 V	Adjust image quality / colo Image quality adjustment	or :	Generate GUI Generate GUI to display on LCD. Start GUI drawing tool	Setting
Selecting the GUI drawing tool Select a tool to generate a GUI to display on the LCD. Use Aeropoint GUI	Generate file	Select folder	Implement a program to display G function. Show sample code	UI in the main()



QE for Display [RX] Application Note

- 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 One-Stop Development Solution (r_aeropoint_rx)" (version 1.00 or a later version) and click on the "Finish" button.





3. If the graphic library is not displayed in the list of components in the "New Component" dialog box, click on "Download more software components".

🙆 New Co	omponent		_		×
Software	Component Selection				ala -
Select con	nponent from those available in list				
Category	All				\sim
Function	All				\sim
Filter					
Compon	nents ^		Туре	Version	^
🖶 8-Bit	Timer		Code Generator	1.7.0	
🗄 Add S	Socket API to TCP/IP(T4) Module. (r_socket_n	x)	Firmware Integration Te	1.32	
H ADPC	CM compress/de-compress codec software lik	brary (Firmware Integration Te	3.04	
Board	d Support Packages. (r_bsp)		Firmware Integration Te	5.62	
Buses			Code Generator	1.8.2	
	based circular buffer library. (r_byteq)		Firmware Integration Te	1.80	
	API for the RX64M, RX65N, RX66N, RX66T, RX	(71M,	Firmware Integration Te	3.20	
	Frequency Accuracy Measurement Circuit		Code Generator	1.8.1	
	Synchronous Control Module for EEPROM A		-	3.01	
Clock	Synchronous Control Module for Serial Flash	h mem	Firmware Integration Te	3.02	~
	only latest version				
Hide it	ems that have duplicated functionality				
Descriptio					
that com Download	ware component generates two units (unit 0, prise two 8-bit counter channels, totaling for i more software components general settings			IR) module	< >
?	< <u>B</u> ack	<u>N</u> ex	tt > <u>F</u> inish	Canc	el



- 4. In the "FIT Module Download" dialog box, remove the check against "Show RX Driver Package only" and select "RX Family Aeropoint module" (Rev.1.00 or a later version).
- 5. Click on "Download".

EIT I	Module Download					
Sele	ect the FIT modules for download					
	Title	Document No.	Rev.	Issue date	^	Select All
	RX Family CAN API Using Firmware Integration Te	R01AN2472EU0500	Rev.5.00	2021-04-01		Deselect All
	RX Family MPC Module Using Firmware Integratio	R01AN1724EJ0380	Rev.3.80	2021-04-01		Deselect All
	RX Family GPIO Module Using Firmware Integratio	R01AN1721EJ0390	Rev.3.90	2021-04-01		
	RX Family emWin v.6.14g module Using Firmware	R01AN5533EJ0130	Rev.1.30	2021-03-31		
	RX Family Aeropoint module Using Firmware Integ	R01AN5793EJ0100	Rev.1.00	2021-03-31		
	RX Family Graphic LCD Controller Module Using Fi	R01AN3609EJ0150	Rev.1.50	2021-03-09		
	RX Family ADC Module Using Firmware Integratio	R01AN1666EJ0470	Rev.4.70	2021-03-01		
	RX Family Board Support Package Module Using Fi	R01AN1685EJ0563	Rev.5.63	2021-01-29		
	RX family TSIP (Trusted Secure IP) Module Firmwar	R20AN0548EJ0111	Rev.1.11	2020-12-31		
	RX Family Clock Synchronous Control Module for	R01AN2325FJ0302	Rev.3.02	2020-12-20	~	
Filt	ered:					
L	Show RX Driver Package only					
Мо	dule Folder Path:					
	C:\Users\ \.eclipse\com.renesas.platform_dow	vnload\FITModules				Browse

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

End User License Agreement(Sample Code)	×
END USER LICENSE AGREEMENT This End User License Agreement (this "EULA") is between you, on behalf of yourself and the company or other entity on whose behalf you are acting (toge "you" and "your") and Renesas Electronics Corporation, a Japanese corporati with a principal place of business at 6-2 Otemachi 2-chome, Chiyoda-Ku, Tokyu Japan ("Renesas") and is effective from the date on which you click "I AGREE, consideration of the mutual promises and covenants herein, you and Renesas hereby agree as follows:	on, o, " In
 Definitions. 1.1."Open Source Code" means certain free or open source software and other components incorporated into or bundled with the Software which is subject to the O Source Terms. 1.2."Open Source Terms" means the terms and conditions that are applicable to a gipiece of Open Source Code. 1.3."Software" means, collectively, the software in source code, binary or library form 	ven



7. When "Graphic Library with One-Stop Development Solution (r_aeropoint_rx)" is displayed in the list of components, select it and click on the "Finish" button.

Select component from those available in list Category All Function All Filter
Function All Filter Type Version Image: Flash API for RX100, RX200, RX600. and RX700. (r_flash_rx) Firmware Integration T 4.50 Image: Flash API for RX100, RX200, RX600. and RX700. (r_flash_rx) Firmware Integration T 4.50 Image: Flash memory Data Manager (r_datfrx_rx) Firmware Integration T 2.01 Image: Flash memory Data Manager (r_datfrx_rx) Firmware Integration T 2.01 Image: Flash memory Data Manager (r_datfrx_rx) Firmware Integration T 2.01 Image: Flash memory Data Manager (r_datfrx_rx) Firmware Integration T 2.01 Image: Flash memory Data Manager (r_datfrx_rx) Firmware Integration T 0.81 Image: Guestic Library with Graphical User Interface (r envin rx) Firmware Integration T 0.81 Image: Graphic Library with One-Stop Developent Solution (r_a Firmware Integration T 1.00 Image: Graphics LCD Controller Module. (r_glcd_rx) Firmware Integration T 1.00 Image: Graphic Library with One-Stop Developent Solution (r_a Firmware Integration T 1.02 Image: Graphic Library with One-Stop Developent Solution (r_a Firmware Integration T 1.02 Image: Graphic Library Mode Code G
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I2C Master Mode Code Generator 1.9.1 # I2C Slave Mode Code Generator 1.8.3 # Interrupt Controller Code Generator 2.0.1 # JPEG Decoder for Renesas MCUs. (r_jpegd_nx) Firmware Integration T 2.06 # JPEG Encoder for Renesas MCUs. (r_jpege_nx) Firmware Integration T 1.01 # Low Power Consumption Code Generator 2.0.1 # MEMDRV Driver (r_memdrv_nx) Firmware Integration T 1.02 # Memory Driver Interface for Open Source FAT File Syste Firmware Integration T 2.20 # MMC Mode MMCIF Driver (r_mmcif_nx) Firmware Integration T 1.07 V Show only latest version V Hide items that have duplicated functionality V
I2C Slave Mode Code Generator 1.8.3 # Interrupt Controller Code Generator 2.0.1 # JPEG Decoder for Renesas MCUs. (r_jpegd_rx) Firmware Integration T 2.06 # JPEG Encoder for Renesas MCUs. (r_jpege_rx) Firmware Integration T 1.01 # Low Power Consumption Code Generator 2.0.1 # MEMDRV Driver (r_memdrv_rx) Firmware Integration T 1.02 # Memory Driver Interface for Open Source FAT File Syste Firmware Integration T 2.20 # MMC Mode MMCIF Driver (r_mmcif_rx) Firmware Integration T 1.07 V Show only latest version V Hide items that have duplicated functionality V
Interrupt Controller Code Generator 2.0.1 Image: PEG Decoder for Renesas MCUs. (r_jpegd_rx) Firmware Integration T 2.06 Image: PEG Decoder for Renesas MCUs. (r_jpege_rx) Firmware Integration T 1.01 Image: Decoder for Renesas MCUs. (r_jpege_rx) Firmware Integration T 1.01 Image: Decoder for Renesas MCUs. (r_jpege_rx) Firmware Integration T 1.01 Image: Decoder for Renesas MCUs. (r_jpege_rx) Firmware Integration T 1.02 Image: Decoder for Renesas MCUs. (r_jpege_rx) Firmware Integration T 1.02 Image: Decoder for Comparison for the for Open Source FAT File Syste Firmware Integration T 2.20 Image: MMC Mode MMCIF Driver (r_mmcif_rx) Firmware Integration T 1.07 V Image: Show only latest version Firmware Integration T 1.07 V
Firmware Integration T 2.06 Firmware Integration T 2.06 Firmware Integration T 1.01 Code Generator 2.0.1 MEMDRV Driver (r_memdrv_rx) Memory Driver Interface for Open Source FAT File Syste MMC Mode MMCIF Driver (r_mmcif_rx) Show only latest version Hide items that have duplicated functionality
Break
H Low Power Consumption Code Generator 2.0.1 Firmware Integration T Code Generator 2.0.1 Firmware Integration T Code Generator 1.02 Firmware Integration T 2.20 Firmware Integration T Show only latest version Hide items that have duplicated functionality
 Hemory Driver Interface for Open Source FAT File Syste Firmware Integration T 2.20 Firmware Integration T 1.07 MMC Mode MMCIF Driver (r_mmcif_rx) Show only latest version Hide items that have duplicated functionality
Image: MMC Mode MMCIF Driver (r_mmcif_nx) Firmware Integration T 1.07 Show only latest version Image: Mide items that have duplicated functionality
 ✓ Show only latest version ✓ Hide items that have duplicated functionality
Hide items that have duplicated functionality
Description Dependency : r_cmt_rx version(s) 4.70 Dependency : r_glcdc_rx version(s) 1.50 Dependency : r_gpio_rx version(s) 3.60
Dependency : r_sci_iic_rx version(s) 2.46 Download more software components Configure general settings



8. Components the added component having dependencies with is 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 shows the error message for a component that has not been added (r_sci_iic_rx and r_sys_time_rx) and warning messages regarding the version of a component (r_cmt_rx).

ompo 🎝 📄 🕀 📫 🕇 🔻	Config		
ت ک	Prc		
type filter text	~		
🗸 🗁 Startup			
V 🗁 Generic			
💣 r_bsp			
🗸 🗁 Drivers			
🗸 🗁 I/O Ports			
💱 r_gpio_rx			
💱 r_mpc_rx			
🗸 🗁 Graphics			
💣 r_glcdc_rx			
🗸 🗁 Timers		Sconfiguration Problems	
😜 r_cmt_rx			
Pr_cmt_rx ✓ ☆ Middleware	<		
 [™] r_cmt_rx ✓ → Middleware ✓ → → Generic 	<	1 error, 1 warning, 0 others	Ture
Participation of the second secon	<	Description	Туре
 [™] r_cmt_rx ✓ → Middleware ✓ ☆ → Generic 	<	^ ^	Type Dependency



Add the required component.

- 9. Select the "Components" tab and click on the "Add component" icon.
- 10.In the "New Component" dialog box, select "Simple IIC Driver (r_sci_iic_rx)" and click on the "Finish" button. Also add the "r_sys_time_rx" component in the same way.

If the component is not in the list of components in the "New Component" dialog box, click on "Download more software components".

	Categor	y All			\sim
	Functio				~
	Filter				-
QE_for_Display_RX65N_Envision.	Comp	onents	Туре	Version	^
ar dr_loi_bisplay_locosid_crivision.	scig g	Mode SDSI Driver (r_sdsi_rx)	Firmware Integration T	2.02	
Software component cor		ple CMT driver for creating timer tick. (r_cmt_rx)	Firmware Integration T	4.70	
software component cor	🖶 Sim	ple DNS Client (r_t4_dns_client_rx)	Firmware Integration T	1.04	
	# Sim	ple FTP Server (r_t4_ftp_server_rx)	Firmware Integration T	1.04	
Compo $ _{Z}^{a} \boxdot \textcircled{H} \Rightarrow$	Config	ple graphic configuration driver (r_simple_graphic_rx)	Firmware Integration T	0.80	
	🖶 Sim	ple HTTP Server (r. t4. http://server.rx)	Firmware Integration T	1.05	
ک ک	Prc 🗄 Sim	ple IIC Driver. (r_sci_iic_rx)	Firmware Integration T	2.46	
	🕀 Sim	ple SNTP Client (r_t4_sntp_client_rx)	Firmware Integration T	1.00	
type filter text		gle Scan Mode S12AD	Code Generator	2.2.0	
✓ → Startup		art Card Interface Mode	Code Generator	1.9.0	
V 🗁 Generic		Clock Synchronous Mode (3-wire method)	Code Generator	1.9.2	
		Operation Mode (4-wire method)	Code Generator	1.7.2	
r_bsp		TCP/IP functions for Renesas MCUs. (r_t4_rx)	Firmware Integration T	2.09	
✓ → Drivers		igned 32-bit circular buffer library. (r_longq) basic(low-level) driver (r_usb_basic)	Firmware Integration T Firmware Integration T	1.80 1.30	
✓ ⇒ I/O Ports		Host Communication Device Class (r usb hcdc)	Firmware Integration T	1.30	
💁 r_gpio_rx		Host Human Interface Device Class (I_usb_head)	Firmware Integration T		
💁 r_mpc_rx					*
✓ (⇒ Graphics		only latest version			
r_glcdc_rx		items that have duplicated functionality			
	Descript				_
V 🔁 Timers		dency : r_bsp version(s) 5.50 Cl simple I2C mode fit module provides a method to tr	ansmit and receive data bet	ween the	$^{\circ}$
💱 r_cmt_rx		and slave devices using the serial communications int			
✓ → Middleware	< in com	pliance with single master mode of the NXP I2C-bus (I	nter-IC-Bus) interface.		\vee
🗸 🔂 Generic	Downlo	ad more software components			
		re general settings			



Update the component to the required version (r_cmt_rx).

