

QE for AFE V2.1.1

Release Note

Thank you very much for using the QE for AFE V2.1.1.

This release note covers product installation, restrictions, and so on. Please read this document before using the product.

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1. About QE for AFE

1.1 Summary

QE for AFE is an evaluation tool for embedded system development that performs graphical tuning with an built-in analog front end (AFE). Using this tool, you can set the AFE registers, write the registers into the evaluation board, and monitor the AFE tuning results in a waveform.

To use this tool, you must have a board that supports QE for AFE. QE for AFE is connected between PC and the board through USB cable and communicates with the board.

1.2 Functions

The main functions are listed below:

1. Connect and operate the evaluation board
2. Config AFE related registers with GUI
3. Display graphics of the AFE tuning results and digital filter frequency response
4. Display graphics of the user application measurement values
5. Generate code with RX SmartConfigurator or RA FSP when working as e² studio plug-in,

1.3 New Functions

1.3.1 Support RX23E-B

QE for AFE V2.1.1 starts to support RX family. RX23E-B is the first supported device.

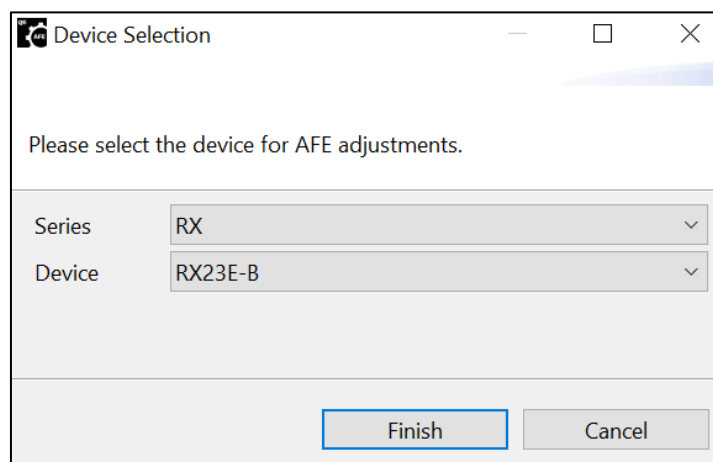


Figure 1-1. Device selection

1.3.2 Support [Application] function

QE for AFE V2.1.1 starts to support [Application] function, which can display graphics of the measurement values of user program. In addition, it is possible to send values to user program and the user program can be controlled by the ON/OFF button. Please refer to related user program application note for details.

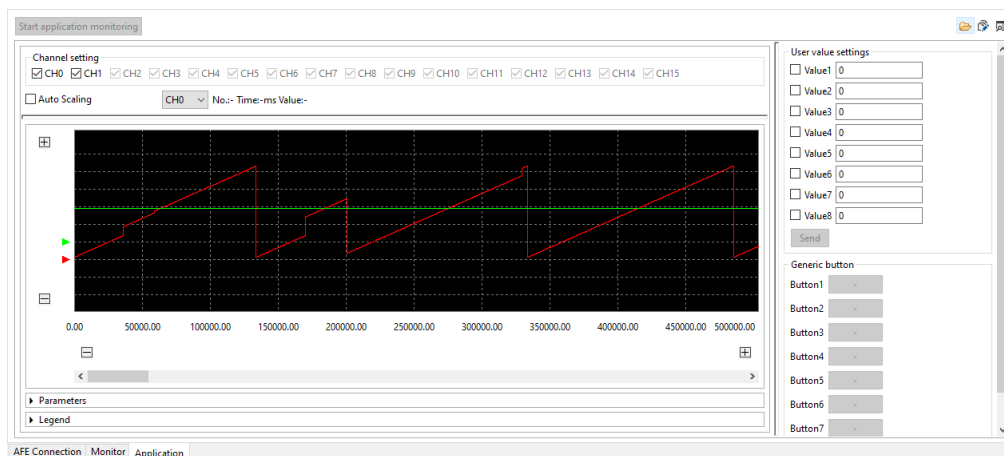


Figure 1-2. Application function

1.3.3 Improve the workflow view

QE for AFE V2.1.1 changes the main view to the workflow view, which contains more detailed guide information and is easier to understand and operate.

