Manual

Renesas IC Toolbox Software

This manual is intended to help users understand the key concepts of the Renesas IC Toolbox (RICBox) software.

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1. Introduction

The RICBox, or Renesas IC Toolbox, is a versatile Windows utility designed to streamline and enhance the development process when working with Renesas products. This tool is particularly useful for engineers and developers as they can configure and program ICs according to their requirements on various evaluation boards.

1.1 System Requirements

RICBox requires Windows 10. The setup program installs **.NET 5.0** alongside RICBox as a self-contained deployment, therefore, **.NET 5.0** does not have to be installed separately.

RICBox ships with an installable version of Python. The setup program will automatically install Python if an appropriate version of Python is not already installed or detected on the computer.

- USB 2.0 or USB 3.0 Interface
- Processor: Minimum 1GHz
- Memory: Minimum 512MB; recommended 1GB
- Available disk space: minimum 600MB (1.5GB 64-bit); recommended 1GB (2GB 64-bit)

2. Installation and Setup

There are two parts to installing and running the RICBox software. The first being the Renesas IC Toolbox and the second being the related device software plugin. Each device has a separate plugin interface available that will install in parallel to the RICBox software. This plugin can be installed through the RICBox update feature after the base software is installed.

2.1 RICBox Software Installation

- Download the RICBox software directly from the Renesas website.
  - This can normally be found on the webpage of the supported devices.
- The downloaded package will have two install files. Run the installer that pertains to the version of windows on the current system. For example:
  - The file labeled RICBox-version-x86.exe needs to be installed on a windows 32-bit system.
  - The file labeled RICBox-version-x64.exe needs to be installed on a windows 64-bit system.

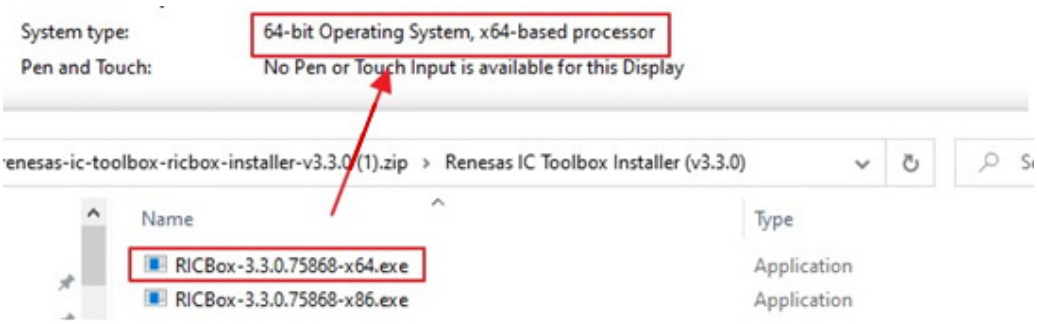


Figure 1. RICBox Installation Files

- Follow the on-screen prompts to finish the installation.
  - If any issues occur during the installation process, try to uninstall and reinstall the software. If the problem persists, then please contact Renesas support.

2.2 Device Software Installation

The RICBox software must be installed before installing a specific device software.

