ISL74420x iRADNavigator GUI

Introduction

The iRADNavigator is a Windows program that provides interactive control of the programmable internal control registers for the ISL74420M and ISL74420SLH devices. These ISL74420x variations are available on several evaluation and demonstration boards.

The ISL74420MEV1Z and ISL74420SLHEV1Z provide users with mechanical switches for configuration. These switches ease user experimentation with frequency and phase selections and other configuration options.

The ISL74420MDEMO1Z and ISL74420SLHDEMO1Z are examples of a small footprint layout with SMD resistors to provide a user-defined power-up configuration.

iRADNavigator provides a means to interactively override either the switch or SMD resistor positions by communicating using the ISL74420x I^2C interface.

The ISL74420M and ISL74420SLH datasheets provide further details regarding the I^2C specifications and links to software tools and approaches for writing and reading device registers.

The user should also download and review the applicable ISL74420MEV1Z, ISL74420MDEMO1Z, ISL74420SLHEV1Z, or ISL74420SLHDEMO1Z manuals.

Contents

1. Functional Description

Every configuration for the ISL74420x can be selected using the available configuration pins. These pins are intended to remain static during operation and are only checked at startup. The configuration set by these pins can be overridden by communicating through the I^2C interface. This capability enables interactive experimentation during system design and allows configuration changes as system requirements evolve without modifying the PCB or BOM.

The iRADNavigator software provides a user interface that gives the operator direct control of the 10 internal registers, which overrides the digital inputs. Table 1 lists the internal registers and their descriptions.

Table 1. I^2C/SMBus Register Addresses and Descriptions

Command Code	Command Name	Comments
0xD0	STROBE_WR	A write of 1 to this register signals that the configuration using the I^2C/SMBus interface is complete.
0xD1	OUT0_FREQ	Selects the output clock frequency for CLKOUT0.
0xD2	OUT0_PH	Selects the phase for CLKOUT0.
0xD3	OUT1_FREQ	Selects the output clock frequency for CLKOUT1.
0xD4	OUT1_PH	Selects the phase for CLKOUT1.
0xD5	OUT2_FREQ	Selects the output clock frequency for CLKOUT2
0xD6	OUT2_PH	Selects the phase for CLKOUT2.
0xD7	OUT3_FREQ	Selects the output clock frequency for CLKOUT3
0xD8	OUT3_PH	Selects the phase for CLKOUT3.
0xD9	MISC_CTRL	Sets the MASTER Pin Leader/Follower mode and Prescale setting

The MISC_CTRL register overrides the state of the PRESCL and MASTER pins. These options are listed in Table 2.

Table 2. MISC_CTRL Register

Register Value	Binary	Leader/Follower Mode	PRESCL Mode
8 (0x08)	1000	Follower	Divide-by-2 (PRESCL low)
9 (0x09)	1001	Follower	Divide-by-4 (PRESCL floating)
10 (0x0a)	1010	Follower	Divide-by-8 (PRESCL high)
11 (0x0b)	1011	Not supported	Not supported
12 (0x0c)	1100	Leader	Divide-by-2 (PRESCL low)
13 (0x0d)	1101	Leader	Divide-by-4 (PRESCL floating)
14 (0x0e)	1110	Leader	Divide-by-8 (PRESCL high)
15 (0x0f)	1111	Not supported	Not supported

2. ISL74420x Setup and I²C/SMBus Connection

This section describes how to establish the I²C/SMBus connections between the ISLUSBPMBADAPT3Z and the ISL74420x boards.

The ISLUSBPMBADAPT3Z board is powered through the host computer's USB port. Power for the target ISL74420x board must be supplied separately.

All five jumpers on the ISLUSBPMBADAPT3Z board should be configured on the 1-2 setting (see Table 3).

Table 3. Jumper Settings

Jumper	Description	1-2 Selection	2-3 selection	Setting for ISL74420
JP1	EN signal to J2 pin 5	Buffered EN	Unbuffered EN	1-2
JP2	READY to J2 pin 1	Buffered READY (output only)	Unbuffered READY	1-2
JP3	SCL to J2 pin 4	Buffered SCL	Unbuffered SCL	1-2
JP4	SDA to J2 pin 2	Buffered SDA	Unbuffered SDA	1-2
JP5	Select Buffer Voltage	3.3V	5V	1-2

2.1 Using an ISL74420xEV1Z board

The ISL74420MEV1Z and ISL74420SLHEV1Z boards each have a convenient 6-pin connector that is compatible with the ISLUSBPMBADAPT3Z board. Connect the Dongle Board and the EVB board as shown in Figure 1.

