Secure Starter Kit
User Manual
V2.3

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Content

1. INTRODUCTION TO STARTERKIT 3
1.1 HARDWARE APPEARANCE 3
1.2 BLOCK DIAGRAM 4
2. STARTERKIT SOFTWARE 5
2.1 SOFTWARE INSTALLER 5
2.2 STARTERKIT FIRMWARE UPDATE 9
2.2.1 Updating Firmware via StarterKit Launcher 9
2.2.2 Update Firmware via StarterKit GUI 10
2.2.3 Update Firmware via Batch 13
2.3 SOFTWARE REMOVAL 15
2.4 SOFTWARE STARTUP 16
2.5 STARTERKIT LAUNCHER 16
3. SYSTEM REQUIREMENT 19
4. SQ7101/SQ7103/SQ7515 19
4.1 STARTERKIT SOFTWARE FUNCTION DESCRIPTION (SQ7101/SQ7103/SQ7515) 19
4.1.1 Software Introduction 19
4.1.2 StarterKit Main Screen 19
4.1.3 Memory 30
4.1.4 Program Device 40
5. SQ713X/SQ713XS/SQ719X 58
5.1 STARTERKIT SOFTWARE FUNCTION DESCRIPTION 58
5.1.1 Software Introduction 58
5.1.2 StarterKit initialization 58
5.1.3 StarterKit Main Screen 60
6. HQS600X 76
6.1 STARTERKIT SOFTWARE FUNCTION DESCRIPTION (HQS600X) 76
6.1.1 Software Introduction 76
6.1.2 StarterKit Main Screen 76
APPENDIX A: HARDWARE SETTINGS PRECAUTIONS FOR PROTOTYPING SQ7515 76
CHANGE HISTORY 78

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1. Introduction to StarterKit

1.1 Hardware Appearance

The Secure Starter Kit is powered by the USB port. Plug the Starter Kit into the USB port and turn the PWR switch to the ON position. When the connection to the computer is successful, the power indicator light will be on (green light). After the software starts, it will scan the currently connected IC devices.

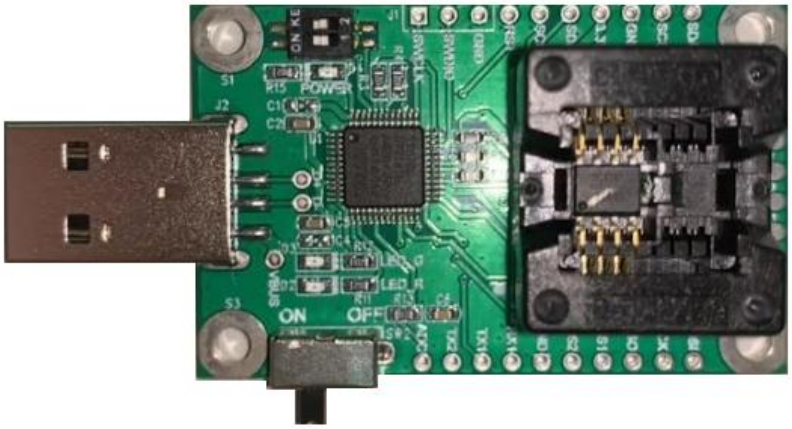


Figure 1 iMQ Secure Starter Kit appearance (with Socket version)

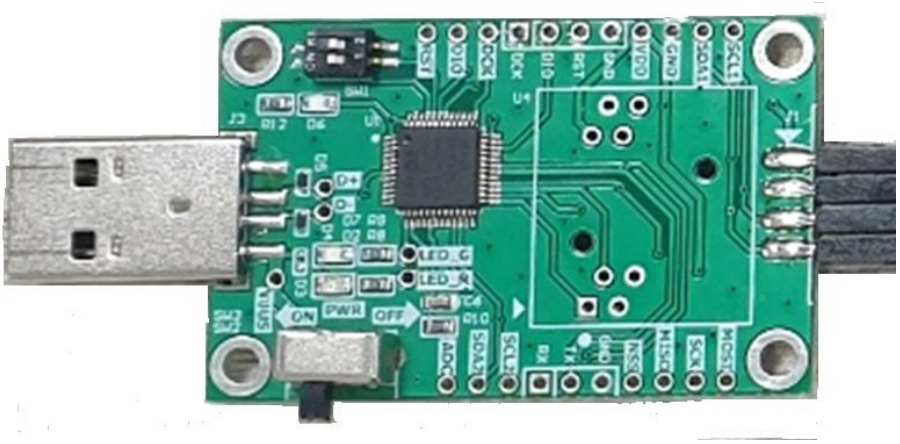


Figure 2 iMQ Secure Starter Kit appearance (no Socket version, used with EVB, for SQ75 series)

Note: Developed for SQ75 series. Please refer to the hardware setting precautions Appendix A.

If developing the IC placed on the Socket, the PWR power switch should be switch to the OFF position before replacing the IC. After the IC is replace, turn the PWR power switch to the ON position again to avoid IC failure caused by live wire operation.

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The IC replacement process placed in the socket is as follows

1. Turn the PWR power switch to the OFF position to turn off the power.
2. Replace the next IC.
3. Turn the PWR power switch to the ON position to turn on the power.

1.2 Block Diagram

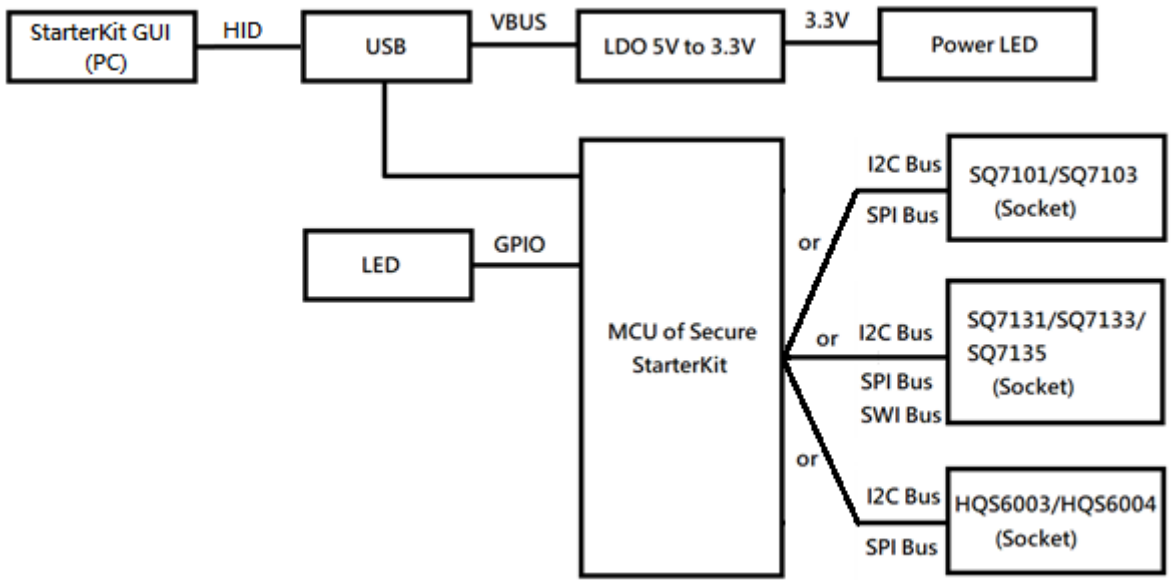


Figure 3 iMQ Starter Kit Block Diagram

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2. StarterKit Software

2.1 Software Installer

Step 1. Click the iMQ StarterKit Setup installation program to execute the installation.

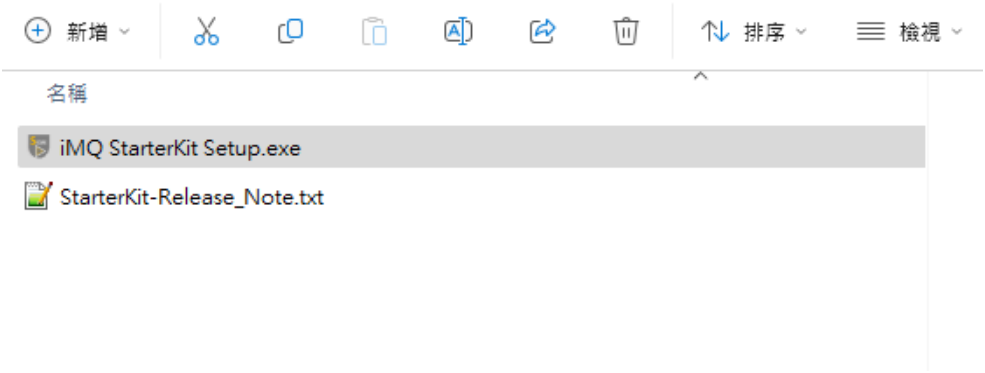


Figure 4 Example: iMQ_StarterKit_Setup

Step 2. Select the iMQ StarterKit installation path, Press "Next."

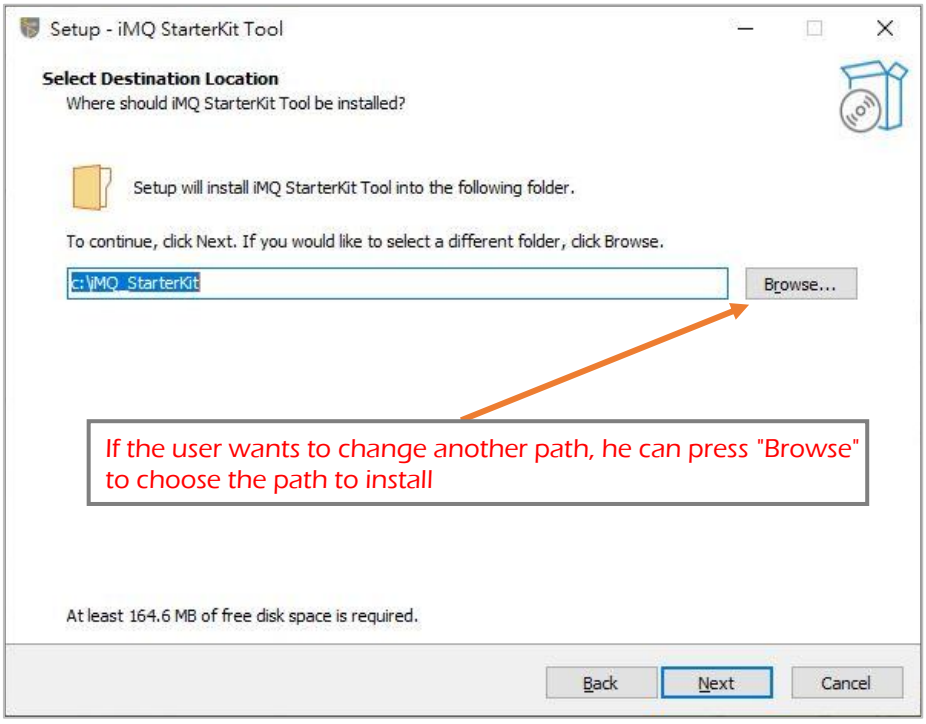


Figure 5 Installation path, the default path is C:\iMQ_StarterKit

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Step 3. After ticking Create a desktop shortcut, Press “Next.”

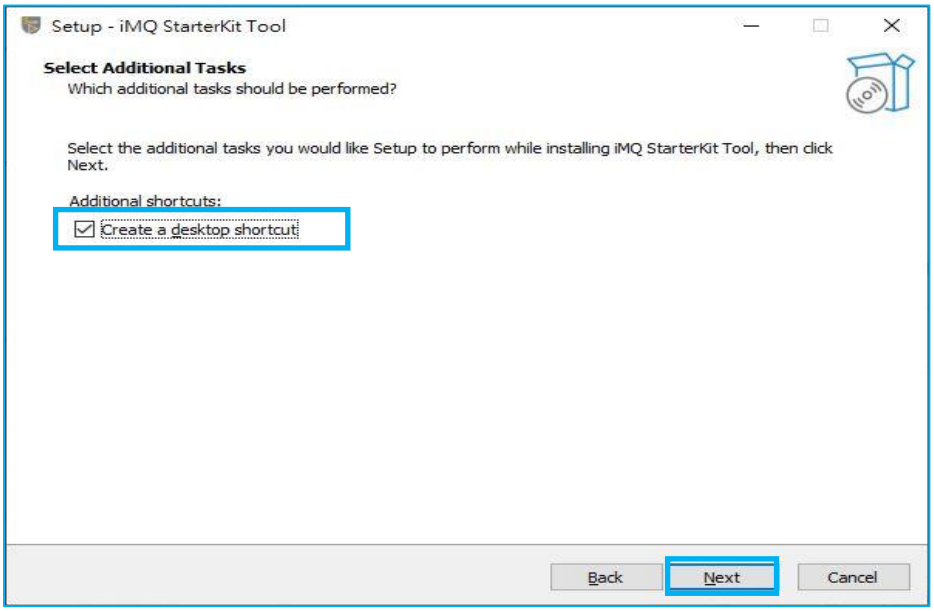


Figure 6 Checkbox to create a desktop shortcut

Step 4. This page will reconfirm the installation path and whether to create a shortcut icon. If there is no problem, press "Install" to install.

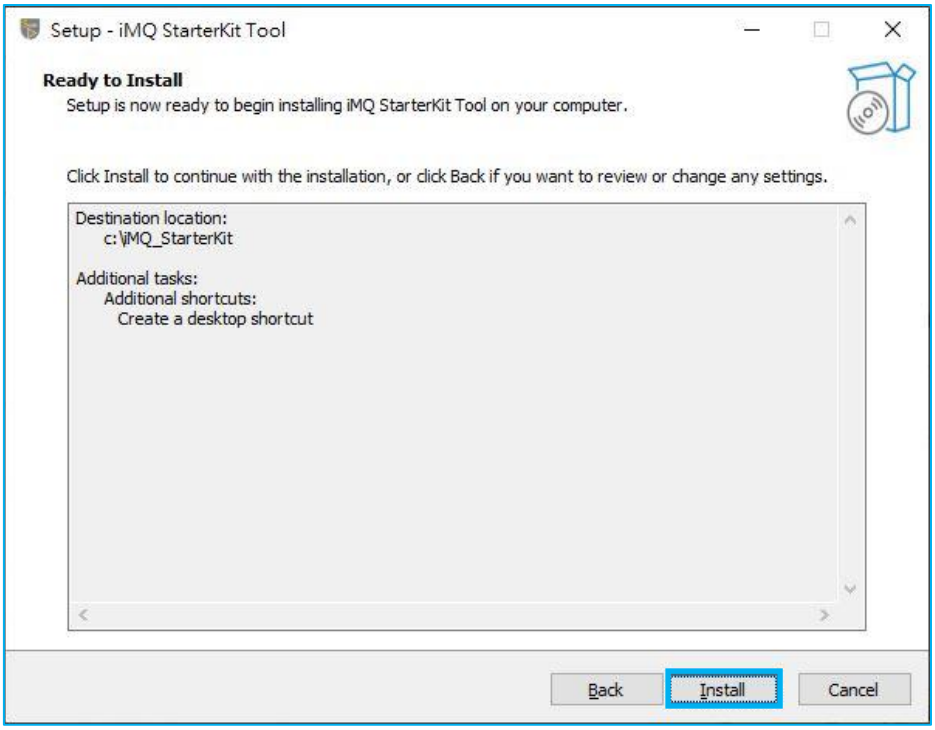


Figure 7 Re-confirm the installation data

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Step 5. This page is a reminder to uninstall original installation.

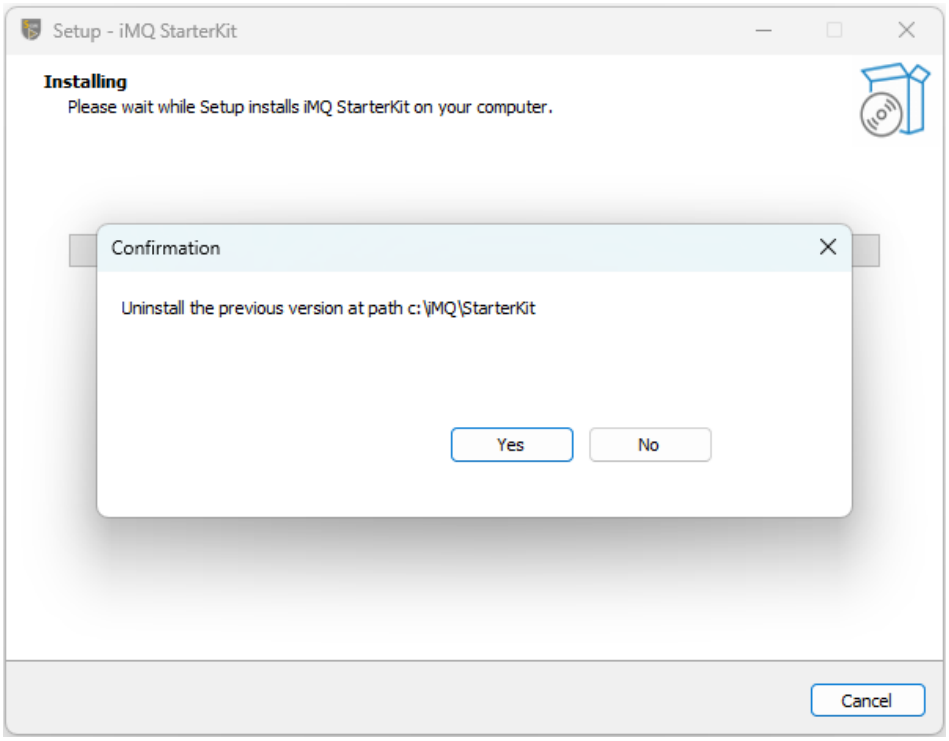


Figure 8 Uninstall confirmation

Step 6. Press "Finish" to complete the installation.

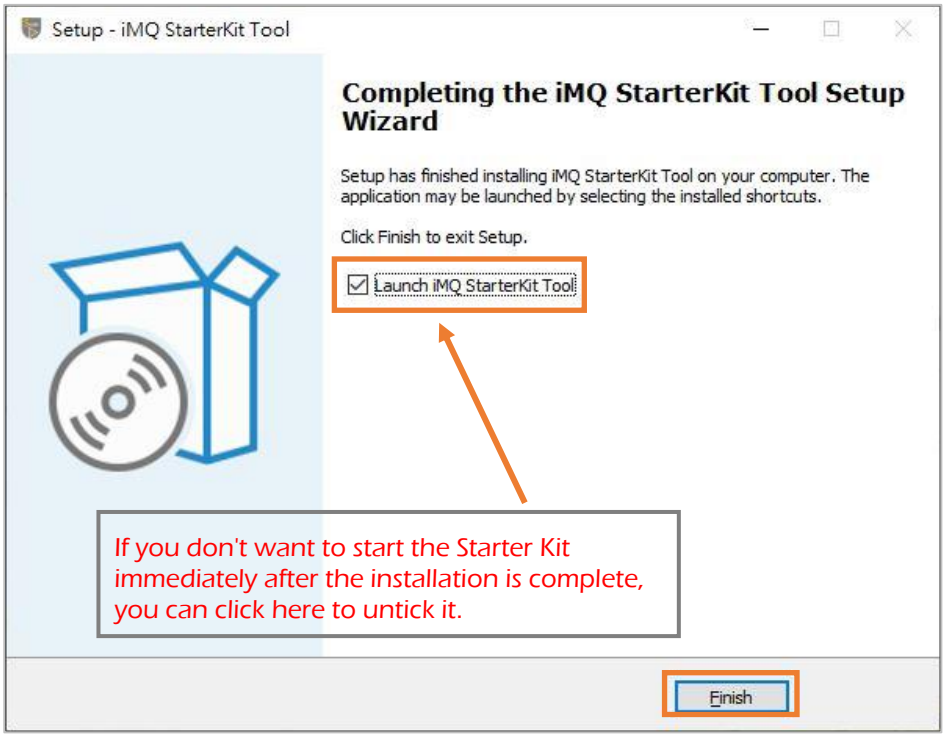


Figure 9 Checkbox to launch iMQ StarterKit Tool

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Note: If the Secure Starter Kit is not connected to the computer when the Starter Kit software is executed, you will not be able to enter the main screen for use, and a "Device not connected" warning window will pop up.