1. Open RICBox and click on *Help* > *Updates* to open the RICBox *Updates* window.

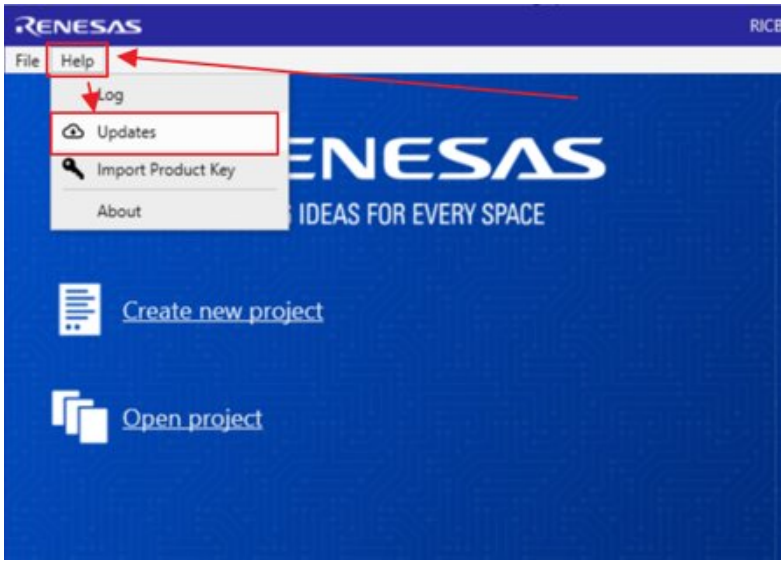


Figure 2. Help > Updates Window

2. This will display the *RICBox Updates* pop-up page.

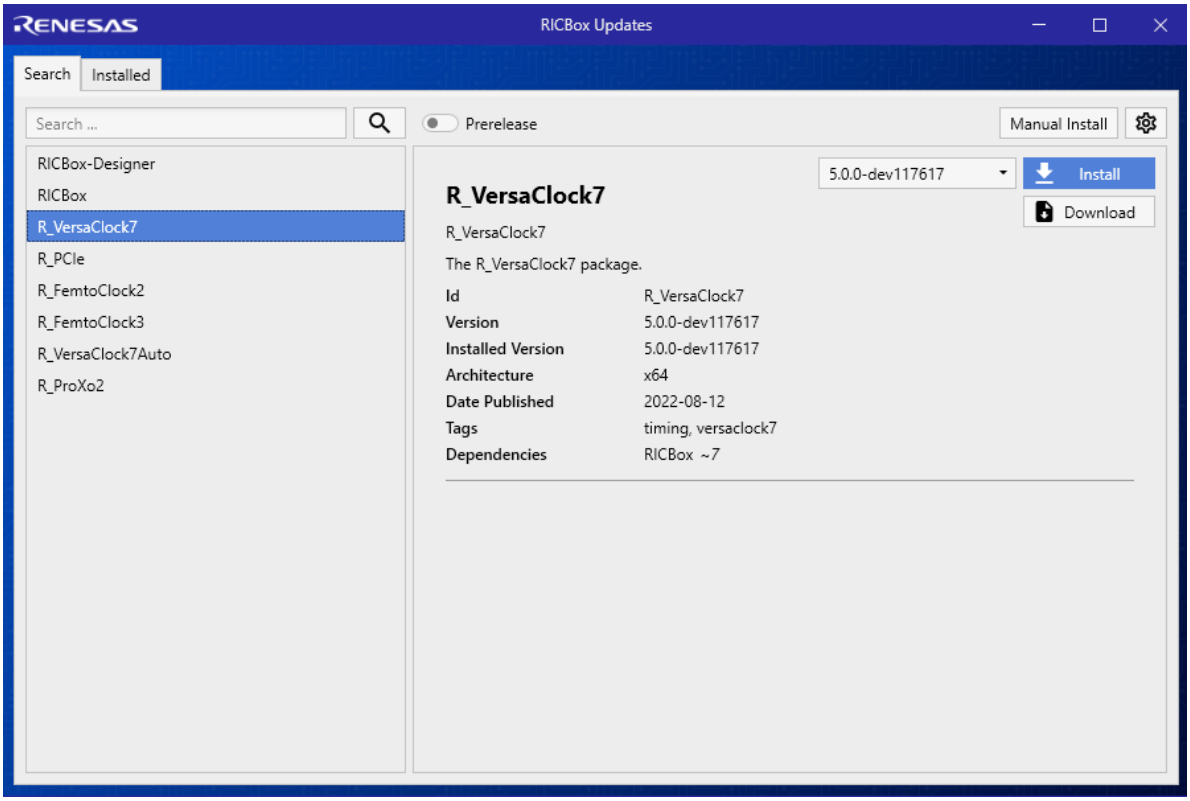


Figure 3. RICBox Updates Page

3. The available plugins will be displayed on the left side of the window.

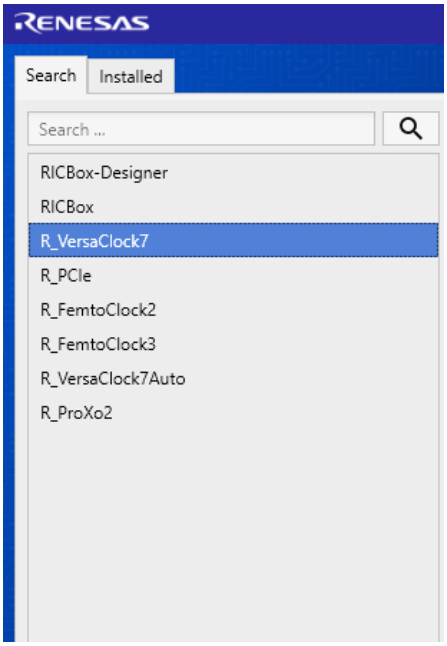


Figure 4. Available Plugins Window

4. Click on one of the installation packages to view the software information.

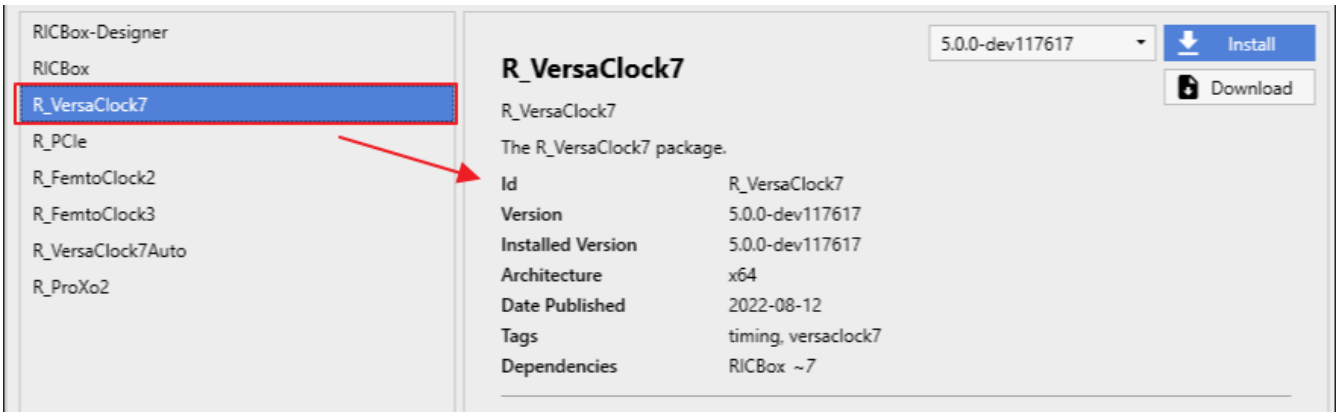


Figure 5. Plugin Software Information Window

5. Use the drop-down menu by the install button to select what version is to be installed.

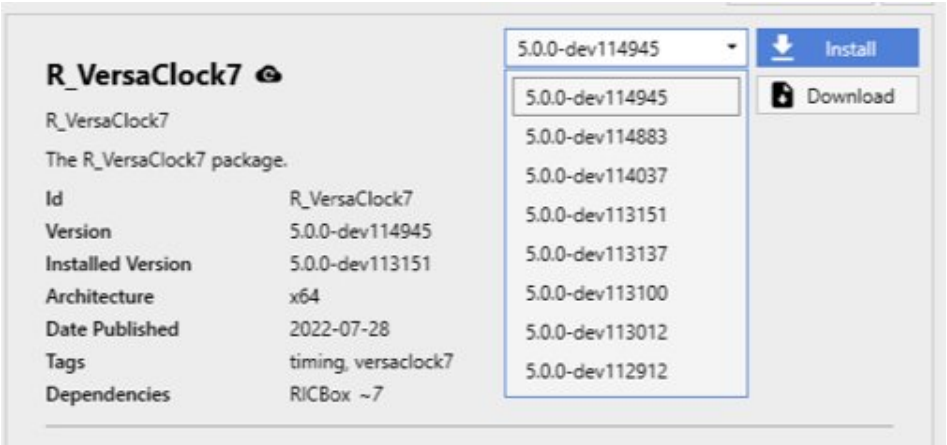


Figure 6. Selectable Versions Window

6. Click the install button to add that package to the install queue (more than one can be added).

7. Click the *Install Now* button in the upper-right corner of the window to initiate the installation process.

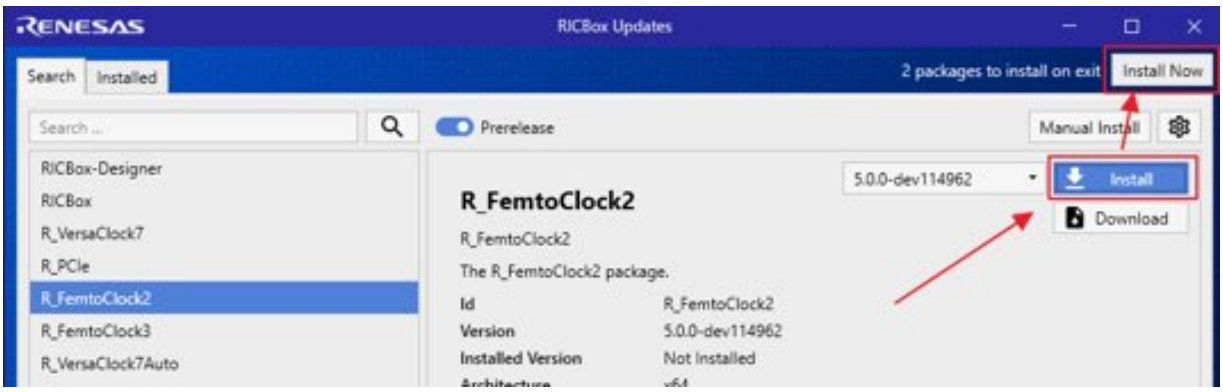


Figure 7. Plugin Install Process

8. Once the installation process is complete, RICBox will restart and the new updates should now be accessible.

3. Loading and Creating Configurations

Settings files are used to save and distribute custom device configurations. They have the file extension '.rbs'. Each settings file contains all of the register settings for a given device, metadata for the RICBox to understand, and other information pertaining to that specific configuration. They can be opened like a text file but should not be edited from any other location than the RICBox software.

Note: Changing values in a settings file from a text editor will corrupt the file and it will not be usable with the RICBox software.

3.1 Creating a New Configuration

1. To create a new configuration, open the RICBox software and click on the *Create New* project button.

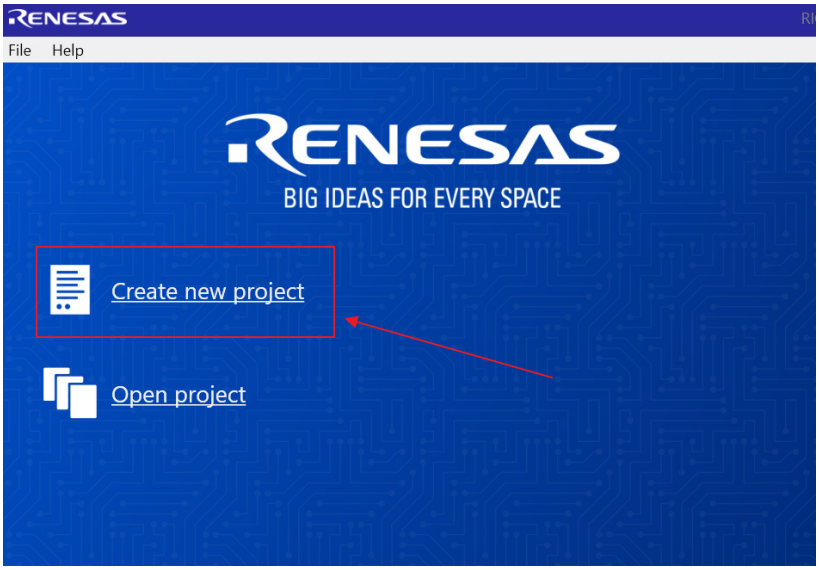


Figure 8. Create New Project Window

2. Then in the "Select Product Family" section, select the device family that is being used. From the "Select Product" section, select the working device. Click the *OK* button to open the new configuration.

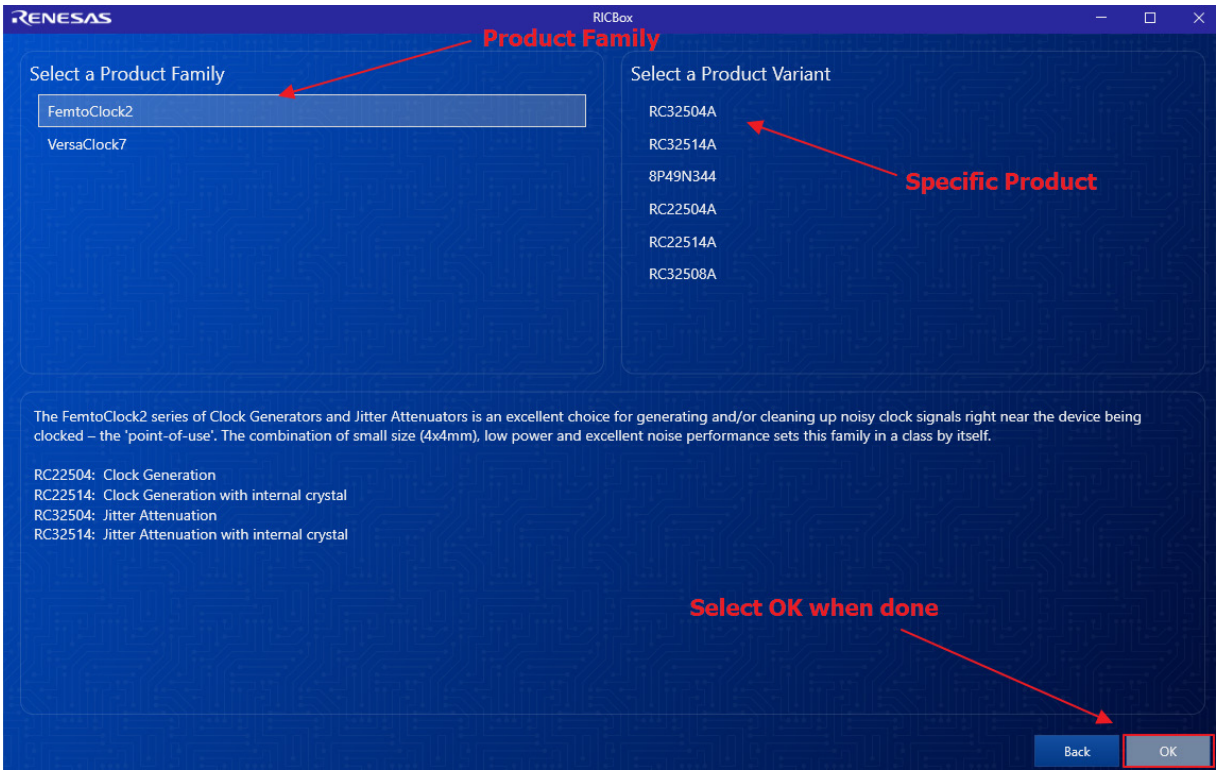


Figure 9. Select Product Plugin

3.2 Loading a Settings File

Loading a settings file is similar to creating a new one. To load an existing settings file, click on the *Browse* button just after opening the RICBox software. This will take the user to a file browser.

Note: Recently used settings files are under the “Recent Files” section.

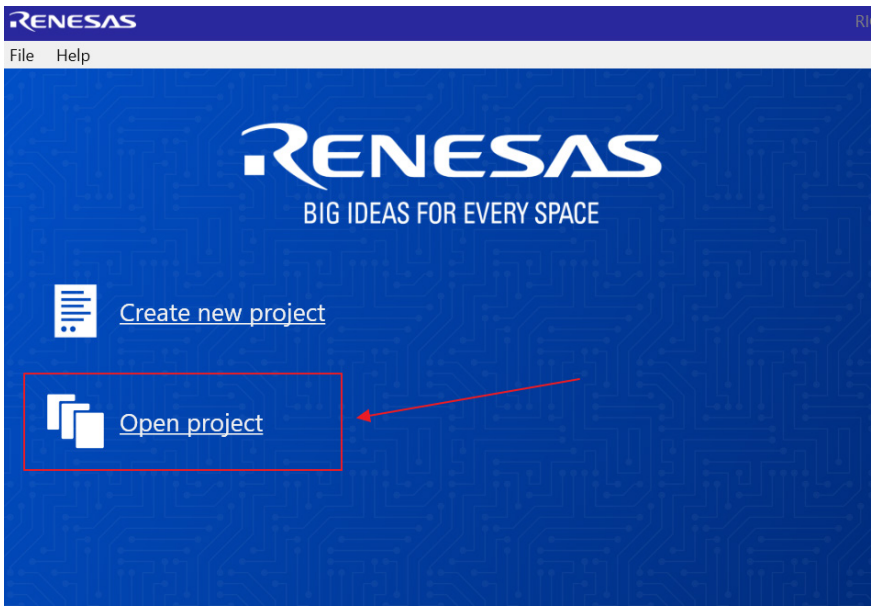


Figure 10. Open Existing Project Window

Navigate to the directory that stores the settings file and select it. RICBox settings files have the file type ‘.rbs’.