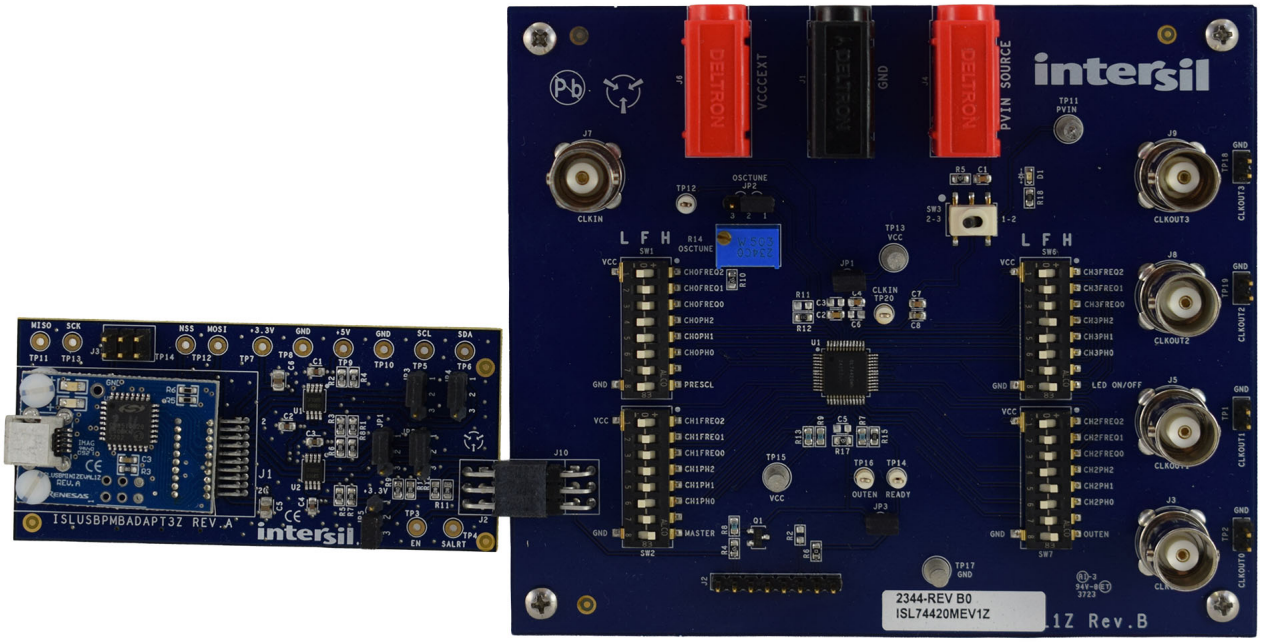

Figure 1. ISLUSBPMBADAPT3Z and ISL74420MEV1Z

The iRADNavigator software can control the OUTEN pin and check the status of the READY pin separately. To enable this functionality on the ISL74420MEV1Z, remove jumper JP3 to separate the OUTEN and READY pins. On the ISL74420SLHEV1Z, the jumper is labeled SW3.

2.2 Using Other Boards

The ISLUSBPMBADAPT3Z dongle and the iRADNavigator software only require a connection to the GND, SDA, and SCL signals to control an ISL74420x device. The OUTEN and READY signals are optional. Using this principle, the software can control the ISL74420x demonstration boards that lack the 6-pin connector, and any other circuit boards as long as the GND, SDA, and SCL signals of the ISL74420x are available.

On the ISLUSBPMBADAPT3Z, these signals are available on test points TP10, TP5, and TP6 across the top edge of the board.

3. iRADNavigator Installation Steps

Complete the following steps to install the iRADNavigator software.

1. Download the latest version of the installer.
2. Run the installer. The user may be required to provide administrator rights.
3. Select the preferred language and proceed through the installer.
4. Review the license agreement. Accept the agreement to install iRADNavigator.
5. Renesas recommends accepting the default Destination Folder and default Start Menu folder.
6. It is helpful to create shortcuts **For all users** on shared computers. This step is shown in Figure 2.