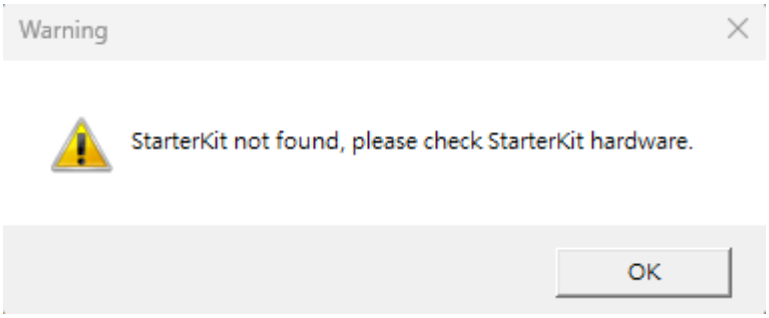


Figure 10 Cannot find Secure StarterKit warning message

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2.2 StarterKit Firmware Update

Updates to StarterKit FW are not always necessary. Only needs to be updated when the FW version changes (Updated information will be described in the release note).

Before installation, you must connect your PC to the StarterKit using a USB cable and power on the StarterKit.

There are three ways to update StarterKit FW:

2.2.1 Updating Firmware via StarterKit Launcher

1. If the firmware version detected by StarterKit Launcher is newer than the firmwareversion detected in StarterKit, a message box will pop up to confirm whether the user wants to update StarterKit FW.

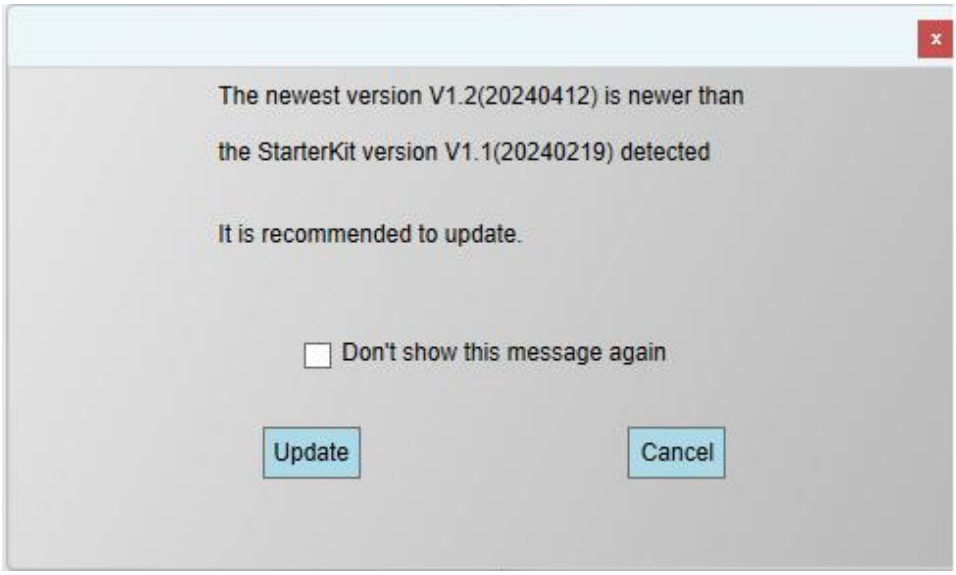


Figure 11 StarterKit Launcher FW update confirmation message box

2. There are two options
   a) Press "Update" button to update StarterKit FW.

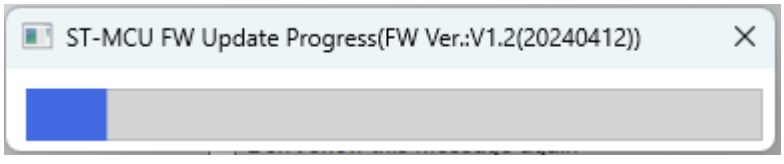


Figure 12 StarterKit Launcher FW update progress bar

   b) Press "Cancel" button to skip FW update.

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3. Check the CheckBox "Don't show this message agin", and it will disable the StarterKit launcher from checking the StarterKit firmware version on subsequent launches. After that, the firmware update confirmation message box will not pop up until the next time you install or import a newer version of firmware.

2.2.2 Update Firmware via StarterKit GUI

There are two menu items of StarterKit firmware update

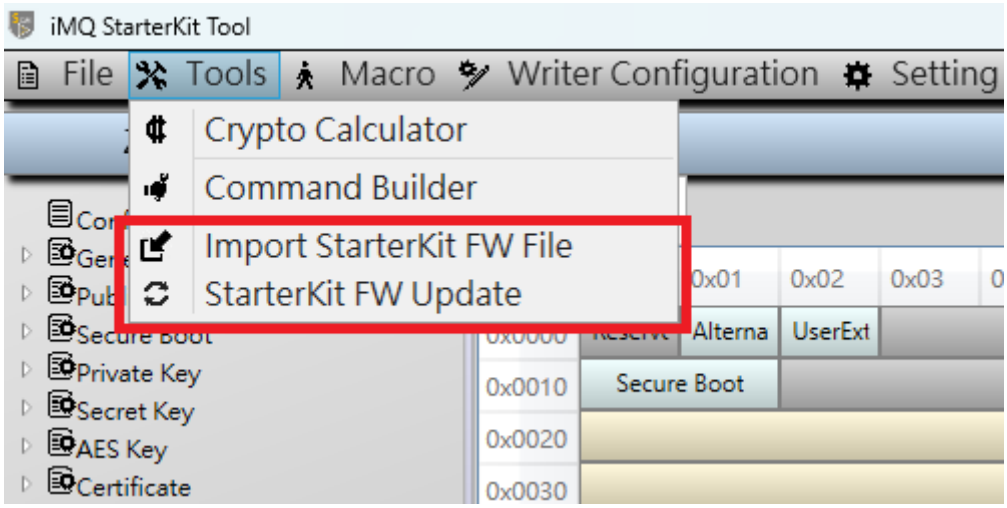


Figure 13 StarterKit GUI firmware update related menu items.

1. Click "Import StarterKit FW file" to select the StarterKit FW hex file for update

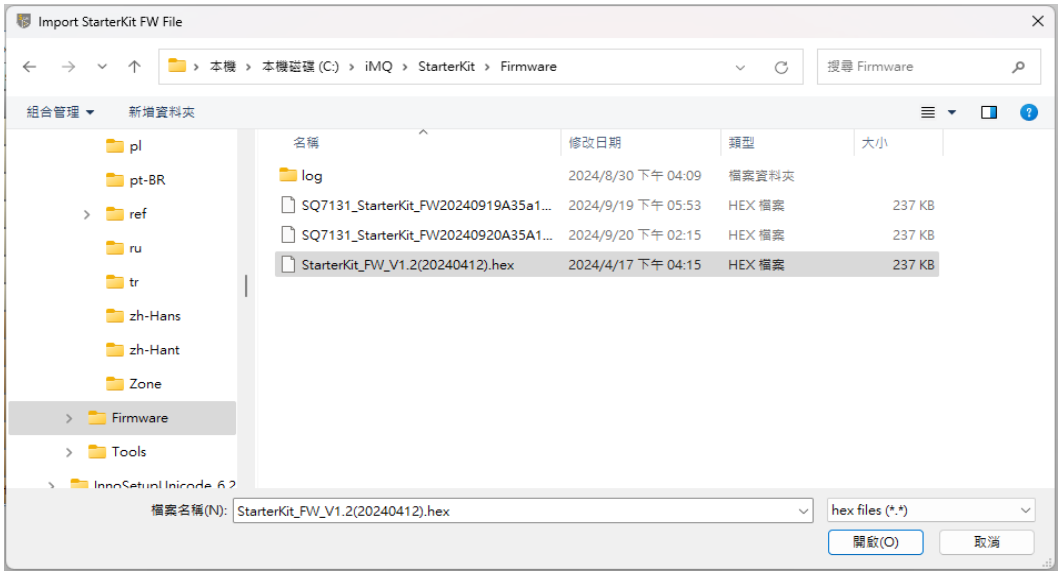


Figure 14 Import StarterKit FW File Dialog

2. After importing StarterKit FW, a firmware selection list box will pop up and focus on the imported item. You can change the selection as needed.

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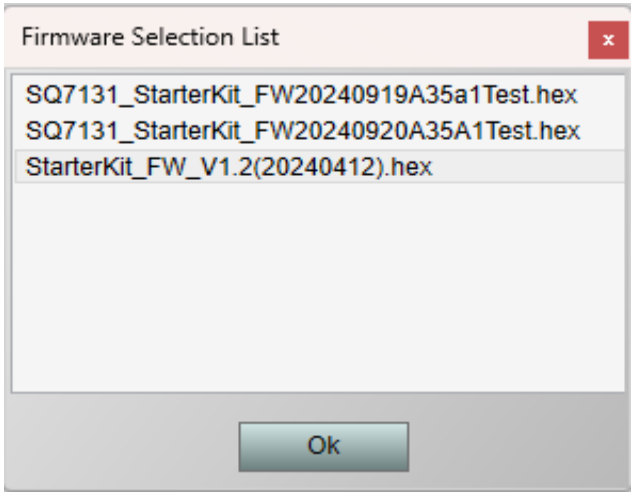


Figure 15 Firmware Selection List box

3. Click the "OK" button and a confirmation message box will pop up. Depending on the selected firmware and PCBA build-in firmware version, the message box will display the appropriate confirmation message [same or newer or older version or other (filename without version or date information)].

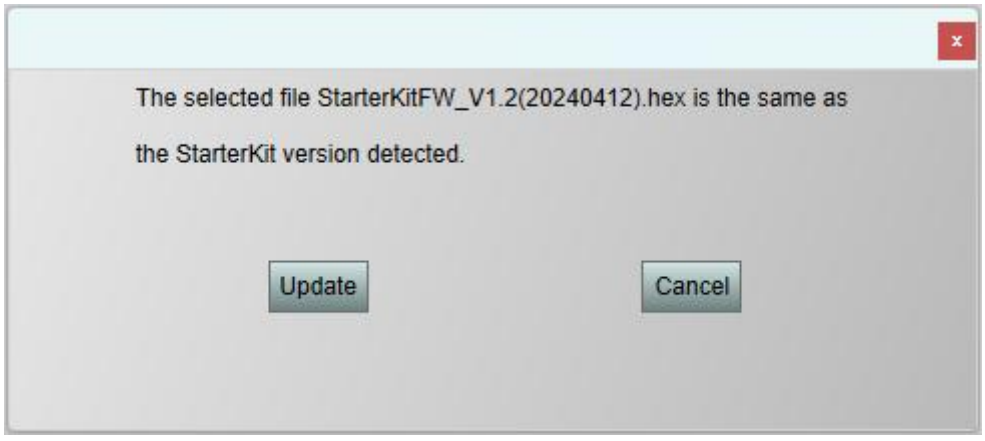


Figure 16 StarterKit GUI FW update confirmation message box - 1

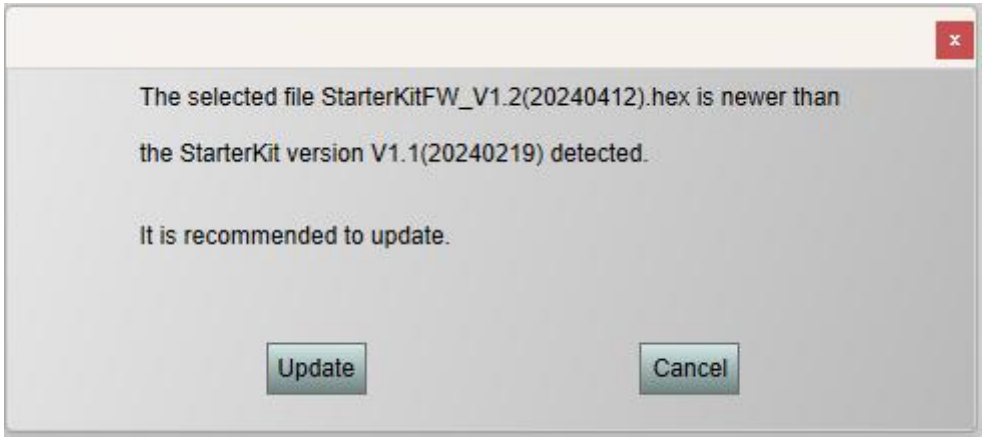


Figure 17 StarterKit GUI FW update confirmation message box - 2

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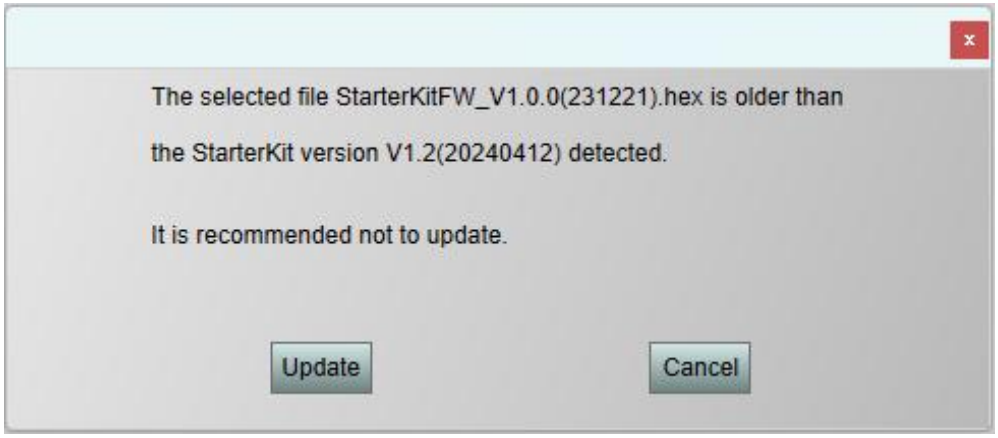


Figure 18 StarterKit GUI FW update confirmation message box - 3

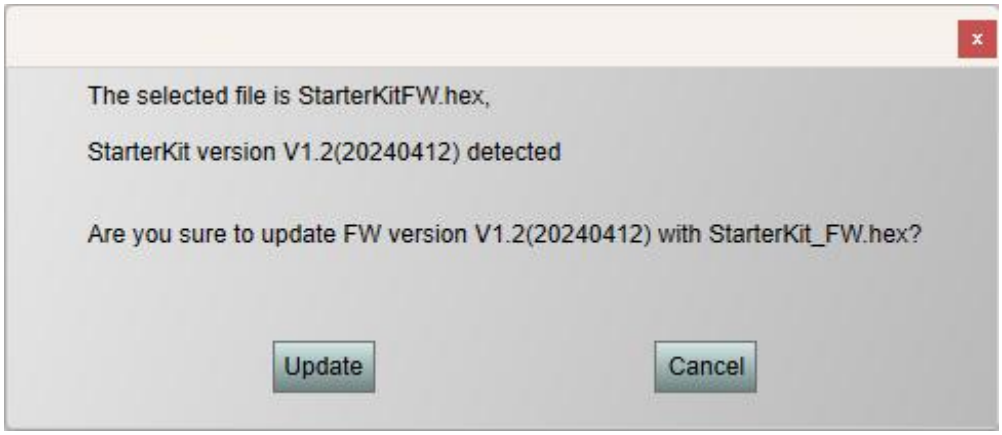


Figure 19 StarterKit GUI FW update confirmation message box - 4

4. There are two options
   a) Press "Update" button to update StarterKit FW.



Figure 20 StarterKit GUI FW update progress bar

   b) Press "Cancel" button to skip FW update.

5. After the update is completed, the update success message dialog box will pop up and the StarterKit tool will be forced to restart.

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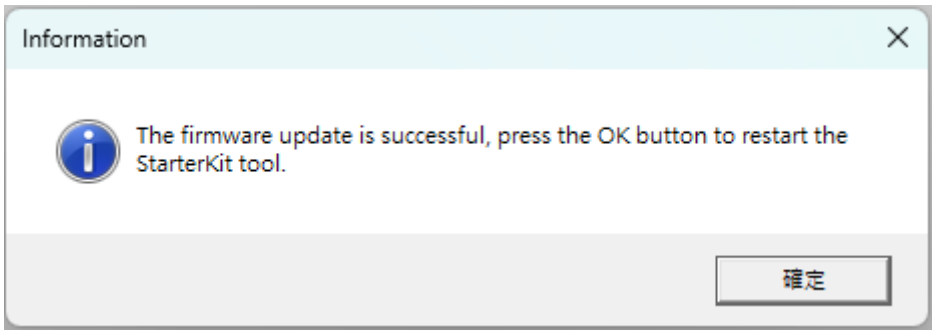


Figure 21 Update success message dialog box

6. After the StarterKit tool restarts, you can view the newly updated StarterKit FW version in the system information window.

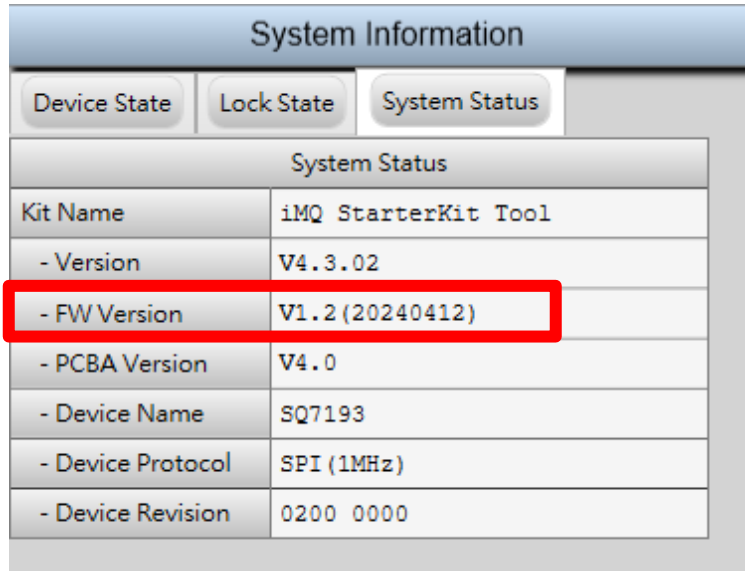


Figure 22 The newly updated StarterKit FW version in the system information window.

7. If you click the submenu item "StarterKit FW Update", the procedure is the same as the submenu item "Import StarterKit FW File" except for the first step of importing FW file (Figure 13) is not included.

2.2.3 Update Firmware via Batch

The steps are as follows:

1. Change Windows directory to c:\iMQ\StarterKit\Firmware (This is the standard installed firmware path. Different installation directory will have different firmware path.).
2. Execute the batch file update.bat.
3. After the batch run, the following message will displayed in the DOS prompt window. You can see StarterKit FW original version and updated version in the message.