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



12.Confirm "Available versions" in the "Change Version" dialog box and click on "Next". 13.Confirm "Setting Overview" and click on "Finish".

Change Version	- 0	×	Change Version	- 0
Version Selection			Setting Overview	
Select available version			The following settings will be added or removed	
Component name: L_cmt_rx			Setting	Status
Current version: 4.40			There are no differences	
Available versions: 4.70		~		
			<	
(?) < Back Next >			? < Back Next > Einish	
(?) < <u>Back</u> <u>Next</u> >	Einish Can		(?) < <u>Back</u> Next > <u>Finish</u>	Cano



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



15. When the confirmation message is displayed in the "Code Generating" dialog box, click on "Yes".

Code Generating	×
The generated code may have runtime problem because of configuration conflictions. Do you want to continue?	
<u>Y</u> es	<u>N</u> o

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

	Te e		
omponen 🎼 🔁 🖬 📫 🕇	Configure		0
ت ت	Property	Value	^
type filter text	✓ [⊕] Configurations		
🗸 🗁 Startup 📃 🔨	# Startup select	Enable (use BSP startup)	
✓ → Generic	# User stack setting	2 stacks	
r_bsp	# User stack size	0x1000	
✓ ▷→ Drivers	# Interrupt stack size	0x400	
✓ → I/O Ports	# Heap size	0x400	
r_gpio_rx	# Initializes C input and output library functions	Enable	
r_mpc_rx	# Enable user stdio charget function	Use BSP charget() function	
✓ (⇒ Communications	# User stdio charget function name	my_sw_charget_function	
r_sci_iic_rx	# Enable user stdio charput function	Use BSP charput() function	
V 🗁 Graphics	# User stdio charput function name	my_sw_charput_function	
r_glcdc_rx	# Processor Mode	Stay in Supervisor mode	
V > Timers	# ID code 1	0xFFFFFFF	
r_cmt_rx	# ID code 2	0xFFFFFFF	~
✓ ➢ Middleware	<		>
🗸 🗁 Timers			~
💣 r_sys_time_rx			
🗸 🗁 Generic			
💣 r_aeropoint_rx			



Set the SCI channel for touch facilities to be used with Aeropoint GUI.

17.Select "r_sci_iic_rx" from the components.

18. Change the setting for the SCI channel for touch facilities to be used with Aeropoint GUI. Specify the value of "MCU supported channels for CHn" of the channel to be used as "Supported".

Table 4-9 SCI Channel Numbers to be Used for Touch Facilities (Initial Values)

Evaluation Board	IIC Channel Number
RSK RX72N	11
Envision RX72N	6
RSK RX65N	7
Envision RX65N	6

oftware component conf	iguation		1
omponents $\downarrow^{a}_{Z} \boxdot \boxplus \clubsuit$	→ ▼ Configure		(i
ة 😜 آ	Property	Value	^
type filter text	✓		
✓ → Startup	# Set parameter checking enable	Include	
✓ → Generic	# MCU supported channels for CH0	Not supported	
r_bsp	# MCU supported channels for CH1	Not supported	
V > Drivers	# MCU supported channels for CH2	Not supported	
✓ → I/O Ports	# MCU supported channels for CH3	Not supported	
r_gpio_rx	# MCU supported channels for CH4	Not supported	
r_mpc_rx	# MCU supported channels for CH5	Not supported	
 Communications 	# MCU supported channels for CH6	Supported	
r_sci_iic_rx	# MCU supported channels for CH7	Not supported	
✓ → Graphics	# MCU supported channels for CH8	Not supported	
r_glcdc_rx	# MCU supported channels for CH9	Not supported	
V > Timers	# MCU supported channels for CH10	Not supported	
r_cmt_rx	# MCU supported channels for CH11	Not supported	
V > Middleware	# MCU supported channels for CH12	Not supported	~
 ✓ (a) Timers 	Macro definition: SCI_IIC_CFG_CH6_INCLUDED Selectable whether to use available channels. 0 = Not supported. 1 = Supported.		^



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19. When a board is selected in the creation of a project, setting the SCI channel for touch facilities to be used with Aeropoint GUI also sets the pins for use with the channel. Select "Serial communications interface" on the "Pins" tabbed page to confirm the settings of the pins. Set the pins here if you are using a custom board.

ardware Res 🕀 🖻 🛱 👪	Pin Functio	n	3	📕 🛄 🖮 🗠
Type filter text	type filter	text (* = any str	ing, ? = any character)	I ~
🗸 🦓 8-bit timer 🔥 🔨	Enabled	Function	Assignment	Pin Number \land
TMR0		SSCL5	Not assigned	Not assigne
TMR1		SSCL6	P01/TMCl0/RXD6/SMISO6/SSCL6/IRQ9/AN1	/ 7
TMR2		SSCL7	Not assigned	Not assigne
TMR3		SSCL8	Not assigned	Not assigne
Compare match timer \		SSCL9	Not assigned	Not assigne
CMTW0		SSCL10	Not assigned	Not assigne
CMTW1		SSCL11	Not assigned	Not assigne
V * Serial communication:		SSCL12	Not assigned	Not assigne
SCI0		SSDA0	Not assigned	Not assigne
SCI1		SSDA1	Not assigned	Not assigne
SCI2		SSDA2	Not assigned	Not assigne
SCI3		SSDA3	Not assigned	Not assigne
SCI4		SSDA4	Not assigned	Not assigne
SCI5		SSDA5	Not assigned	Not assigne
SCI6		SSDA6	P00/TMRI0/TXD6/SMOSI6/SSDA6/IRQ8/AN1	/ 8
SCI7 V		SSDA7	Not assigned	/ Not assigne *

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





Make the initial settings for the GUI drawing tool.

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

23. Values are set according to the information on the board selected in the project. The setting for "SCI channel number" in the "Touch function settings" group must match the channel number specified to be "Supported" as the "r_sci_iic_rx" component in the Smart Configurator. 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.

	Compoint GUI setting	×
3. GUI creation on LCD Installing the GUI drawing tool driver. Install GUI drawing tool driver. Added How to add Initial setting of GUI drawing tool. Configure settings to use GUI drawing tool.	Aeropoint GUI setting Board settings Target name LCD width Hob LCD height 272 LCD settings LCD orientation ORIENTATION_0 CD pin settings LCD display pin Port 6 v Bit 5 v Memory settings Address of frame buffer 1 Address of frame buffer 2 Address of frame buffer 2 Address of frame buffer 2 Address of frame buffer 3 Outgout pin to D-Amp board (DAMP_A) Port: 6 v Bit: 6 v Uke stings Uke sti	Use touch
GUI drawing tool setting : Info setting Generate file	Ether to use ETHER0 UART settings	
Generate GUI Generate GUI to display on LCD. Start GUI drawing tool Setting Implementation Implement a program to display GUI in the main()	Touch function settings Image: Set out operation SCI channel number Slave address of touch panel Ox38 Image: Pin for touch panel Port: Image: Port: Image: Port: Image: Port: Image: Port: Image: Pinter Port: Imag	
function. Show sample code		Cancel <u>H</u> elp



QE for Display [RX] Application Note

RX Family

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

Click on the "Generate file" button to output qe_aeropoint_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.





25. If the addresses of the frame buffers and Aeropoint data buffer which have been set in the "Aeropoint GUI setting" dialog box overlap with the section address, the given addresses must be adjusted to eliminate the overlap.

Leaving the default values as they are will not require any changes in the case of the RX65N RSK, RX65N Envision, RX72N RSK, or RX72N Envision.

		Section Viewer		
		Address	Section Name	
		0x00000004	SU	
			SI	
			B_1	
			R_1	
			B_2	
Aeropoint GUI setting			R_2	
Aeropoint Gor setting			В	Add Section
Board settings			R	New Overlay
	BYCCH	0xFFE00000	C_1	Remove Section
Target name	RX65N		C_2	
LCD width	480		C	Move Up
LCD height	272		C\$*	Move Down
LCD height	212		D*	
LCD settings			W*	
LCD orientation	ORIENTATION 0		L	
CCD Unentation	ORIENTATION_0 ~		P*	
LCD pin settings		0xFFFFFF80	EXCEPTVECT	
✓ LCD backlight pin	Port: 6 \checkmark Bit: 6 \checkmark	0xFFFFFFFC	RESETVECT	
✓ LCD display pin	Port: 6 ~ Bit: 3 ~	Override Linke	r Script	
Memory settings				Browse
Address of frame buffer 1	0x0001DE00			
Address of frame buffer 2	0x00800000	Imp	ort Export Re-Apply	
Address of Aeropoint data buffer	0x00822080			OK Cancel

Table 4-10 Addresses of Frame Buffers and Aeropoint Data Buffer (Initial Values)

Evaluation Board	Address of Frame Buffer 1	Address of Frame Buffer 2	Address of Aeropoint Data Buffer
RSK RX72N	0x0003C000	0x0005E000	0x00800000
Envision RX72N			
RSK RX65N	0x0001DE00	0x00800000	0x00822080
Envision RX65N			



26. Select "Properties" under the "Project" menu to open the "Properties" window.

Select "Settings" in the "Properties" window then "Section" in the "Tool Settings" tabbed page. Click on the "Browse" button for "Section (-start)".





27.Change the section address so that the addresses do not overlap with those of the frame buffer. Click on the "OK" button.

		×
Section Viewer		
Address	Section Name	
0x00000004	SU	
	SI	
	B_1	
	R_1	
	B_2	
	R_2	
	В	Add Section
	R	New Overlay
0xFFE00000	C_1	
	C_2	Remove Section
	C	Move Up
	C\$*	Move Down
	D*	
	W*	
	L	
	P*	
0xFFFFF80	EXCEPTVECT	
0xFFFFFFC	RESETVECT	
Override Lin	ker Script	
		Browse
Im	nport Export Re-Apply	
		OK Cancel

28.Confirm the settings of libraries. The libraries for the RXv3 instruction set and the RXv2 instruction set are automatically set as inputs for RX72x and RX65x devices, respectively, by default. Manually set the library of the RXv2 instruction set for an RX72x device.

 Table 4-11
 Settings of the Aeropoint Libraries

Device	Instruction Set	Aeropoint Library	Setting
RX72x	RXv3	libcri_Atom_Multiplayer_RXv3_CCRX.lib libcri_AeropointLite_RXv3_CCRX.lib	Automatic
	RXv2	libcri_Atom_Multiplayer_RXv3_CCRX.lib libcri_AeropointLite_RXv2_CCRX.lib	Manual
RX65x	RXv2	libcri_Atom_Multiplayer_RXv2_CCRX.lib libcri_AeropointLite_RXv2_CCRX.lib	Automatic







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

29. Click on the "Setting" button under "Generate GUI" to open the "Aeropoint GUI settings" dialog box.

30. Click on the "Installing Aeropoint GUI" button to install Aeropoint GUI by following the instructions of the AeropointLite setup wizard that is displayed.

3. GUI creation on	LCD			
alling the GUI drawi				
nstall GUI drawing tool driver.	How to add			
Added				
Initial setting of GUI dr Configure settings to use GUI dr	awing tool.			
GUI drawing tool setting	:			
Info setting			Aeropoint GUI settings	Aeropoint GUI settings
Generate file	Select folder		🚫 Install Aeropoint GUI	🚫 Install Aeropoint GUI
Generate GUI Generate GUI to display on LCD.			For the following situations, Click	For the following situations, Click on the installing button:
Start GUI drawing tool	Setting			-If you have not installed Aeropoint GUI already.
Implementation			Installing Aeropoint GUI	-If you have not updated Aeropoint GUI to the latest version.
Implement a program to display function.	GUI in the main()			
Show sample code				OK <u>H</u> elp
🖟 AeropointLite(64bit)			- 🗆 X	×
Welcome to the A	veropointLite(6	5	64bit) Setup Wizar)4bit) Setup Wizar
The installer will guide you th	ough the steps required	1	to install AeropointLite(64bit) on your computer.	to install AeropointLite(64bit) on your computer.
WADNING, This serves the				uninks have an all instances time of the stime
Unauthorized duplication or o	listribution of this program,	i,	yright law and international treaties. or any portion of it, may result in severe civil mum extent possible under the law.	or any portion of it, may result in severe civil



31. After having installed Aeropoint GUI, the state indicator of the "Aeropoint GUI settings" dialog box is changed as "Aeropoint GUI is installed". Click on the "OK" button to close the "Aeropoint GUI settings" dialog box.