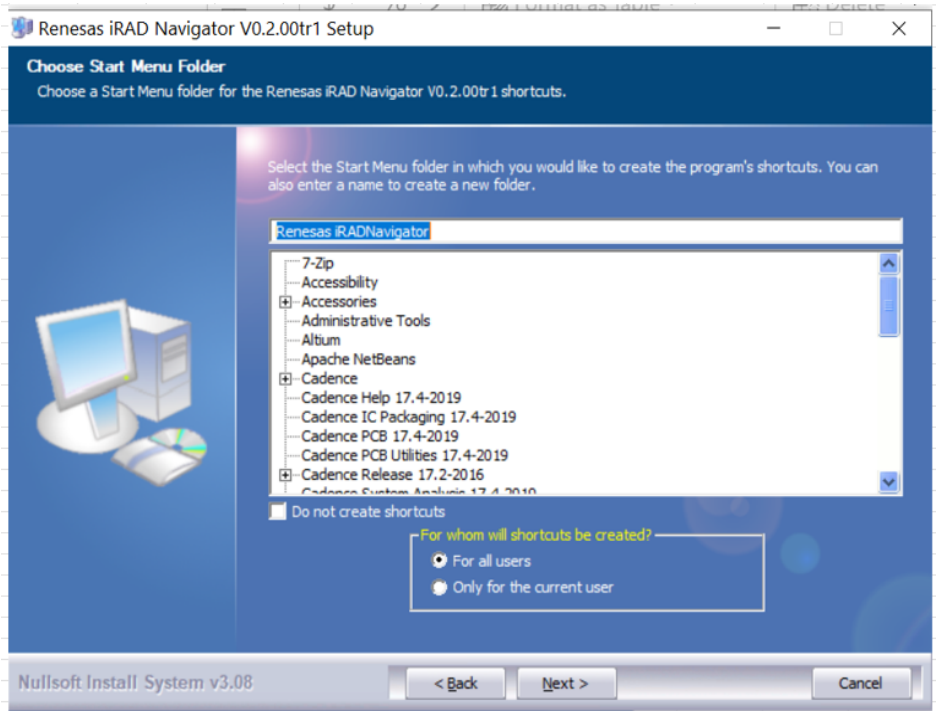

Figure 2. Optional: Create shortcuts for all users

7. Select **Create a Desktop Icon** if required. This step is shown in Figure 3.

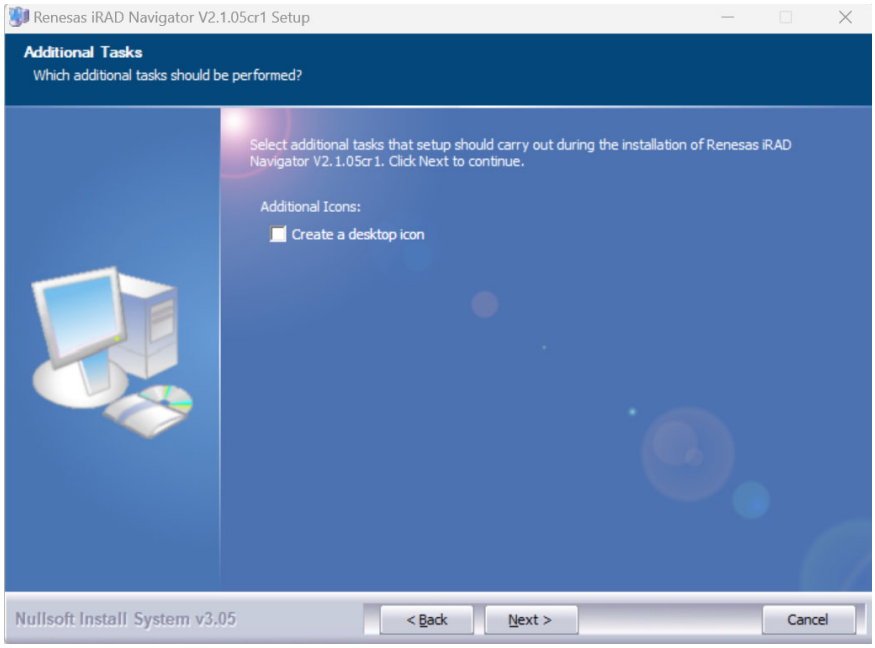

Figure 3. Create a Desktop Icon

8. Proceed through the installer until it is finished.

4. Using iRADNavigator

This section describes how to use the iRADNavigator software to control an ISL74420x IC.

4.1 Device Selection

After opening the iRADNavigator program, the initial startup screen opens (Figure 4).

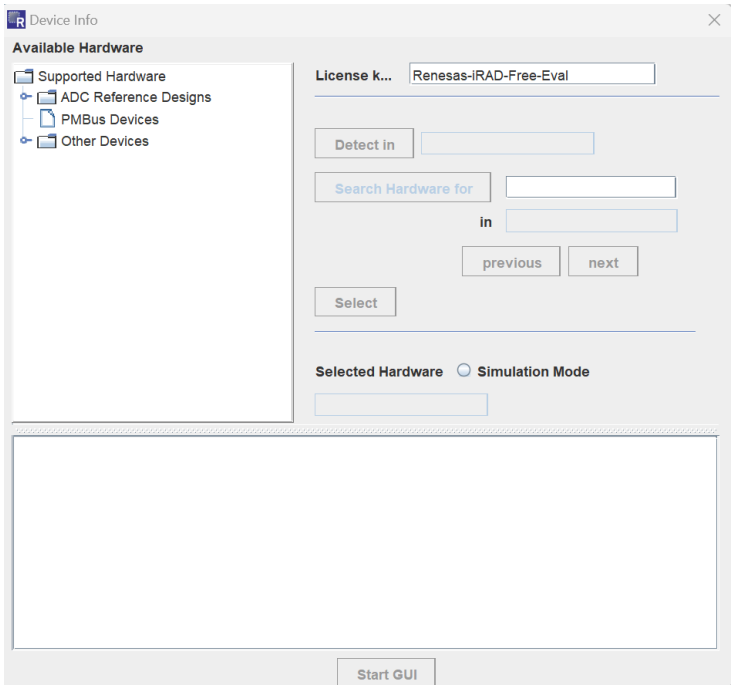

Figure 4. Initial Startup Screen

1. Under **Available Hardware**, select **Other Devices** and then **ISL74420**.
2. Click on the **Select** button in the middle. The screen should look like Figure 5.

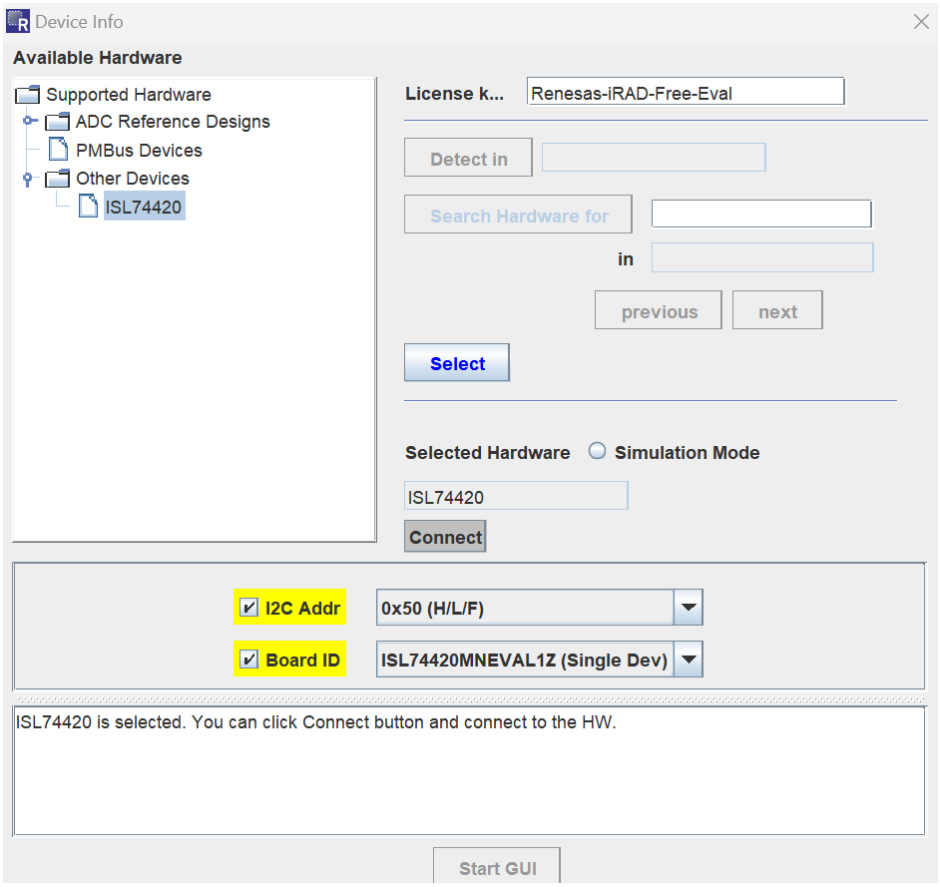

Figure 5. Select Other Devices/ISL74420 (Click Select)

3. Keep the default **I2C Addr** selected in most situations. Refer to the applicable datasheet if a different address must be used.
4. Keep the **Board ID** selected if using an ISL74420xEV1Z board. Deselect if using a different board.
5. Click **Connect** and wait until the **Board init is successful!** message appears and the **Start GUI** button is available. This takes several seconds.
6. Click on the **Start GUI** button at the bottom of the window.