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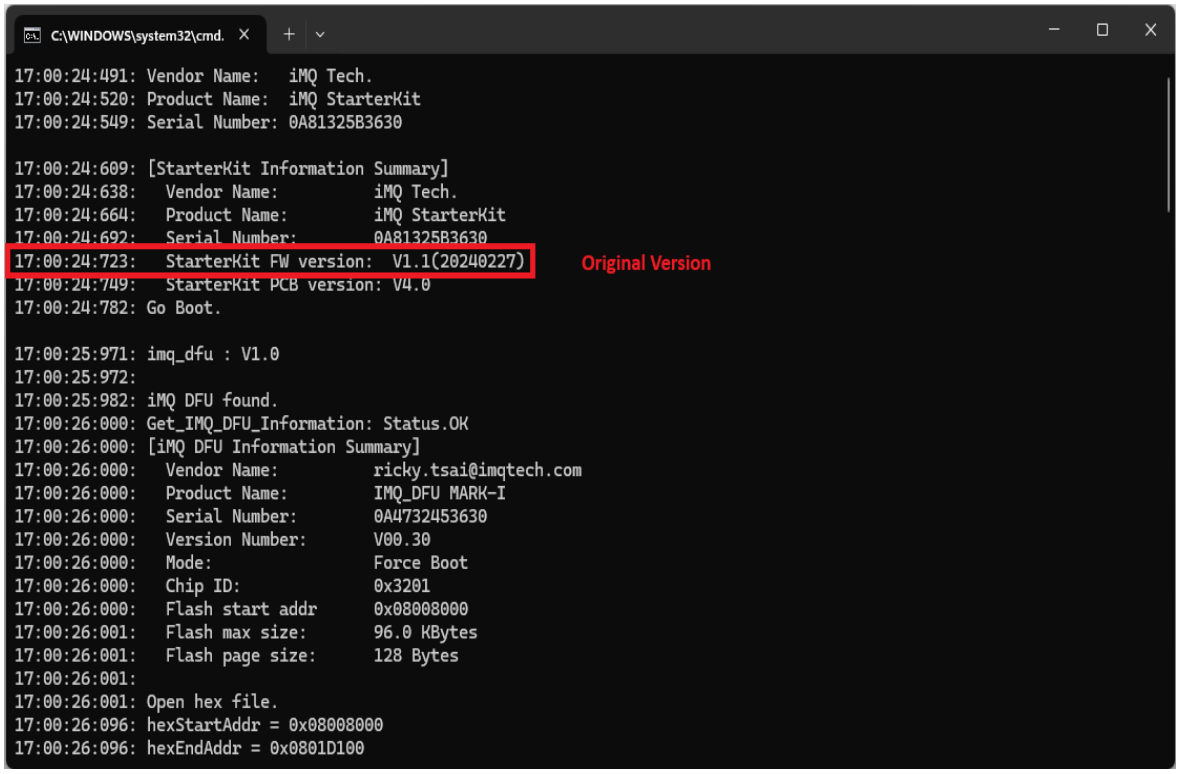


Figure 23 FW update start message

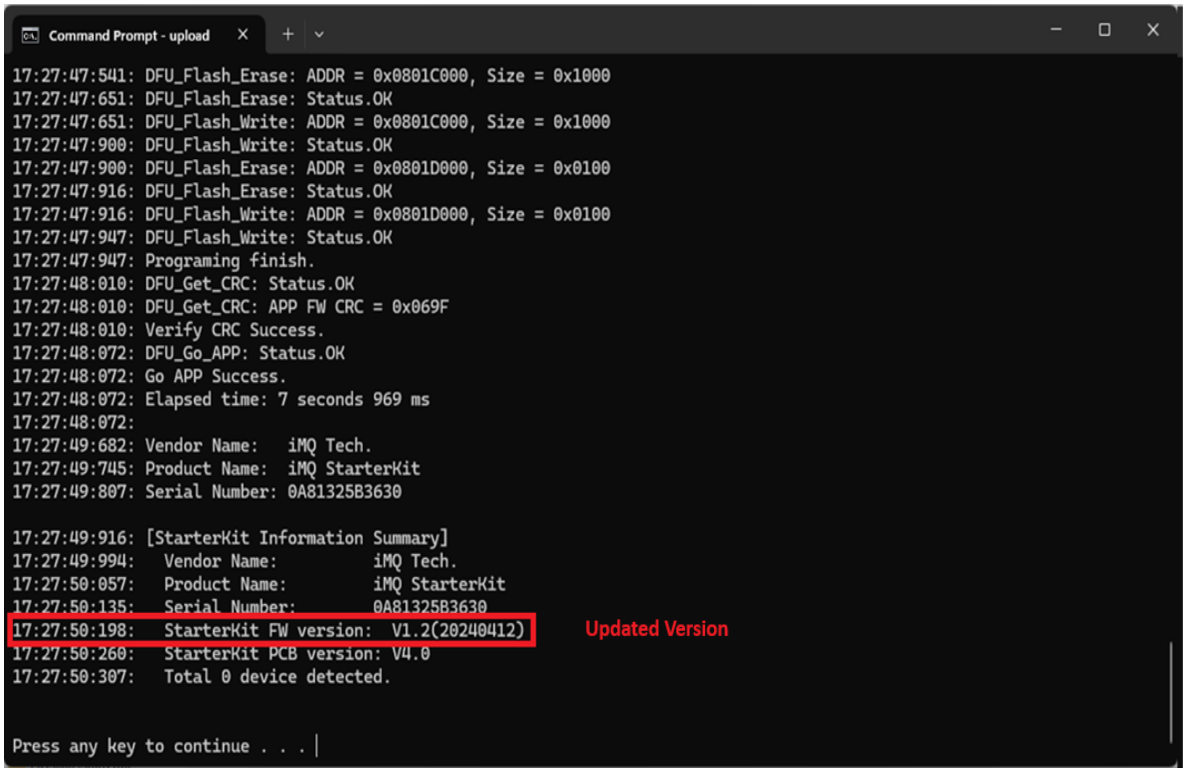


Figure 24 FW update successful message

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2.3 Software Removal

To completely remove the installed iMQ StarterKit, you can remove it according to the normal removal process or follow the steps below:

Step 1. Click to execute uninst000.exe from the installation directory

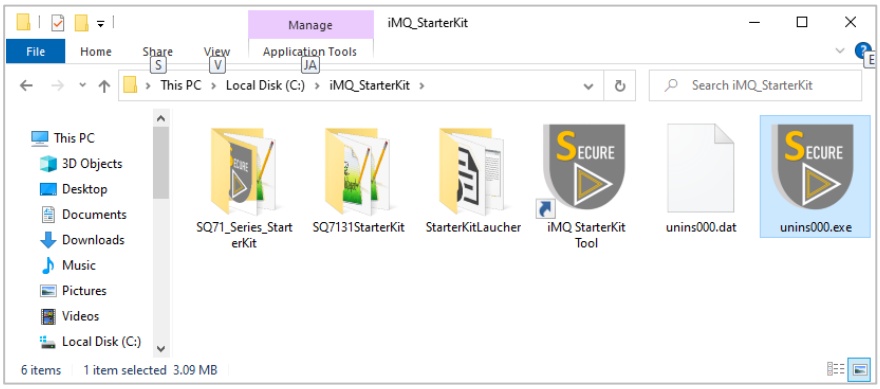


Figure 25 Installation directory

Step 2. Confirm whether you want to remove the StarterKit software

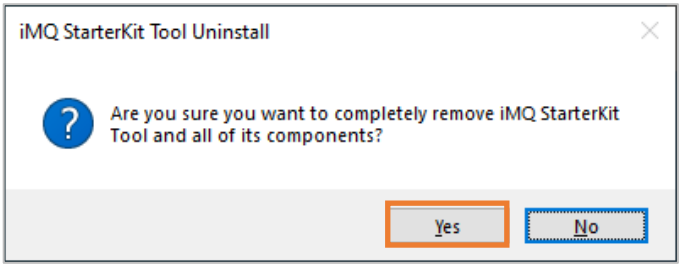


Figure 26 Confirm to uninstall StarterKit

Step 3. Successful removal

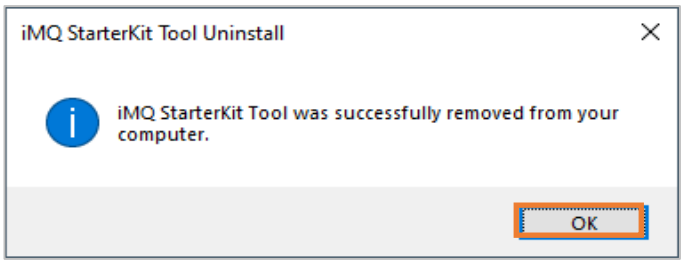


Figure 27 Uninstall successful message

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2.4 Software Startup

Step 1. Connect the Secure Starter Kit to the computer via USB.

Step 2. Execute iMQ Starter Kit software program

Double-click the iMQ StarterKit Tool shortcut icon to start software.



Figure 28 iMQ StarterKit Tool shortcut icon

2.5 StarterKit Launcher

When different devices on the Starter Kit Socket are equipped with different interfaces, the launcher will detect and display the currently connected device and interface information in the list. The user selects the device and clicks "Select Device" to enter the main screen.

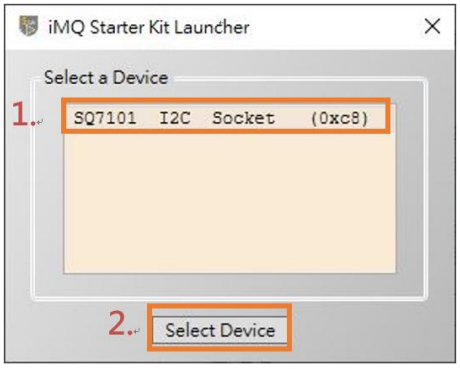


Figure 29 Using the Secure Starter Kit, and Socket is SQ7101 (I2C) device.



Figure 30 Using the Secure Starter Kit, and Socket is SQ7103 (SPI) device.

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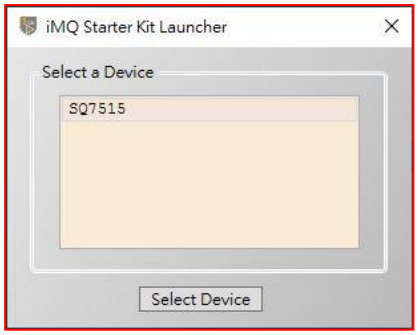


Figure 31 Use the Secure Starter Kit to configure or read the Security Processor with SQ7515 EVB

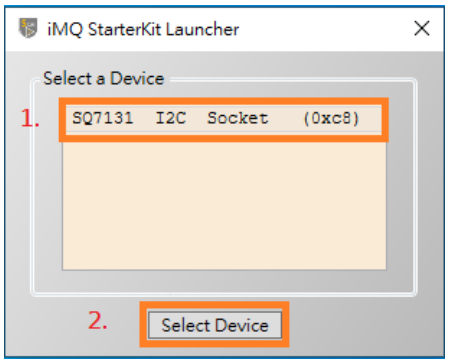


Figure 32 Using the Secure Starter Kit, and Socket is SQ7131 (I2C) device.

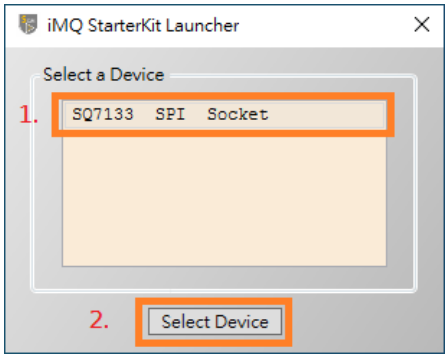


Figure 33 Using the Secure Starter Kit, and Socket is SQ7133 (SPI) device.

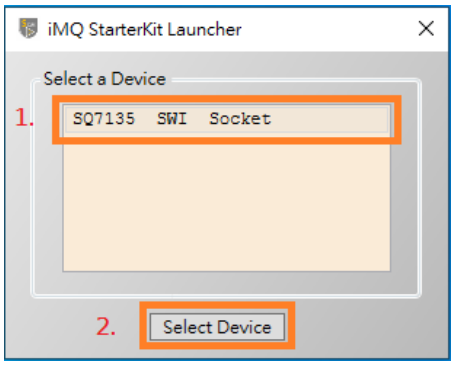


Figure 34 Using the Secure Starter Kit, and Socket is SQ7135 (SWI) device.

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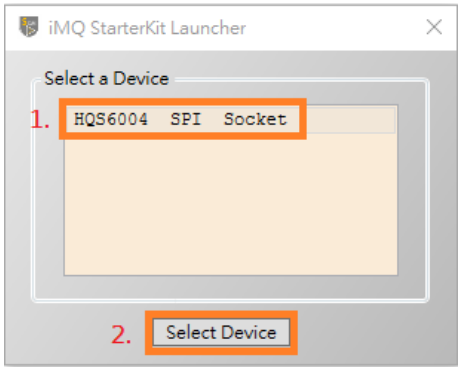


Figure 35 Using the Secure Starter Kit, and Socket is HQS6004 (SPI) device.

Note: When replacing the IC on the Socket, please make sure that the PWR switch on the Starter Kit is turn off. Please refer to 1.1 Hardware appearance.

If the device is not scanned, a prompt screen as shown in the figure below will pop up, and the user can check whether the Secure Starter Kit is connected to the computer.

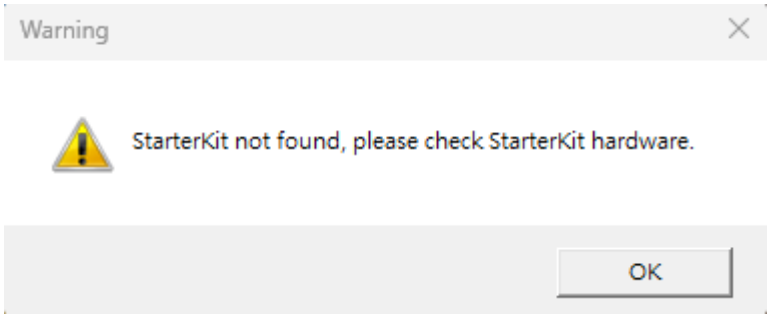


Figure 36 Cannot find Secure StarterKit message

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3. System Requirement

Before using the Security Starter Kit, prepare the following items and confirm your computer's system specifications.

- Windows 10 OS, Microsoft.NET Framework 4.8 (inclusive) or above.
- Secure Starter Kit (Hardware)
- iMQ Starter Kit Setup Software installation package

Note：Microsoft.NET Framework 4.8 Official Download

4. SQ7101/SQ7103/SQ7515

4.1 StarterKit Software Function Description (SQ7101/SQ7103/SQ7515)

The function description in this chapter applies to support symmetric encryption algorithm products. (e.g. SQ7101, SQ7103, SQ7515)

4.1.1 Software Introduction

The user interface is divided into two windows. The first is the main screen, all build command, sending commands, opening the Memory window, toolbox (Tool), transfer records, etc. are all executed and displayed in this window; The second is the memory window, it must be opened from the main screen to be displayed, and its function is to configure the memory.

4.1.2 StarterKit Main Screen

The main screen is divided into four parts, namely:

1. Build Command: Including command packet block, send packet information block, receive return packet information block and execute command button.
2. Menu Bar: Menus for File, Memory, Tool, and About.
3. Status Bar: Displays the connected device, its communication protocols and device addresses.
4. Log: Record the time and content of command transmission and received messages.

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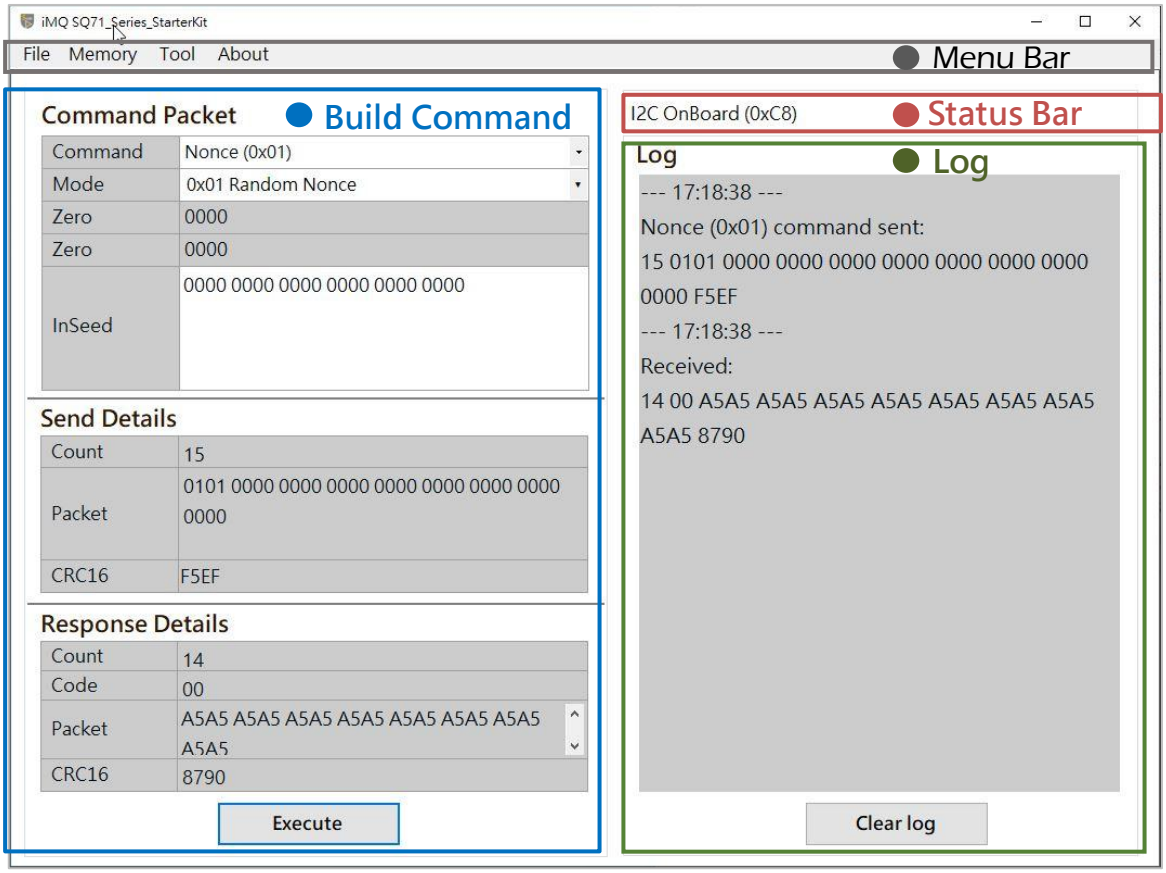


Figure 37 SQ710x StarterKit main screen

4.1.2.1 Build Command

The Build Command area is divided into three blocks, namely: command packet block, send detail block, response details block and execute button.

1. **Command packet block:** It is used to select commands, modes, parameters and other settings. Commands are drop-down menus, and there are many commands to choose. The parameters will change according to the command selected by the user.
2. **Execute button:** After pressing "Execute", the command and parameter in the command packet block will be executed.
3. **Send details block:** Display the data length, content and CRC check code of the transmitted packet.
4. **Response details block:** Display the data length, return code, content and CRC check code of the received packet.