Aeropoint GUI settings	×	
O Aeropoint GUI is installed		
For the following situations, Click on the installing button:		
-If you have not installed Aeropoint GUI already.		
-If you have not updated Aeropoint GUI to the latest version.		
Installing Aeropoint GUI		
OK <u>H</u> elp		

32. The "Start GUI drawing tool" button is now active.

Click on this button to start the PowerPoint file in which Aeropoint GUI add-ins have been included.

Installing the GUI drawing tool driver Install GUI drawing tool driver. Added How to add Initial setting of GUI drawing tool Configure settings to use GUI drawing tool Gong tool setting : Info setting Generate file Select folder Setting Implementation Implemen	3. GUI creation on LCD	AutoSave 💽 🖓 - 🖓 🖫 👻 QE_for_Display + 🖉 Search	• • • ×
Configure settings to use GUI drawing tool. GUI drawing tool setting : Info setting Generate file Select folder Click to add first slide Click to add first slide Implementation Implementation Implementation	Install GUI drawing tool driver.	Target device Actual device With	ය Share 🖓 Comments
	Configure settings to use GUI drawing tool. GUI drawing tool setting : Info setting Generate file Select folder Generate GUI Generate GUI Generate GUI to display on LCD. Start GUI drawing tool Setting Implementation Implement a program to display GUI in the main() function.		

Note: The usage of Aeropoint GUI add-ins in PowerPoint may differ from the method described in this application note due to changes to the specifications. Refer to the respective help systems regarding the usage of Aeropoint GUI add-ins in PowerPoint.



33.Create a GUI in PowerPoint.

Click on "Click to add first slide" to add a slide.

Select "Rectangles" from "Shapes" in the "Insert" menu to add a rectangle as the background of the screen.

Set a desired format from "Shape Styles" on the "Shape Format" menu. Adjust the size by expanding the image to fill the screen.





34. Open "Shape" in the "AeropointLite" menu to set the ID to 0 or a greater value. Here, specify the ID as 0.





35. Select an oval shape from "Shapes" on the "Insert" menu to add a circle as the shape of a button. Set a desired format from "Shape Styles" on the "Shape Format" menu.





36.Open "Shape" in the "AeropointLite" menu to set the ID to 0 or a greater value. Here, specify the ID as 1. Select "Button" to open the "Button" dialog box. Set "Name" and "ID", then click on the "OK" button.





37. After having created the GUI, save the PowerPoint file.

If the "Automatically generate GUI code from PowerPoint at build time" checkbox in "Aeropoint GUI setting" is selected, the GUI code is automatically generated from the PowerPoint file during building of a project; so the GUI code need not be manually output.

File Horn Toracion Annutions Side Shore Review View Heip AeropointLife Image: Side Shore Image: Side Shore Side Shore None Image: Side Shore Side Shore None Image: Side Shore None None Image: Side Shore None Image: Side Shore None None Image: Side Shore None Image: Side Shore None None None N	AutoSave 💽 🗄 り~ ひ) 또 QE_for_Display •	₽ Search	ALC: NO	•	- o ×
Slide 1 of 1 D Japanese ▲ Notes ■ B ■ Aeropoint GUI setting × UART settings × Use UART for command control > SCI channel number 2 Value 6 SI Use touch operation > SL channel number 6 Pin for touch panel 0x38 Pin for touch panel Port: 0 v Bit: 7 v If the PowerPoint at build time] If the PowerPoint when the project is built. Finter on PowerPoint when the project is built.	Target device Actual device Write All	Abc Sound Movie	Pipe Edit Function	view Help <u>AeropointLite</u>	යි Share	
Slide 1 of 1 D Japanese ▲ Notes ■ B ■ Aeropoint GUI setting × UART settings × Use UART for command control > SCI channel number 2 Value 6 SI Use touch operation > SL channel number 6 Pin for touch panel 0x38 Pin for touch panel Port: 0 v Bit: 7 v If the PowerPoint at build time] If the PowerPoint when the project is built. Finter on PowerPoint when the project is built.						
	Clic	k to add notes				_
UART settings Use UART for command control ScI channel number 2 Touch function settings ✓ Use touch operation ScI channel number 6 ♥ Dis touch operation Slave address of touch panel Ørda Pin for touch panel Port: 0 ∨ Bit: 7 ∨	Slide 1 of 1 💭 Japanese			Notes ■ 88	៣ 및∎→	
UART settings Use UART for command control SCI channel number 2 Touch function settings Use touch operation SCI channel number 6 Slave address of touch panel Ørit 7 Bitt 7 Image: State address of touch panel Ørit	Aeropoint GUI setting					×
	Use UART for command SCI channel number Touch function settings Use touch operation SCI channel number Slave address of touch pane	2 el 0x38	¢ Bit: 7 ~ f	the PowerPoint file has been up	dated, the GUI code will b	I time] e automatically



38. 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].