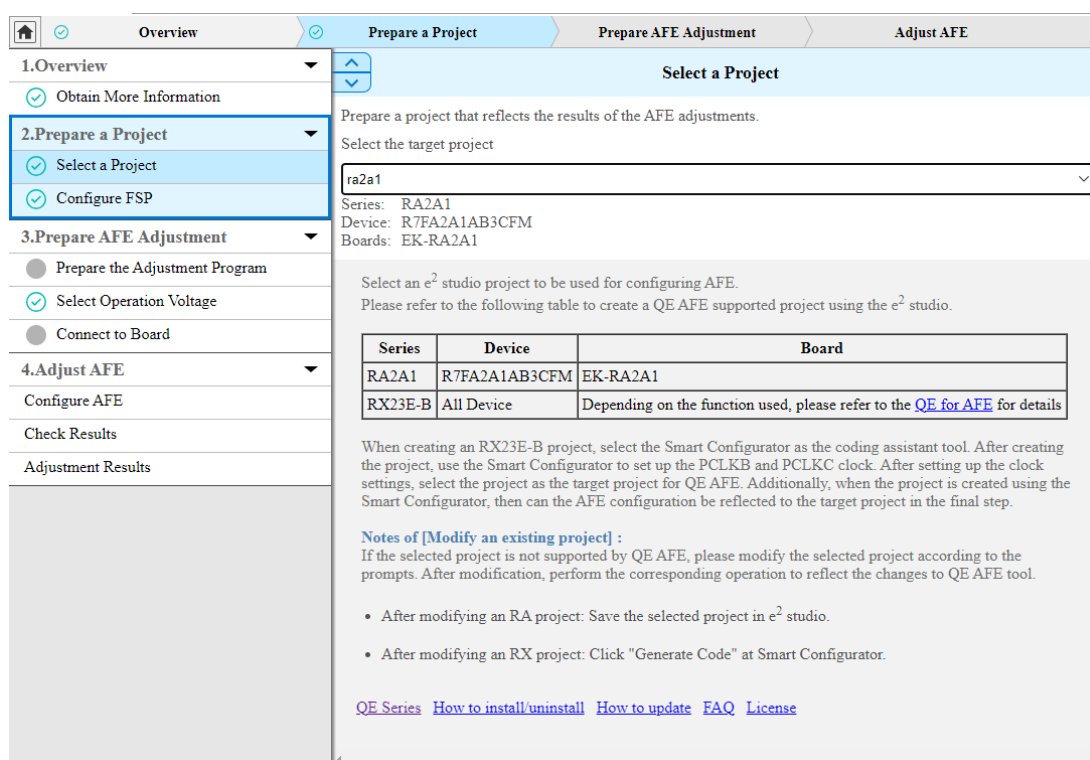


Figure 1-3. New workflow view

The workflow view can switch between two styles according to the window's width.

- Guide style
Press the menus on the left to show the setting items on the right part. Step by step from the top of the menu.
- Simple style
Show all settings. Step by step from the top of the workflow.

Note: The setting items of both workflow styles are the same as the old main view.

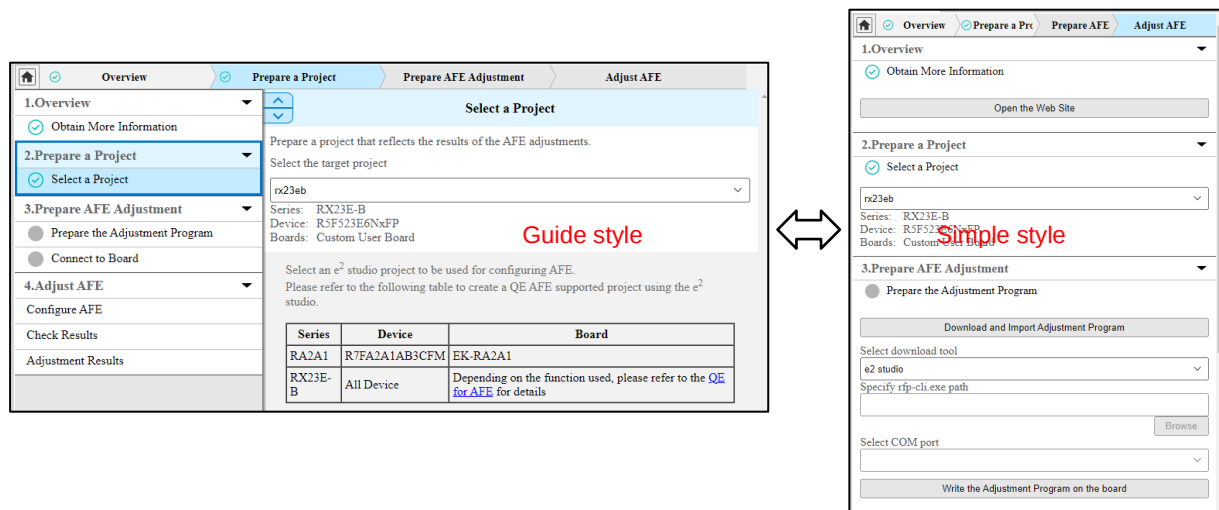


Figure 1-4. Styles of new workflow

1.3.4 Eliminate the limitation of monitoring time width

QE for AFE V2.1.1 can accept a large [Time Width(ms)] input without a memory overflow issue.

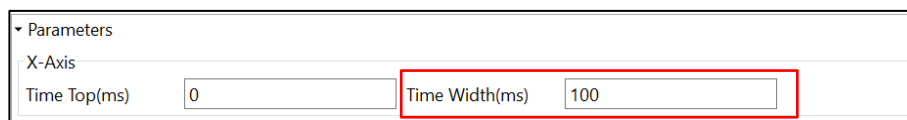


Figure 1-5. Time width setting

1.3.5 Output messages in console when operation failed

QE for AFE V2.1.1 can output messages in console for failed operations:

- When opening a mismatched device data file
- When pressing [Stop AFE Monitoring] button failed
- When invalid data received from board was discarded in drawing waveform

1.3.6 Change [Start AFE Tuning] button text and position

QE for AFE V2.1.1 changes [Start AFE Tuning] icon button to [Start AFE monitoring] button with text and move the button position to the left of the toolbar.



Figure 1-6. [Start AFE monitoring] button

1.3.7 Support to switch the operation buttons style

The operation button display can be switched between two styles: display only icon or display both icon and text. The favorite style can be selected by the right-click menu.