Note 1: All fields are expressed in hexadecimal

Note 2: The gray background field is read-only information, user cannot modify it; the white background field, it means user can input or sele**Command**

Change fields by command

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Send packet :

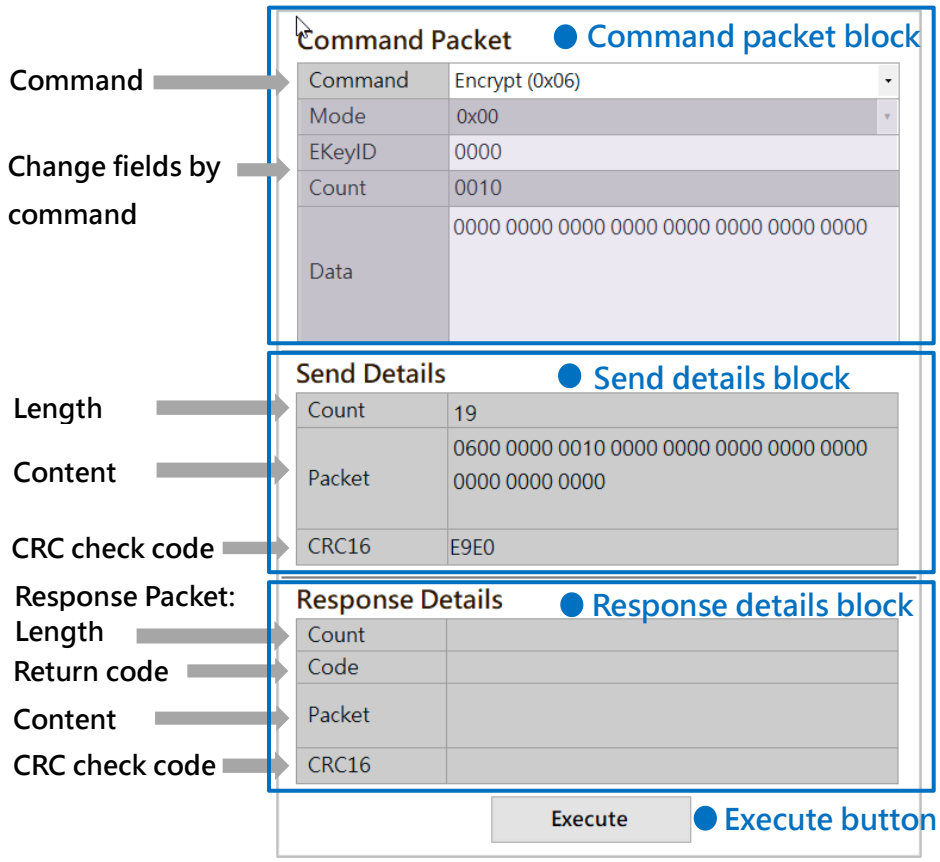


Figure 38 SQ710x Build Command area

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4.1.2.2 Main Menu

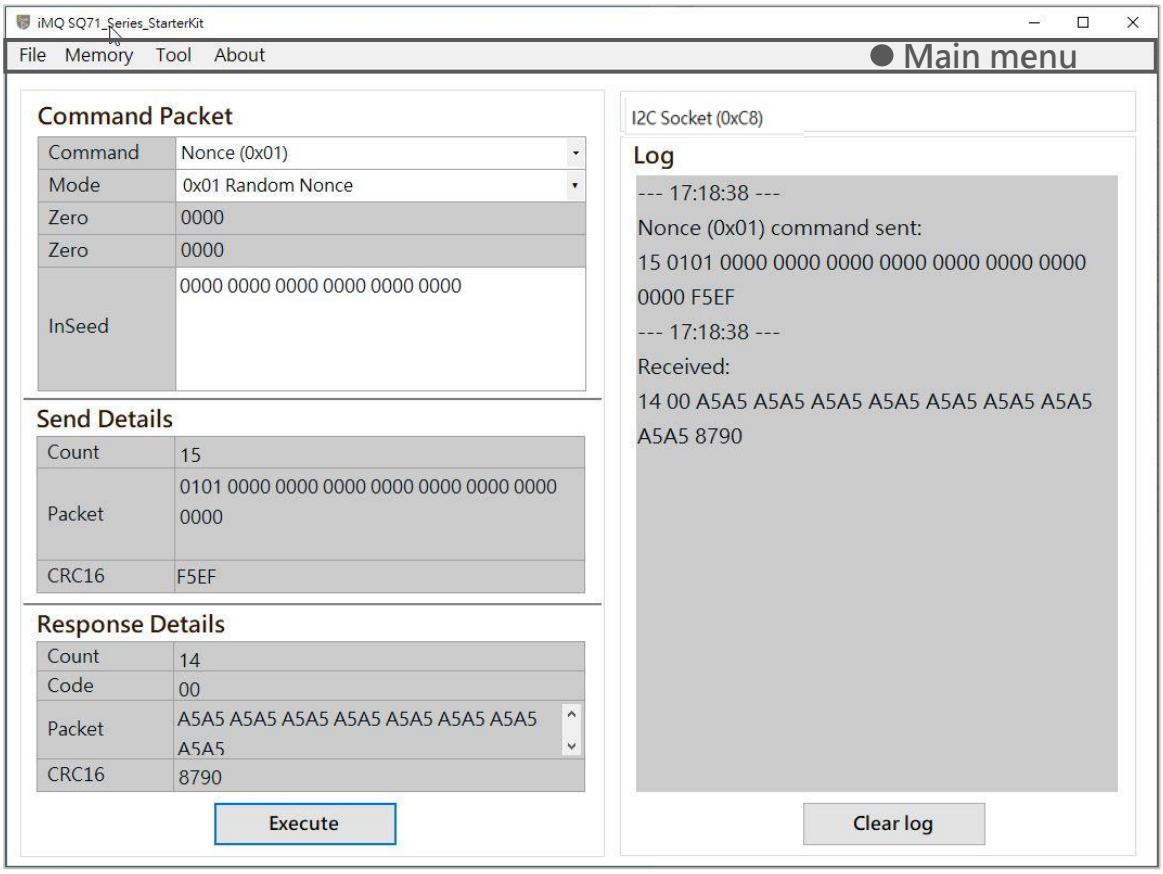


Figure 39 SQ710x Main menu

There are menus for File, Memory, Tool, and about on the menu bar, as shown in the figure below:

1. **File sub menu**: Click File, press Exit to close the main screen and memory window.



Figure 40 SQ710x File sub menu

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2. **Memory sub menu:** Click Memory, it will pop up memory window after the reading is completed.

Note 1: Do not remove the Secure Starter Kit from the computer while the reading is in progress.

Note 2: The memory window will be explained in the following chapter 「4.1.3 Memory」

Figure 41 SQ710x Memory sub menu

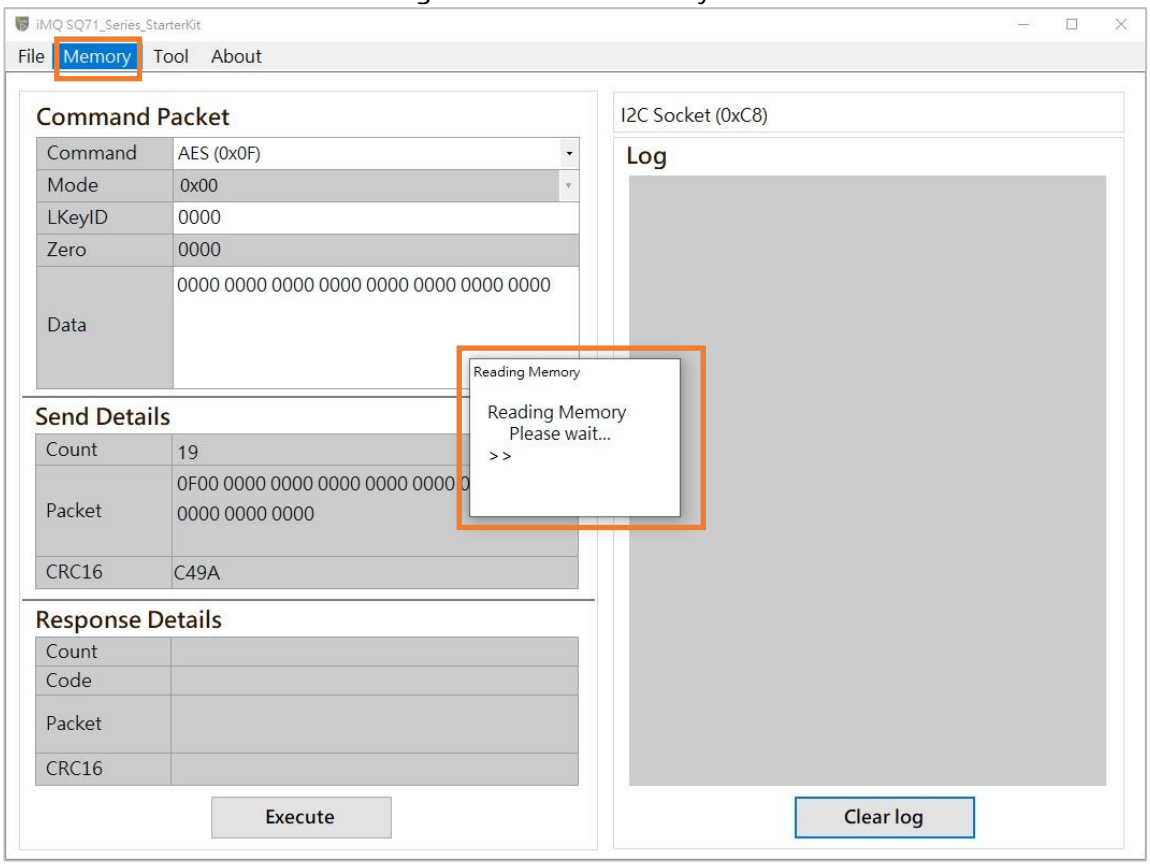


Figure 41 SQ710x Memory sub menu

3. **Tool sub menu:** Click Tool, and then select XOR to open the XOR calculation.

Tool\XOR



Figure 42 SQ710x Tool sub menu/XOR

Note 1: When Data1 and Data2 have different lengths, the effective calculation length will be based on the shorter Data length.

Note 2: XOR calculation tool for hexadecimal calculation.

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Click Tool, and then select Program Device to open the Program Device window.

Tool\Program



Figure 43 SQ710x Tool sub menu/Program Device

Note 3: The program device window will be explained in the following chapter 「4.1.4 Program Device」

4. **About sub menu:** Click About to view software, firmware, and Secure StarterKit hardware versions information.



Figure 44 SQ710x: SQ710x About sub menu

Note 1: Do not remove the Security Starter Kit from your computer while viewing the version.
Note 2: When a new version of iMQ StarterKit is released, it will be released on the following website:
http://www.imqtech.com/
http://www.imqtech.com.cn/



Figure 45 SQ710x SQ710x About dialog

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4.1.2.3 Status Bar

The communication protocol and device address of the device connected to StarterKit will be displayed on the status bar. As shown in the figure below, the communication protocol is I2C, and the device I2C address is 0xC8.

Note 1: The communication protocol and device address displayed on the status bar are the same as the slave device selected by the user before entering the main screen.

Note 2: After entering the main screen, if you change the communication address of the device, you must re-plug the Secure Starter Kit and restart the Starter Kit program, the new device address will take effect.

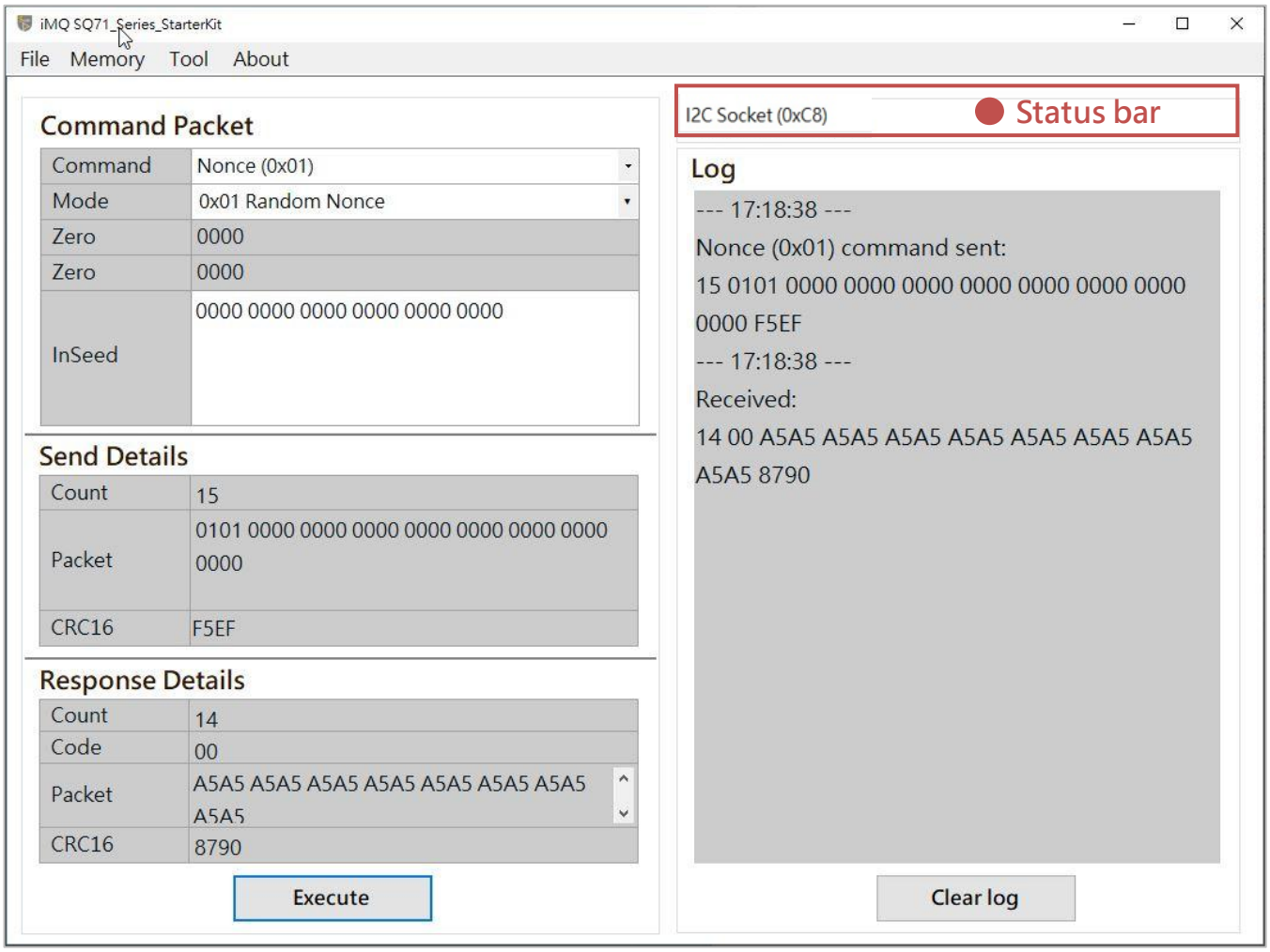


Figure 46 SQ710x Status bar

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If the slave device is a SPI device (such as SQ7103), the status bar will display "SPI Socket."

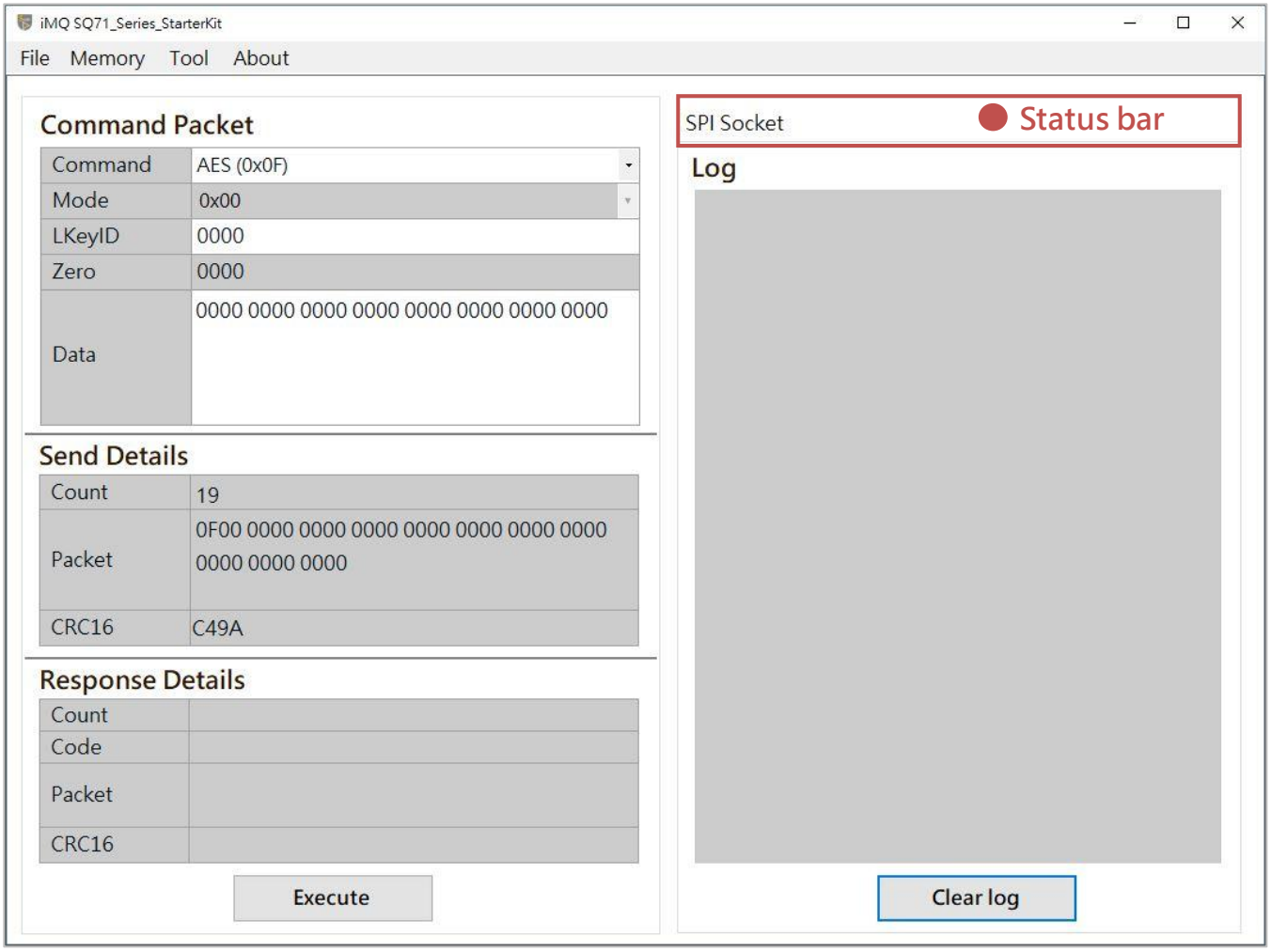


Figure 47 SQ710x Status bar (SPI device)

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4.1.2.4 Log

This area records the time and content of command sending and receiving packet messages.