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



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

<pre>1</pre>	<pre>1 2 3 4 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5</pre>	<pre>1 1 2 2 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5</pre>	<pre>1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</pre>	<pre>file :: (0f-for_Display_EXGSN_Envision.c DATE :: 2021-04-05 DESCEPTION: Main Program NUTE:THIS IS A TYPICAL EXAMPLE. finclude "cri_aero_config_ais.n" #include "Cri_aero_config_ais.n" #include</pre>
<pre>frle : QE_for_Display_RX65M_Envision.c DATE : 2021-04-05 DESCRIPTION : Main Program NOTE:THIS IS A TYPICAL EXAMPLE. finclude "cri_aero_config_mis.h" finclude "cri_aero_config_mis.h" finclude "cri_aero_config_mis.h" finclude "cri_aero_pror.h" finclude "CRI_AERO_CONFIG_ATS_USE_FLASH /* When using slides in 50 or external FLASH. */ flag = CriAeroPlayer_Initialize(MULL); finclude "riaeroPlayer_Initialize(&QE_for_Display_RX65M_Envision_gData); mendif finclude "Cri_AeroPlayer_Initialize(age_for_Display_RX65M_Envision_gData); mendif finclude "Cri_aeroPlayer_Initialize(age_for_Display_RX65M_Envision_gData); for(;;) { CriWint3 errorNo = CriAeroError_GetLastError(); printf("CriAeroPlayer_Initialize failed.errorNo:%d", errorNo); for(;;) {</pre>	<pre> FILE : QE_for_Display_RX65N_Envision.c DATE : 2821-04-05 DESCRIPTION : Main Program NOTE:THIS IS A TYPICAL EXAMPLE. iminclude cril_aero_config_ais.h #include cril_aero_config_ais.h #</pre>	<pre>FILE : (0E_for_Display_RX65N_Envision.c DATE : 2021-04-05 DESCREPTOR : Main Program NOTE:THIS IS A TYPICAL EXAMPLE. include "r- sac entry.h" Finclude "cri_aero_Display_RX65N_Envision.h" finclude "cri_aero_Display_RX65N_Envision.h" void main(void) criBool flag = CRI_TRUE; // Initialize "/ evid main(void) criBool flag = CRI_TRUE; // Initialize "/ flag = CriAeroPlayer_Initialize(NULL); etelse // When using Slides in SD or external FLASH. */ flag = CriAeroPlayer_Initialize(&QE_for_Display_RX65H_Envision_gOata); mendif eff(flag == CRI_FALSE) { criDato Flag = CRI_TRUE; // Initialize (&QE_for_Display_RX65H_Envision_gOata); etelse // Stitch from title to slide 1. */ // 'S switch from title to slide 1. */ //</pre>	<pre>file : (0 = for_Display_RX65W_Envision.c DATE : 2021-04-05 DESCREPTION: Hain Program NOTE:THIS IS A TYPICAL EXAMPLE. include "criaero_player.h" finclude "criaero_pl</pre>	<pre> File : : QE_for_Display_EX6SH_Envision.c DSKRTTCD: Nain Programs NOTE:THIS IS A TYPICAL EXAMPLE. include 'r_sec_entry.h" #include 'r_sec_entry.h" #include 'r_isero_profig_pis.s"* #include 'r_isero_pr</pre>
<pre>16 17 19 18 19 19 19 20 20 21 21 22 24 24 24 25 25 25 25 25 25 25 25 25 25 25 25 25</pre>	<pre>16 17 void main(void); 18 9 9 void main(void) 20 17 21 22 23 24 24 24 24 24 25 25 25 26 26 27 26 26 27 26 27 27 26 27 27 27 28 27 29 29 29 20 20 20 20 20 20 20 20 20 20 20 20 20</pre>	<pre>void main(void); void main(void); crimool flag = CRI_TRUE; /* Initialize */ effic CRI_AERO_CONFIG_AIS_USE_FLASH /* When using slides in S0 or external FLASH. */ flag = CriAeroPlayer_Initialize(NULL); effic = criAeroPlayer_Initialize(RQE_for_Display_RX65N_Envision_gData); endif endif ('flag == CRI_FALSE) { frig = criAeroPlayer_Initialize failed.errorNo:%d*, errorNo); for(;;) for(;;) } effic 1 /* Switch from title to slide 1. */ /* Switch from title to sl</pre>	<pre>void main(void); void main(void) CriBool flag = CRI_TRUE; /* Initialize */ eif CRI_AERO_CONFIG_AIS_USE_SD CRI_AERO_CONFIG_AIS_USE_FLASH /* When using slides in SD or external FLASH. */ flag = CriAeroPlayer_Initialize(&QE_for_Display_RX65N_Envision_gData); Hendif if(flag == CRI_FALSE) { CriUint32 errorNo = CriAeroError_GetLastError(); printf('CriAeroPlayer_Initialize failed.errorNo;Kd*, errorNo); for(;;) { printf('CriAeroPlayer_Initialize failed.errorNo;Kd*, errorNo); for(;;) } eifif 1 /* Switch from title to slide 1. */ /* You can also switch slides by LAN or UART command. */ CriAeroPlayer_ReadSlide(1); Hendif /* Main loop */ e while (flag) { /* Finalize */ CriAeroPlayer_Finalize(); return; } /* Teturn; /* CriAeroPlayer_Finalize(); return; /* CriAeroPlayer_Finalize(); return; /* CriAeroPlayer_Finalize(); return; /* CriAeroPlayer_Finalize(); /* Finalize */ CriAeroPlayer_Finalize(); /* Finalize(); /* Finalize(); /* Finalize(); /* Finalize(); /* Finalize(); /* Finalize(); /* CriAeroPlayer_Finalize(); /* Finalize(); /* CriAeroPlayer_Finalize(); /* CriAeroPlayer_Finalize(); /* Finalize(); /* Finalize(); /* CriAeroPlayer_Finalize(); /* CriAeroPlayer_Finalize(); /</pre>	<pre>void main(void); e void main(void) CriBool flag = CRI_TRUE; /* Initialize */ eif CRI_ARRO_CONFIG_AIS_USE_FLASH /* When using slides in SD or external FLASH.*/ flag = criAeroPlayer_Initialize(NULL); ealse /* When using slides in Memory.*/ flag = criAeroPlayer_Initialize(&QE_for_Display_RX6SN_Envision_gData); endif if(flag == CRI_FALSE) { CriUnit32 errorWo = CriAeroError_GetLastError(); printf("CriAeroPlayer_Initialize failed.errorWo:Xd", errorWo); for(;;) } errorHo = CriAeroPlayer_Initialize failed.errorWo:Xd", errorWo); for(;;) /* Switch from title to slide 1. */ /* You can also switch slides by LAN or UART command. */ CriAeroPlayer_ReadSlide(1); eredif /* Main loop */ e while (flag) /* flag = CriAeroPlayer_Main(); /* finalize */ CriAeroPlayer_Finalize(); return; } /* CriAeroPlayer_Finalize(); return; } /* CriAeroPlayer_finalize(); return; /* CriAeroPlayer_finalize(); return; /* CriAeroPlayer_finalize(); return; /* CriAeroPlayer_finalize(); return; /* CriAeroPlayer_finalize(); return; /* CriAeroPlayer_finalize(); return; /* CriAeroPlayer_finalize(); return; /* CriAeroPlayer_finalize(); /* CriAeroPlayer_fi</pre>
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<pre>21 CriBool flag = CRI_TRUE; 22 /* Initialize */ 23 #if CRI_AEBO_CONFIG_ATS_USE_SD CRI_AEBO_CONFIG_ATS_USE_FLASH 24 #if CRI_AEBO_CONFIG_ATS_USE_SD CRI_AEBO_CONFIG_ATS_USE_FLASH 25 #ilog = CriAeroPlayer_Initialize(NUL); 26 #else 28 /* When using slides in Memory. */ 29 flag = criAeroPlayer_Initialize(&QE_for_Display_RX65N_Envision_gData); 30 #endif 31 eif(flag == CRI_FALSE) 32 f if(flag == CRI_FALSE) 33 { 34 CriUint32 errorNo = CriAeroError_GetLastError(); 35 printf("CriAeroPlayer_Initialize failed. errorNo:%d", errorNo); 36 for(;;) 37 { 38 } 39 } 39 }</pre>	<pre>21 CriBool flag = CRI_TRUE; 22 /* Initialize */ 23 eff CRI_ARBO_COMPIG_AIS_USE_SD CRI_AERO_COMPIG_AIS_USE_FLASH 24 eff CRI_ARBO_COMPIG_AIS_USE_SD CRI_AERO_COMPIG_AIS_USE_FLASH 25 eff CRI_ARBO_COMPIG_AIS_USE_SD CRI_AERO_COMPIG_AIS_USE_FLASH 26 eff CRI_ARBO_COMPIG_AIS_USE_SD CRI_AERO_COMPIG_AIS_USE_FLASH 27 effig = CriAeroPlayer_Initialize(NULL); 28 */***********************************</pre>	<pre>21 22 23 24 25 25 25 26 27 26 27 27 27 27 27 28 29 29 29 29 20 20 20 20 20 20 20 20 20 20 20 20 20</pre>	<pre>CriBool flag = CRI_TRUE; /* Initialize */ eff CRI_AERO_CONFIG_ATS_USE_SD CRI_AERO_CONFIG_ATS_USE_FLASH /* When using slides in SD or external FLASH. */ flag = CriAeroPlayer_Initialize(NULL); emelse /* When using slides in Nemory. */ flag = criAeroPlayer_Initialize(&QE_for_Display_RX65H_Envision_gData); emedif if(flag == CRI_FALSE) { criUint32 errorNo = CriAeroError_GetLastError(); printf('CriAeroPlayer_Initialize failed. errorNo:Kd", errorNo); for(;) } emif 1 /* Switch from title to slide 1. */ /* You can also switch slides by LAN or UART command. */ criAeroPlayer_ReadSlide(1); emedif /* Main loop */ emif flag = CriAeroPlayer_Nain(); } /* Finalize */ criAeroPlayer_Finalize(); return; } </pre>	<pre>criBool flag = CRI_TRUE; /* Initialize */ eff CRI_ARRO_CONFIG_AIS_USE_SD CRI_AERO_CONFIG_AIS_USE_FLASH /* When using slides in SD or external FLASH.*/ flag = criAeroPlayer_Initialize(NULL); emedia endif criUnit22 errorNo = CriAeroError_GetLastError(); printf('CriAeroPlayer_Initialize failed.errorNo:Kd*, errorNo); f fro;;; } epintf('CriAeroPlayer_Initialize failed.errorNo:Kd*, errorNo); f criUnit22 errorNo = CriAeroError_GetLastError(); printf('CriAeroPlayer_Initialize failed.errorNo:Kd*, errorNo); f for;;; } endif * Switch from title to slide 1.*/ /* You can also switch slides by LAN or UART command.*/ CriAeroPlayer_ReadSlide(1); emedif /* Main loop */ endif /* flag = CriAeroPlayer_Main(); } /* finalize */ CriAeroPlayer_Finalize(); return; } </pre>
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<pre>29 flag = CriAeroPlayer_Initialize(&QE_for_Display_RXG5N_Envision_gData); 30 #endif 31 if(flag == CRI_FALSE) 33 { 34 CriUint32 errorNo = CriAeroError_GetLastError(); 35 printf("CriAeroPlayer_Initialize failed. errorNo:%d", errorNo); 36 for(;;) 37 { 38 } 39 }</pre>	<pre>29 flag = CriAeroPlayer_Initialize(&QE_for_Display_RX65N_Envision_gData); 30 #endif 31 #endif 32 @ if(flag == CRI_FALSE) 33 { Criuint32 errorNo = CriAeroError_GetLastError(); 35 printf("CriAeroPlayer_Initialize failed. errorNo:%d", errorNo); 36 @ for(;;) 37 { { 38 } } 39 } 40 @ #if 1 42 /* Switch from title to slide 1. */ 43 /* Switch from title to slide 1. */ 44 GriAeroPlayer_ReadSlide(1); 45 @ #endif</pre>	<pre>29 flag = CriAeroPlayer_Initialize(&QE_for_Display_RXSSN_Envision_gData); 80 #endif 81 81 82 0 if(flag == CRI_FALSE) 83 (CriUint32 errorNo = CriAeroError GetLastError(); 94 0 for(;;) 83 } 84 0 (flag) 84 0 (flag) 84 0 (flag) 85 0 (/* Nain loop */ 85 0 (/* Main ?/ 85 0 (/* Main ?/</pre>	<pre>29 flag = CriAeroPlayer_Initialize(&QE_for_Display_RX65M_Envision_gData); 8 endif 31 endif 32 e if(flag == CRI_FALSE) 33 { CriUint32 errorNo = CriAeroPror_GetLastError(); 4 printf(*CriAeroPlayer_Initialize failed. errorNo:%d*, errorNo); 5 for(;;) 5 e for(;;) 5 e if 1 witch from title to slide 1. */ 5 e if 1 witch from title to slide 1. */ 5 e if 1 witch from title to slide 1. */ 5 e if 1 witch from title to slide 1. */ 5 e if 1 witch from title to slide 1. */ 5 e if 1 witch from title to slide 1. */ 5 e if 1 witch from title to slide 1. */ 5 e if 1 witch from title to slide 1. */ 5 e while (flag) 6 e if 1 witch from title to slide 1. */ 5 e if 1 witch from title 1 witch from</pre>	<pre>29 flag = CriAeroPlayer_Initialize(&QE_for_Display_RX65W_Envision_gData); #endif 31 #endif 32 @ if(flag == CRI_FALSE) 4 [CriUint32 errorNo = CriAeroError_GetLastError(); 54 printf("CriAeroPlayer_Initialize failed. errorNo:%d", errorNo); 57 @ for(;;) 58 @ #if 1 40 @ #if 1 41 @ #if 1 42 /* Switch from tile to slide 1. */ 43 /* Vou can also switch slides by LAN or UART command. */ 44 @ fif 45 @ main loop */ 46 @ fif 47 @ /* Main loop */ 48 @ while (flag) 49 @ { /* Main loop */ 49 @ while (flag) 50 /* Finalize */ 51 @ criAeroPlayer_Main(); 52 } } 53 /* Finalize */ 54 /* Finalize */ 55 @ criAeroPlayer_Finalize(); 56 return; 58 } }</pre>
<pre>32 e if(flag == CRI_FALSE) 33 { 34 CriUint2 errorNo = CriAeroError_GetLastError(); 35 printf("criAeroPlayer_Initialize failed. errorNo:%d", errorNo); 36 for(;;) 37 { 38 } 39 } </pre>	<pre>32 e if(flag == CRI_FALSE) 33 { 34 criuint32 errorNo = CriAeroError_GetLastError(); 35 printf("CriAeroPlayer_Initialize failed. errorNo:Kd", errorNo); 36 e for(;;) 37 { 38 } 40 { 41 errorNo = CRI_FALSE { 42 // * Switch from title to slide 1. */ 43 // * Switch from title to slide 1. */ 44 criAeroPlayer_ReadSlide(1); 45 #endif</pre>	<pre>32 e if(flag == CRI_FALSE) 33 { 34 { 35 criuint32 errorNo = CriAeroError_GetLastError(); 36 printf(*CriAeroPlayer_Initialize failed. errorNo:Kd*, errorNo); 37 { 38 } 40 { 41 errorNo = CriAeroPlayer_Initialize failed. errorNo:Kd*, errorNo); 42 /* Switch from title to slide 1. */ 43 /* Switch from title to slide 1. */ 44 criAeroPlayer_ReadSlide(1); 45 #endif 46 47 /* Nain loop */ 48 e while (flag) 49 { 49 { 50 } 51 flag = CriAeroPlayer_Plain(); 52 } 53 </pre>	<pre>22 = if(flag == cRI_FALSE) 33 { 34 { 35 critint32 errorNo = CriAeroError_GetLastError(); 35 printf("CriAeroPlayer_Initialize failed. errorNo:%d", errorNo); 36 for(;;) 37 { 38 } 40 { 39 } 41 errorNo = CriAeroPlayer_Initialize failed. errorNo:%d", errorNo); 42 { 43 } 44 criAeroPlayer_ReadSlide(1, */ 45 riaeroPlayer_ReadSlide(1); 45 errorNo = CriAeroPlayer_Nain(); 46 errorNo = CriAeroPlayer_Nain(); 47 flag = CriAeroPlayer_Nain(); 48 errorNo = CriAeroPlayer_Nain(); 49 } 40 { 40 /* Finalize */ 41 criAeroPlayer_Finalize(); 42 /* finalize */ 43 /* finalize */ 44 /* criAeroPlayer_Finalize(); 45 /* finalize */ 46 /* finalize */ 47 /* finalize */ 47 /* finalize */ 48 /* finalize */ 49 /* finalize */ 49 /* finalize */ 40 /* finalize */ 40 /* finalize */ 41 /* finalize */ 42 /* finalize */ 43 /* finalize */ 44 /* finalize */ 45 /* finalize */ 45 /* finalize */ 46 /* finalize */ 47 /* finalize */ 47 /* finalize */ 48 /* finalize */ 49 /* finalize */ 40 /* finalize */ 41 /* finalize */ 41 /* finalize */ 42 /* finalize */ 43 /* finalize */ 44 /* finalize */ 45 /* fi</pre>	<pre>32</pre>
<pre>34 CriUint32 errorNo = CriAroError_GetLastError(); 35 printf("CriAeroPlayer_Initialize failed. errorNo:%d", errorNo); 36 for(;;) 37 { 38 } 39 }</pre>	<pre>34 CriUint32 errorNo = CriAeroError_GetLastError(); 35 printf("criAeroPlayer_Initialize failed. errorNo:%d", errorNo); 36 for(;;) 37 { 38 } 39 } 40 eff 1 42 /* Switch from tile to slide 1. */ 43 /* You can also switch slides by LAN or UART command. */ 44 CriAeroPlayer_ReadSlide(1); 45 #endif</pre>	<pre>34 CriUint32 errorNo = CriAeroError_GetLastError(); 35 printf("criAeroPlayer_Initialize failed. errorNo:%d", errorNo); 36 { 37 { 38 } 39 } 40 41 @ #if 1 42 /* Switch from title to slide 1. */ 43 /* You can also switch slides by LAN or UART command. */ 44 CriAeroPlayer_ReadSlide(1); 45 #endif 46 ************************************</pre>	<pre>44 CriUint2 errorNo = CriAeroError_GetLastError(); 55 printf("CriAeroPlayer_Initialize failed. errorNo:Xd", errorNo); 56 for(;;) 57 { 58 } 59 } 50 { 59 } 50 { 50 { 50 { 50 { 50 { 50 { 50 { 50 {</pre>	<pre>14 Crilint2 errorNo = CrileroError_GetLastError(); 15 printf(*CrileroPlayer_Initialize failed. errorNo:Kd*, errorNo); 16 for(;;) 17 { 18 } 19 } 10 effi 1 /* Switch from title to slide 1. */ 17 You can also switch slides by LAN or UART command. */ 17 CrileroPlayer_ReadSlide(1); 18 effi 19 /* Main loop */ 19 effi 19 flag = CrileroPlayer_Main(); 10 /* Finalize */ 11 CrileroPlayer_Finalize(); 12 } 14 /* Finalize */ 15 CrileroPlayer_Finalize(); 15 /* erunn; 15 /* er</pre>
	41 eff 1 42 /* Switch from title to slide 1. */ 43 /* You can also switch slides by LAN or UART command. */ 44 CriAeroPlayer_ReadSlide(1); 45 Wendif	<pre>41 = eif 1 42 43 44 44 45 45 45 46 46 46 46 47 47 47 47 47 47 47 47 47 47 47 47 47</pre>	<pre>41 = #if 1 42 43 44 45 45 46 46 47 47 47 47 47 47 47 47 47 47 47 47 47</pre>	<pre>41 = #if 1 42 43 44 45 45 46 46 47 47 47 47 47 47 47 47 47 47 47 47 47</pre>



QE for Display [RX] Application Note

Note: If the runtime of the Aeropoint GUI FIT module does not match the version of the data output from PowerPoint, an error icon (••) is displayed. See the tooltip shown by hovering the mouse cursor over the icon and update the Aeropoint GUI FIT module or output the PowerPoint code again.