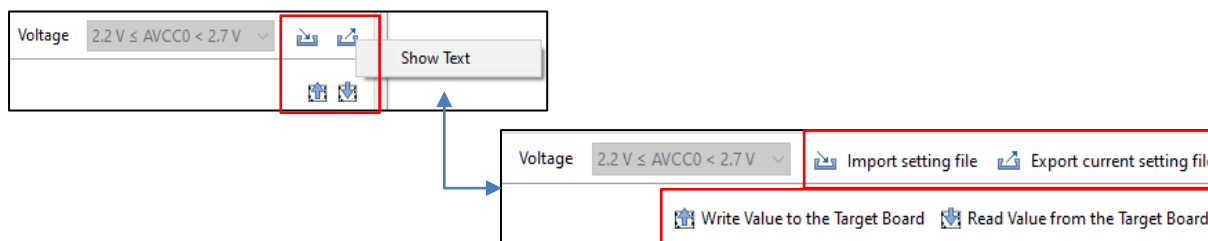


Figure 1-7. Switching operation button style

1.4 Supported Environment

- RA2A1
 - Windows 10 (64-bit version), Windows 11 (64-bit version)
 - Renesas e² studio 2023-10 and later
 - Evaluation board: EK-RA2A1
 - RA2A1 Group Board Control Program for “QE for AFE” in application note R01AN5795EJ0200
Note: Board control program should be built with FSP3.6.0.
- RX23E-B
 - Windows 10 (64-bit version), Windows 11 (64-bit version)
 - Renesas e² studio 2023-10 and later
 - Evaluation board: RSSK RX23E-B
 - RX23E-B Group Board Control Program for “QE for AFE” in application note R01AN6364EJ0100

1.5 Supported Microcontrollers

- RA Family (only MCUs that incorporate the AFE)
 - RA2A Series: RA2A1
- RX Family (only MCUs that incorporate the AFE)
 - RX200 Series: RX23E-B

2. Installation and Uninstallation

2.1 Installing This Product

Use either of the following procedure to install this product.

2.1.1 Install from the "Renesas Software Installer" menu of e² studio

1. Start e² studio.
2. Select the "Renesas Views" - "Renesas Software Installer" menu of e² studio to open the "Renesas Software Installer" dialog box.
3. Select the "Renesas QE" and click the "Next >" button
4. Select the "QE for AFE (v2.1.1)" check box and click the "Finish" button.
5. Check that the "Renesas QE for AFE" check box is selected in the "Install" dialog box and click the "Next >" button.
6. Check that the "Renesas QE for AFE" check box is selected as the target of installation and click the "Next>" button.
7. After confirming the license agreements, if you agree to the license, select the "I accept the terms of the license agreements" radio button, and click the "Finish" button.
8. When the dialog box for selecting a trusted certificate appears, check the displayed certificate, and then click on the "Trust Selected" button to continue installation.
9. Restart the e² studio by following the instructions on the screen.
10. Start this product from the "Renesas Views" - "Renesas QE" menu of e² studio. For details about how to use this product, see the "Help" menu of e² studio.

2.1.2 Install using QE (zip file) downloaded from the Renesas website

A downloaded zip file has both a plugin version and a standalone version.

2.1.2.1 Install Plugin Version

1. Extract the downloaded zip file.
2. Start the e² studio.
3. Click on "Help", and then click on the "Install New Software..." menu item to open the "Install" dialog box.
4. Click on the "Add..." button to open the "Add Repository" dialog box.
5. Click on the "Archive..." button, select the installation file (zip file under the QE-AFE folder) in the opened file selection dialog box, and then click on the "Open" button.
6. Click on the "Add" button in the "Add Repository" dialog box.
7. Expand the "Renesas QE" item shown in the "Install" dialog box, select the "Renesas QE for AFE" check box, and then click on the "Next>" button.
*If you check off the "Contact all update sites during install to find required software" checkbox, you can shorten the installation time.
8. Confirm that the installation target is "Renesas QE for AFE", and then click on the "Next>" button.
9. After checking the license, select the "I accept the terms of the license agreements" radio button if you agree it, and then click on the "Finish" button.
10. When the dialog box for selecting a trusted certificate appears, check the displayed certificate, and then click on the "Trust Selected" button to continue the installation.
11. Restart the e² studio by following the instructions on the screen.
12. Start this product from the "Renesas Views" - "Renesas QE" menu of the e² studio. For details about how to use this product, see the "Help" menu of e² studio.

2.1.2.2 Install Standalone Version

1. Extract ".zip" file to a user-specified location on the PC.
Note: Please do not put the tool under OS program folder (C:\Program Files)
2. Start this product by double clicking "\QE-AFE\eclipse\qe-afe.exe".
3. For the first time this product starts, there is a dialog of license agreement. After checking the license, you can select "Agree" or "Disagree".