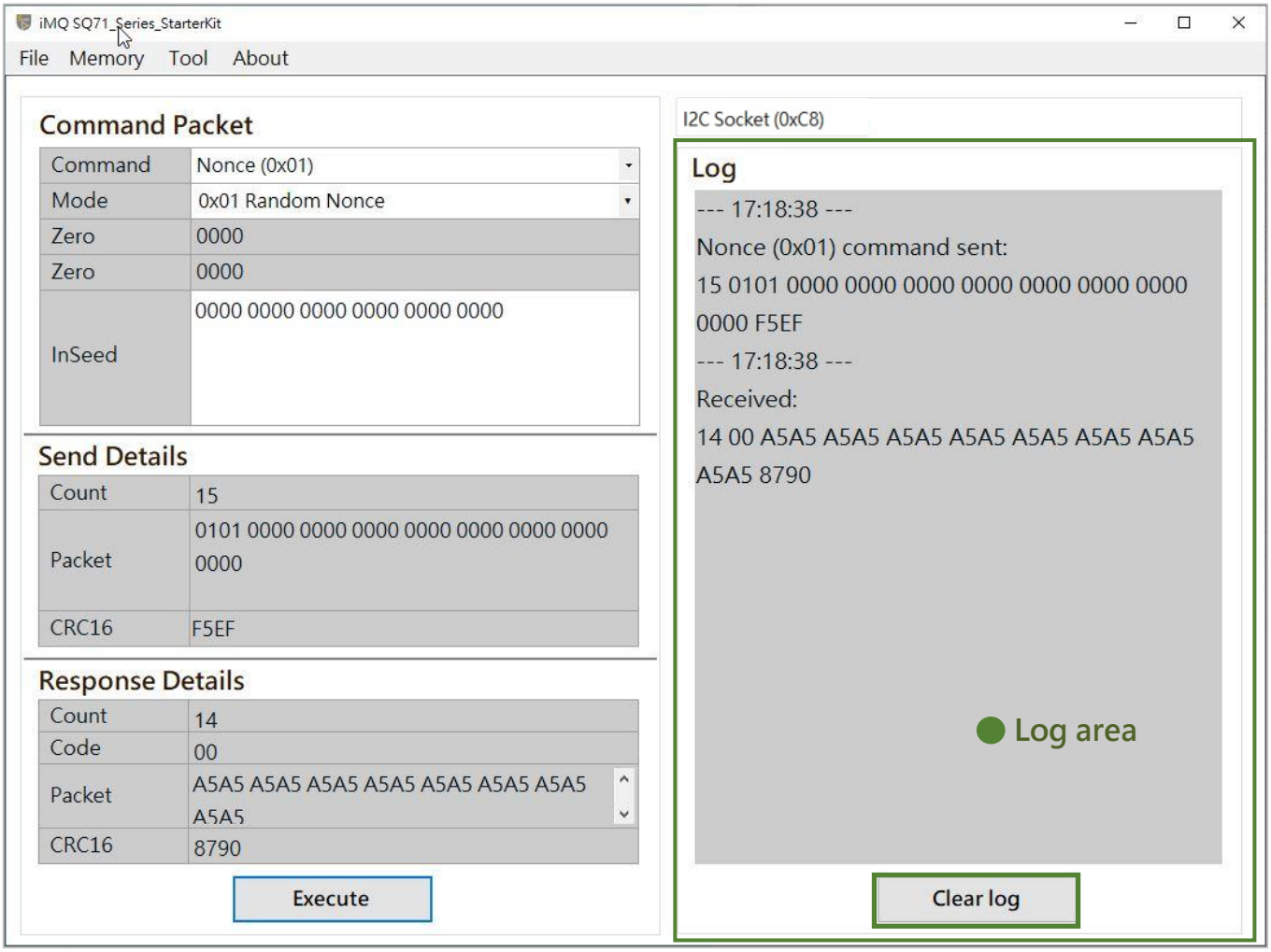


Figure 48 SQ710x Log area

Note 1: If there are too many logs, users can click the "Clear Logs" button to clear the logs.
Note: After the log is cleared, it cannot be restored!

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4.1.2.5 AES-256 Support

Support AES-256 key, AES-256 option appears on some Command windows item, check to enable/disable the support for AES-256 key.

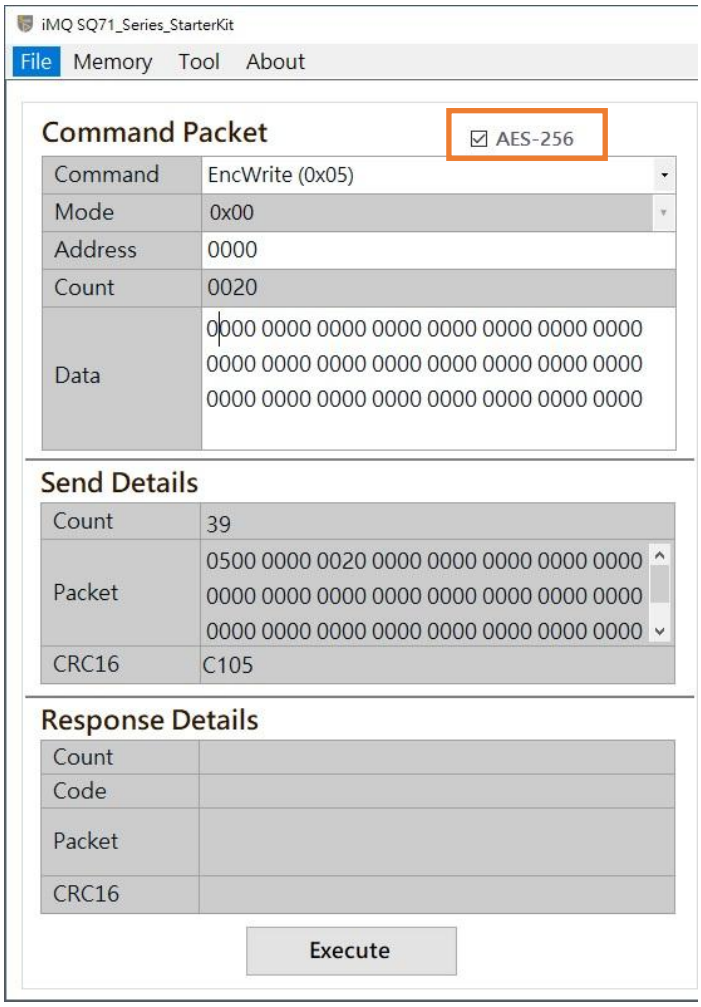


Figure 49 SQ710x Enable AES-256

To enable AES-256, you must first set Byte-4 of the key configuration in the Memory page, and select "Yes" for the AES256 field.

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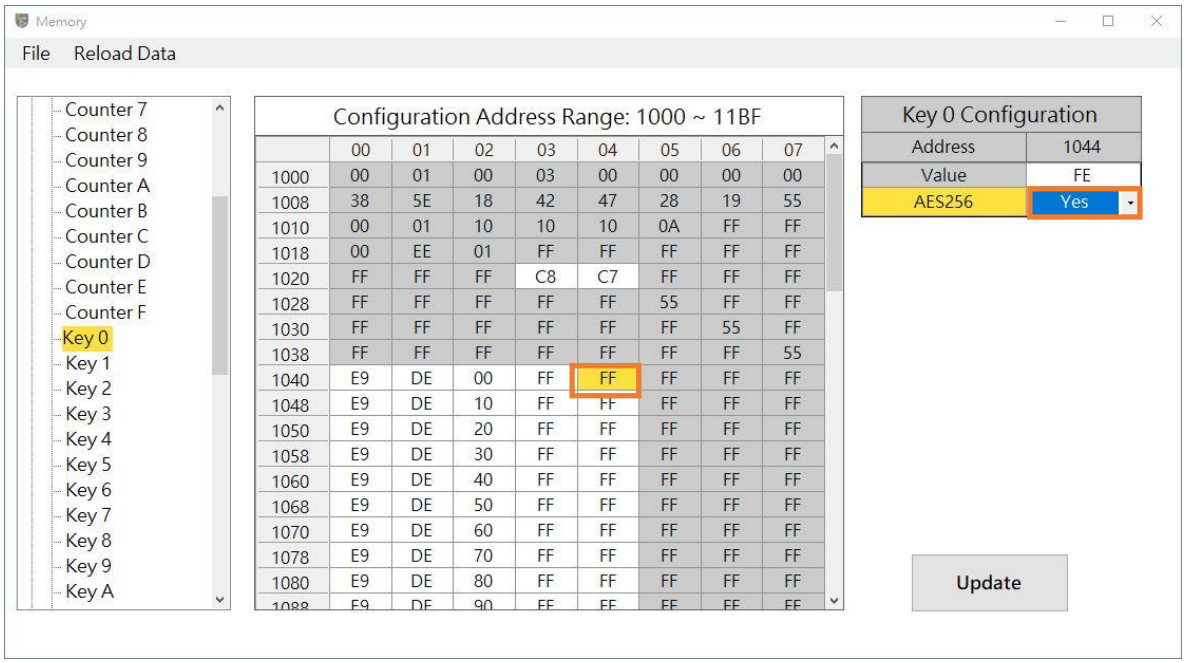


Figure 50 SQ710x Memory: AES256 field selected as "Yes"

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4.1.3 Memory

Click "Memory", and the memory window will pop up after the reading is completed.

Note: Do not remove the Secure Starter Kit from the computer while the reading is in progress.

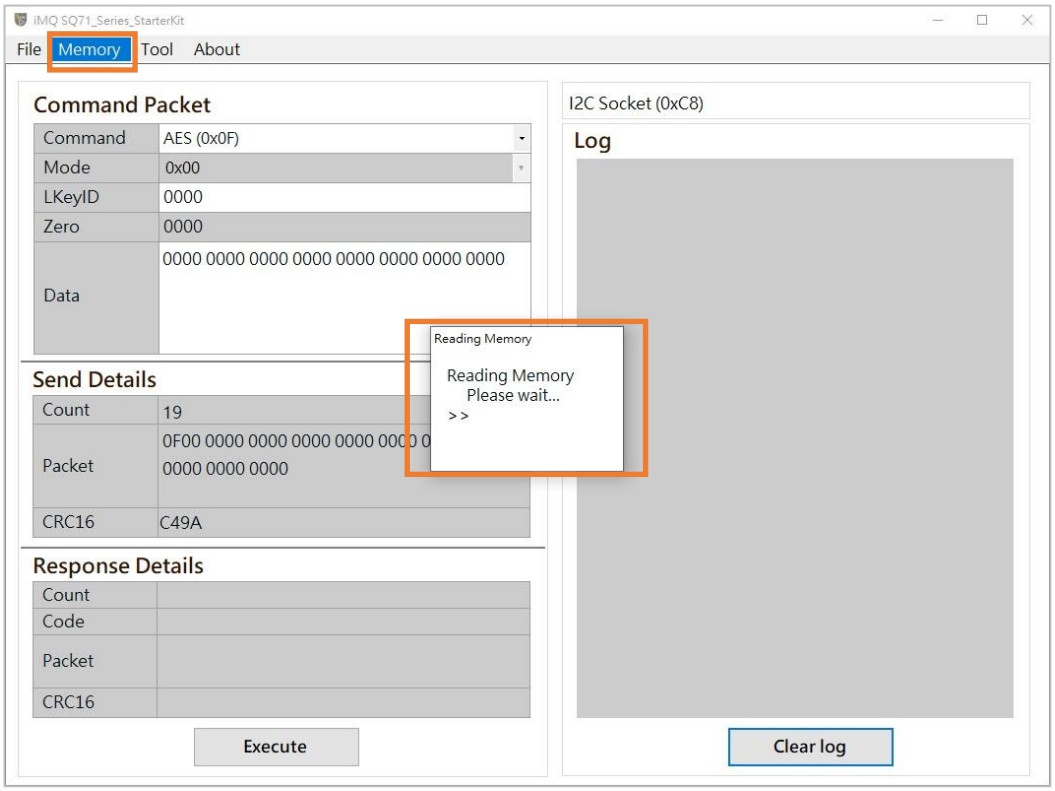


Figure 51 SQ710x Click Memory on the main menu

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The memory window can be divided into memory configuration block, configuration menu block and menu bar, which will be explained in the following chapters.

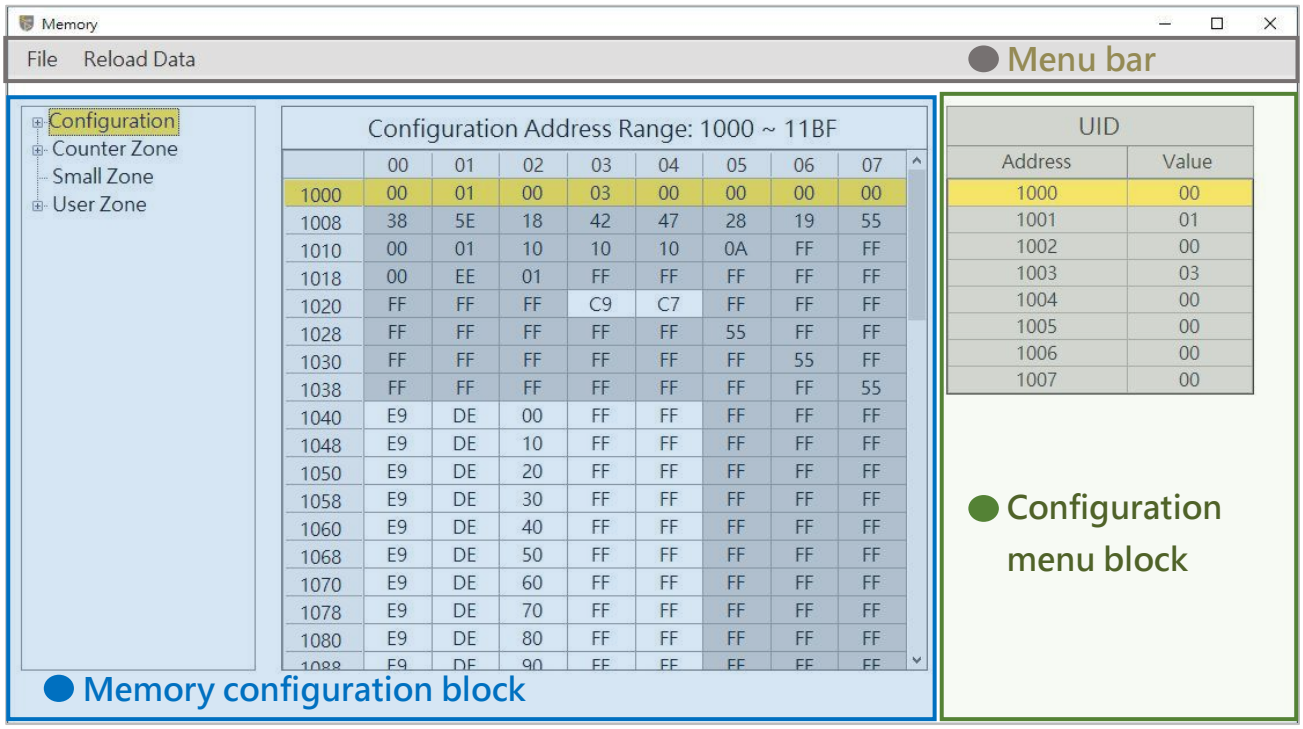


Figure 52 SQ710x Memory window

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4.1.3.1 Memory Configuration

The left side displays each memory zone that can be viewed, and the user can select to view. The memory data of the zone is displayed in the middle field (expressed in hexadecimal).

Note 1: If the user wants to modify the configuration, first select the memory address to be modified, and then modify it in the configuration menu displayed on the far right.

Note 2: If the field has a gray background, it means read-only (Read-only) information, and the user cannot change its settings.

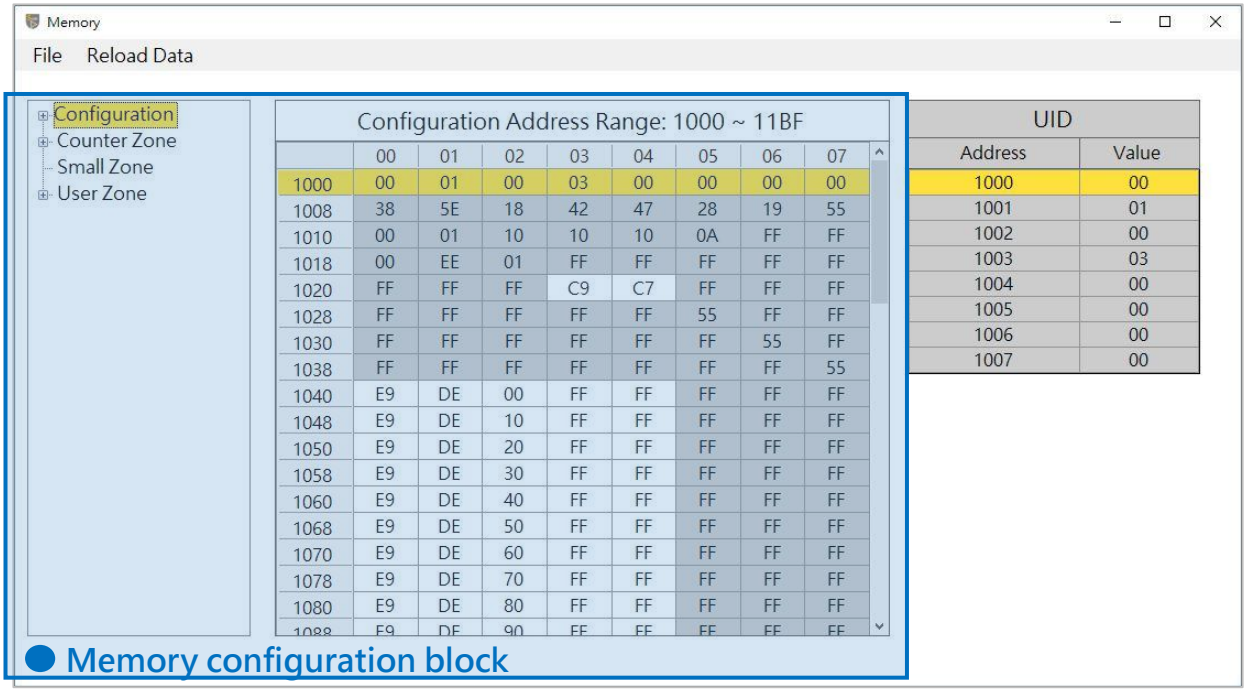


Figure 53 SQ710x Memory: Memory configuration block

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4.1.3.2 Configuration Menu

The configuration menu is divided into configuration zone and other zones.

- Configuration: Set the configuration of chip, key, user area and counter.
- Other zones: User Zone, Counter Zone and Small Zone.

4.1.3.2.1 Configuration Update

After selecting the address to be modified in the memory configuration block, the configuration menu corresponding to the address will be displayed. The following steps take configuring Key 0 as an example.

Step 1. At memory configuration block (the leftmost field) select Configuration\Key 0.

Step 2. At memory configuration block (middle field) select the address to modify the configuration.
Key 0 configuration address is 0x1040.

Step 3. Configure in the configuration menu
Click the configuration field, and the options available for configuration will be listed, and user can configure according to your needs.

Step 4. Confirm update configuration
After pressing "Update", the newly configured options will be written to Device, and the new configuration values will be displayed on Value.