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_RX65N_Envision	Added How to ad	Id Added How to add
Selecting an evaluation board Select when using an evaluation board. Evaluation board : EnvisionRX65N (V1.00) How to Select Selecting a LCD If not in the list, select Custom from the combo box Select and add LCD information. Maker/Type : EastRising Model name/Size : ER-TFT043-3 Select at tool to generate a GUI to display on the LCD. Use Aeropoint GUI	LCD display adjustment Adjust on the board to display on the LCD. Adjustment for display on LCD : TCON/LCD setting Timing adjustment Graphic layer setting Adjust image quality / color : Image quality adjustment Generate file	Initial setting of GUI drawing tool Configure settings to use GUI drawing tool. GUI drawing tool setting : Info setting Generate file Select folder Generate GUI to display on LCD. Start GUI drawing tool Setting Implementation Implement a program to display GUI in the main() function. Show sample code
	Û	
		vint GUI FIT and code generated from GUI drawing tool is not the source code from PowerPoint.



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_RX65N_Envision HardwareDebug).
- 2. Click on "Build".



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



Note: If the "Automatically generate GUI code from PowerPoint at build time" checkbox in "Aeropoint GUI setting" is selected, a build error will occur since all of the required configuration files will not be created in the first build. Build the project again.



4.6 Connecting a Debugger and Executing the Program

- 1. Click on the project you want to debug (e.g. QE_for_Display_RX65N_Envision HardwareDebug).
- 2. Click on "Debug Configurations" from the "Run" menu item.

File Edit Source Refactor Navigate Search	n Project Renesa	as Views	Run	Window Help	
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	Converting the			Debug Configurations	



QE for Display [RX] Application Note

- 3. Select the "Connection Settings" tab on the "Debugger" tabbed page of the "Debug Configurations" dialog box.
- 4. Change the value for "Main Clock Source" to "EXTAL".
- 5. Change the values for "Extal Frequency [MHz]" and "Connection Type" to suit the board. For setting the board, refer to chapter 2, Operating Environment.
- 6. Change the value for "Power Target From The Emulator (MAX 200mA)" according to the board and click on the "Apply" button. Clicking on the "Debug" button starts the connection to the target.

 Table 4-12
 Power Supplied from the Emulator

Evaluation Board	Power Supplied from the Emulator
RSK RX72N	No
RSK RX65N	
Envision RX72N	No
Envision RX65N	

Note: To supply power to the RSK RX72N and RSK RX65N, use an external power source having a stable DC output (min. 10 W) and center-positive connector.

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B Hardware Debugging	GDB Settings Connection Settings Debug Tool Settin	ngs	
B OpenOCD Debugging	✓ Clock		^
B Simulator Debugging (RH850)	Main Clock Source	EXTAL	~
a Applet	Extal Frequency[MHz]	12.0000	
a Application	Operating Frequency [MHz]		
inch Group	Permit Clock Source Change On Writing Internal	Yes	¥
Inch Group (Deprecated)	 Connection with Target Board 		
note Java Application	Emulator	(Auto)	
esas GDB Hardware Debugging	Connection Type	JTag	¥
QE_for_Display_RX65N_Envision Ha	JTag Clock Frequency[MHz]	6.00	¥
test HardwareDebug	Fine Baud Rate[Mbps]	1.50	\sim
nesas Simulator Debugging (RX, RL7	Hot Plug	No	¥
	✓ Power		
	Power Target From The Emulator (MAX 200mA)	No	×
	Supply Voltage (V)	3.3	~
	✓ CPU Operating Mode		
	Register Setting	Single Chip	¥
	Mode pin	Single-chip mode	~
	Change startup bank	No	~
	Startup bank	Bank 0	~
	 Communication Mode 		*
< >			
		Revert	Apply



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

📴 Conf	irm Perspective Switch	×
?	This kind of launch is configured to open the Debug perspective when it suspends. This Debug perspective supports application debugging by providing views for displaying the debug stack, variables and breakpoints. Switch to this perspective?	
<u>R</u> em	ember my decision <u>S</u> witch <u>N</u> o	

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

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🛊 Debug 🛛 🗖 🗉	QE_for_Display_	RX65N_Envision.c 🕡 resetprg.c 🛛	' 🗆	(x)= V 🔀 💁	в 🏊 р 🛠 Е 🚼	P 🚺 I 🔭	
📄 🔌 i> 🤣		□ R_BSP_POR_FUNCTION(R_BSP_STARTUP_FUNCTION)	^			1 🛋 🖬 🗐	1 et 1
E OLE for Display, RAGSN _Envisio w	sio 190 191 [cc 192 tt r 193	<pre>{ /* Stack pointers are setup prior to calling this function - see comments above */ /* You can use auto variables in this function but such variables other than register * will be unavailable after you change the stack from the I stack to the U stack (if /* The bgs sections have not been cleared and the data sections have not been initiali * and constructors of C++ objects have not been executed until the _INITSCT() is exec #if fSp_Cfq_USER_STACK_ENABLE == 1 INTERNAL_NOT_USED(ustack_area); #endif MifEdf(_CCRX) defined(_GNUC_) /* Initialize the Interrupt Table Register */ R_BSP_SET_INT8(R_BSP_SECTOP_INTVECTTBL); #ifidef 85P_NCU_EXCEPTION_TABLE /* Initialize the Enception Table Register */ // Initialize the Enception Table Register */ // Encilize the Enception Table Register */ // Initialize the Enception Table Register */ // Initialize the Enception Table Register */ // Encilize the Enception Ta</pre>	• 5	Name	Туре		
	211 ffe016b5 212	<pre>R_BSP_SET_EXTB(R_BSP_SECTOP_EXCEPTVECTTBL); #endif</pre>					
	213		~	/		> <	
							• - F
	_	Registers 🔝 Problems 🌒 Smart Browser 🙀 Debugger Console 📋 Debug Shell 📋 Memory			1 D C C		•
	Finished target	N_Envision HardwareDebug [Renesas GDB Hardware Debugging]					
	GDB: 50559						
	Target connecti Target connecti	on status - OK					
	Starting downlo	ad					


RX Family

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



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





11. When the setting of the display device is done correctly, the following screen will be displayed on the LCD panel. Touch the button and confirm that the color changes according to your settings. If Aeropoint GUI was used as the drawing tool, the "Aeropoint" logo will be displayed.





5. Hardware

5.1 Configuration of Hardware

Table 5-1 shows the LCD panel used in this application note.

Board	Information on the LCD Panel Product		
RSK RX72N	Manufacturer: Newhaven Display Co.		
RSK RX65N	Part number: NHD-4.3-480272EF-ATXL#-CTP		
	Display size:480 x 272		
	Synchronization signal: VS, HS, DE (three signals)		
	Built-in touch controller		
Envision RX72N	Manufacturer: EastRising Co.		
Envision RX65N	Part number: ER-TFT043-3		
	Display size:480 x 272		
	Synchronization signal: VS, HS, DE (three signals)		
	Built-in touch controller		

5.2 Pin Functions

The following shows pins used on each RSK and Envision and describes the pin functions used. Select the pins according to the product you are using. Pin functions are automatically set by using the Smart Configurator and QE for Display [RX].



Connected Device	Pin Name	Input/Output	Description
NHD-4.3-	P14/LCD_CLK-B	Output	Outputs the panel clock.
480272EF-	P13/LCD TCON 0-B	Output	Outputs the synchronization signal (VSYNC).
ATXL#-CTP	PJ2/LCD_TCON 2-B	Output	Outputs the synchronization signal (VOTNO). (HSYNC).
	PB1/LCD_TCON 3-B	Output	Outputs the synchronization signal (DE).
	PC5/LCD_DATA 0-B	Output	Outputs the LCD signal R[3].
	P82/LCD_DATA 1-B	Output	Outputs the LCD signal R[4].
	P81/LCD_DATA 2-B	Output	Outputs the LCD signal R[5].
	P80/LCD_DATA 3-B	Output	Outputs the LCD signal R[6].
	PC4/LCD_DATA 4-B	Output	Outputs the LCD signal R[7].
	P55/LCD_DATA 5-B	Output	Outputs the LCD signal G[2].
	P54/LCD_DATA 6-B	Output	Outputs the LCD signal G[3].
	P11/LCD_DATA 7-B	Output	Outputs the LCD signal G[4].
	P83/LCD_DATA 8-B	Output	Outputs the LCD signal G[5].
	PC7/LCD_DATA 9-B	Output	Outputs the LCD signal G[6].
	PC6/LCD_DATA 10-B	Output	Outputs the LCD signal G[7].
	PJ0/LCD_DATA 11-B	Output	Outputs the LCD signal B[3].
	P85/LCD_DATA 12-B	Output	Outputs the LCD signal B[4].
	P84/LCD_DATA 13-B	Output	Outputs the LCD signal B[5].
	P57/LCD_DATA 14-B	Output	Outputs the LCD signal B[6].
	P56/LCD_DATA 15-B	Output	Outputs the LCD signal B[7].
	PQ1/SSCL11	Input/output	Inputs or outputs for the clock of the I ² C interface connected to the touch controller.
	PQ2/SSDA11	Input/output	Inputs or outputs for the data of the I ² C interface connected to the touch controller.
	P27/general-purpose input/output port	Output	Backlight
	PK4/general-purpose input/output port	Output	Panel reset
	PL3/general-purpose input/output port*	Output	Touch controller reset

 Table 5-2
 Pins and Functions to be Used (RSK RX72N)

Note: When PL3 is to be used, a resistor must be changed. For details, refer to the user's manual of the evaluation board.



Connected	Pin Name	Input/Output	Description
Device			
ER-TFT043-3	PB5/LCD_CLK-B	Output	Outputs the panel clock.
	PB4/LCD_TCON 0-B	Output	Outputs the synchronization signal (VSYNC).
	PB2/LCD_TCON 2-B	Output	Outputs the synchronization signal (HSYNC).
	PB1/LCD_TCON 3-B	Output	Outputs the synchronization signal (DE).
	PB0/LCD_DATA 0-B	Output	Outputs the LCD signal B[3].
	PA7/LCD_DATA 1-B	Output	Outputs the LCD signal B[4].
	PA6/LCD_DATA 2-B	Output	Outputs the LCD signal B[5].
	PA5/LCD_DATA 3-B	Output	Outputs the LCD signal B[6].
	PA4/LCD_DATA 4-B	Output	Outputs the LCD signal B[7].
	PA3/LCD_DATA 5-B	Output	Outputs the LCD signal G[2].
	PA2/LCD_DATA 6-B	Output	Outputs the LCD signal G[3].
	PA1/LCD_DATA 7-B	Output	Outputs the LCD signal G[4].
	PA0/LCD_DATA 8-B	Output	Outputs the LCD signal G[5].
	PE7/LCD_DATA 9-B	Output	Outputs the LCD signal G[6].
	PE6/LCD_DATA 10-B	Output	Outputs the LCD signal G[7].
	PE5/LCD_DATA 11-B	Output	Outputs the LCD signal R[3].
	PE4/LCD_DATA 12-B	Output	Outputs the LCD signal R[4].
	PE3/LCD_DATA 13-B	Output	Outputs the LCD signal R[5].
	PE2/LCD_DATA 14-B	Output	Outputs the LCD signal R[6].
	PE1/LCD_DATA 15-B	Output	Outputs the LCD signal R[7].
	P33/SSCL6	Input/output	Inputs or outputs for the clock of the I ² C interface connected to the touch controller.
	P32/SSDA6	Input/output	Inputs or outputs for the data of the I ² C interface connected to the touch controller.
	P67/general-purpose input/output port	Output	Backlight
	PB3/general-purpose input/output port	Output	Panel reset
	P66/general-purpose input/output port	Output	Touch controller reset

 Table 5-3
 Pins and Functions to be Used (Envision RX72N)



Connected Device	Pin Name	Input/Output	Description
NHD-4.3-	PB5/LCD_CLK-B	Output	Outputs the panel clock.
480272EF-	PB4/LCD TCON 0-B	Output	Outputs the synchronization signal (VSYNC).
ATXL#-CTP	PB2/LCD_TCON 2-B	Output	Outputs the synchronization signal (VOTNO). (HSYNC).
	PB1/LCD_TCON 3-B	Output	Outputs the synchronization signal (DE).
	PB0/LCD_DATA 0-B	Output	Outputs the LCD signal R[3].
	PA7/LCD_DATA 1-B	Output	Outputs the LCD signal R[4].
	PA6/LCD_DATA 2-B	Output	Outputs the LCD signal R[5].
	PA5/LCD_DATA 3-B	Output	Outputs the LCD signal R[6].
	PA4/LCD_DATA 4-B	Output	Outputs the LCD signal R[7].
	PA3/LCD_DATA 5-B	Output	Outputs the LCD signal G[2].
	PA2/LCD_DATA 6-B	Output	Outputs the LCD signal G[3].
	PA1/LCD_DATA 7-B	Output	Outputs the LCD signal G[4].
	PA0/LCD_DATA 8-B	Output	Outputs the LCD signal G[5].
	PE7/LCD_DATA 9-B	Output	Outputs the LCD signal G[6].
	PE6/LCD_DATA 10-B	Output	Outputs the LCD signal G[7].
	PE5/LCD_DATA 11-B	Output	Outputs the LCD signal B[3].
	PE4/LCD_DATA 12-B	Output	Outputs the LCD signal B[4].
	PE3/LCD_DATA 13-B	Output	Outputs the LCD signal B[5].
	PE2/LCD_DATA 14-B	Output	Outputs the LCD signal B[6].
	PE1/LCD_DATA 15-B	Output	Outputs the LCD signal B[7].
	P01/SSCL6	Input/output	Inputs or outputs for the clock of the I ² C interface connected to the touch controller.
	P00/SSDA6	Input/output	Inputs or outputs for the data of the I ² C interface connected to the touch controller.
	PB7/general-purpose input/output port	Output	Backlight
	P97/general-purpose input/output port	Output	Panel reset