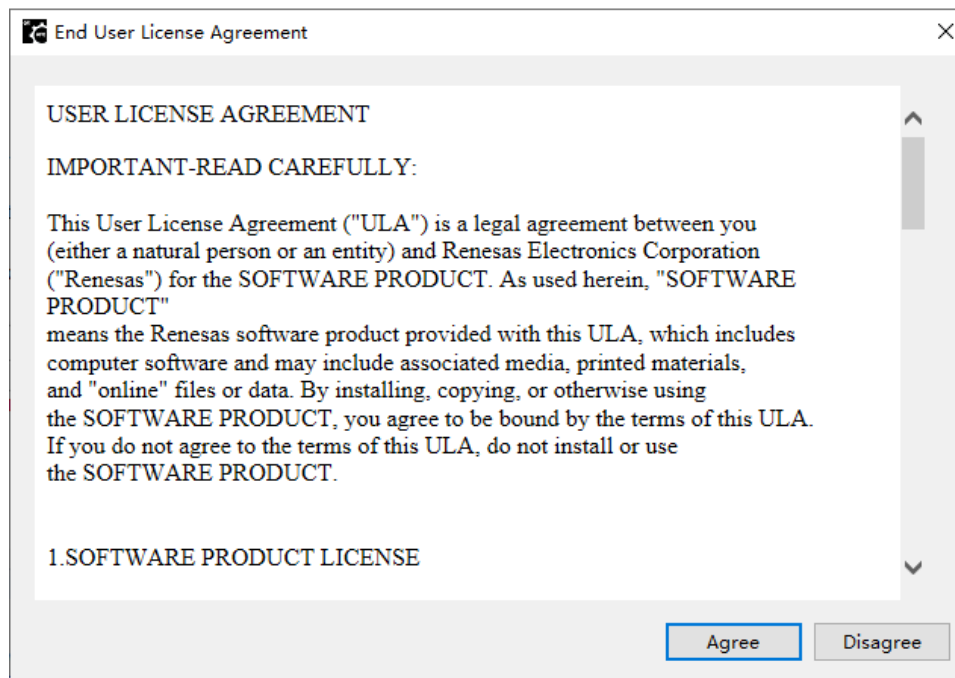


Figure 2-1. License agreement dialog

4. If "Agree" is selected in above step, the product is launched then you can use it; if "Disagree" is selected in above step, the product won't be launched.

2.2 Updating This Product

If you have already used this product, you can update it in the same way as the procedure for installation.

2.3 Uninstalling This Product

Follow the procedure below to uninstall this product.

2.3.1 Uninstall Plugin Version

1. Start the e² studio.
2. Select "Help -> About e² studio" to open the "About e2 studio" dialog box.
3. Click the "Installation Details" button to open the "e2 studio Installation Details" dialog box.
4. Select "Renesas QE for AFE" displayed on the "Installed Software" tabbed page and click on the "Uninstall..." button to open the "Uninstall" dialog box.
5. Check the displayed information and click on the "Finish" button.
6. Restart the e2 studio by following the instructions on the screen.

2.3.2 Uninstall Standalone Version

Delete the entire folder which .zip package is extracted.

3. Notes / Restrictions

3.1 Usage Considerations

Please pay attention to the following items.

Table 3-1 List of Limitation

✓ : Applicable, -: Not Applicable

No	Description	RA2A1	RX23E-B	Remarks
1	Notes on reading Board Control Program application note	✓	✓	
2	Notes on pressing [Write Value to The Target Board] button after configuring an AFE component setting	✓	-	
3	Notes on ADC16 One-shot and Auto mode selection on [Monitor] View	✓	-	
4	Notes on closing [AFE Monitor (QE)] view of e ² studio plugin version	✓	✓	
5	Notes on OPAMP trimming function failed using Emulator connection	✓	-	
6	Notes on downloading AFE adjustment project	✓	✓	
7	Notes on location path of standalone version (qe-afe.exe)	✓	✓	
8	Notes on using e ² studio installation package	✓	✓	

3.1.1 Notes on reading Board Control Program application note

QE for AFE works with the control program operating on the evaluation board. So when using this product, please read the related Board Control Program application note first and use the recommended parameters in the application note. The parameters to be concerned include:

- System clock setting
- Sampling time of communication I/F
- Default bitrate setting of UART connection

3.1.2 Notes on pressing [Write Value to The Target Board] button after configuring an AFE component setting

It is recommended to press [Write Value to The Target Board] button each time completing one AFE component configuration and move to next AFE component configuration. The reason is that the board control program checks the validity of the new register value according to the existing register value on the evaluation board. Keeping the register values on the evaluation board always consistent with the GUI configuration can avoid unexpected errors when writing new registers values to the evaluation board.

3.1.3 Notes on ADC16 One-shot and Auto mode selection on [Monitor] View

ADC16 has 2 monitoring modes: One-shot and Auto. The waveform of these 2 modes is depending on ADC16 sampling time setting:

- When ADC16 sampling time is short (performing high-speed conversion)
 - One-shot mode: QE for AFE reads data from evaluation board and draws the waveform only once
 - Auto mode: QE for AFE reads data from evaluation board and draws the waveform continuously until the "Stop AFE Monitoring" button is pressed
- When ADC16 sampling time is long (performing low-speed conversion)
 - Either One-shot mode or Auto mode, the waveform are same: QE for AFE reads data from evaluation board and draws the waveform continuously until the "Stop AFE Monitoring" button is pressed.

Note: for detailed procedure of One-shot measurement and Auto measurement, please refer to board control program application note chapter "1.1.2 Measured Value Transmission Operation during A/D Conversion and Comparison"

3.1.4 Notes on closing [AFE Monitor (QE)] view of e2 studio plugin version

In e² studio plugin version, if multiple [AFE Monitor (QE)] views are open under different perspectives, closing one [AFE Monitor (QE)] view while the monitor is running, the monitor won't be stopped (the tuning result still can be observed after switching to another perspective). Closing the [AFE Monitor (QE)] view of all perspectives can end the tuning process.

3.1.5 Notes on OPAMP trimming function failed using Emulator connection

When using Emulator connection mode, OPAMP trimming function occasionally fails. The failed phenomenon is that even click "Next" and wait a while on Step1 or Step2, the wizard can't move to next step. So to execute OPAMP trimming function successfully, please take priority to use USB or UART connection mode.

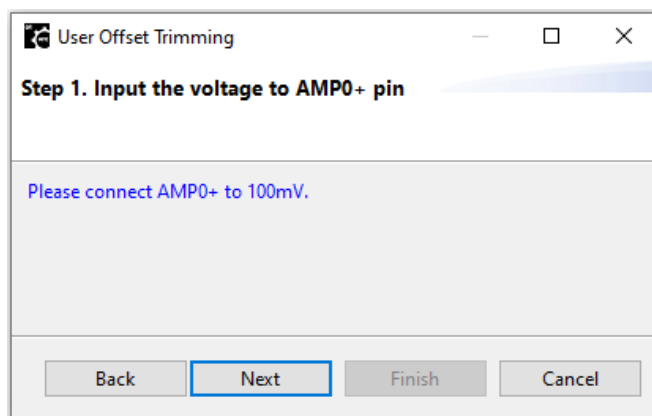


Figure 3-1 OPAMP trimming function dialog

3.1.6 Notes on downloading AFE adjustment project

To download AFE adjustment project, please kindly take note to set the region using the following steps. Otherwise, project can't be downloaded.