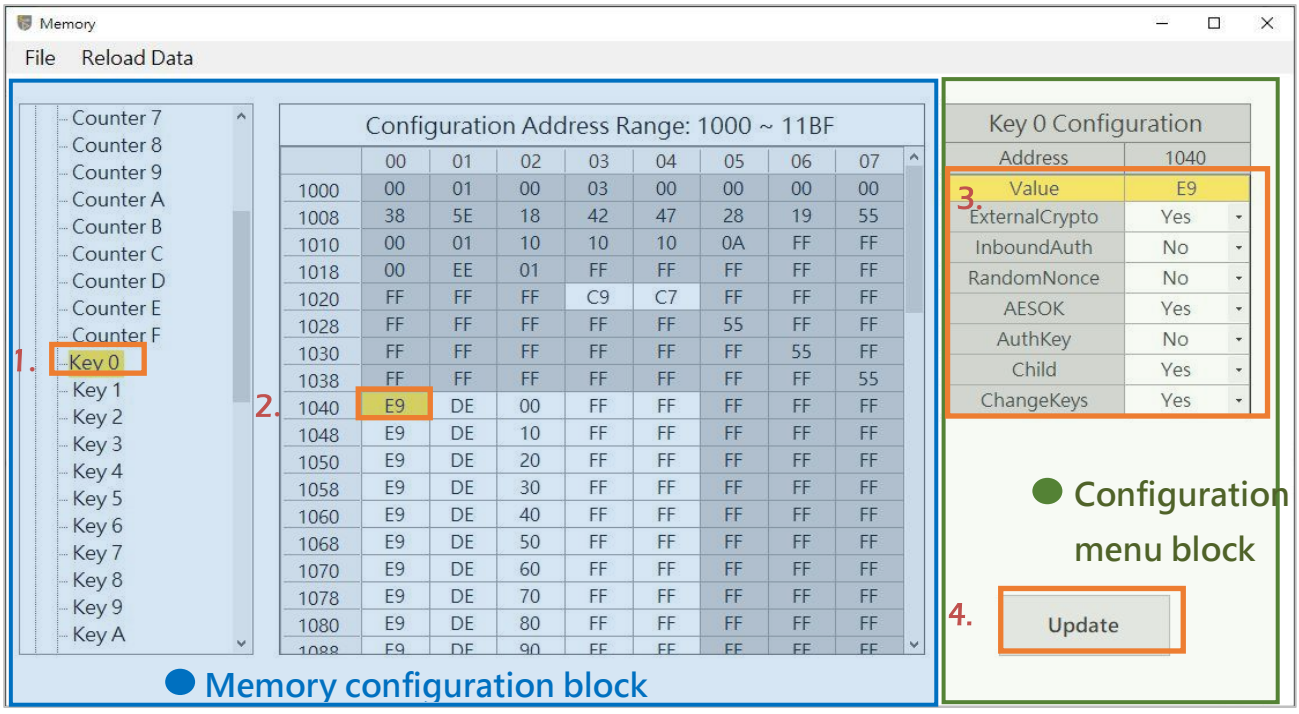


Figure 54 SQ710x Memory: Configuration update

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4.1.3.2.2 Other zones update

After selecting the address to be modified in the memory configuration block, a continuous section will be automatically selected, and the value of the continuous section will be displayed on the right configuration menu. The user double-clicks the Value field in the configuration menu, and the window for updating the value will pop up. The window shows the starting address of the continuous zone and all the values of the zone, and the value can be modified directly. After modification, click the "Update" button to write to the device. The following steps take modifying the data of User Zone00 as an example.

Step 1. At memory configuration block (the leftmost field) select User Zone\User Zone 00.

Step 2. At memory configuration block (middle field) select the address to modify the configuration.
User Zone address is 0x0000~0x00FF, a total of 256 bytes.

Step 3. Double-click the Value field to be modified in the configuration menu.
Click the Value field to modify the configuration, and the window for updating the value will pop up.

Step 4. Enter new value in the update value window
After pressing “OK”, the new value update is displayed in the configuration menu.

Step 5. Confirm update configuration
After pressing “Update”, the new value will be written to Device.

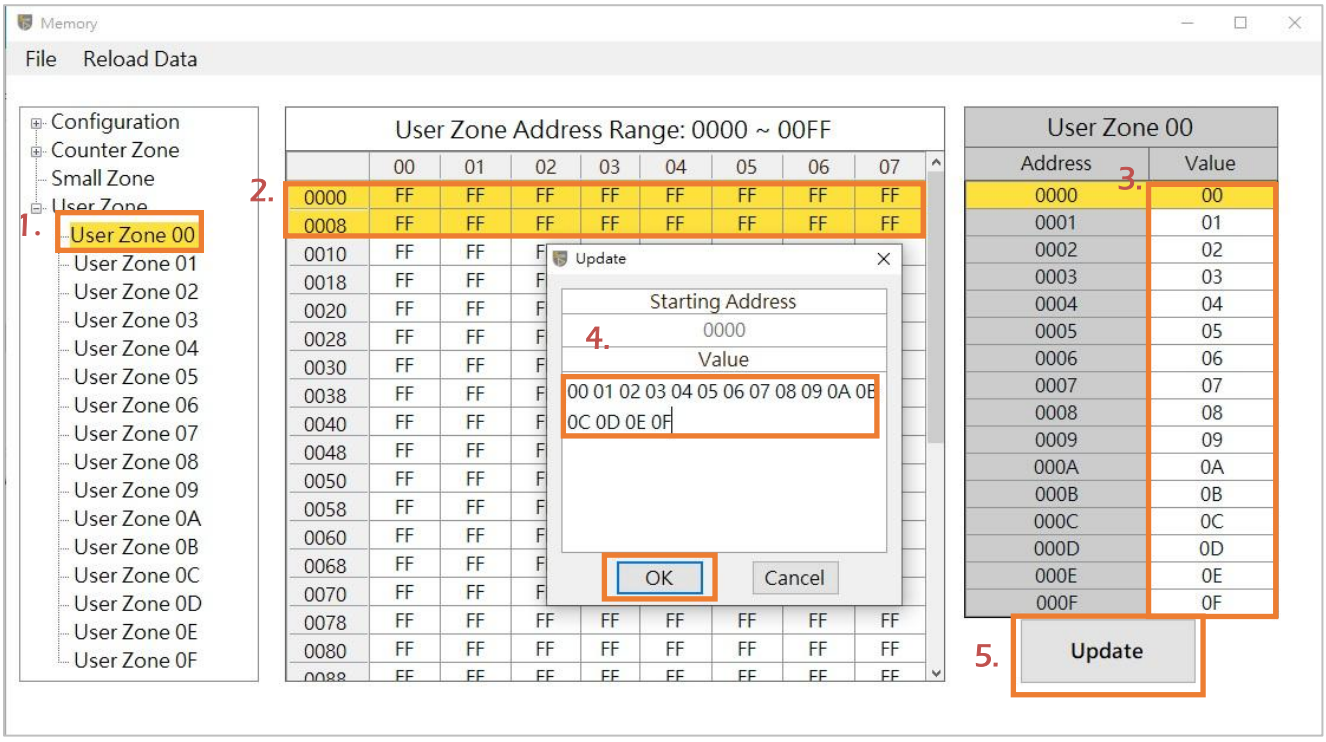


Figure 55 SQ710x Memory: User Zone update

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4.1.3.3 Menu Bar

There are File and Reload Data menus on the memory menu, as shown in the figure below:

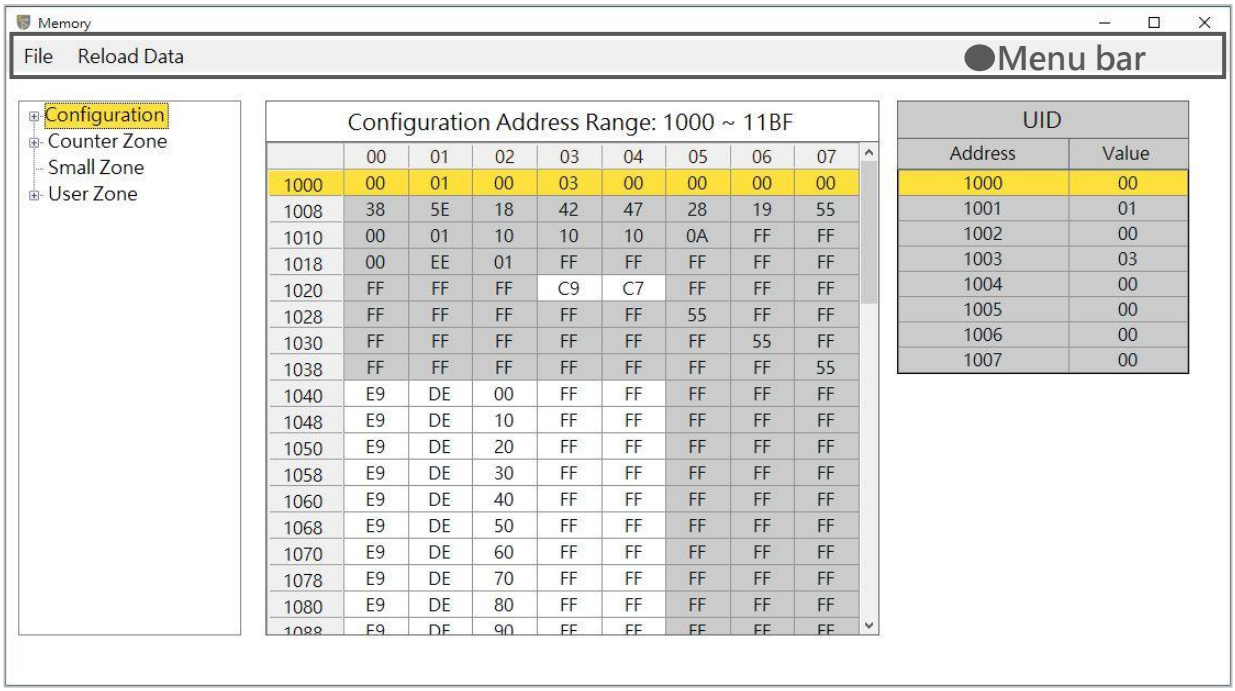


Figure 56 SQ710x Memory: Menu bar

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4.1.3.3.1 File Sub Menu

Click File to export or import the data of the device memory block.

a. **Export file**

Can export device memory configuration data.

Step 1. At menu select File\ Export Data

The export file format is .Json format.

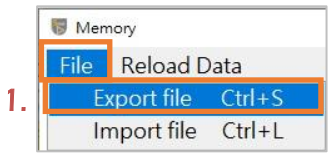


Figure 57 SQ710x Memory: File sub menu/Export file

Step 2. After selecting the save path, press Save

You can chooses the save path, use the default file name or name it yourself.

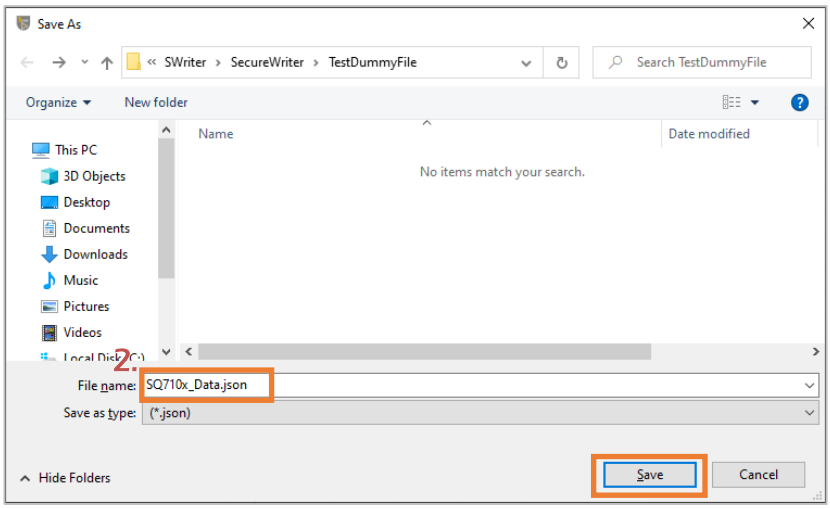


Figure 58 SQ710x Memory: Export file dialog

Note: The default export file name is SQ710x_Data.json, and user can name it.

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Step 3. After exporting the data, the Export Finish message box will pop up, press OK.

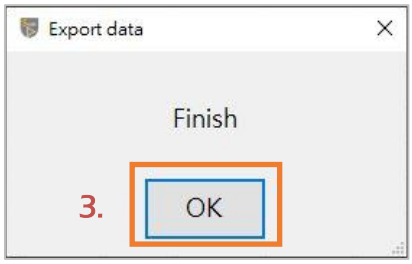


Figure 59 SQ710x Memory: Export finish message

b. Import Data

Can import previously exported configuration data.

Step 1. At menu select File\Import Data

The import file format is .Json format.

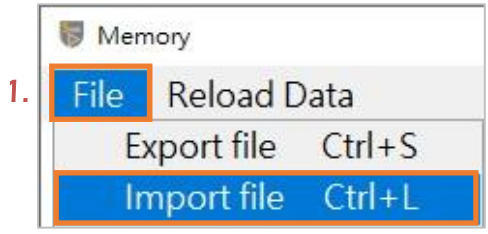


Figure 60 SQ710x Memory: File sub menu/Import file

Step 2. After selecting the .json/.jsfw file to be loaded, click "Open"

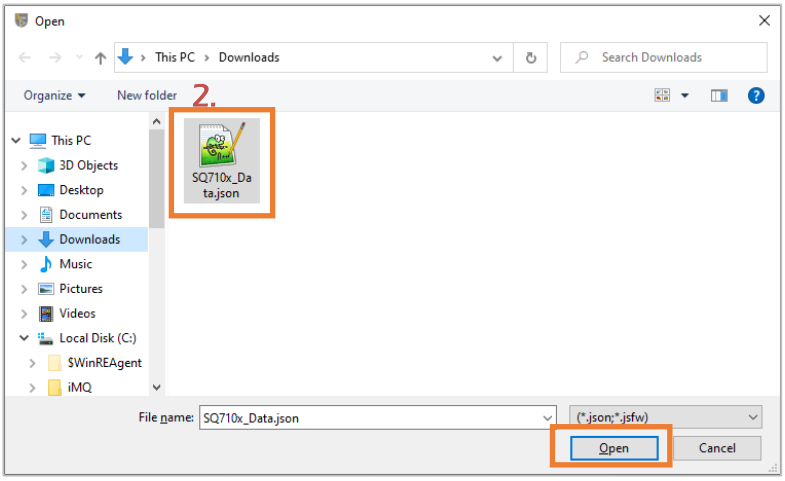


Figure 61 SQ710x Memory: Import file dialog

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Step 3. Pop up display memory zone list for user to select the zone to import

The user can choose to import a single zone or all zones. In the following example, after selecting "All", press OK to import the data of all zones.

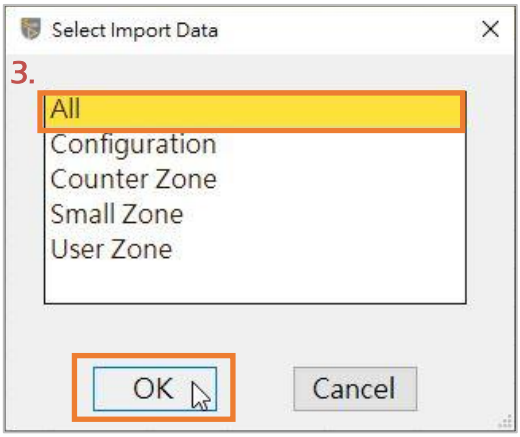


Figure 62 SQ710x Memory: Select import data dialog

Step 4. After importing the data, the Import Finish message box will pop up, press OK.

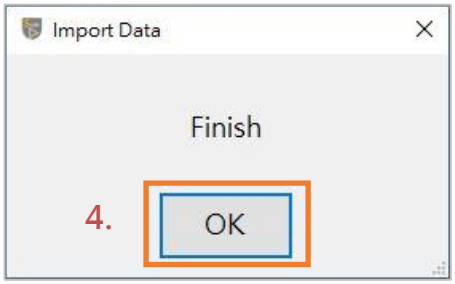


Figure 63 SQ710x Memory: Import data finish message

Note: After the import is finished and press OK, it will automatically execute reload data.

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c. Reload Data

Reload device all memory configuration data and display on screen.

Step 1. At Menu click Reload Data.

Reload device all memory configuration data.



Figure 64 SQ710x Memory: Reload Data sub menu item

Step 2. Wait for the reload to complete

Note 1: Do not remove the Secure Starter Kit from the computer while the data is being read.
Note 2: After modifying any configuration on the memory window, you must press "Reload Data", and the data on the window will display the updated value.
Note 3: The shortcut key for the "Reload Data" button is "Ctrl+r"

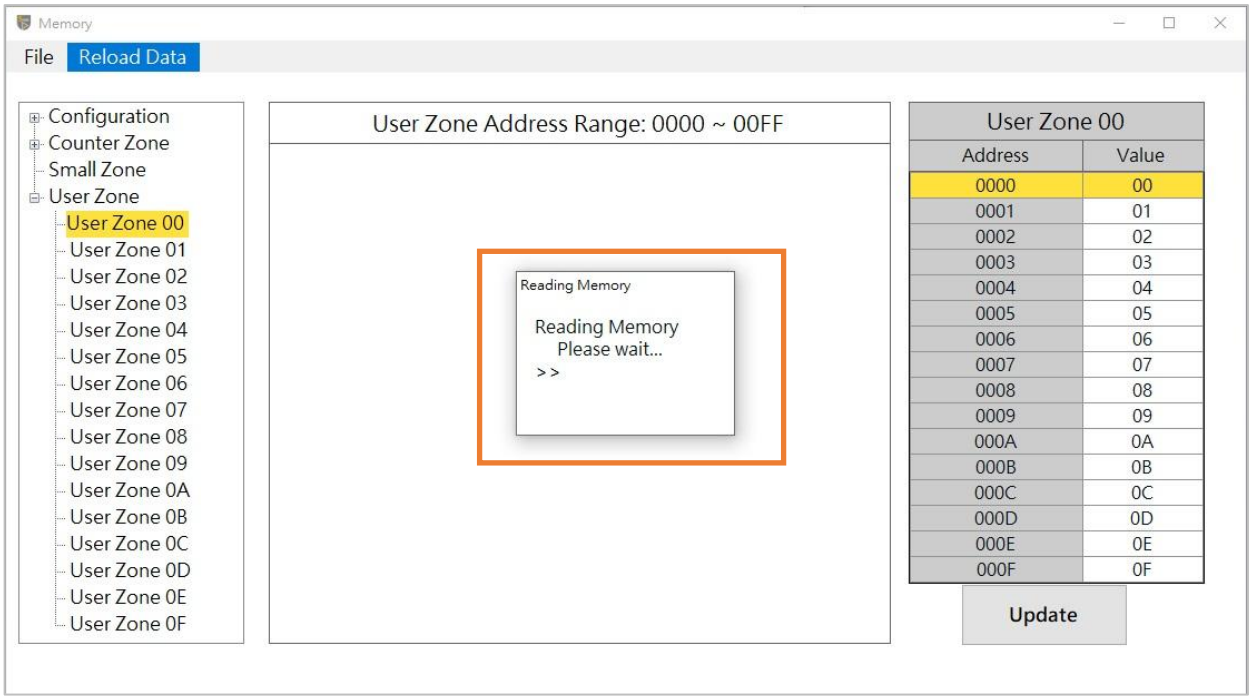


Figure 65 SQ710x Memory: Reloading memory dialog

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4.1.4 Program Device

After clicking Tool\Program Device, the program device window will pop up. This function can only program Socket devices.