Table 5-4Pins and Functions to be Used (RSK RX65N)



Connected	Pin Name	Input/Output	Description
Device			
ER-TFT043-3	PB5/LCD_CLK-B	Output	Outputs the panel clock.
	PB4/LCD_TCON 0-B	Output	Outputs the synchronization signal (VSYNC).
	PB2/LCD_TCON 2-B	Output	Outputs the synchronization signal (HSYNC).
	PB1/LCD_TCON 3-B	Output	Outputs the synchronization signal (DE).
	PB0/LCD_DATA 0-B	Output	Outputs the LCD signal B[3].
	PA7/LCD_DATA 1-B	Output	Outputs the LCD signal B[4].
	PA6/LCD_DATA 2-B	Output	Outputs the LCD signal B[5].
	PA5/LCD_DATA 3-B	Output	Outputs the LCD signal B[6].
	PA4/LCD_DATA 4-B	Output	Outputs the LCD signal B[7].
	PA3/LCD_DATA 5-B	Output	Outputs the LCD signal G[2].
	PA2/LCD_DATA 6-B	Output	Outputs the LCD signal G[3].
	PA1/LCD_DATA 7-B	Output	Outputs the LCD signal G[4].
	PA0/LCD_DATA 8-B	Output	Outputs the LCD signal G[5].
	PE7/LCD_DATA 9-B	Output	Outputs the LCD signal G[6].
	PE6/LCD_DATA 10-B	Output	Outputs the LCD signal G[7].
	PE5/LCD_DATA 11-B	Output	Outputs the LCD signal R[3].
	PE4/LCD_DATA 12-B	Output	Outputs the LCD signal R[4].
	PE3/LCD_DATA 13-B	Output	Outputs the LCD signal R[5].
	PE2/LCD_DATA 14-B	Output	Outputs the LCD signal R[6].
	PE1/LCD_DATA 15-B	Output	Outputs the LCD signal R[7].
	P01/SSCL6	Input/output	Inputs or outputs for the clock of the I ² C interface connected to the touch controller.
	P00/SSDA6	Input/output	Inputs or outputs for the data of the I ² C interface connected to the touch controller.
	P66/general-purpose input/output port	Output	Backlight
	P63/general-purpose input/output port	Output	Panel reset
	P07/general-purpose input/output port	Output	Touch controller reset

 Table 5-5
 Pins and Functions to be Used (Envision RX65N)



6. Using QE for Display [RX]

This chapter describes the usage of QE for Display [RX] according to the actual flow of display adjustment. For details on the facilities of QE for Display [RX], refer to the help file which comes with QE for Display [RX].

6.1 Starting QE for Display [RX]

Selecting "Renesas Views" -> "Renesas QE" -> "LCD Main RX (QE)" from the menu of the e² studio starts QE for Display [RX] (Figure 6-1).



Figure 6-1 Initial State of QE for Display [RX]

After a project has been selected in "1. Selecting a project" in the workflow diagram of QE for Display [RX], selecting "Renesas Views" -> "Renesas QE" -> "Display Tuning RX (QE)" from the menu of the e² studio opens the "Display Tuning RX (QE)" view of QE for Display [RX] (Figure 6-2).

Figure 6-2 is the display of a block diagram of the hardware of the GLCDC, showing the path for the output of image data and the relationships between the positions where images are to be corrected. Clicking on "Brightness" or "Contrast" for the adjustment of image quality produces the "Image Quality Adjustment" tabbed page, which allows various adjustments.





Figure 6-2 "Display Tuning RX (QE)" View



6.2 Setting Data on the LCD Panel

Information on the LCD panel which is connected to the user system is specified. When the display is connected to a system under development, you need to compare and adjust the specifications of the LCD panel and the display controller and find specifiable and appropriate settings. Information that has been specified is used in comparison.

The LCD mounted on the RSK is an NHD-4.3-480272EF-ATXL#-CTP manufactured by Newhaven Display International. The LCD mounted on the Envision is an ER-TFT043-3 manufactured by EastRising Technology Co., Ltd.

For the package of QE for Display [RX] V2.0.0 or later versions, selecting a project for which the board to be used has been specified in the "LCD Main RX (QE)" view displays information on the LCD panel.

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💭 Display Tuning RX (QE) 🔀			- 🐼 📢 🖪 😭 🖓		
Start Display Adjustment					Î
Maker/Type: EastRising	Model Name/Size	ER-TFT043-3		`	/

Figure 6-3 Selecting the LCD Panel

When information on the LCD panel is set, the display type can be specified by selecting from among three patterns. The display type adopted is 3 (the method of using Vsync, Hsync, and DE signals) for the LCD panel mounted on the RSK and Envision.

For details on setting information on the LCD panel, refer to chapter 7, Setting Detailed Data on the LCD Panel.

6.3 Setting the Output of Control Signals

Select the "TCON/LCD Setting" tabbed page in the "Display Tuning RX (QE)" view and specify the settings for the output of control signals (Figure 6-4).

The following settings for the output of control signals are available on this page.



[Panel Driver Signal (TCON) Output Selection] Selection of output pins: Output to the LCD_TCON0 to LCD_TCON3 pins (TCON0 to TCON3) Active sense of control signals: Positive sense: [High Active] Negative sense: [Low Active] [LCD Setting] [LCD Output Format] 24-bit RGB888 output: [24bit (GLCDC_OUT_FORMAT_24BITS_RGB888)] 18-bit RGB666 output: [18bit (GLCDC_OUT_FORMAT_18BITS_RGB666)] 16-bit RGB565 output: [16bit (GLCDC_OUT_FORMAT_16BITS_RGB565)] [Timing of Output Data] Output on rising edges of the panel clock: [Rising (GLCDC_SIGNAL_SYNC_EDGE_RISING)] Output on falling edge of the panel clock: [Falling (GLCDC_SIGNAL_SYNC_EDGE_FALLING)] [Background Color] 0x00000000 to 0x00FFFFF [Bit-endian of Output Data] Little Endian (GLCDC_ENDIAN_LITTLE) Big Endian (GLCDC ENDIAN BIG) [Pixel Order of Output Data] RGB (GLCDC_COLOR_ORDER_RGB) BGR (GLCDC COLOR ORDER BGR) [LCD Backlight Control] Selection of control Selection of port number: PORT0 to PORTJ Selection of bit position: BIT0 to BIT7 Active sense of control signals: Negative sense: [Low Active] Positive sense: [High Active] [LCD Reset Control] Selection of control Selection of port number: PORT0 to PORTJ Selection of bit position: BIT0 to BIT7 Active sense of control signals: Negative sense: [Low Active] Positive sense: [High Active]



8	— 🗆 X
💭 Display Tuning RX (QE) 🛛	🖓 📢 📔 🛱 🖓 💷 🖇 🖳 🗖
Start Display Adjustment	^
Maker/Type: EastRising Model Name/Size: ER-TFT04	I3-3 ~
Block Image TCON/LCD Setting Timing Adjustment Graphic Layer Setting Image Quality Adjustment	t
Panel Driver Signal (TCON) Output Selection	
Vsync: TCON0 V Low Active V	
Hsync: TCON2 V Low Active V	
DE: TCON3 ~ High Active ~	
LCD Setting	
LCD Output Format: 16bit (GLCDC_OUT_FORMAT_16BITS_RGB565) V	
Timing of Output Data: Rising (GLCDC_SIGNAL_SYNC_EDGE_RISING) ~	
Background Color: 0x00 000000	
Bit-endian of Output Data: Little Endian (GLCDC_ENDIAN_LITTLE)	
Pixel Order of Output Data: RGB (GLCDC_COLOR_ORDER_RGB) ~	
LCD Backlight Control	
Enable Control	
Port Number: PORT6 v Bit Position: BIT6 v High Active v	
LCD Reset Control	
Enable Control	
Port Number: PORT6 v Bit Position: BIT3 v High Active v	
	~

Figure 6-4 "TCON/LCD Setting" Tabbed Page



The following lists the settings that match the specifications of the each RSK and Envision board.

	RSK RX72N	RSK RX65N	Envision RX72N	Envision RX65N	
Selection of output p	bins	·	•	·	
Vsync	TCON0		TCON0		
Hsync	TCON2		TCON2		
DE	TCON3		TCON3		
Active sense of cont	rol signals				
Vsync	Negative sense: [Low	w Active]	Negative sense: [Low Active]		
Hsync	Negative sense: [Lov	w Active]	Negative sense: [Low Active]		
DE	Positive sense: [High	h Active]	Positive sense: [Hig	h Active]	
[LCD Output Format]	16-bit RGB565 output [16bit (GLCDC_OUT_FORMAT_16 BITS_RGB565)]		16-bit RGB565 output [16bit (GLCDC_OUT_FORMAT_16 BITS_RGB565)]		
[Timing of Output Data]	Output on rising edges of the panel clock [Rising (GLCDC_SIGNAL_SYNC_ EDGE_RISING)]		Output on rising edges of the panel clock [Rising (GLCDC_SIGNAL_SYNC_ EDGE_RISING)]		
[Background Color]	0x00000000		0x0000000		
[Bit-endian of Output Data]	Little Endian (GLCDC_ENDIAN_LITTLE)		Little Endian (GLCDC_ENDIAN_LITTLE)		
[Pixel Order of Output Data]	BGR (GLCDC_COLOR_ORDER_BGR)		RGB (GLCDC_COLOR_ORDER_RGB)		
[LCD Backlight Cont	rol]				
Selection of control	Enabled		Enabled		
[Port Number]	PORT2	PORTB	PORT6	PORT6	
[Bit Position]	BIT7	BIT7	BIT7	BIT6	
Active sense of control signals	Positive sense: [High Active]		Positive sense: [High Active]		
[LCD Reset Control]					
Selection of control	Enabled		Enabled		
[Port Number]	PORTK	PORT9	PORTB	PORT6	
[Bit Position]	BIT4	BIT7	BIT3	BIT3	
Active sense of control signals	Positive sense: [High	n Active]	Positive sense: [High Active]		



6.4 Setting the Graphics Layers

Select the "Graphic Layer Setting" tabbed page in the "Display Tuning RX (QE)" view and specify the settings for the graphics.

The following settings for graphics are available on this page.

[Select Using Graphic Layer] Graphic layer 1 Graphic layer 2 Graphic layers 1 and 2 [Graphic Layer 1 Setting] [Height of Image Data] 16 to the value of VDP on the [Timing Adjustment] tabbed page [Width of Image Data] 16 to the value of HDP on the [Timing Adjustment] tabbed page [Display Start Position (x-coordinate)] 0 to the value of "VDP - 16" on the [Timing Adjustment] tabbed page [Display Start Position (y-coordinate)] 0 to the value of "HDP - 16" on the [Timing Adjustment] tabbed page [Start Address of Frame Buffer] 0x00000040 to 0xFFFFFC0 [Output Data Format] ARGB8888 (GLCDC_IN_FORMAT_32BITS_ARGB8888) RGB888 (GLCDC_IN_FORMAT_32BITS_RGB888) RGB565 (GLCDC_IN_FORMAT_16BITS_RGB565) ARGB1555 (GLCDC_IN_FORMAT_16BITS_ARGB1555) ARGB4444 (GLCDC_IN_FORMAT_16BITS_ARGB4444) CLUT8 (GLCDC_IN_FORMAT_CLUT8) CLUT4 (GLCDC IN FORMAT CLUT4) CLUT1 (GLCDC IN FORMAT CLUT1) [Graphic Layer 2 Setting] The same settings as those for [Graphic Layer 1 Setting] [Interrupts Setting] Selection of enabling VPOS detection Selection of enabling VPOS interrupts Selection of the use of a callback function [Callback Function Name] Desired character string



Start Display Adjustment	
Maker/Type: EastRising	V Model Name/Size : ER-TFT043-3 V
ock Image TCON/LCD Setting Tir	ning Adjustment Graphic Layer Setting Image Quality Adjustment
Display Start Position HDF	<u>ه</u>
+	
VDP	Height of Image Data
*- L-	
Width of Ima	age Data
Select Using Graphic Layer:	Graphic Layer2 🗸
Graphic Layer1 Setting	
Height of Image Data:	272 🚖
Width of Image Data:	480
Display Start Position(x-coodinate)	
Display Start Position(y-coodinate)	
Start Address of Frame Buffer:	0x 00000040
Output Data Format:	ARGB8888 (GLCDC_IN_FORMAT_32BITS_ARGB88888)
Graphic Layer2 Setting	
Height of Image Data:	272 🚖
Width of Image Data:	480 🚖
Display Start Position(x-coodinate)	· 0 🚖
Display Start Position(y-coodinate)	: 0
Start Address of Frame Buffer:	0x 00800000
Output Data Format:	RGB565 (GLCDC_IN_FORMAT_16BITS_RGB565)
Interrupts Setting	
Interrupts Setting Enable VPOS Detection	

Figure 6-5 "Graphic Layer Setting" Tabbed Page



The following lists the settings that match the specifications of the each RSK and Envision board.