- 1) Select [Window] > [Show View]>[Smart Browser] menu.
- 2) Select [Setting] in the Smart Browser [View menu].
- 3) Select one region in the settings dialog and click [Apply and Close] button.

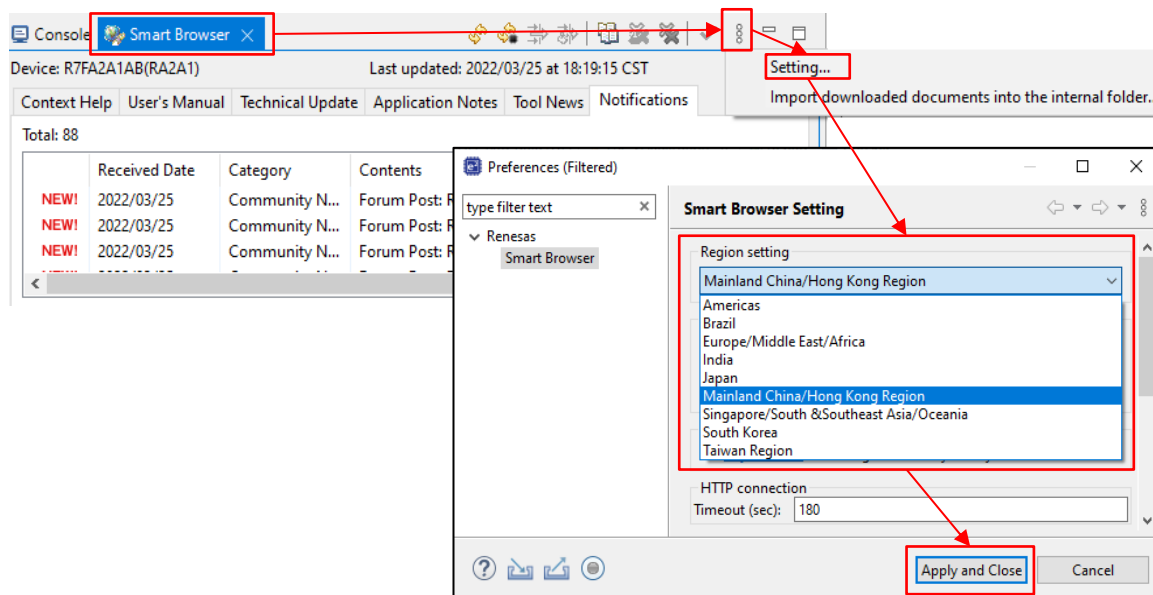


Figure 3-2 Smart Browser Region setting

3.1.7 Notes on installation path

In the following locations, QE for AFE will not work properly if there is a folder name starting with "u" (lowercase) in the path.

- Location of extracting the standalone version (. zip file)
- Location of installing e² studio

For example, "C:\install\usertool" is an invalid path , because the "usertool" folder starts with "u".

However, for folder names that start with "U" (Uppercase), QE for AFE can work normally.

For example, "C:\User\ < account name >" is a valid path.

3.1.8 Notes on using e² studio installation package

To install QE AFE V2.1.1 using e² studio installation package, please take note that you must select RA device family in e² studio Setup wizard.

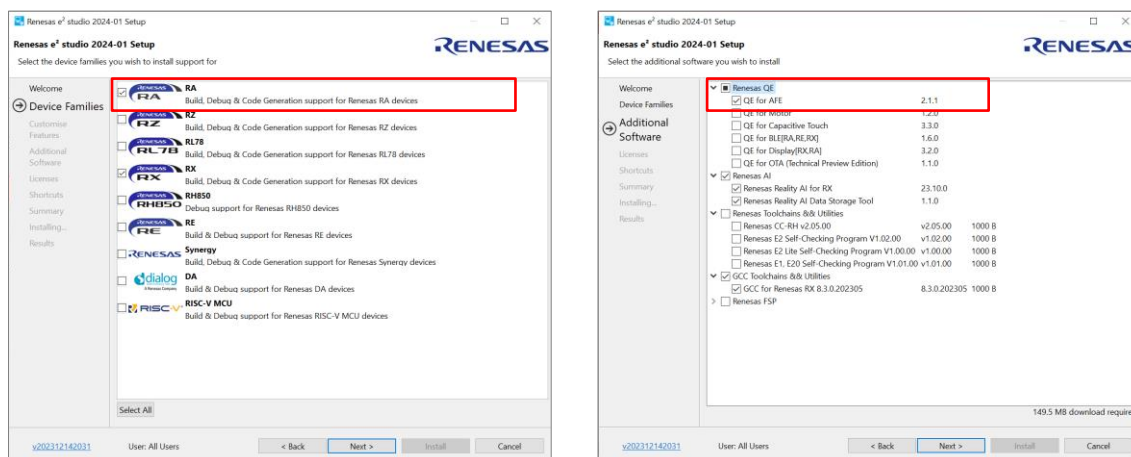


Figure 3-3 e² studio Setup wizard setting

In the case that RA device family is not selected, you will meet the following error message on the e² studio setup end page.