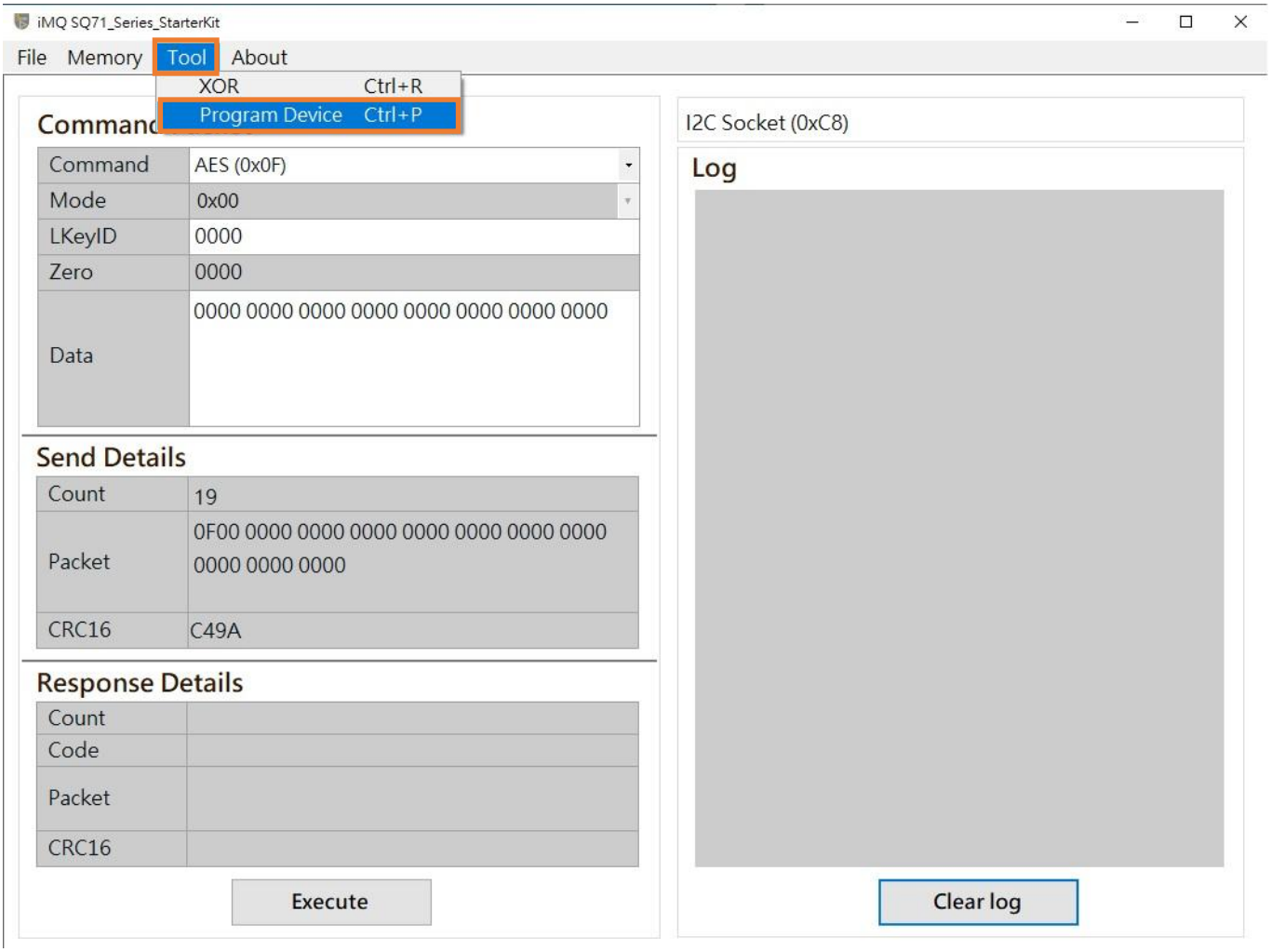


Figure 66 SQ710x StarterKit Tool sub menu/Program Device

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The program device window can be divided into memory configuration, function options, menu bar, and log window are described in the following sections.

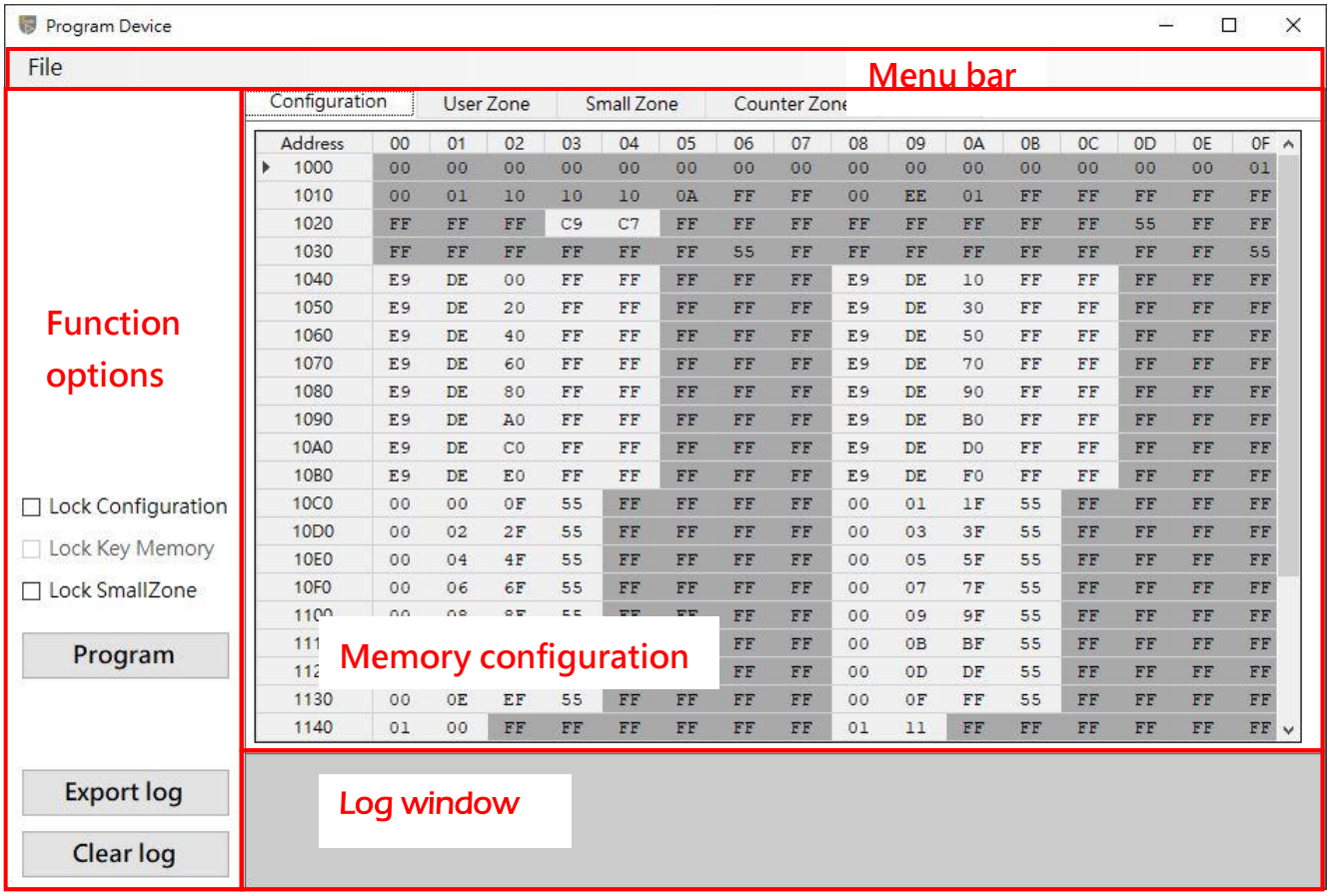


Figure 67 SQ710x Program Device window

4.1.4.1 Memory Configuration

The Tab Page displays each memory zone that can be viewed. After the user clicks, it will switch to the corresponding memory zone page. The value of the memory zone is displayed in the middle field (expressed in hexadecimal).

4.1.4.1.1 Configuration

This page can set the configuration of chip, key, user zone and counter zone. User can directly click on the field to edit, but if the field background is gray, it means read-only information. The configuration address range is 0x1000 ~ 0x11BF.

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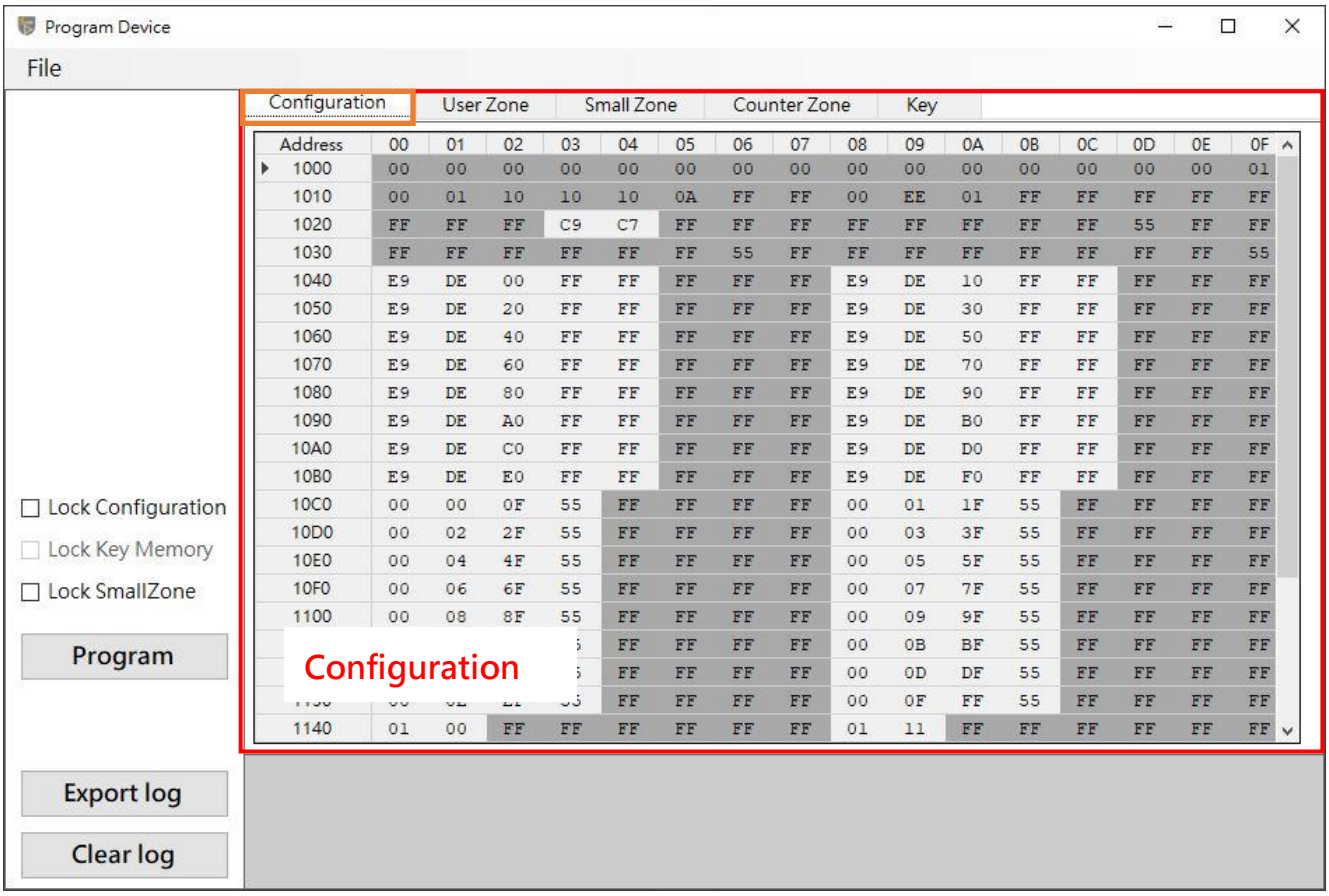


Figure 68 SQ710x Program Device: Configuration Zone

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4.1.4.1.2 User Zone

This page can edit the content of the User Zone; users can directly click on the field to edit.

The User Zone address range is 0x0000 ~ 0x00FF.

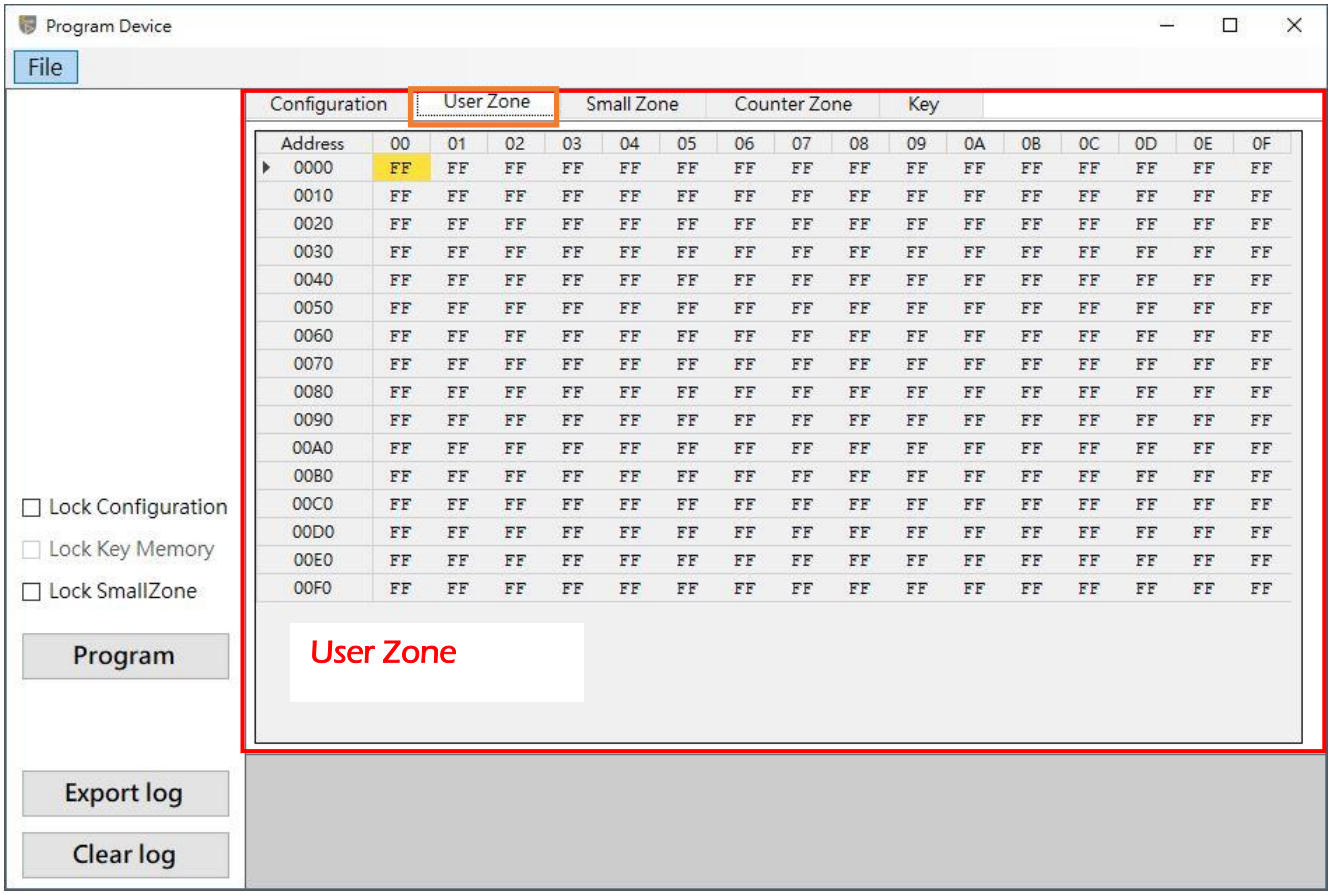


Figure 69 SQ710x Program Device: User Zone

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4.1.4.1.3 Small Zone

This page can edit the content of the Small Zone; users can directly click on the field to edit.

The Small Zone address range is 0x1300 ~ 0x15FF.

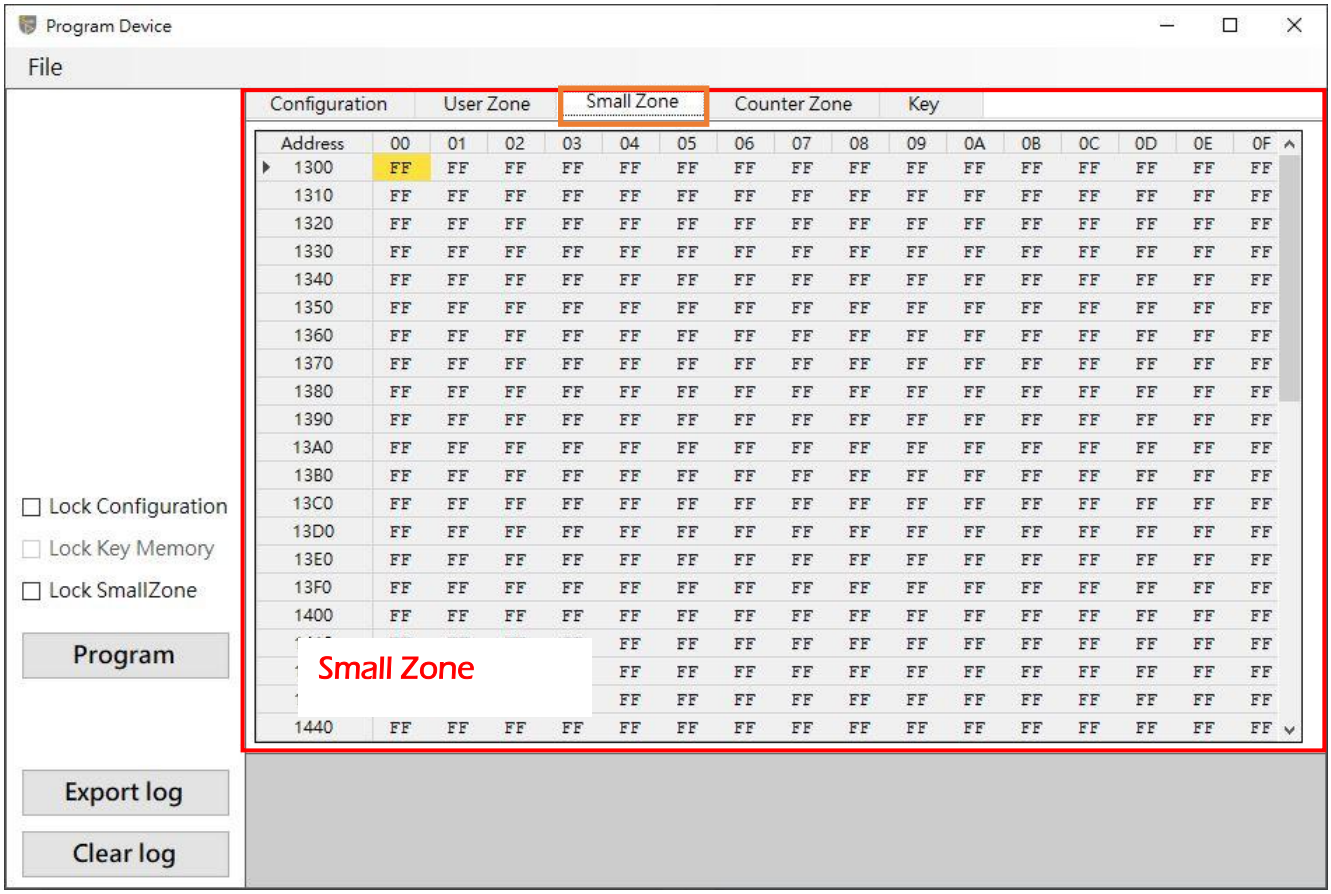


Figure 70 SQ710x Program Device: Small Zone

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4.1.4.1.4 Counter Zone

This page can edit the content of the Counter Zone; users can directly click on the field to edit.