	RSK RX72N		RSK RX65N		
	emWin	Aeropoint GUI	emWin	Aeropoint GUI	
[Select Using Graphic Layer]	Graphic layer 2	Graphic layer 2	Graphic layer 2	Graphic layer 2	
[Graphic Layer 1 S	Setting]				
All items	Disabled	Disabled	Disabled	Disabled	
[Graphic Layer 2 S	Setting]				
[Height of Image Data]	272	272	272	272	
[Width of Image Data]	480	480	480	480	
[Display Start Position (x- coordinate)]	0	0	0	0	
[Display Start Position (y- coordinate)]	0	0	0	0	
[Start Address of Frame Buffer]	0x00800000	0x0003C000	0x00800000	0x0001DE00	
[Output Data Format]	RGB565 (GLCDC_IN_FO RMAT_16BITS_ RGB565)	CLUT8 (GLCDC_IN_FO RMAT_CLUT8)	RGB565 (GLCDC_IN_FO RMAT_16BITS_ RGB565)	CLUT8 (GLCDC_IN_FO RMAT_CLUT8)	
[Interrupts Setting]]				
[Enable VPOS Detection]	Enabled	Enabled	Enabled	Enabled	
[Enable VPOS Interrupt]	Enabled	Enabled	Enabled	Enabled	
[Use Callback Function]	Used	Used	Used	Used	
[Callback Function Name]	_VSYNC_ISR	criAeroGraphics_ VSyncCallback_ AIS	_VSYNC_ISR	criAeroGraphics_ VSyncCallback_ AIS	

Table 6-2 Settings of Graphics Layers Used for the Application (RSK RX72N/RX65N)



	Envision RX72N		Envision RX65N	
	emWin	Aeropoint GUI	emWin	Aeropoint GUI
[Select Using Graphic Layer]	Graphic layer 2	Graphic layer 2	Graphic layer 2	Graphic layer 2
[Graphic Layer 1 S	Setting]			
All items	Disabled	Disabled	Disabled	Disabled
[Graphic Layer 2 S	Setting]			
[Height of Image Data]	272	272	272	272
[Width of Image Data]	480	480	480	480
[Display Start Position (x- coordinate)]	0	0	0	0
[Display Start Position (y- coordinate)]	0	0	0	0
[Start Address of Frame Buffer]	0x00800000	0x0003C000	0x00800000	0x0001DE00
[Output Data Format]	RGB565 (GLCDC_IN_FO RMAT_16BITS_ RGB565)	CLUT8 (GLCDC_IN_FO RMAT_CLUT8)	RGB565 (GLCDC_IN_FO RMAT_16BITS_ RGB565)	CLUT8 (GLCDC_IN_FC RMAT_CLUT8)
[Interrupts Setting]			•	
[Enable VPOS Detection]	Enabled	Enabled	Enabled	Enabled
[Enable VPOS Interrupt]	Enabled	Enabled	Enabled	Enabled
[Use Callback Function]	Used	Used	Used	Used
[Callback Function Name]	_VSYNC_ISR	criAeroGraphics_ VSyncCallback_ AIS	_VSYNC_ISR	criAeroGraphics VSyncCallback_ AIS

Table 6-3 Settings of Graphics Layers Used for the Application (Envision RX72N/RX65N)



6.5 Adjusting the Timing of Control Signals for the LCD Panel

Clicking on the "Start Display Adjustment" button after the debugger is connected opens the "Select a program" dialog box. Selecting the program and clicking on the "Start adjustment" button starts adjustment of the display.

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🖵 Display Tuning RX (QE) 🕴	🖾 🕂 📔 🛱 🖓 🗇 🗖
Start Display Adjustment	^

Figure 6-6 "Start Display Adjustment" Button

	×
 Execute a program you will be using to produce a display on the screen and ac he position and image quality by confirming the display on the screen on the ctual board. Select the program for producing a display on the screen. Use the dedicated adjustment program. Use user program. * Before starting adjustment, confirm that the created project has been built and the call of the main() function is possible. * If you are using the user program, confirm drawing on the LCD as well as the above items. 	-
GLCDC pin setting	
1 5	
The pins used in GLCDC are assigned to the following ports.	
Function Port number	
LCD_CLK PB5	
LCD_TCON0 PB4	
LCD_TCON2 PB2	
LCD_TCON3 PB1	
LCD_DATAO PBO	

Figure 6-7 "Select a program" Dialog Box



RX Family

QE for Display [RX] Application Note

During adjustment of the display, the message "Please tune the display. Do not restart or reset the program." is displayed and the "Start Display Adjustment" button is replaced by the "Finish Display Adjustment" button. Changing the values shown in Figure 6-8 changes the timing of the control signals. This tool directly writes the changed values to registers of the GLCDC so that they are reflected in the operation of the LCD panel on the board.



Figure 6-8 Adjusting the Timing of Control Signals

Select the frequency of the panel clock from the combo box. The selected frequency is used to calculate the refresh rate, which is indicated at the bottom of the page, along with a value for any difference from the recommended value for the LCD panel. The value recommended for the LCD panel will have been specified as the initial value.

Adjust the individual parameters in the spin boxes. The result of adjustment being shown in red numerals means that the value is out of the range of the specifications of the GLCDC or of the LCD panel. In such cases, adjust the value so that it is within the range of the specifications of the GLCDC and of the LCD panel. Check the range of values which are allowable in the specifications of the GLCDC by hovering the mouse over the value for adjustment that is being shown in red.



In an RSK, if a value being adjusted is restored to its default (the specifications of the LCD panel mounted on the RSK) with the "Restore the Displayed Settings to the Default" button, the recommended value for the horizontal front porch (HFP) of the LCD panel will be two, and this must be modified since it is out of the range of the specifications of the GLCDC. Modify the value to three or greater to satisfy the specifications of both the LCD panel and GLCDC. After that, the display of the adjusted value is changed from red to black.

After you have determined the adjusted values, you can write the values from this tool to the registers of the GLCDC and check the results.



Figure 6-9 Buttons for Setting Registers

The following two methods are used to set or make changes to values in the registers.

Button	Name	Description
Ş	Set the Register	The settings are written to the registers. This button is only effective during adjustment of the display.
	Set the Registers in Real-time when the Parameters are Changed	When this button is active, changes are automatically written to registers every time the setting is changed. This button is not active by default.
	are changed	Writing to the registers only proceeds when the display is being adjusted; no operation proceeds if the display is not being adjusted.

Table 6-4	Facilities for Setting or Making Changes to Values in Registers
-----------	---

If "Use the dedicated adjustment program." is selected in the "Select a program" dialog box for use in adjusting the display and the display is correctly set, a one-pixel-wide red line is drawn around the outer periphery of a blue-colored image as shown in Figure 6-10.



Figure 6-10 Display on the LCD Panel



Note:

For the facility to write the adjusted values to registers in QE for Display [RX], the graphics screen is adjusted to be aligned with the upper left of the background screen when the timing is adjusted.

For definitions of the graphics and background screens, refer to the RX65N Group, RX651 Group User's Manual: Hardware (R01UH0590) or RX72N Group User's Manual: Hardware (R01UH0824).

Due to the display type and specifications of the LCD panel, fine changes to setting values (e.g. moving by several pixels) or changes to particular settings may not appear on the LCD panel. For example, the LCD panels mounted on the RSK and Envision are of display type 3, which does not allow the movement of positions in response to changes to the settings for the back porches and so on.



6.6 Reflecting the Output of Control Signals, Setting of Graphic Layers, and the Results of Timing Adjustment

The output of control signals, setting of graphic layers, and the results of timing adjustment can be reflected in a program through the output of a header file. Clicking on the "Generating Header File" button of QE for Display [RX] (Figure 6-11) generates a header file that reflects the specified items.

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When you select "For Display Settings" only and click on "Generate", a header file is generated at the specified destination for output. The name of the header file and the output destination can be specified as desired.

For Display Settings :		
C:\work\e2_studio\workspace\	QE_for_Display_RX65N_Envision\src\r_lcd_timing.h	Browse
For Image Adjustment :		
C:\work\e2_studio\workspace\	QE_for_Display_RX65N_Envision\src\r_image_config.h	Browse

Figure 6-12 Selecting "For Display Settings"

To reflect the timing of the project, output the header file with the name 'r_lcd_timing.h' in the following directory, and clean and build the project.

Directory:

<workspace folder>¥<project folder>¥src



RX Family

6.7 Image-Downloading Facility

In QE for Display [RX], image quality is adjusted by checking the LCD according to the characteristics of the LCD. The image that is displayed on the LCD can be changed without changing the program.

Using the image-downloading facility downloads image data (binary file) from the personal computer to be displayed on the LCD.

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Figure 6-13 "Send the Image File" Button

Click on the "Send the Image File" button on the toolbar.

📴 Send the	lmage	×
Address :	0x800000]
Size[byte] :]
Sending File :	C:\test_e2studio_env\workspace\QE_for_Display_RX65N_Envision\image\Load_Sample_480x272_lit.bin	Browse
	Swap byte ordering	
	Send Cancel	<u>H</u> elp

Figure 6-14 "Send the Image" Dialog Box

Specify the address of the destination and the file to be sent in the "Send the Image" dialog box. By default, the value that has been set in the graphics 2 frame buffer control register is specified as "Address". When specification of "Size" is omitted, the entire file specified in the "Sending File" edit box is written to the range from the address specified in the "Address" edit box.

This application note includes sample image data. Send the following.

File:

Load_Sample_480x272_lit.bin

When sending is successfully completed, color bars are displayed as shown in Figure 6-15.





Figure 6-15 Image on Completion of Sending



6.8 Adjusting Image Quality

Clicking on the items for image quality adjustment enclosed by red frames in Figure 6-16 on the "Block Image" tabbed page makes the "Image Quality Adjustment" tabbed page appear, enabling the adjustment of image quality.

0	— 🗆 X
💭 Display Tuning RX (QE) 🔀	🐼 📢 📓 🕱 M 💷 🕴 🗖 🖬
Start Display Adjustment	Â
Maker/Type: EastRising V Model Name/Size: ER-TFT043-3	~
Block Image TCON/LCD Setting Timing Adjustment Graphic Layer Setting Image Quality Adjustment	
GLCDC	
Background generator Image Synthesizer Output Controller Video timing generating Brightness Graphic Layer Gamma correction Dither process Dither process TCON/LCD Setting Here Buffer Area For For Layer1 Layer2	
	•

Figure 6-16 Buttons for Selecting the Adjustment of Image Quality



RX Family

The "Image Quality Adjustment" tabbed page enables the adjustment of image quality. QE for Display [RX] supports "Calibration Route Setting" and four facilities for adjusting image quality: "Brightness", "Contrast", "Gamma correction", and "Dither process".

Changes to these settings are reflected in real-time, allowing the adjustment of image quality with reference to the display on the LCD panel.

Image quality is adjusted by using "Quick Setting" or "Custom". If you select "Custom", refer to the RX65N Group, RX651 Group User's Manual: Hardware (R01UH0590), RX72N Group User's Manual: Hardware (R01UH0824) and the RX Family Graphic LCD Controller Module Using Firmware Integration Technology (R01AN3609), check the meanings of the settings made in each of the registers and the specifiable values, and adjust the image quality accordingly.

6		— 🗆 X
💭 Display Tuning RX (QE) 🗧	S 🖓 📢	🕒 🛱 😋 🗆 🕴 🗖 🗖
Start Display Adjustr	nent	î
Maker/Type : EastRising	✓ Model Name/Size : ER-TFT043-3	~
Block Image TCON/LCD Set	ing Timing Adjustment Graphic Layer Setting Image Quality Adjustment	
Calibration Route Setting Brightness Contrast Gamma correction Dither process	Brightness Quick Setting :	
	Custom : BRTG[9:0] (Green) 512 BRTB[9:0] (Blue) 512 BRTR[9:0] (Red) 512	^
		Ŷ

Figure 6-17 "Image Quality Adjustment" Tabbed Page



6.9 Generating a Header File with the Results of Adjusting Image Quality

Click on the "Generating Header File" icon of QE for Display [RX] to generate a header file that reflects the results of image quality adjustment which have been specified (see Figure 6-18).