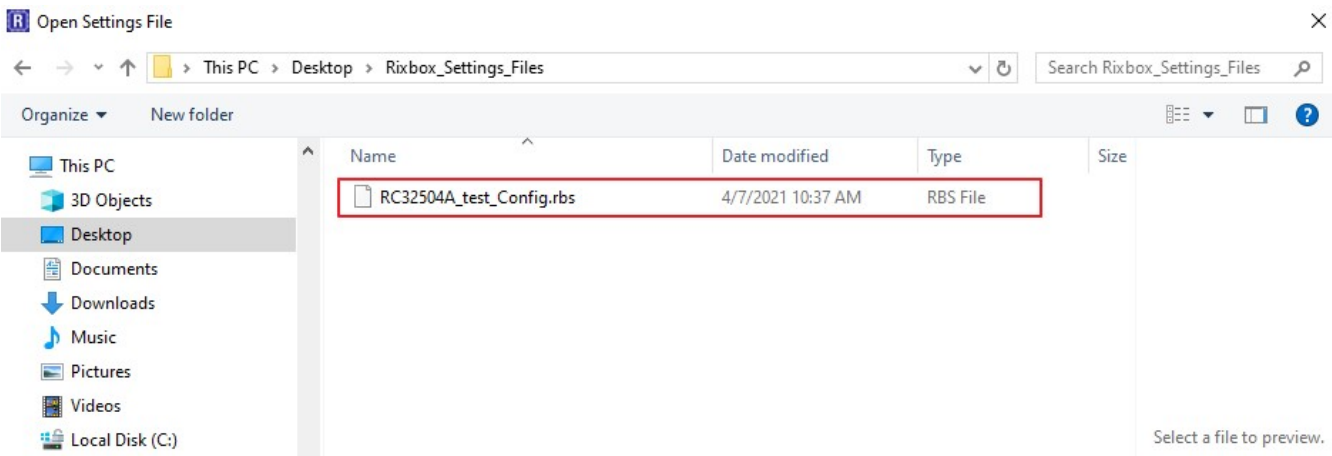


Figure 11. Select RBS File

4. Side Panel Buttons

The side panel consists of five separate buttons. Each button opens to a separate page. Each page has a unique view, enabling the configuration of the device from different perspectives.

Figure 12. Side Panel Buttons

- **Control Panel** – displays the device overview
- **Wizard** – displays the wizard view for initial device configuring
- **Configuration** – displays the register settings in a readable text format with a search engine
- **Registers** – shows a graphic of the registers in the device
- **Block Diagram** – displays a configurable block diagram view

4.1 Control Panel View

The control panel view displays an overview page depicting the major settings for the device. This page can be used as an important reference for the overall device configuration. Each device will display different values in the overview section depending on what is the most important information pertaining to the configuration.

RC32504A (RCx25x4A)

Driver version

Settings	
Dash Code	
Mode	
Current Mode	JA
Input	
XTAL	50MHz
REFCLK	10MHz
nREFCLK	10MHz
SysClock	
Quad sys clock	~227.2727MHz
Output	
Q0	156.25MHz [LVDS]
Q1	156.25MHz [LVDS]
Q2	100MHz [CMOS, Qx/nQx Opposite Phase]
Q3	100MHz [HCSL]
APLL	
APLL Frequency	10GHz
Divider	100
Loop Bandwidth	~363.0624kHz
Phase Margin	59.84 degrees
3rd Pole Frequency	~11.0524MHz
DPLL	
Enabled	yes
DPLL profile	JAMODE (jitter attenuator mode)
DPLL Frequency	10GHz
Divider	1000
Normal Bandwidth	~23.8203Hz (-4.7189% from goal of 25Hz)
Acquire Bandwidth	~222.3226Hz (-11.0709% from goal of 250Hz)
Decimator Bandwidth	~1.5542kHz (-37.8301% from goal of 2.5kHz)
Normal Gain Peaking	~0.1804dB
Acquire Gain Peaking	~0.192dB

Figure 13. Control Panel Overview Page

4.2 Wizard Setup

When creating new configuration, the wizard page is the first screen to appear. The intention of the wizard is to allow the configuration of the main parts of a given device without having to navigate through the entire GUI to do so. It does this through a step process where navigation is performed through a set of pages; each page pertaining to a different section of the device that is necessary for overall configuring.

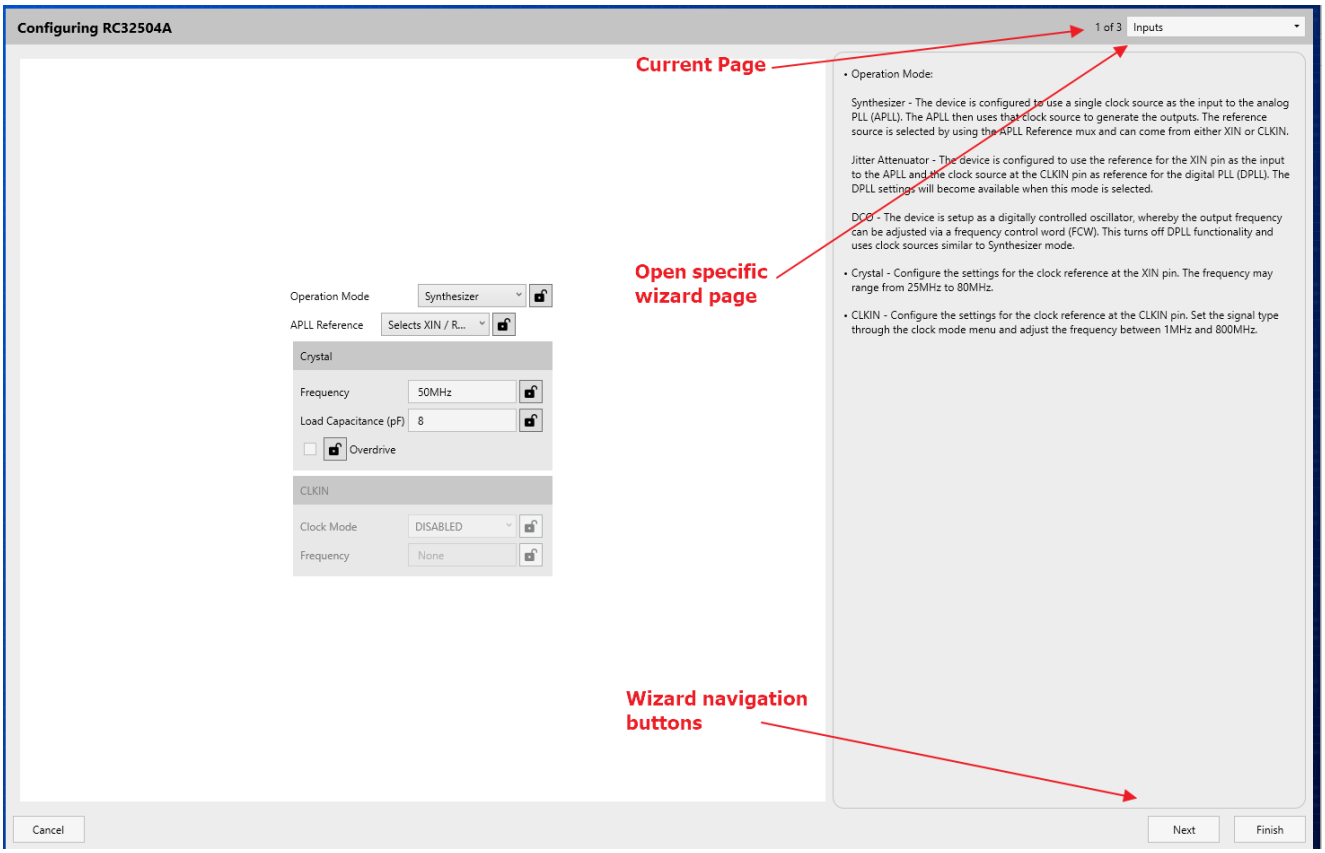


Figure 14. Wizard Page Navigation Window

4.3 Configuration View

Configuration view enables easy navigation through register settings via the tabs at the top of the page. Each section has all of the critical registers and data fields listed to allow configuration of the device block.

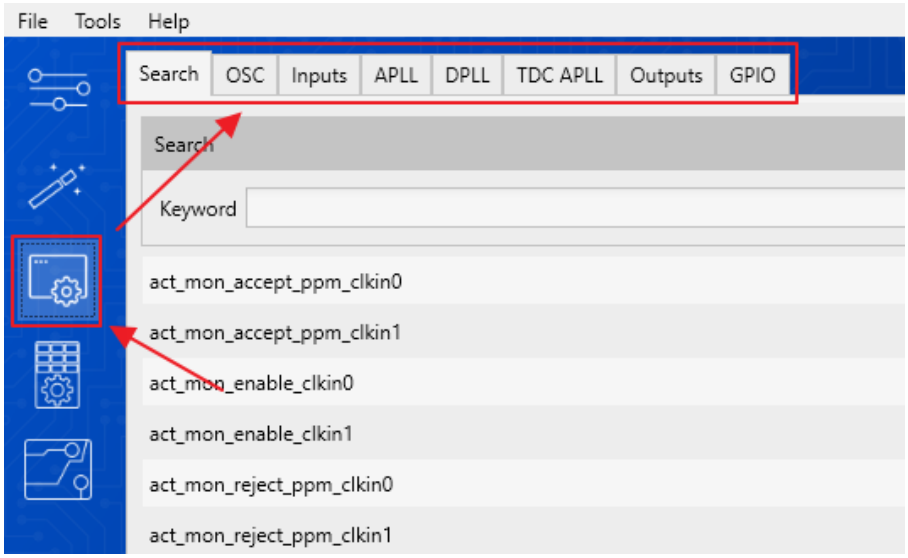


Figure 15. Configuration View Tabs

The search tab provides access to the configurable fields through a search bar. The search engine can be used to find any specific configurable field.

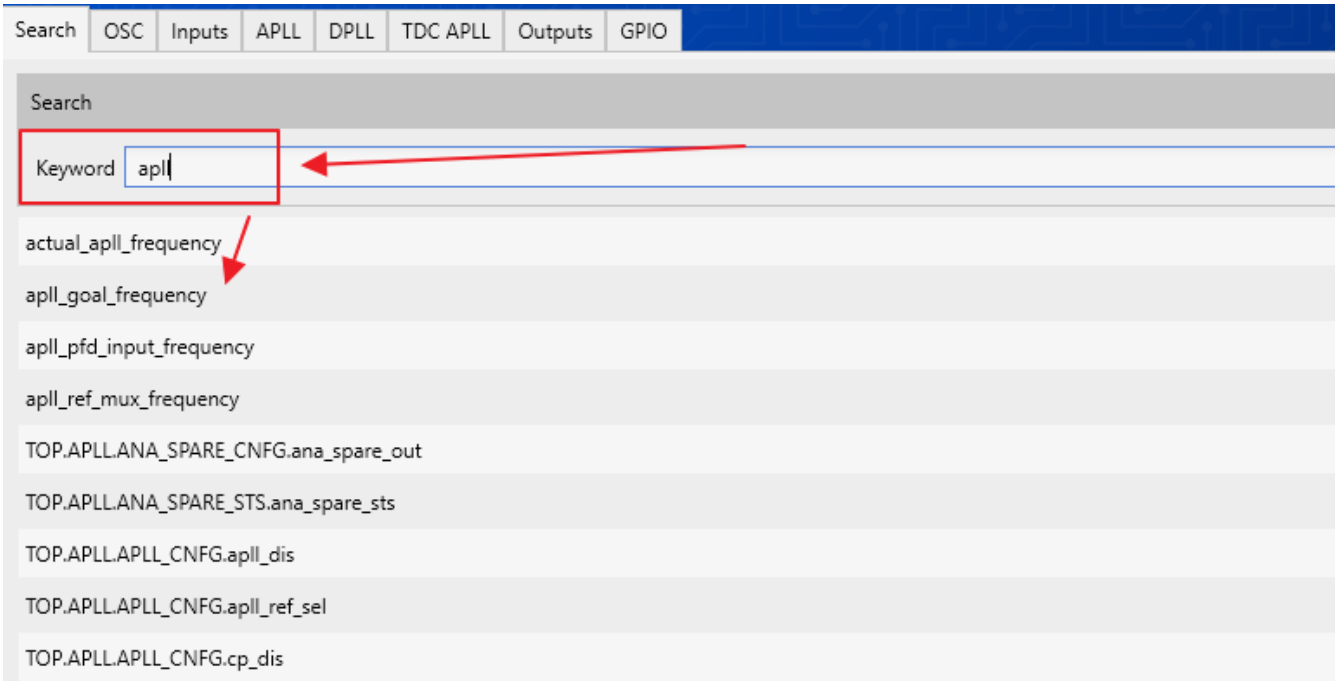


Figure 16. Configuration View Search

4.4 Register View

The register view shows a graphical diagram of the registers and allows the user to read or write any of the individual registers. By clicking on the individual register block, the given registers for that block will appear to the right. They can either be adjusted by writing directly to the diagram or entering values into the data fields on the right.