4.2 Application Tabs

The iRADNavigator program for the ISL74420x features four different tabs:

- Feature Control
- Register Control
- Block Diagram
- Typical Application

4.2.1 Feature Control

The **Feature Control** tab initially shows the frequency and phase options that were last stored in the ISL74420x registers. At any time the user can reread those registers by clicking the **Read settings** button. These registers are initially populated with the configuration from the ISL74420x pin-strapping.

1. To change the settings, modify the drop-down menus to reach the required configuration.
2. Click **Write settings** to apply those settings to the part's registers.
3. **Write to finalize** first checks the settings for any rule violations. If no violations are detected, it writes all of the configuration registers and the STROBE_WR register. Review the *ISL74420M Datasheet* or *ISL74420SLH Datasheet* for more information about the STROBE_WR register.

Note: The OUTEN pin must be written **High** to enable the ISL74420x outputs.

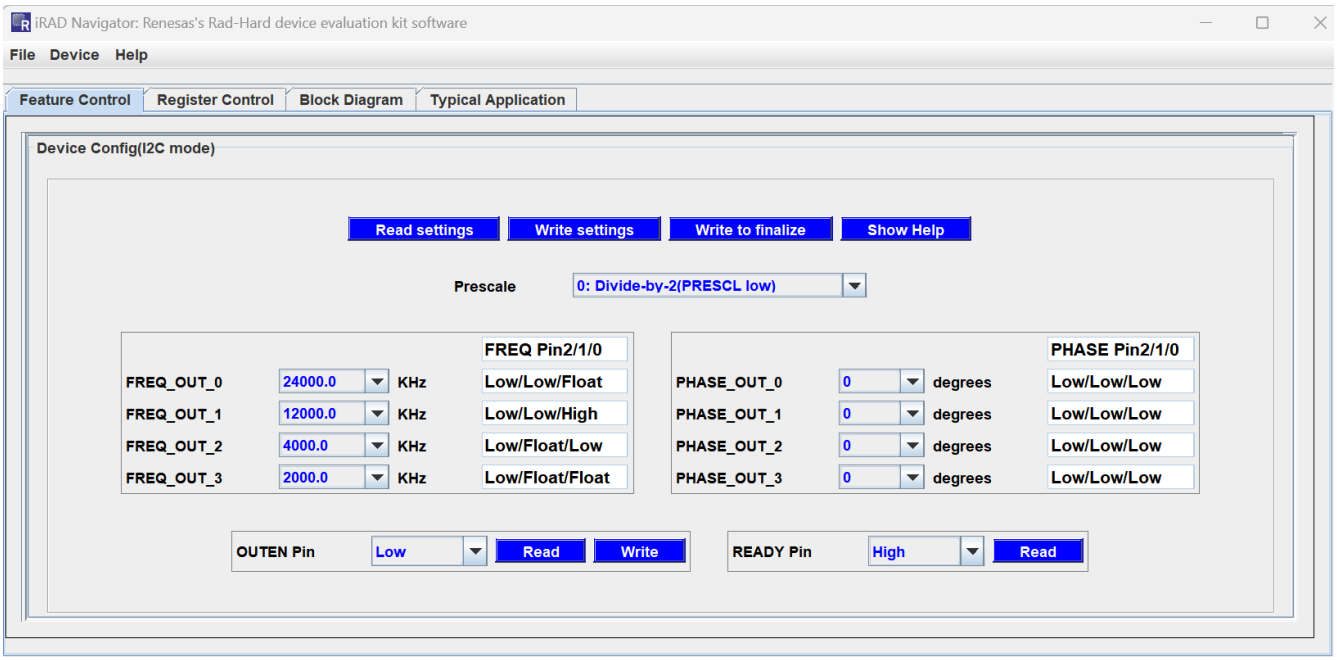

Figure 6. Feature Control Tab

4.2.2 Register Control

The **Register Control** tab allows the user to read and write the ISL74420x internal registers directly. The default is hexadecimal, which can be changed with the **Number Base** menu at the top of the window. Registers can be read and written individually, as specific selections, or all together.

The **Device Address** can also be changed on this tab, which is useful if more than one ISL74420x shares an I^2C bus.

This tab is used to read back the register values after the correct configuration is selected in the **Feature Control** tab.