When you select "For Image Adjustment" only and click on "Generate", a header file is generated at the specified destination for output. The name of the header file and the output destination can be specified as desired.

Select the Header File		×
For Display Settings :		
C:\work\e2_studio\workspace\QE_for_Display_	RX65N_Envision\src\r_lcd_timing.h	Browse
For Image Adjustment :		
C:\work\e2_studio\workspace\QE_for_Display_	RX65N_Envision\src\r_image_config.h	Browse
	Generate Cancel	<u>H</u> elp

Figure 6-18 Selecting "For Image Adjustment"

To reflect the settings of image quality adjustment in the project, output the header file with the name 'r_image_config_.h' in the following directory, and clean and build the project.

Directory:

<workspace folder>¥<project folder>¥src



7. Setting Detailed Data on the LCD Panel

If you select "Custom" from the "Maker/Type" pull-down list in the upper section of the dialog box shown in Figure 6-2, the "Edit Custom Display Data" dialog box (Figure 7-1) appears. Enter information on the LCD panel in this dialog box.

Maker/Type : A Model Name/Size :			~
Display Type 1 Display Type 2 Display Type 3 CLK IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	···	Recom	Divert the existing data
Parameter	Min.	Тур.	Max.
Panel Clock Frequency (PCF) [MHz]	-		-
Panel Clock Period (PCP) [ns]	-	-	-
Horizontal Frequency (HF) [KHz]	-	-	-
Horizontal Period (HP) [us]	-	-	-
Horizontal Total Period (HTP) [Clock]	-	-	-
Horizontal Pulse Width (HPW) [Clock]	-		-
Horizontal Display Period (HDP) [Clock]	-		-
Horizontal Front Porch (HFP) [Clock]	-		-
Horizontal Back Porch (HBP) [Clock]	-		-
Vertical Frequency (VF) [Hz]	-	-	-
Vertical Period (VP) [ms]	-	-	-
Vertical Total Period (VTP) [Line]	-	-	-
Vertical Pulse Width (VPW) [Line]	-		-
Vertical Display Period (VDP) [Line]	-		-
Vertical Front Porch (VFP) [Line]	-		-
Vertical Back Porch (VBP) [Line]	-		-
URL :			

Figure 7-1 "Edit Custom Display Data" Dialog Box

7.1 Entering Names for Registration

Enter the desired names in "Maker/Type" and "Model Name/Size" in the "Edit Custom Display Data" dialog box (Figure 7-2). These names will be registered in the drop-down list for selection.

e ² Edit Custom Dis	olay Data	×
Maker/Type :	Maker1	~
Model Name/Size :	LCD1	

Figure 7-2 Registering a Name

7.2 Selecting the Display Type

Table 7-1, Main Control Signals, lists the control signals required for connecting an LCD panel. QE for Display [RX] supports devices which have three display types with combination of those control signals.

Table 7-1	Main Control Signals
-----------	----------------------

Name	Outline of Facility
Horizontal synchronization signal (Hsync)	The signal that generates the timing for one line to be displayed
Vertical synchronization signal (Vsync)	The signal that generates the timing for one screen to be displayed
Panel clock (CLK)	The signal that drives the sampling of pixels to be displayed
Display enable (DE)	The signal indicating that valid data are being output
Data (Data)	Data to be displayed

The user must check which control signals are required in the specifications of the LCD panel in use and select the appropriate one from among the three display types shown in Table 7-2, Display Types and Control Signals to be Used.

Table 7-2 Display Types and Control Signals to be Used

Name	Display type 1 CLK	Display type 2	Display type 3
Horizontal synchronization signal (Hsync)	Used	Unused	Used
Vertical synchronization signal (Vsync)	Used	Unused	Used
Panel clock (CLK)	Used	Used	Used
Display enable (DE)	Unused	Used	Used
Data (Data)	Used	Used	Used



RX Family

7.3 Entering Control Timing

Enter the control timing with reference to the datasheet for the LCD panel. Values entered under Typ. are used as the initial values for timing control. Values entered under Min. and Max. are used to check whether or not the timing as adjusted by using the QE for Display [RX] GUI is within the range.

Figure 7-3 shows the result of data input for the LCD panel mounted on the RSK. Enter values with reference to Table 7-3, Excerpt from the Datasheet for the LCD Panel on the RSK.

Maker/Type :	Maker1			~
Model Name/Size :	LCD1			
 Display Type 1 Display Type 2 Display Type 3 	CLK IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	ſL		Divert the existing data
Parameter		Min.	Тур.	Max.
Panel Clock Freque	ency (PCF) [MHz]	-	9.0	15.0
Panel Clock Period	I (PCP) [ns]	66.666666666	111.111111111	-
Horizontal Frequer	ncy (HF) [KHz]	-	17.14	-
Horizontal Period (HP) [us]		-	58.3430571761	-
Horizontal Total Period (HTP) [Clock]		525	525	605
Horizontal Pulse Width (HPW) [Clock]		2	41	41
Horizontal Display Period (HDP) [Clock]		480	480	480
Horizontal Front P	orch (HFP) [Clock]	2	2	82
Horizontal Back Po	orch (HBP) [Clock]	2	2	41
Vertical Frequency	(VF) [Hz]	-	59.94	-
Vertical Period (VP) [ms]	-	16.6833500166	-
Vertical Total Perio	d (VTP) [Line]	285	286	399
Vertical Pulse Width (VPW) [Line]		1	10	11
Vertical Display Period (VDP) [Line]		272	272	272
Vertical Front Porch (VFP) [Line]		1	2	227
Vertical Back Porch (VBP) [Line]		1	2	11
URL :				

Figure 7-3 Result of Control Timing Input



Demonstern	Or much all	Spec.			
Parameter	Symbol	Min.	Тур.	Max.	Unit
Clock cycle	fclk	-	9	15	MHz
Hsync cycle	1/th	-	17.14	-	KHz
Vsync cycle	1/th	-	59.94	-	Hz
Horizontal Signal			·		
Horizontal cycle	th	525	525	605	CLK
Horizontal display period	thd	480	480	480	CLK
Horizontal front porch	Thf	2	2	82	CLK
Horizontal pulse width	thp	2	41	41	CLK
Horizontal back porch	thb	2	2	41	CLK
Vertical Signal			·		
Vertical cycle	tv	285	286	399	Н
Vertical display period	tvd	272	272	272	Н
Vertical front porch	tvf	1	2	227	Н
Vertical pulse width	tvp	1	10	11	Н
Vertical back porch	rvb	1	2	11	Н

Table 7-3 Excerpt from the Datasheet for the LCD Panel on the RSK

7.4 Editing Created Display Data

When the "Edit and Delete the Custom Display..." menu item is executed after clicking on the menu button on the toolbar, the created display data can be re-edited.



Figure 7-4 "Edit and Delete the Custom Display..." Menu Item



8. Details of Settings

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

8.1 Setting the GLCDC FIT Module in Ways not Supported for QE for Display [RX]

The Smart Configurator can be used to change the settings of the GLCDC FIT module in ways that are not supported by QE for Display [RX]. However, changing the settings from the default values may lead to an error. Confirm the specifications of the GLCDC FIT module.

For the specifications of the GLCDC FIT module, refer to the RX Family Graphic LCD Controller Module Using Firmware Integration Technology Application Note.

8.2 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] and the settings of parameters of the GLCDC FIT module.

Figure 8-1 shows the flow of troubleshooting.



Figure 8-1 Troubleshooting



8.3 Setting the Maximum Memory Size for Use with the GUI

If a created GUI contains many widgets, the GUI may not work properly when they are displayed on the screen with the memory settings at the time. In this case, increase the value of "Maximum memory size used in GUI" in the "emWin setting" dialog box. The default setting is 80 KB (1024 * 80 = 81920). Set a value, such as 100 KB, that is suitable for the GUI you have created.

🗿 emWin setting			×
Board settings Board LCD width LCD height LCD settings LCD rotation Color depth Pin settings ✓ LCD reset pin ✓ LCD backlight pin ✓ LCD backlight pin ✓ LCD touch IC reset pin Memory settings Address of frame buffer 1	RX65N_ENVISION_KIT 480 272 ORIENTATION_0 16bits Port: Bit: Port: Bit: 7 0x00000000	ORIENTATION_0 ORIENTATION_CW	
Address of frame buffer 2 Maximum memory size used in GUI Touch setting Slave address of touch panel Multi-touch setting Multi-touch function Maximum number of touch panel points Communication channel IIC channel number DRW2D setting DRW2D	0x00000100 B1920 0x38 Not Use 10 6 Use	ORIENTATION_180	
		OK Cancel He	р

Figure 8-2 "emWin setting" Dialog Box



8.4 Points for Caution on the Image Drawing Speed

This chapter describes points for caution on the image drawing speed. In addition, since the GUI drawing process was improved in emWin FIT V6.14.g.1.20, download that or a later version and use it if you had been using an earlier version.

8.4.1 Point for Caution on Using JPEG Images with AppWizard

Since there is no JPEG decoder in 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.



Figure 8-3 Expanding "Set bitmap" and Selecting a JPEG Image



8.4.2 Setting the Bitmap Format in AppWizard

Note: Since this problem has been resolved in AppWizard V1.08_6.14d or later version, download emWin FIT V6.14g.1.20 and use that or a later version.

In versions earlier than V1.08_6.14d, AppWizard would create an uncommon bitmap format when the color format was 16 bits. Thus, if the bitmap format applied to the image is "Auto", the drawing engine would not draw it well. Follow the steps described below to change the bitmap format.

1. Click on the "Images" button at the lower left corner of AppWizard.



Figure 8-4 Clicking on "Images"

2. The "Images" dialog box will open. In this dialog box, you can select the format to be used for the generated bitmap image. Click in the "Format" column of an image entry and select the bitmap format. For images that require transparency, select "True color with alpha, RB swap, alpha inverted". This is a 32-bpp format that the drawing engine can draw.

For images that neither have nor require transparency, select "High color (565), RB swap". This is a 16-bpp format that the drawing engine can also draw.



Figure 8-5 Selecting the Bitmap Format



Revision History

		Description	1			
Rev. Date		Page	Summary			
1.00	Sep.17.20	-	First edition issued.			
1.10	Dec.25.20	12	Added notes on installing QE for Display [RX] by using the			
			Renesas software installer for the e ² studio.			
		18	Added a step for opening the Smart Configurator perspective.			
		21 to 26	Changed sources of examples of images from the Envision RX72N BDF to the Envision RX65N BDF.			
		44	Added a step for opening the debug perspective.			
			Added the display of the console of QE for Display.			
		45	Added an image of the "Set the Register" icon.			
		57	Added a step for confirming code generation.			
		64	Added a step for setting the compiler.			
		69	Added a step for adjusting the size of an image in the "Editor" panel.			
		73 to 75	Added steps for setting the bitmap format.			
		76	Added a step for confirming the operation of the button in the			
			preview.			
		107	Added "Main Clock Source", "Extal Frequency [MHz]", and			
			"Connection Type" to the description of the "Debug			
			Configuration" dialog box.			
		110	Added a step for confirming the operation when the button is			
			touched.			
	141	Added the section "Setting the Maximum Memory Size Used in the GUI".				
		142 and	Added the section "Points for Caution on the Image Drawing			
		143	Speed".			
1.21	May.26.21	1 and 4	Added statements on supporting the Aeropoint GUI.			
		5	Modified statements on supporting the Aeropoint GUI.			
		6	Modified the version of the e ² studio IDE in table 2-1.			
		9	Added a document related to the Aeropoint FIT module.			
		11 to 13	Modified the descriptions due to updating of the versions of the e ² studio and QE for Display [RX].			
		27	Added a description of the size of the heap to be used by the Aeropoint GUI FIT module.			
		29	Modified the description on supporting the Aeropoint GUI.			
		31, 33,	Updated the version of "Graphics LCD Controller Module			
		and 34	(r_glcdc_rx)".			
		37 and 38	Added a statement that the values in the "Timing Adjustment"			
			tabbed page are automatically set according to the board.			
		40	Added a statement that the settings in "PLL Circuit Frequency			
			[MHz]" differ with the version of the e ² studio.			
		47 and 48	Added a note on changing the GUI drawing tool after the GLCDC controller has been installed.			
		37 to 47	Added a description of "Auto Adjustment" and updated the display of the screen.			
		50 and 53	Updated the version of "Graphic Library with Graphical User Interface (r_emwin_rx)".			
		60	Added a statement on the setting of "Maximum memory size used in GUI".			



QE for Display [RX] Application Note

61	Changed the name of the file to be generated.
70	Added a reference to the image format to be specified.
79 to 104	Added the section "Using Aeropoint GUI to Create a GUI for an LCD".
105	Added a note on generating code at the time of building when using Aeropoint GUI.
110	Added images displayed when using Aeropoint GUI.
124 and 125	Described values of "Graphic Layer Setting" dividing into tables for RSK and Envision.
127 and 128	Corrected statements in descriptions.
130	Modified the title of section 6.6.



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.

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