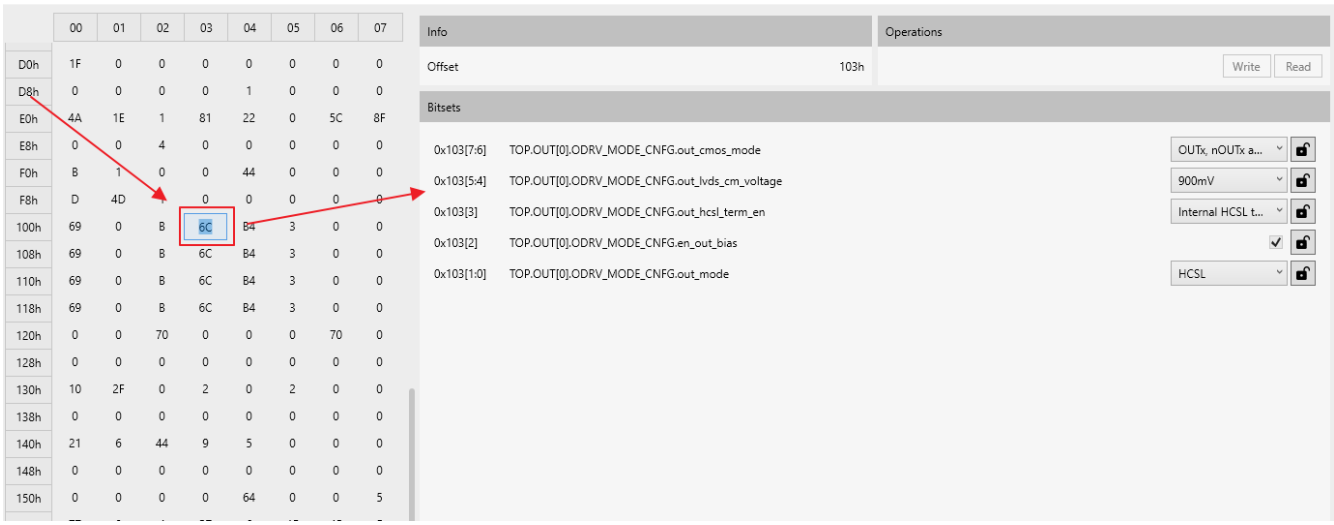


Figure 17. Register Access Window

4.5 Block Diagram View

The block diagram view is intended to give a visual representation to the internal register settings. The diagram has the same block representation as in each datasheet. To navigate around the block diagram, click on any of the blocks and open the pop-up page. This leads to a more in-depth look as to what registers are available to configure each block.

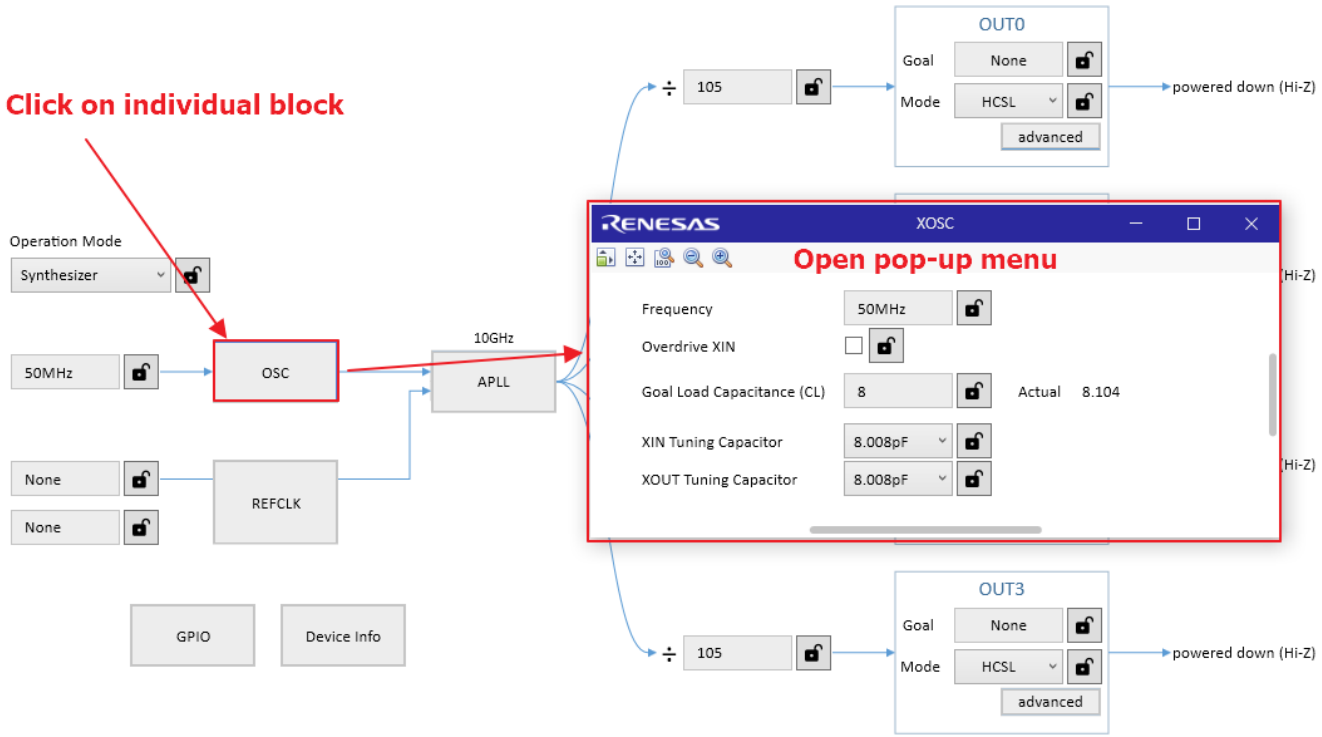


Figure 18. Block Diagram Pop-up Page

5. Device Connection

Device connection is handled through the button on the lower right-hand corner of the screen. Before connecting to a device, ensure that the device is properly powered. If using a Renesas evaluation board, the RICBox software can automatically detect the connection protocol type. To directly connect to a device:

1. Click on the *Not Connected* button in the lower right-hand corner.

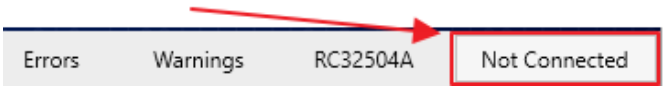


Figure 19. Not Connected Button

2. Click the *Connect* button right next to the program button (this may take a few seconds to establish a proper connection).

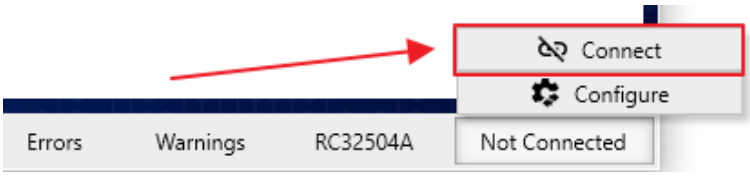


Figure 20. Connect Button

3. Once fully connected to a device, the connection button will be illuminated green.

Figure 21. Connected Button Illuminated

4. Once a device is fully connected, click on the *Program* button to write all register values from the configuration to the device. After the program button has been clicked the first time, the device will follow all configuration updates without having to re-write the registers. For example, if a user programs a configuration and then changes the output frequency afterwards, the device will reflect the new output frequency.

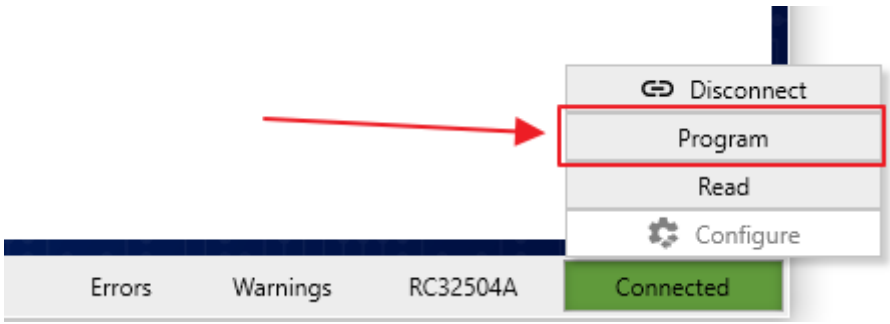


Figure 22. Program Button

5.1 Scanning for Connected Devices

To use the device scanning tool:

1. Click on the *Not Connected* button in the lower right-hand corner of the screen.

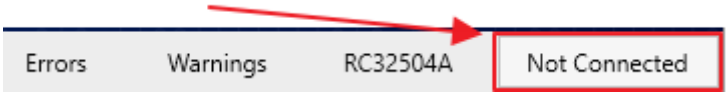


Figure 23. Not Connected Button

2. Click the *Configure* button next to the read button.

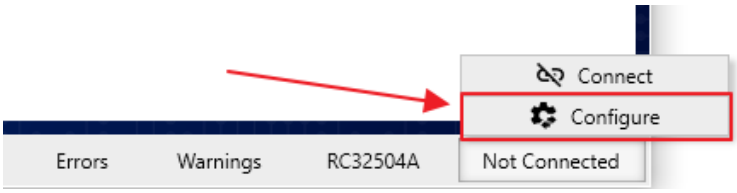


Figure 24. Configure Button

3. Under the “Auto” tab, click the *Refresh* button.

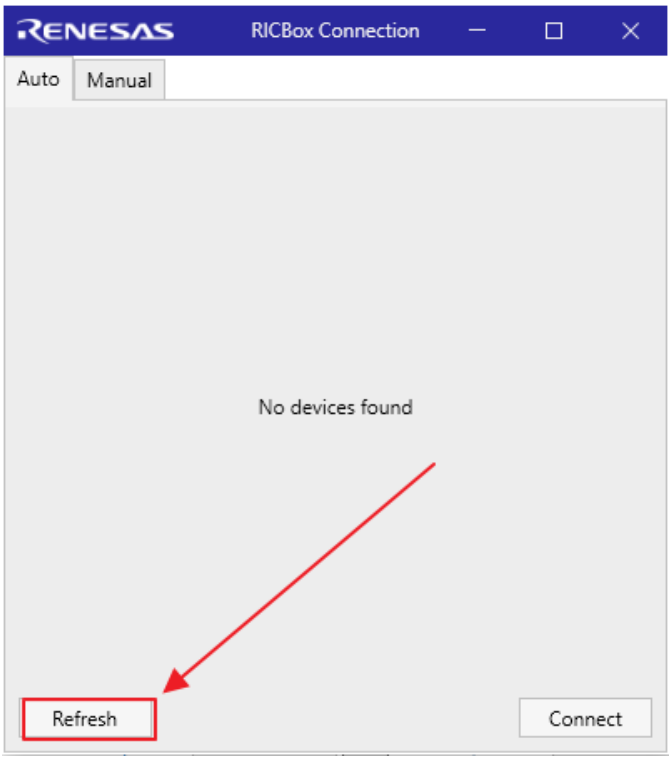


Figure 25. Refresh Connection

4. A list of connected devices should be displayed. Select the desired connected device, then click on *Connect*.

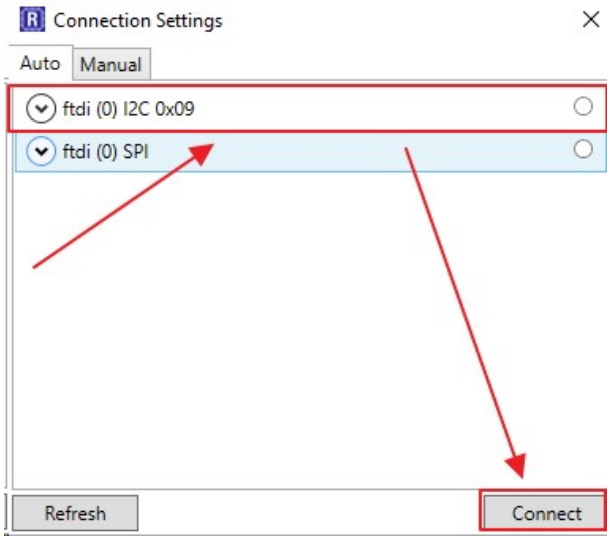


Figure 26. Connect Button in Connection Settings

5.2 Connecting to the Emulator

The RICBox software comes equipped with an emulator to simulate the connection to a real device. To establish a connection to the emulator:

1. Click the *Not Connected* button in the lower right-hand corner of the screen.

Figure 27. Not Connected Button

2. Click the *Configure* button next to the Read button.

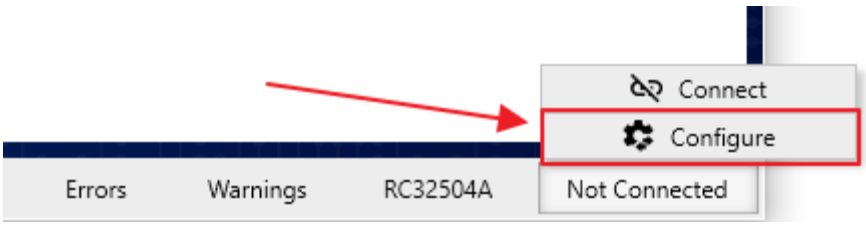


Figure 28. Configure Button

3. Click on the “Manual” tab.

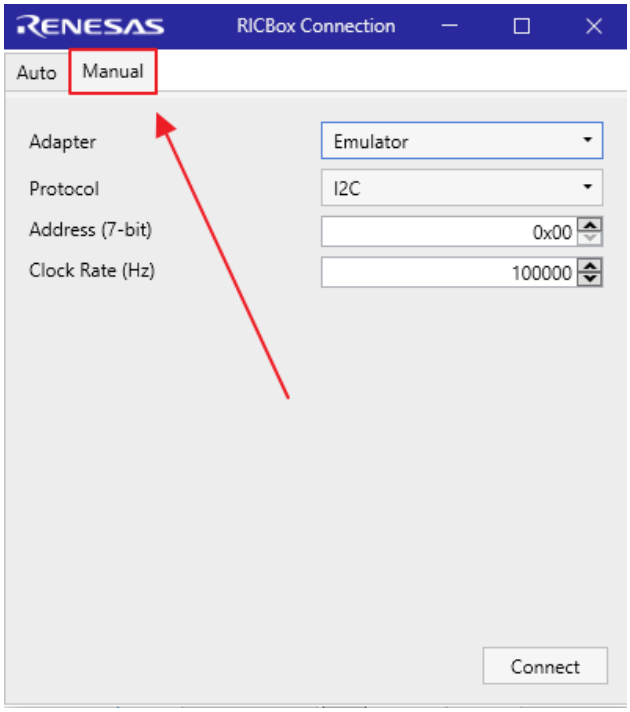


Figure 29. Manual Connection Settings

4. Change the Adapter settings to “Emulator”.

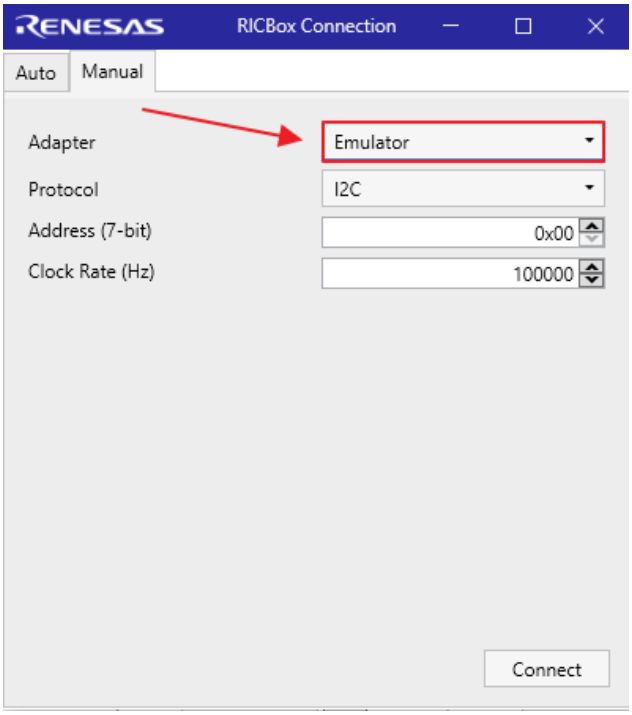


Figure 30. Emulator Setup

5. Select the desired connection protocol and click *Connect*.

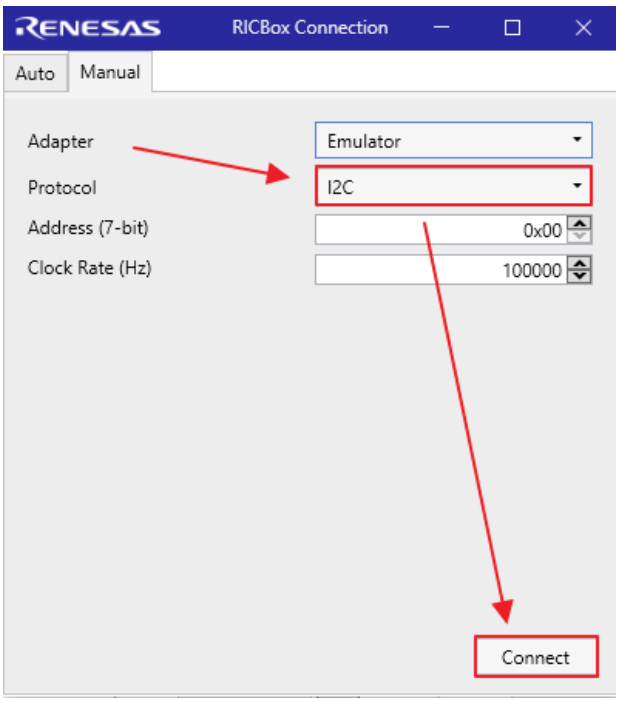


Figure 31. Emulator Connect

6. Errors and Warnings

Error and warning messages indicate that one or more of the register settings are not properly set. An error/warning message will be displayed on the tool bar at the bottom of the screen. To view the current errors, click on the Red highlighted errors button. If there is none, then no errors are occurring. The warnings will be displayed with a yellow button indicator. All Errors should be handled before programming a device.

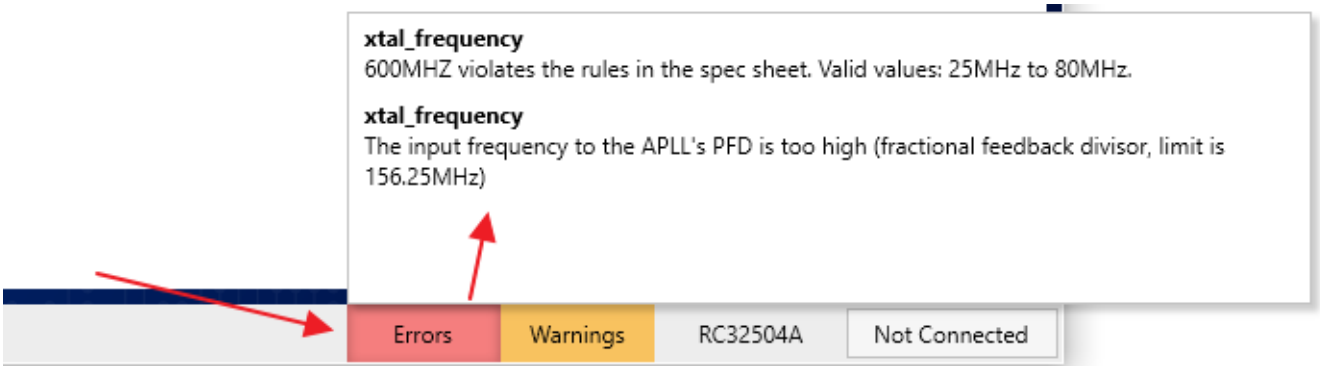


Figure 32. Error and Warnings View

7. Command Line Interface (CLI)

The CLI is a power tool for configuring and testing devices. It gives users quick access to everything the GUI has to offer, but in a terminal command line.