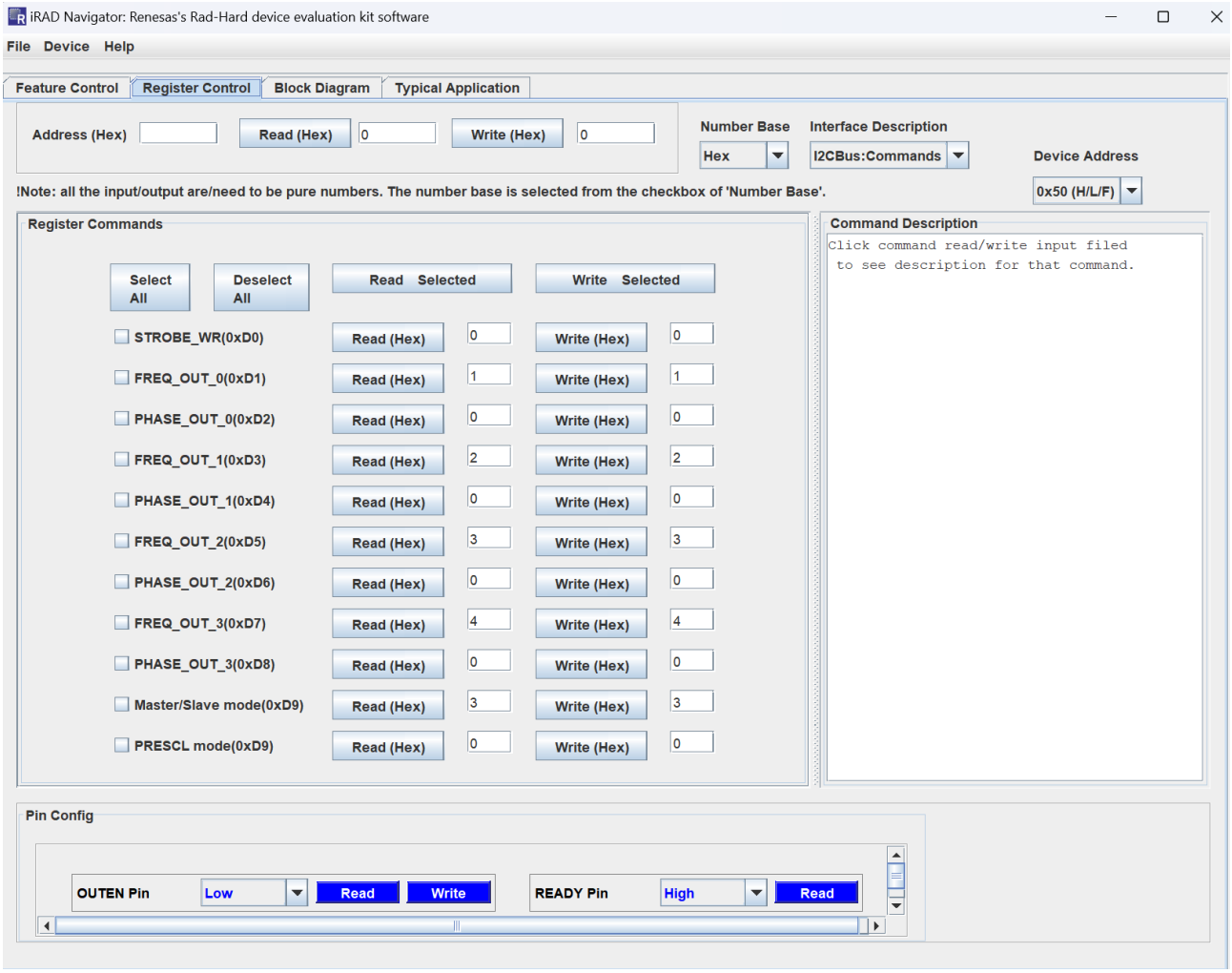

Figure 7. Register Control Tab

4.2.3 Block Diagram

The **Block Diagram** tab displays a copy of the datasheet block diagram.

4.2.4 Typical Application

The **Typical Application** tab displays a copy of the datasheet typical application diagram.

4.3 Saving and Loading Registers

The ISL74420x registers are volatile memory, meaning that the configuration resets to the pin-configured settings whenever power is cycled to the ISL74420x. The iRADNavigator program addresses this by allowing the user to save the register configuration to their computer and load it again later.

To save the configuration, complete the following steps.

1. Access the **File** menu in the top-left corner of the window and select **Save Registers**.
2. Navigate to a folder and enter a descriptive file name
3. Save the .csv file.

To load the configuration, complete the following steps.

1. Access the **File** menu and select **Load Registers**.
2. Navigate to the folder where the configuration file is stored.
3. Select and open the register file. The settings are applied immediately and a popup message appears, reminding the user to write to the STROBE_WR register if necessary.

4.3.1 Example Register Files

Several example configuration files are included with the installation. They are intended to exercise the CLKOUT Configuration Scenarios described in the *ISL74420x Datasheets*.

These files should be located in the default `Load Registers` directory. They can also be reached in the program installation directory, usually:
`C:\Users\Public\Renesas\iRADNavigatorV2.1.05cr1\GUI\data\ISL74420\SingleDevice`

The filenames correspond to the particular Configuration Scenario in CLKOUT Waveforms and Register Settings for Examples 1 through 5. For example, `SavedRegisters_Scene1_default.csv` loads a configuration that demonstrates Scenario 1.