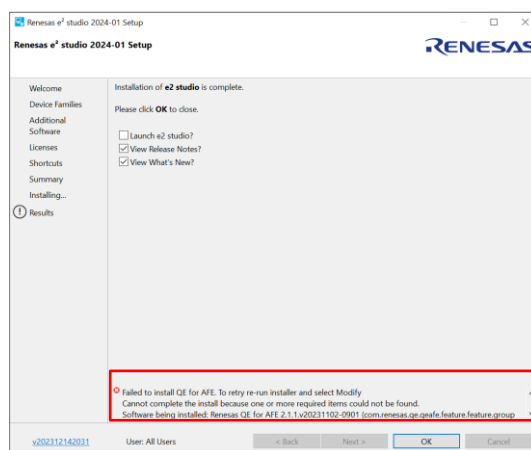


Figure 3-4 QE AFE installation failed

There are 2 workarounds are provided when you meet this error.

- 1) Please try the installation method [“2.1.1 Install from the "Renesas Software Installer" menu of e2 studio”](#). By this way, QE AFE V2.1.1 can be installed in e²studio without RA device family installed.

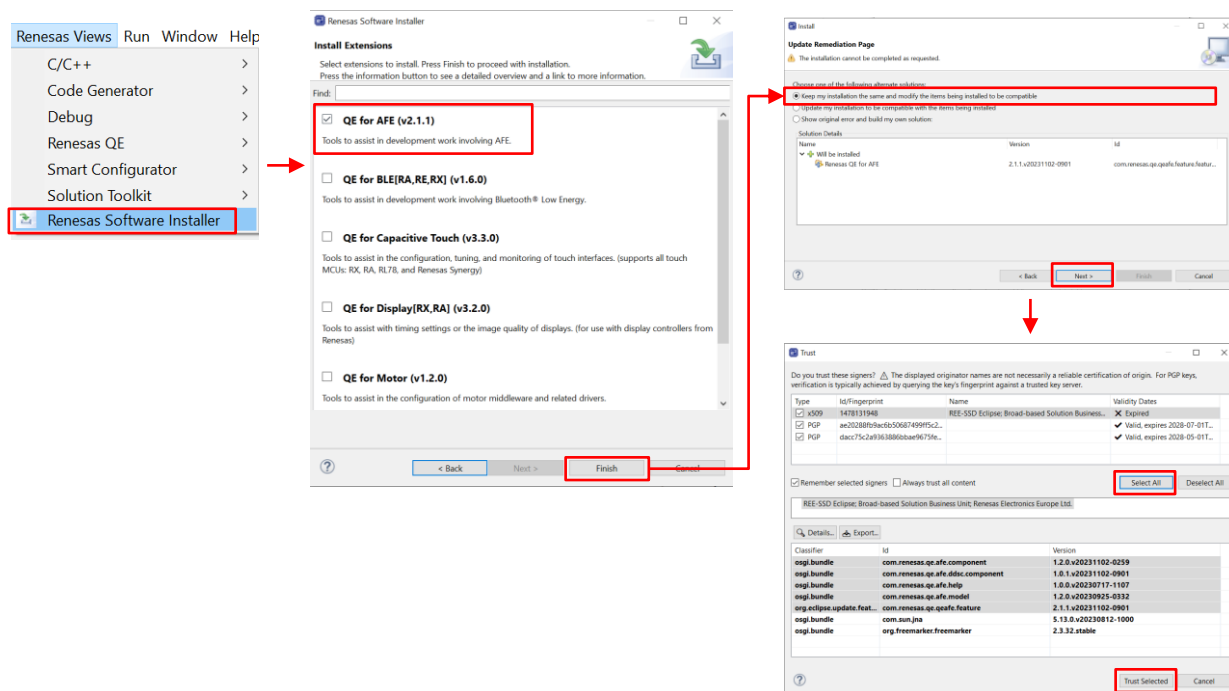


Figure 3-5 To install QE AFE without RA device family installed

- 2) Please re-install e² studio. On the device selection wizard page, please take note to select RA device family (refer to Figure 3-3).

3.2 Functional Restrictions

The following restrictions apply to QE for AFE V2.1.1. These restrictions will be solved in next or future version.

Table 3-2 List of Restrictions

✓ : Applicable, -: Not Applicable

No	Description	RA2A1	RX23E-B	Remarks
1	Restrictions on showing a video about how to use QE AFE	-	✓	
2	Restrictions on ACMPLP configuration	✓	-	
3	Restrictions on migration pin allocation to Smart Configurator	-	✓	

3.2.1 Restrictions on showing a video about how to use QE AFE

The video is not ready for publish, so you can't open the video even if you press the video button.



Figure 3-3 Video button

[Workaround]

Please wait for the video content published.

3.2.2 Restrictions on ACMPLP configuration

- “DAC8 channel 0 output” is selected as ACMPLP0 input (refer to figure3-4 (1))
 - When switcher (A) selects Vref (refer to figure3-4 (A))
 - When ACMPLP0 is disabled (refer to figure3-4 (D))
 - When switcher (B) selects IVREF0, switcher (C) selects Vref (refer to figure3-4 (B) and (C)) and ACMPLP1 is enabled (figure3-4 (E) selects “Enable”)