1. Start by clicking on the “Tools” drop-down menu off the main menu. Click on *CLI*.

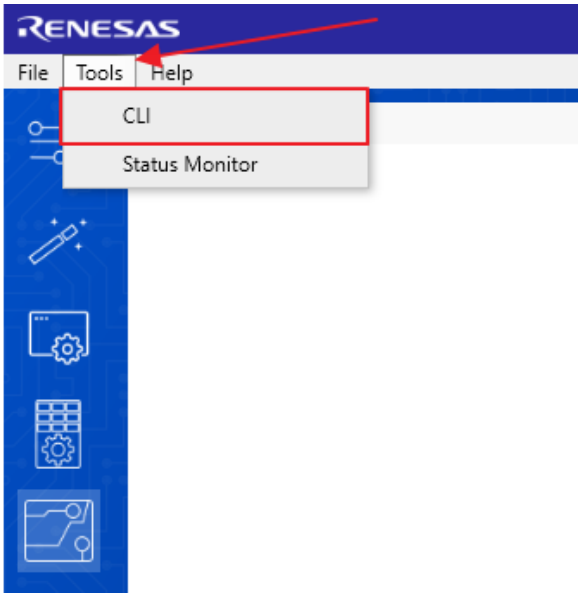


Figure 33. Tools Menu > CLI

2. When the CLI window opens, type “help” for a list of all available commands

Figure 34. CLI Help

Every command has documentation on how to use it. Choose a command and type “-h” after it to view the available options.

```
RENESAS                                  RICBox CLI

> connect -h
usage: connect [-h] [-c CHANNEL] [-i INDEX] [-p PORT_NUMBER] [-a ADDRESS]
               [--offset-size OFFSET_SIZE] [--spi-mode {0,1,2,3}]
               [--spi-bit-order {msbfirst,lsbfirst}] [--spi-3wire]
               [--baud BAUD] [--ssc-interface {i2c,owi}]
               [--rsense-interface {i2c,owi}] [--device DEVICE]
               [{ftdi,aardvark,linuxi2c,linuxspi,ssc,rsense,emulator}]
               [{custom,i2c,spi,owi,ssc,smbuslike,rs232,rsense}]

Connect to a device so read/write commands can be issued.

positional arguments:
  {ftdi,aardvark,linuxi2c,linuxspi,ssc,rsense,emulator}
                        Type of the adapter providing connectivity to the
                        device.
  {custom,i2c,spi,owi,ssc,smbuslike,rs232,rsense}
                        Serial protocol for the connection (e.g., i2c, spi,
                        ssc, rsense)

optional arguments:
  -h, --help            show this help message and exit
  -c CHANNEL, --channel CHANNEL
                        FTDI channel / serial number (e.g., A or B for
                        FT2232HQ)
  -i INDEX, --index INDEX
                        FTDI index (e.g., 0 or 1 for FT2232HQ)
  -p PORT_NUMBER, --port-number PORT_NUMBER
                        Aardvark port number (e.g., 0 or 1) for I2C/SPI, COM
                        port number for SSC and RSense (e.g. 2 for COM2).
  -a ADDRESS, --address ADDRESS
                        I2C: 7-bit hex address of slave. Not used for other
                        protocols.
  --offset-size OFFSET_SIZE
                        offset size, in bytes
  --spi-mode {0,1,2,3}  SPI mode.
  --spi-bit-order {msbfirst,lsbfirst}
                        SPI bit order. Default is MSB first.
  --spi-3wire           Use SPI in three wire mode.
  --baud BAUD           Baud rate in bps for RS232 and SSC connections.
  --ssc-interface {i2c,owi}
                        Intra-interface for SSC connections
  --rsense-interface {i2c,owi}
                        Intra-interface for RSense connections
  --device DEVICE       The device id of a (sub)device within a composite
                        device.

connect -h
```

Figure 35. CLI Connect Command Help

8. Status Monitor

The RICBox software has a feature to monitor all status bits of any device. To open this up, click the “Tools” menu button at the top of the screen and click on *Status Monitor*. Once open, click the *Start* button to start polling the registers in the device.

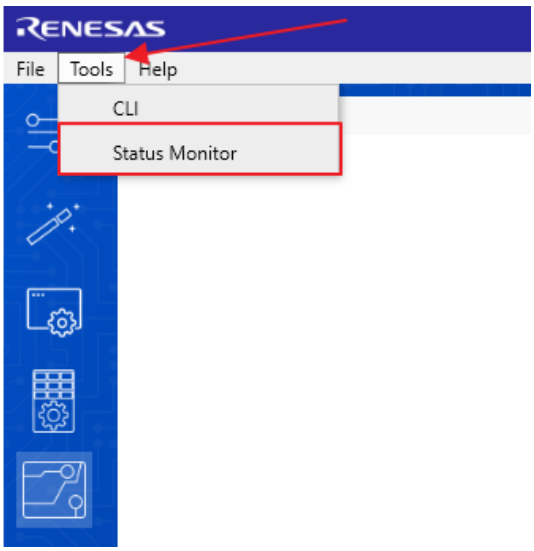


Figure 36. Tolls Menu > Status Monitor

New registers can be added to the list by typing in the register name in the field in the upper right corner of the screen and clicking *Add*.

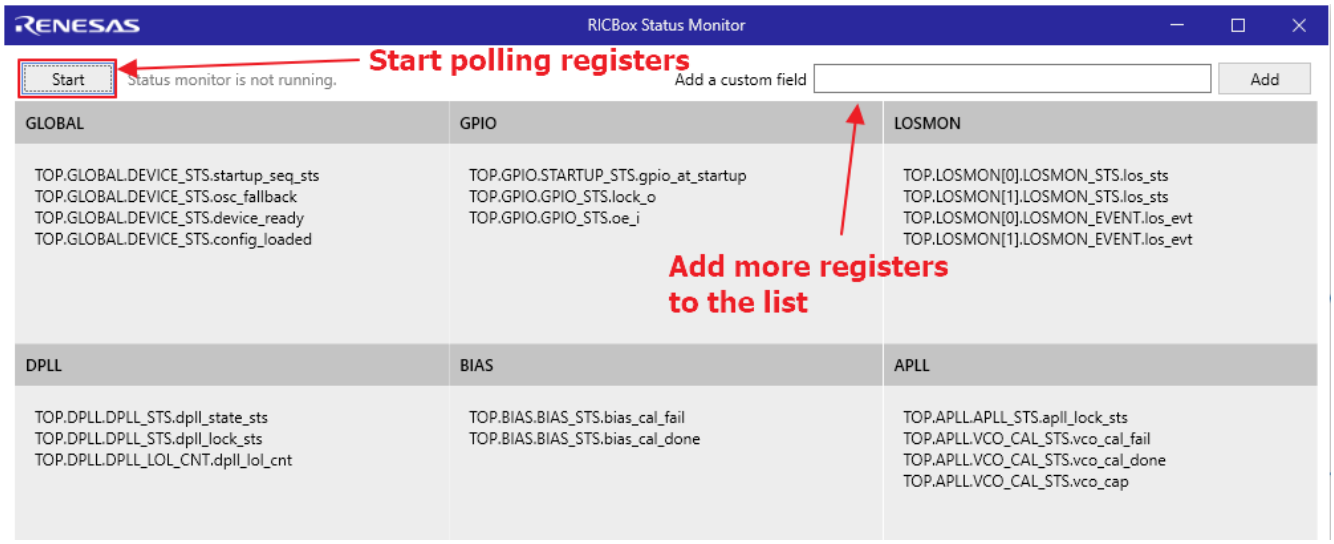


Figure 37. Status Monitor Window

Note: Click *Stop* when finished with monitoring as the register polling may interfere with other feature of the software.

Note: Currently the status monitor only shows the register value and not what the value means. Users have to search up the register name in the configuration view and read the tooltip for more information.

9. Logging

The logging page shows communication transactions as well as debugging information. This a great tool for understanding the communication needed to properly program a device.

1. Go to the “Help” menu at the top of the page and click on *Log*.

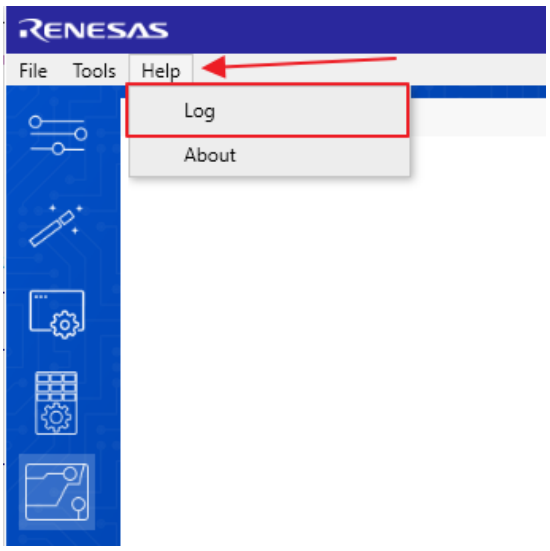


Figure 38. Help Menu > Log

2. Deselect the *Debug* check box to show the registers written to the device in real-time. When a device is connected, clicking on the program button or changing register values will show up in the log.
3. Check the *Trace* check box to show the errors that are handled by RICBox.

Figure 39. Trace Button

The buttons in the lower right corner of the page are as follows:

- The file icon button takes the user to the directory that stores the log file.
- The “X” icon button clears the contents of the log.
- The arrow icon button takes the user to the bottom of the log view.

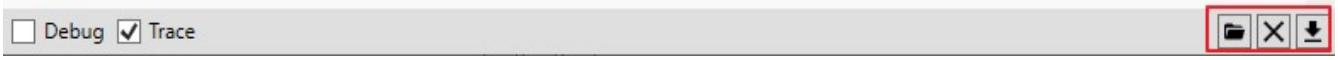


Figure 40. Log Buttons

10. About

The “About” page depicts important information about the current running software.

To see the “About” page, go to the main menu at the top of any page, go to the “Help” tab, then click *About*.

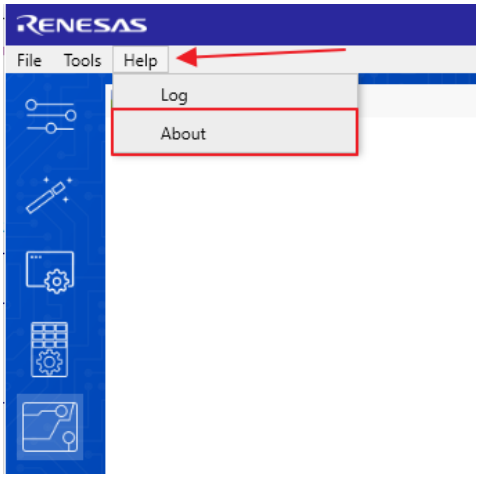


Figure 41. Help Menu > About

This shows the versions of all currently installed individual device software and RICBox. This is handy when updating the current software. It is important to always use the most up to date software version as new features are frequently added.