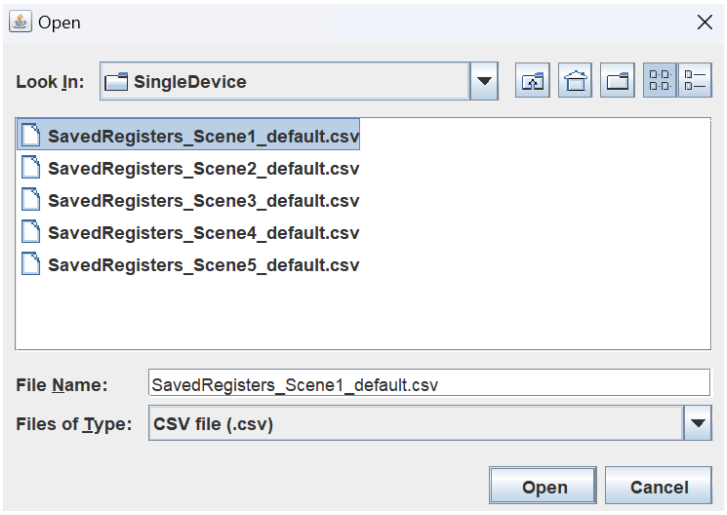

Figure 8. Example Configuration Filenames

4.4 CLKOUT Waveforms and Register Settings for Examples 1 through 5

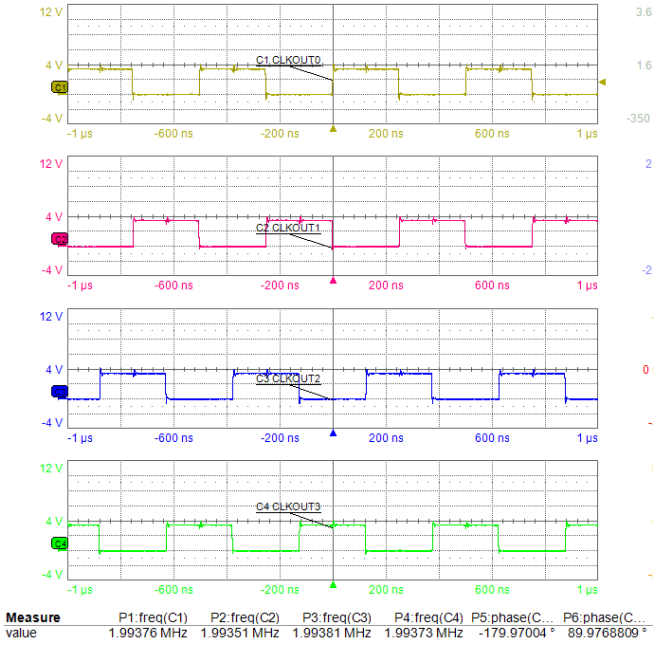

Figure 9. Oscilloscope Measurements of Example 1

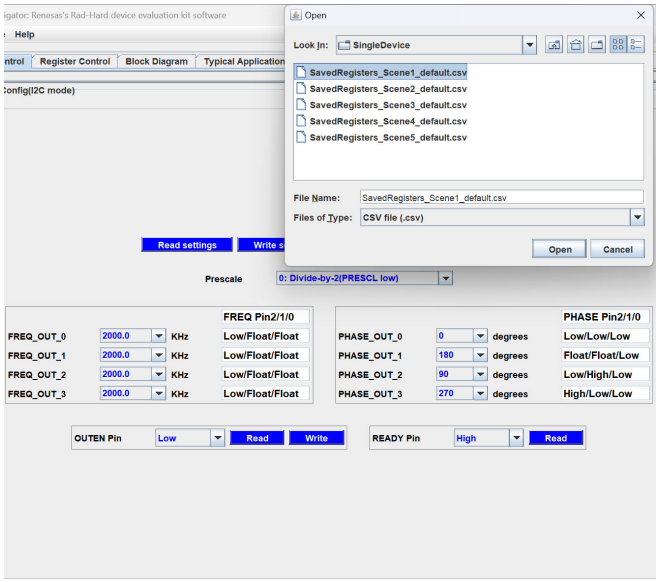

Figure 10. Register Settings of Example 1

Note: All four outputs have the same frequency (2MHz) with 90° phase increments.

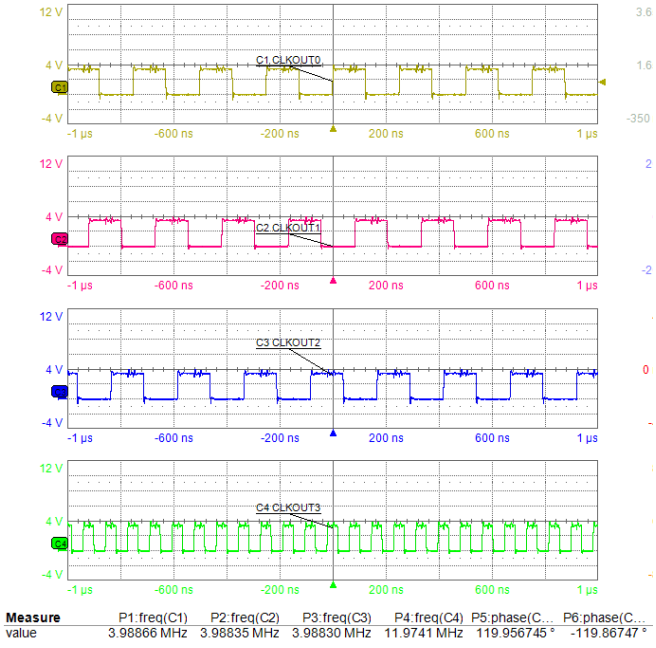

Figure 11. Oscilloscope Measurements of Example 2

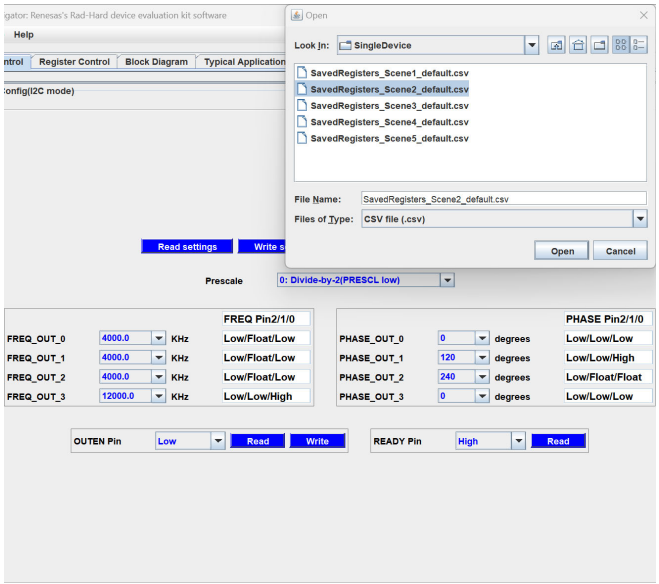

Figure 12. Register Settings of Example 2

Note: Three outputs have the same frequency (4MHz), one output at a different frequency (12MHz).