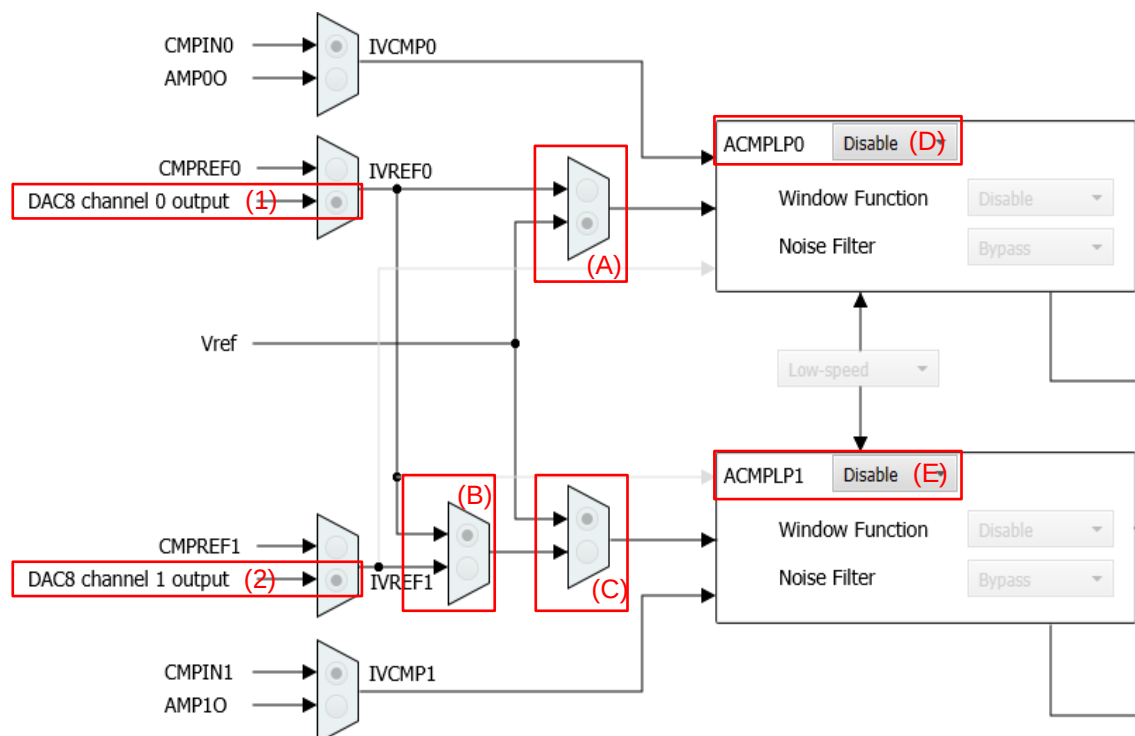
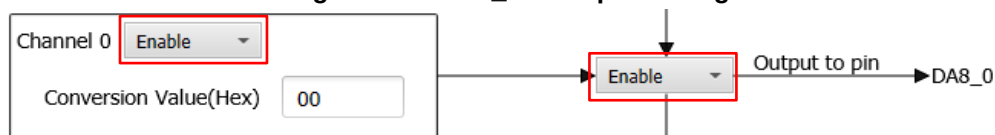


Figure 3-4 ACMPLP1 example setting

Either of above ACMPLP0 settings will cause the register value cannot be successfully written to the EK-RA2A1 board with the following 1) – 3) settings.

- 1) Set P013 as DA8_0 function in DAC8 page (P013PFS = 0A018000)

Figure 3-5 DA8_0 example setting



- 2) Select DA8_0 as OPAMP1 input in OPAMP page (AMP1PS = 80)

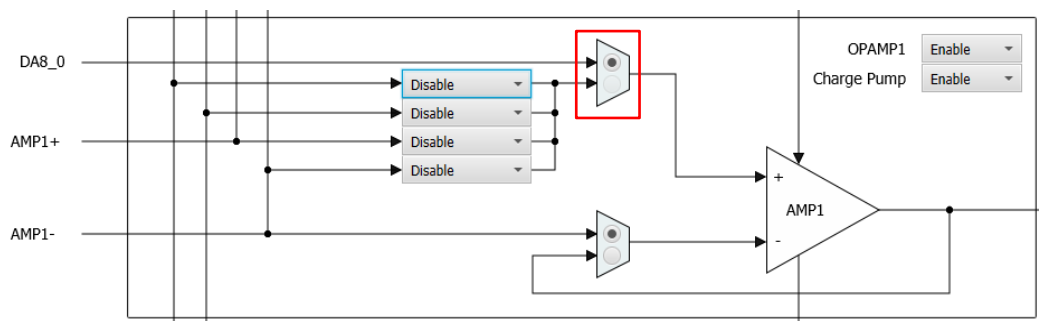
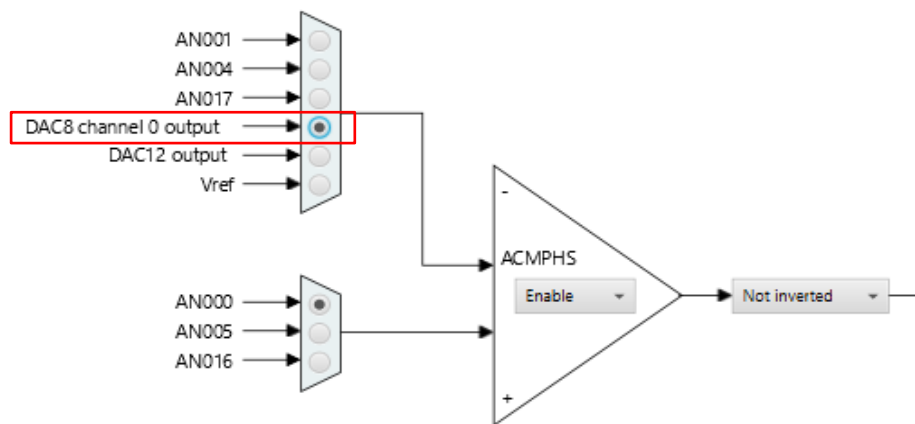


Figure 3-6 OPAMP example setting

- 3) Select "DAC8 channel 0 output" as input in ACMPHS page (CMPSEL1 = 08)

Figure 3-7 ACMPHS example setting



[Workaround]

In above ACMPLP0 setting, (1) setting is invalid. So please change (1) from "DAC8 channel 0 output" to "CMPREF0".