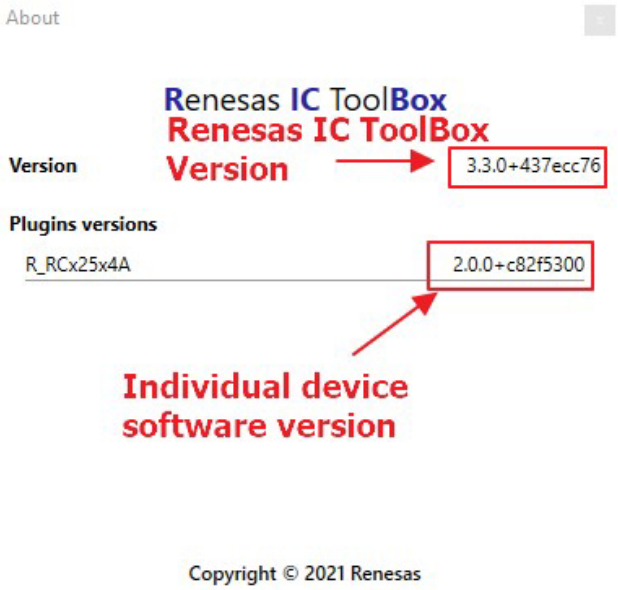


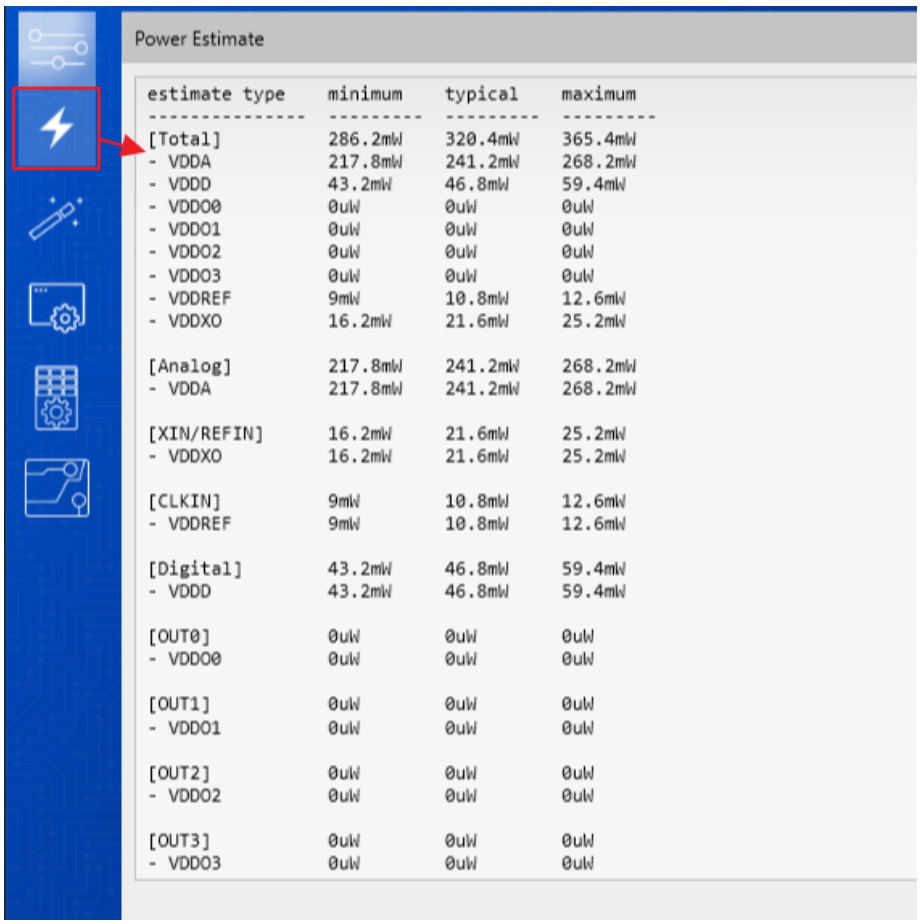
Figure 42. Current Device and Software Versions Window

11. Power Estimation View

Device plugins that support power estimation view will have an additional side-panel button with a lightning bolt icon.

Figure 43. Power Estimation View Button

Click this button to open a window displaying the estimated power consumption of the device given the current configuration settings. Results are shown in terms of minimum, typical, and maximum power consumption for the configuration.



Power Estimate

estimate type	minimum	typical	maximum
[Total]	286.2mW	320.4mW	365.4mW
- VDDA	217.8mW	241.2mW	268.2mW
- VDDD	43.2mW	46.8mW	59.4mW
- VDDO0	0uW	0uW	0uW
- VDDO1	0uW	0uW	0uW
- VDDO2	0uW	0uW	0uW
- VDDO3	0uW	0uW	0uW
- VDDREF	9mW	10.8mW	12.6mW
- VDDXO	16.2mW	21.6mW	25.2mW
[Analog]	217.8mW	241.2mW	268.2mW
- VDDA	217.8mW	241.2mW	268.2mW
[XIN/REFIN]	16.2mW	21.6mW	25.2mW
- VDDXO	16.2mW	21.6mW	25.2mW
[CLKIN]	9mW	10.8mW	12.6mW
- VDDREF	9mW	10.8mW	12.6mW
[Digital]	43.2mW	46.8mW	59.4mW
- VDDD	43.2mW	46.8mW	59.4mW
[OUT0]	0uW	0uW	0uW
- VDDO0	0uW	0uW	0uW
[OUT1]	0uW	0uW	0uW
- VDDO1	0uW	0uW	0uW
[OUT2]	0uW	0uW	0uW
- VDDO2	0uW	0uW	0uW
[OUT3]	0uW	0uW	0uW
- VDDO3	0uW	0uW	0uW

Figure 44. Power Estimation View Window

12. Cloud Updating

In addition to installing device plugins, the cloud update feature can help maintain software versions, display plugin related information, view currently installed plugins, and receive notifications of new software. To access these features, access the updates page in the RICBox GUI by going to “Help > Updates” while on the main page. View the currently installed plugins by clicking on the “Installed” tab.

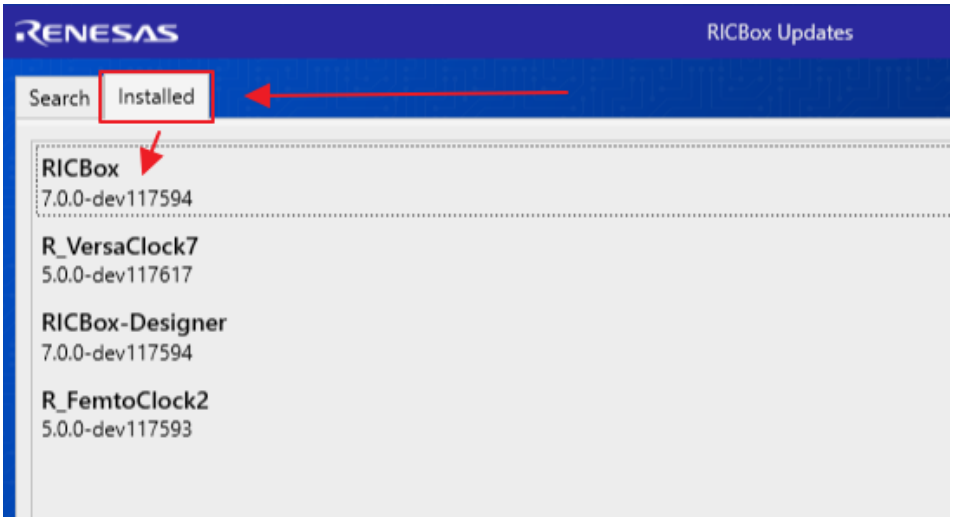


Figure 45. Installed Software

When new release software version is available, RICBox will notify users with a banner at the top of the main page when the software is initially opened.

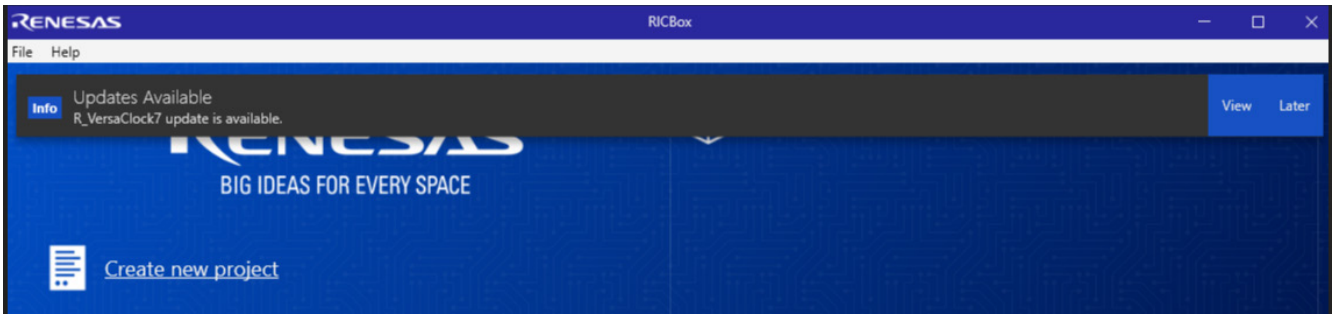


Figure 46. Software Update Banner

Download an external plugin package for manual PC installation by clicking on the *Download* button for an *rbpkg* file.

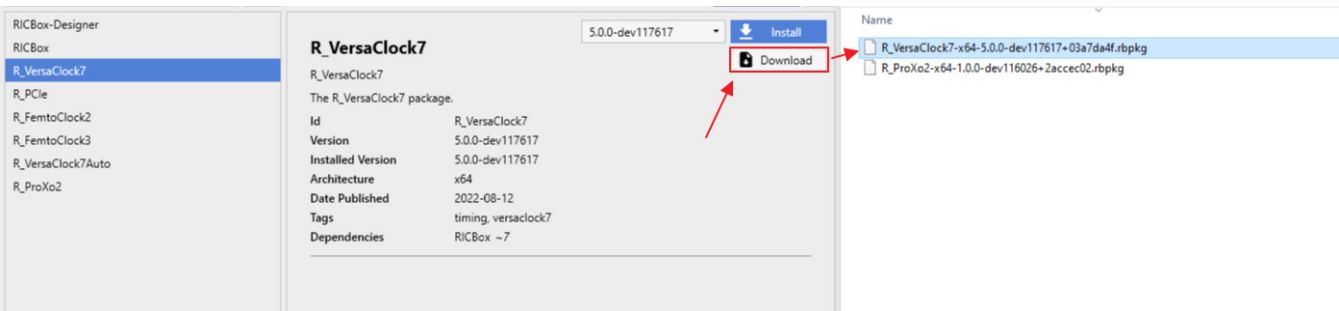


Figure 47. Download ‘rbpkg’ Plugin

Manually install a plugin by clicking on the *Manual Install* button and navigating to an ‘rbpkg’ file.