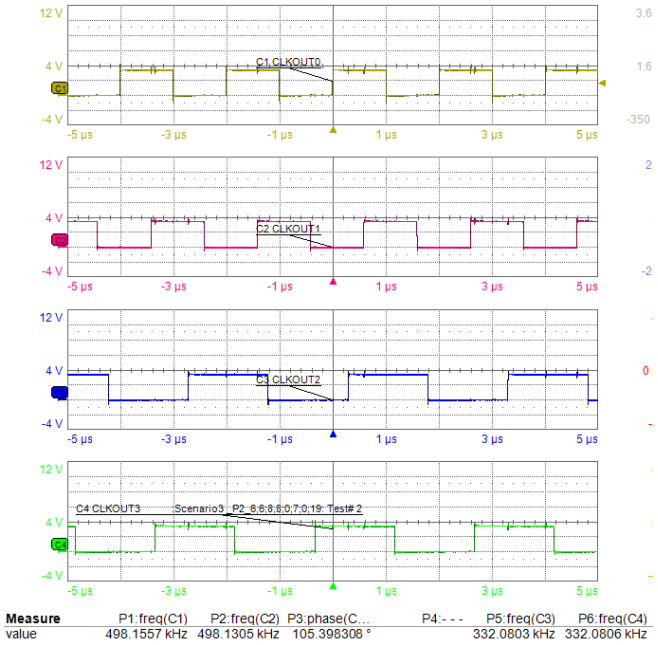

Figure 13. Oscilloscope Measurements of Example 3

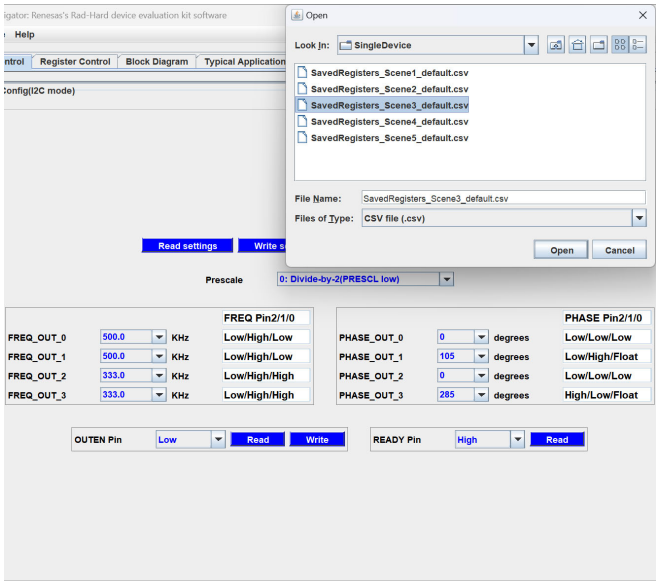

Figure 14. Register Settings of Example 3

Note: Two outputs have the same frequency (500kHz), the other two outputs are at a different frequency (333kHz) C1-C2 Phase (105°), C3-C4 Phase (-75°).

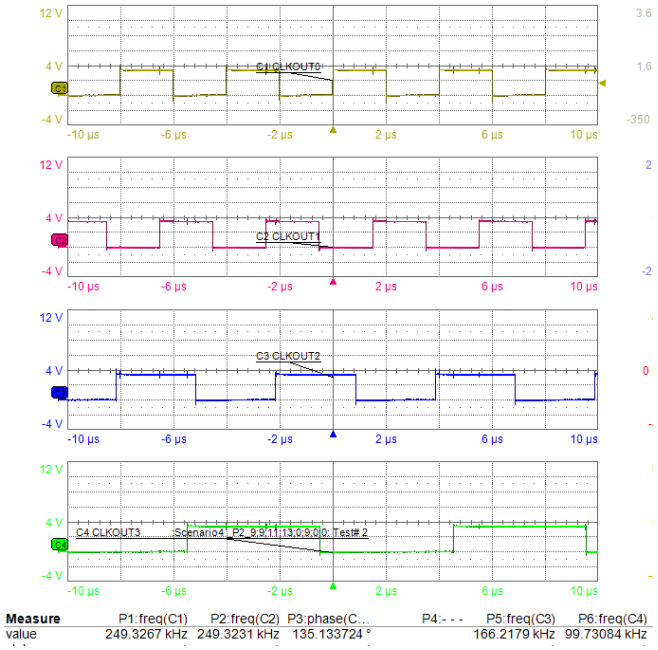

Figure 15. Oscilloscope Measurements of Example 4

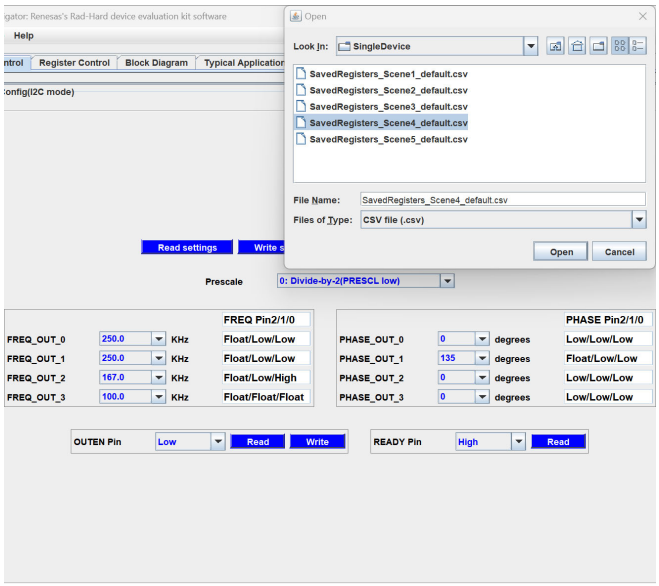

Figure 16. Register Settings of Example 4

Note: Two outputs have the same frequency (250kHz), the other two outputs are at two different frequencies (166kHz and 100kHz).