■ "DAC8 channel 1 output" is selected as ACMPLP1 input (refer to figure3-4 (2))

- When switcher (B) selects IVREF0 (refer to figure3-4 (B))
- When switcher (C) selects Vref (refer to figure3-4 (C))
- When ACMPLP1 is disabled (refer to figure3-4 (E))

Either of above ACMPLP1 settings will cause the same limitations 1) and 2) as selecting" DAC8 channel 0 output "above.

[Workaround]

In above ACMPLP1 setting, (2) setting is invalid. So please change (2) from "DAC8 channel 1 output" to "CMPREF1".

3.2.3 Restrictions on migration pin allocation to Smart Configurator

When reflecting AFE setting to Smart Configurator, in certain case, the pin allocation in QE for AFE might be lost in Smart Configurator [Pin] > [Pin Functions] setting.

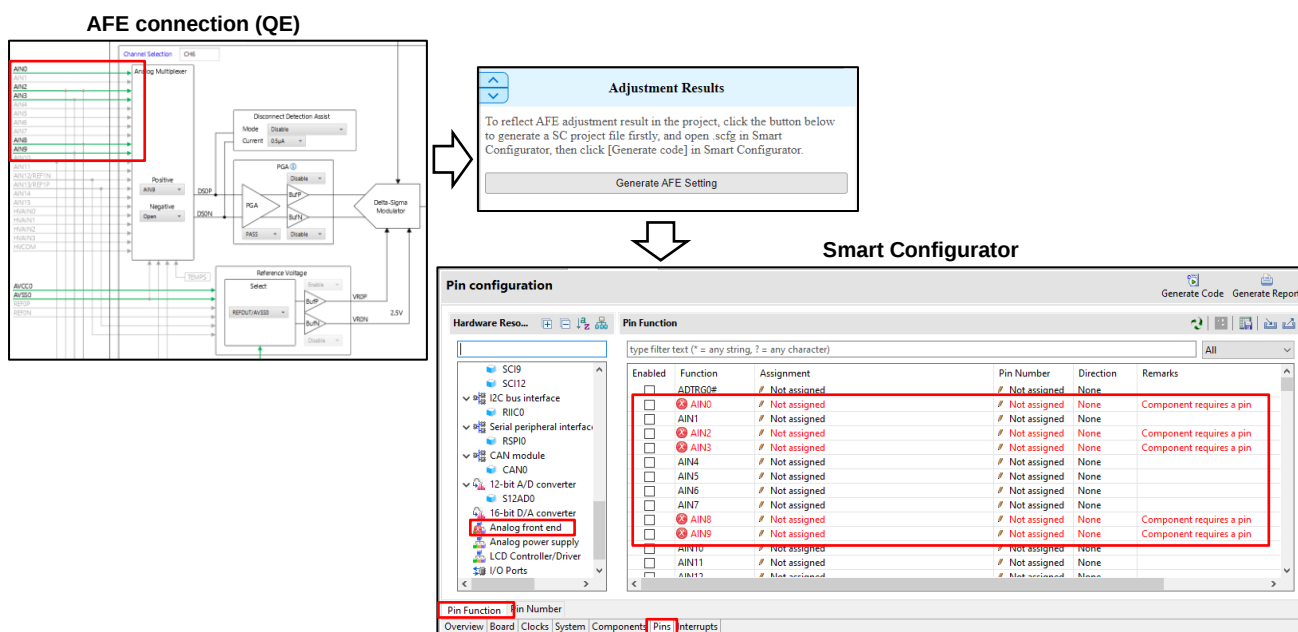


Figure 3-8 Missing pin allocation

[Workaround]

After “Generate AFE Setting” operation, please open Smart Configurator [Pin] > [Pin Functions] and check. If the AFE module on the left tree display an error, then manually select the pins on the right table according to QE for AFE setting.

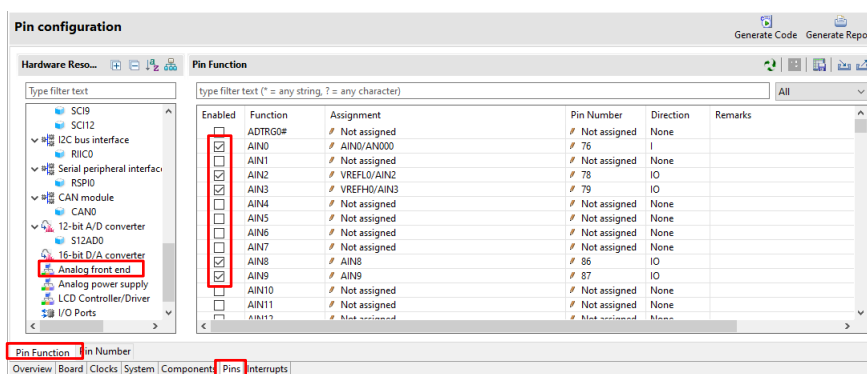


Figure 3-9 Select the pins manually

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Nov.15.23	-	First edition issued.
1.01	Dec.12.23	11	Added "3.1.7 Notes on installation path"
1.02	Dec.22.23	12,13	Added "3.1.8 Notes on using e2studio installation package"

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Precaution against Electrostatic Discharge (ESD)

A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity.

Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

2. Processing at power-on

The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.

3. Input of signal during power-off state

Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

4. Handling of unused pins

Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.

5. Clock signals

After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.

6. Voltage application waveform at input pin

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).

7. Prohibition of access to reserved addresses

Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

8. Differences between products

Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
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