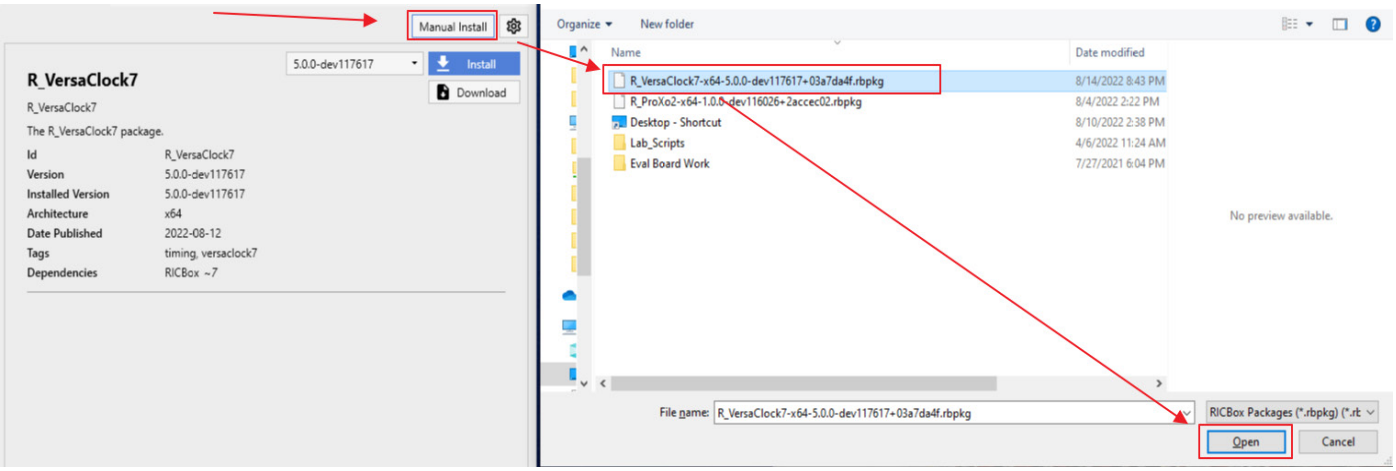


Figure 48. Manual Plugin Install

13. Register Write Export

Device plugins that support register write exporting will have the option to select it in the Tools menu. Click on *Register Write Export*.

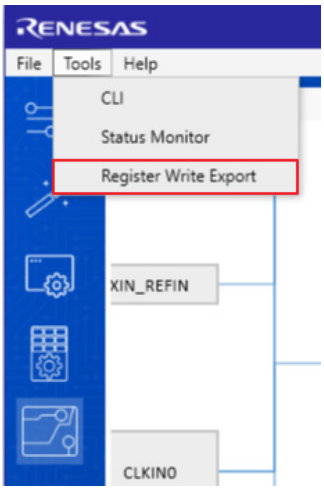


Figure 49. Register Write Export Button

A pop-up page will be displayed after clicking the *Register Write Export* button. The page displays the configurable settings for the exported file. Changing settings, like the Protocol, will change the transaction type in the exported file. Each setting corresponds to the format of the output file.

Figure 50. Register Write Export Pop-up Page

Once the settings are selected, click the *Export* button and save the file as a text file. The exported file will be formatted like an algorithm, with each line being another serial transaction in order.

```
##########################################################################################
# VersaClock7 (0.0.0.dev117604)
# RC21008A
# 2022-08-15T12:06:40
# protocol: I2C
# offset size: 1
# mtu: 16
# All values are in hex
#
# WRITE <7-bit I2C address>, <length>, <offset>, <byte stream including offset>
#   I2C address is included because some offsets may require targeting a different address.
#   Length is the number of bytes in the stream, including the register offset. This could
#     be inferred by examining the byte stream but is included for convenience.
#   Offset is embedded in the byte stream but is listed separately for convenience.
# WAIT <time_ms>
##########################################################################################
# program all registers
# write 00, 00, 00... to offset 0xFC
WRITE, 00, 05, FC, FC 00 00 00 00
# write 33, 10, 00... to offset 0x00
WRITE, 00, 11, 00, 00 33 10 00 00 22 01 00 00 2A F0 12 01 00 00 01 00
# write 00, 30, 00... to offset 0x10
WRITE, 00, 11, 10, 10 00 30 00 00 00 00 05 80 80 00 8C 03 00 00 00 00
# write 00, 03, 22... to offset 0x20
WRITE, 00, 07, 20, 20 00 03 22 09 08 79
# write 00, B2, 00... to offset 0x27
WRITE, 00, 11, 27, 27 00 B2 00 00 00 45 28 68 20 01 80 00 00 01 80 00
# write 00, 02, 00... to offset 0x37
WRITE, 00, 11, 37, 37 00 02 00 50 00 02 00 50 00 02 00 50
```

Figure 51. Export Register Writes

14. Multiple Configuration Support

More than one device configuration can be created at a time. Different configurations can hold differing device settings but still be saved to the same RICBox settings file (.rbs). In the lower right corner of a plugin GUI, click on the part number box to view the configuration selection drop-down menu.

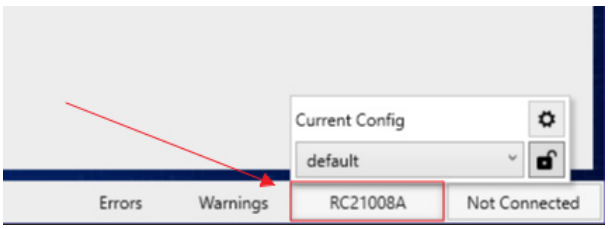


Figure 52. Configuration Menu

Use this menu to change the currently active configuration. The initial configuration is always labeled default.

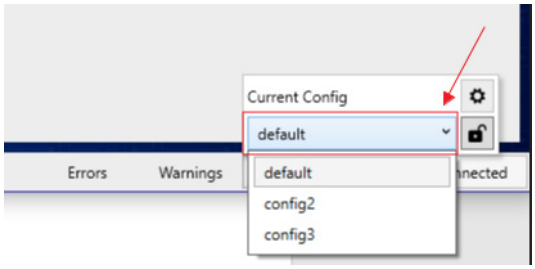


Figure 53. Configuration Selection

Click on the settings button to view the configurations pop-up menu.

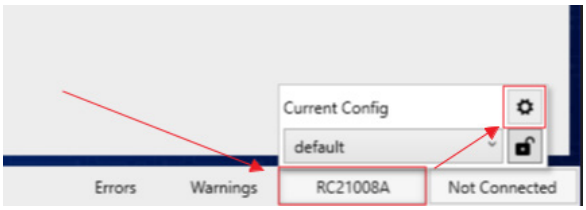


Figure 54. Configuration Settings

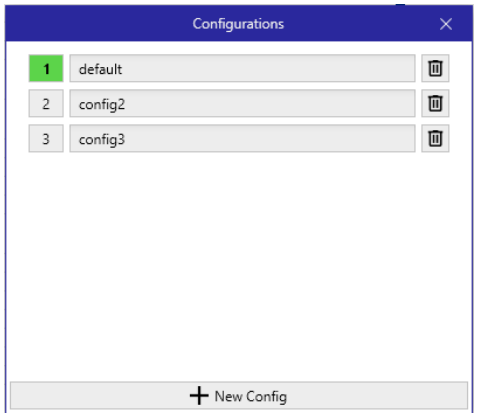


Figure 55. Configurations Pop-up Menu

Click the numbers to change the currently active configuration. Green is the active configuration.

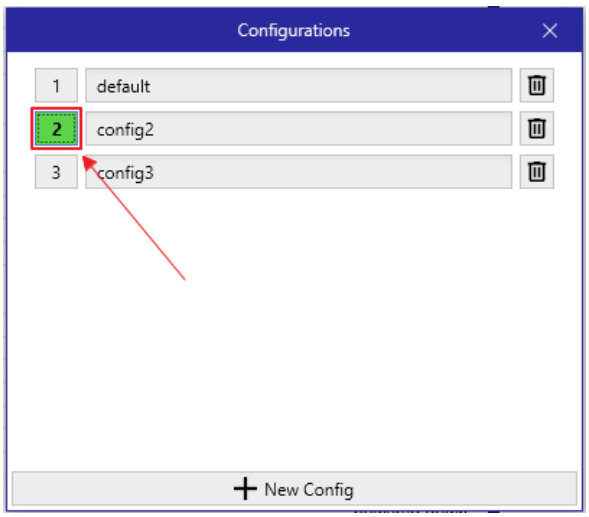


Figure 56. Current Active Configuration

Change the name of any configuration by clicking on the name box and entering a new one. The trash icon button deletes the corresponding configuration. The “New Config” button creates a new configuration.

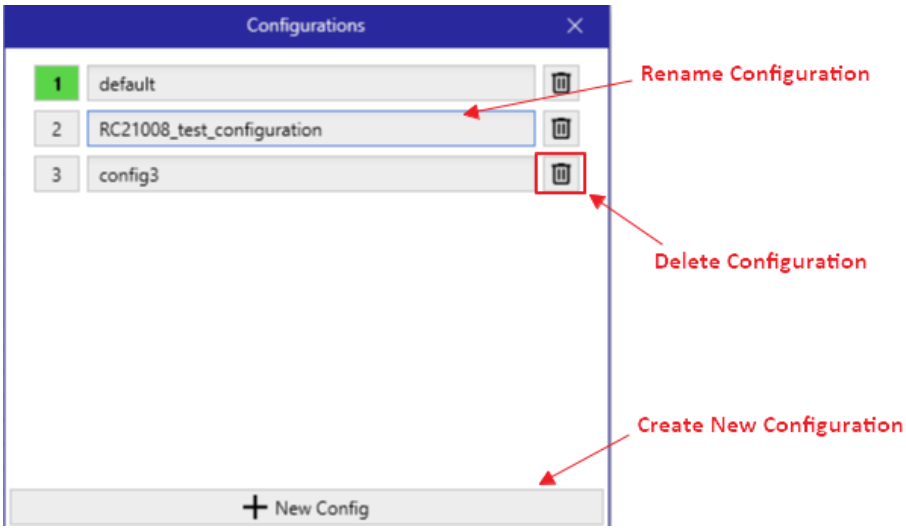


Figure 57. Configurations Settings Overview

The CLI offers additional configuration support features. Opening the CLI and typing ‘config –h’ will reveal the available configuration functions.

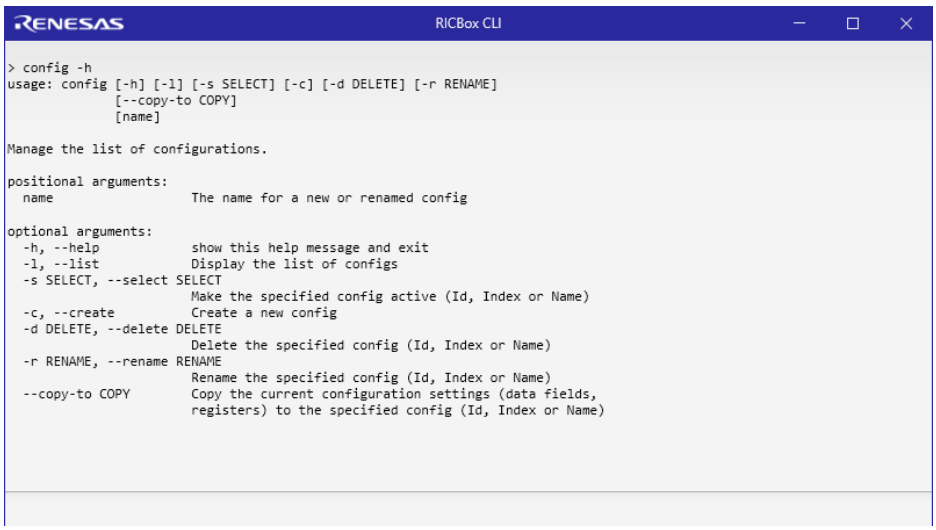


Figure 58. Configurations in the CLI

15. Revision History

Revision	Date	Description
1.02	May 22, 2024	Updated System Requirements section.
1.01	Aug 23, 2022	Updated screen shots and added new features.
1.00	Jul 2, 2021	Initial release.

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