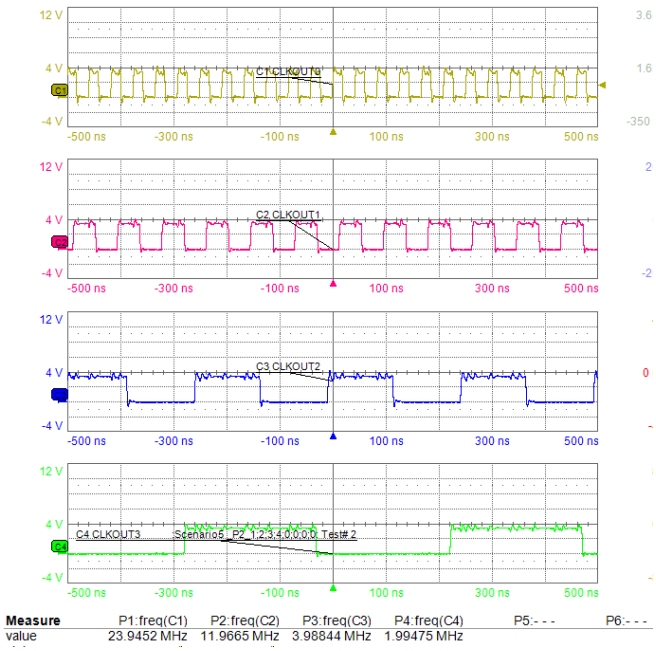

Figure 17. Oscilloscope Measurements of Example 5

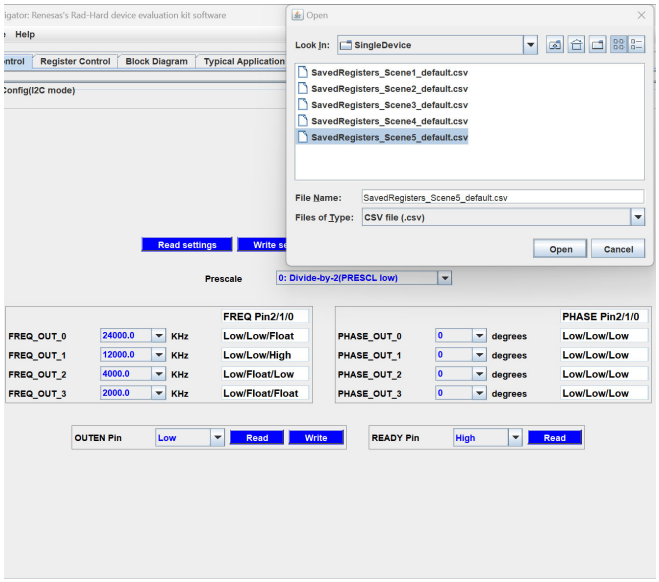

Figure 18. Register Settings of Example 5

Note: Four different frequencies: 24MHz,12MHz, 4MHz, 2MHz

5. Troubleshooting

The following are a few easy troubleshooting steps that can be taken if the program or part do not operate as expected.

1. Close and restart the program.
2. Close the program, unplug the ISLUSBPMBADAPT3Z from the computer, then plug it back in and restart the program.
3. Check the Product ID (PID) and Vendor ID (VID) of the ISLUSBPMBADAPT3Z in the Device Manager.
   a. Open Windows Device Manager and expand **Human Interface Devices**.
   b. Plug in the ISLUSBPMBADAPT3Z to identify which **USB Input Device** it is.
   c. Select the correct **USB Input Device** and right-click to check its Properties.
   d. Change to the **Details** tab and change the Property menu to **Hardware Ids**.
   e. Verify that the VID is 09AA and the PID is 2019 as shown in Figure 19.

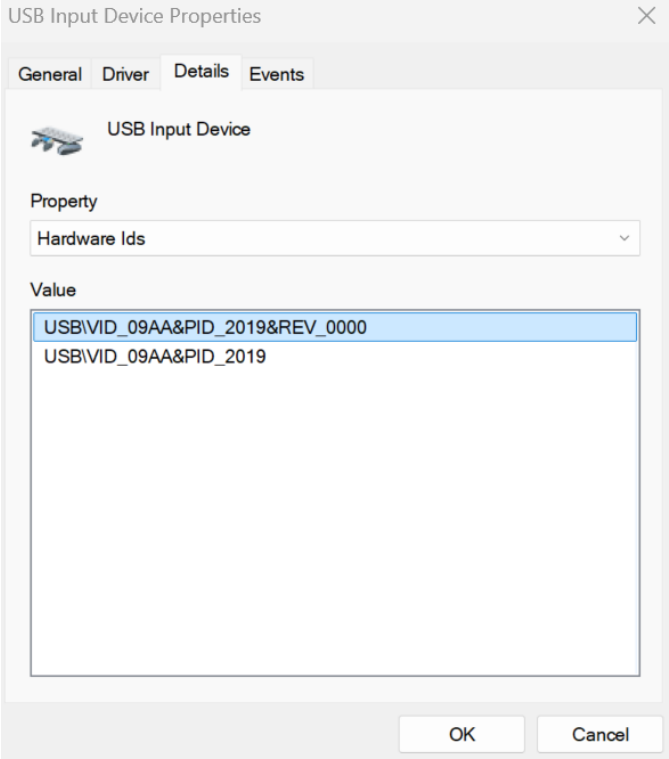

Figure 19. HID Device ISLUSBPMBADAPT3Z VID = 09AA and PID = 2019

   f. Contact the factory for assistance if the VID and PID do not match.

6. Revision History

Revision	Date	Description
1.00	Mar 30, 2026	Initial release.

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Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

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