The Counter Zone address range is 0x1200 ~ 0x127F.

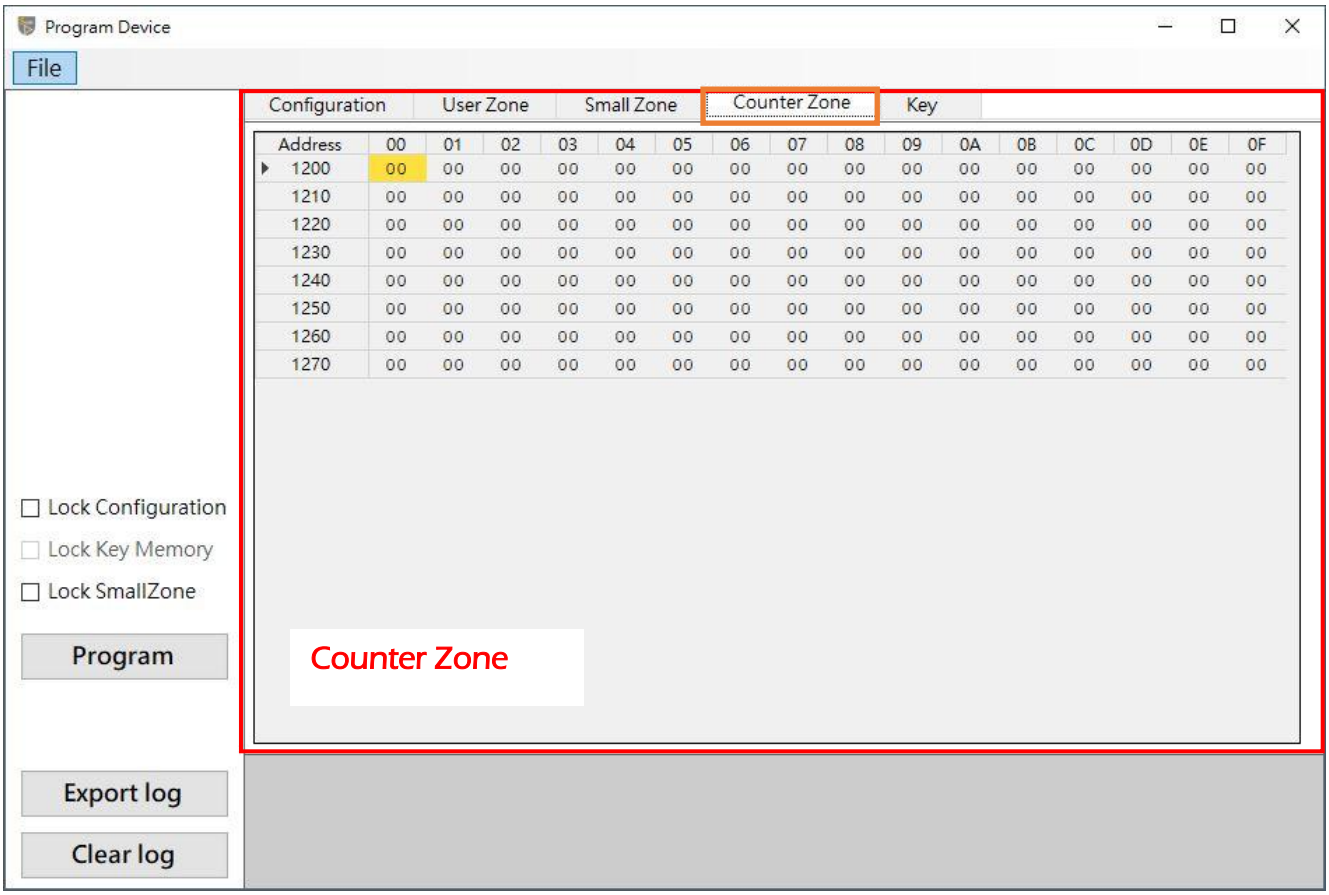


Figure 71 SQ710x Program Device: Counter Zone

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4.1.4.1.5 Key

This page can edit the content of the Key; users can directly click on the field to edit.

The Key address range is 0xF200 ~ 0xF2FF.

The function of each field is described as follows:

1. **Selected:** When checked, it means that the key is enabled and the key can be edited. The key will be written when program.
2. **AES256:** When checked, it means to enable AES256, and the Key Value can input a value of 256 Bits. (If the AES256 enabled, the memory location of the next key will be used when writing to the IC, so when this field is checked, the content of the next key will be closed and the user cannot edit it.)
3. **Key Generator:** You can use this function to randomly generate Key Value or reset it.
   a. Select the target Key.
   b. Generate the Key Value of the target Key as a random number. (It can only be clicked when the target Key is enabled)
   c. Reset the Key Value of the target Key to all 0xFF (It can only be clicked when the target Key is enabled).

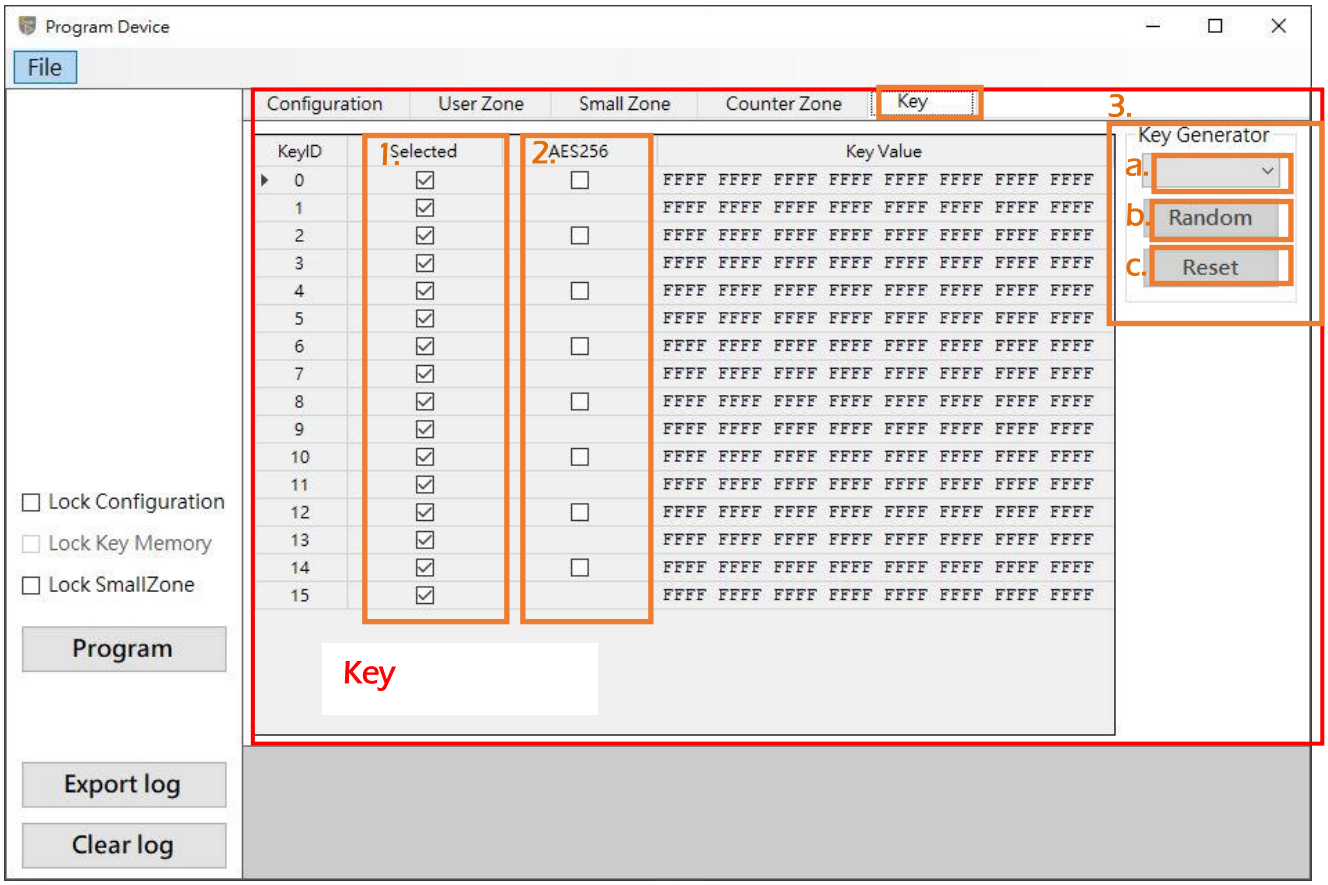
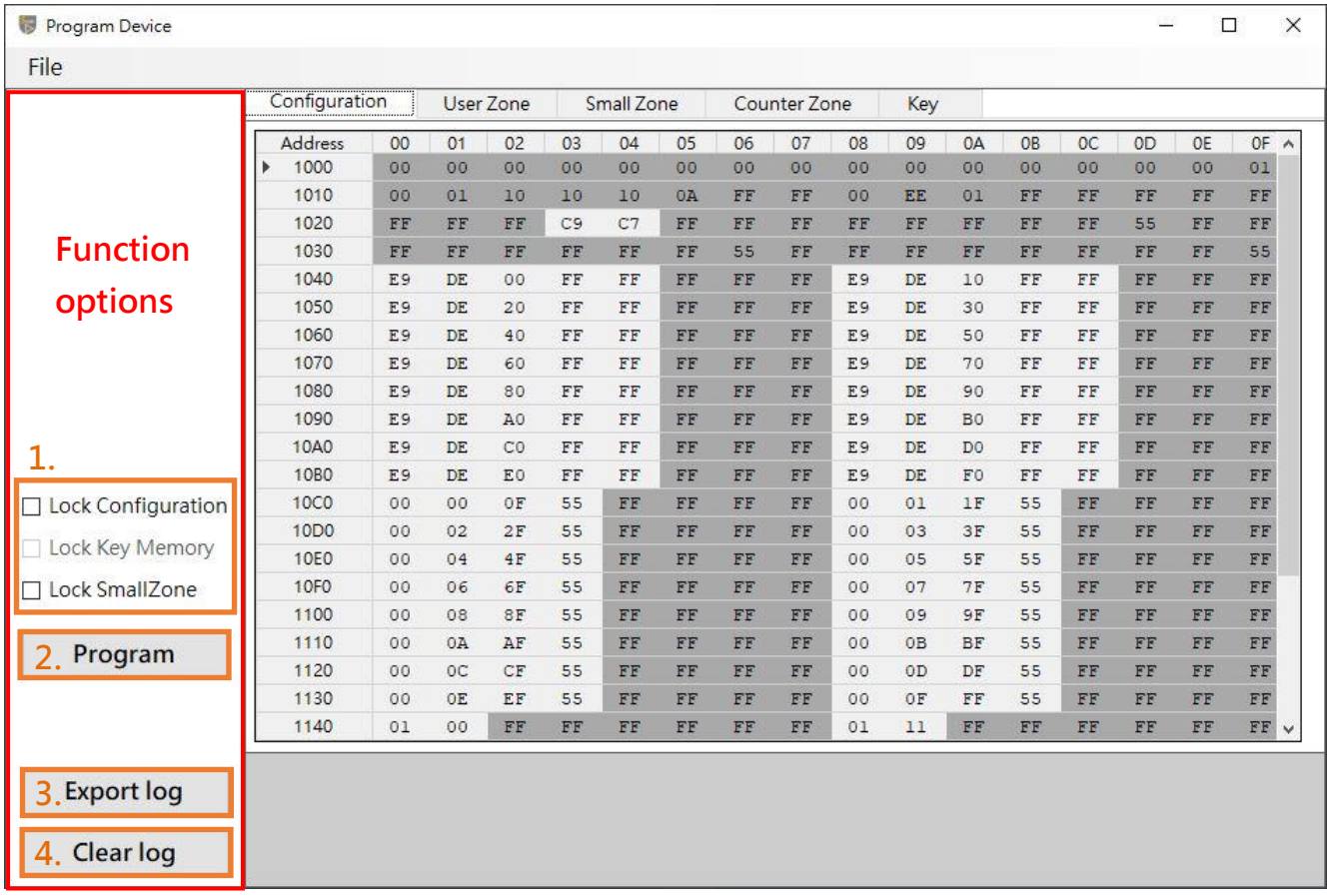


Figure 72 SQ710x Program Device: Key Zone

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4.1.4.2 Function Options



Address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
1000	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	01
1010	00	01	10	10	10	0A	FF	FF	00	EE	01	FF	FF	FF	FF	FF
1020	FF	FF	FF	C9	C7	FF	FF	FF	FF	FF	FF	FF	FF	55	FF	FF
1030	FF	FF	FF	FF	FF	FF	55	FF	FF	FF	FF	FF	FF	FF	FF	55
1040	E9	DE	00	FF	FF	FF	FF	FF	E9	DE	10	FF	FF	FF	FF	FF
1050	E9	DE	20	FF	FF	FF	FF	FF	E9	DE	30	FF	FF	FF	FF	FF
1060	E9	DE	40	FF	FF	FF	FF	FF	E9	DE	50	FF	FF	FF	FF	FF
1070	E9	DE	60	FF	FF	FF	FF	FF	E9	DE	70	FF	FF	FF	FF	FF
1080	E9	DE	80	FF	FF	FF	FF	FF	E9	DE	90	FF	FF	FF	FF	FF
1090	E9	DE	A0	FF	FF	FF	FF	FF	E9	DE	B0	FF	FF	FF	FF	FF
10A0	E9	DE	C0	FF	FF	FF	FF	FF	E9	DE	D0	FF	FF	FF	FF	FF
10B0	E9	DE	E0	FF	FF	FF	FF	FF	E9	DE	F0	FF	FF	FF	FF	FF
10C0	00	00	0F	55	FF	FF	FF	FF	00	01	1F	55	FF	FF	FF	FF
10D0	00	02	2F	55	FF	FF	FF	FF	00	03	3F	55	FF	FF	FF	FF
10E0	00	04	4F	55	FF	FF	FF	FF	00	05	5F	55	FF	FF	FF	FF
10F0	00	06	6F	55	FF	FF	FF	FF	00	07	7F	55	FF	FF	FF	FF
1100	00	08	8F	55	FF	FF	FF	FF	00	09	9F	55	FF	FF	FF	FF
1110	00	0A	AF	55	FF	FF	FF	FF	00	0B	BF	55	FF	FF	FF	FF
1120	00	0C	CF	55	FF	FF	FF	FF	00	0D	DF	55	FF	FF	FF	FF
1130	00	0E	EF	55	FF	FF	FF	FF	00	0F	FF	55	FF	FF	FF	FF
1140	01	00	FF	FF	FF	FF	FF	FF	01	11	FF	FF	FF	FF	FF	FF

Figure 73 SQ710x Program Device: Function Options

Function options are divided into 4 parts: :

1. **Lock options:** User can select the memory zone to be locked. After the program is completed, it will be locked according to the checked items.

a. **Lock Configuration:** Configuration zone can no longer be written after locking, you can only use Block Read command to read.

b. **Lock Key Memory:** Key Memory Key memory can no longer be written after locking. (Lock Configuration must be locked before Lock Key Memory.)

c. **Lock Small Zone:** Small zone can no longer be written after locking, you can only use Block Read command to read.

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2. **Program:** After the user clicks, a confirmation window will pop up, and the program process will start after clicking "Yes."

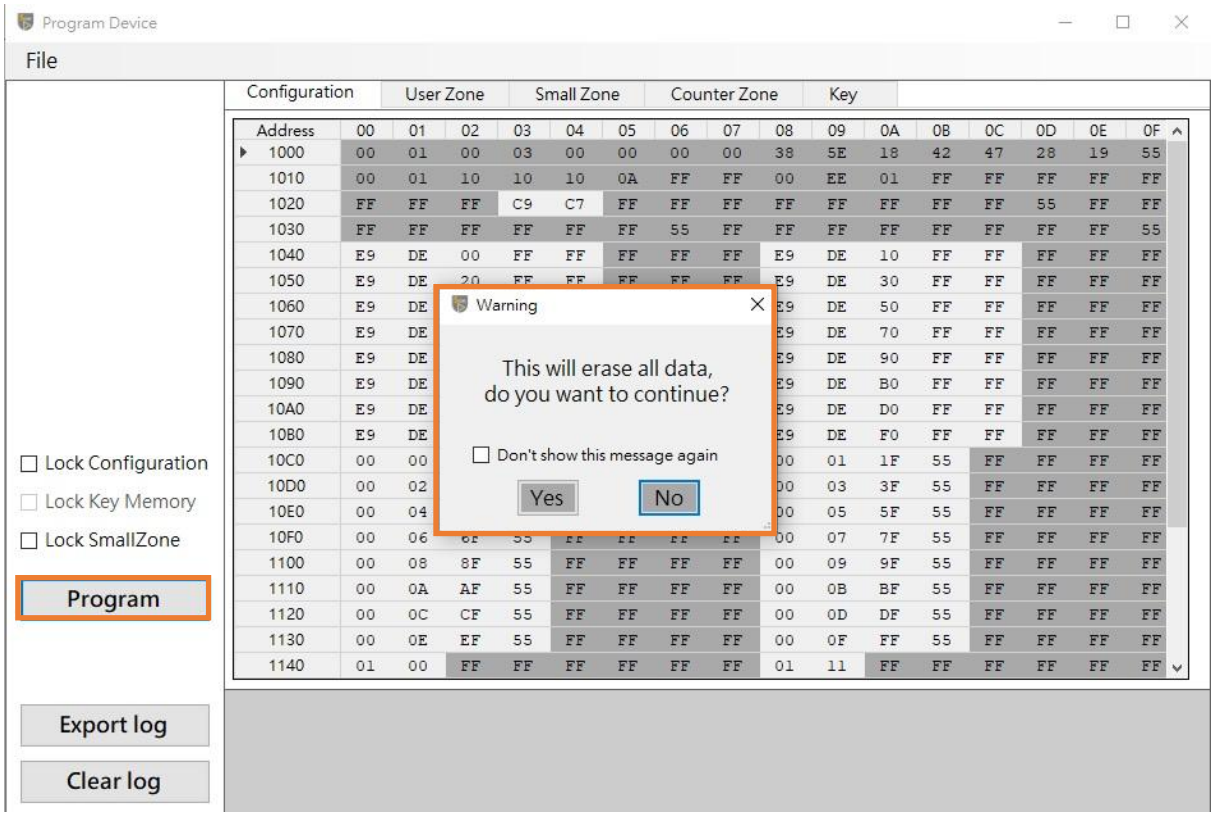


Figure 74 SQ710x Program Device: Program confirm message box

The program process is as follows:

a. Check if the Socket device exists, when the device does not exist, an error window will be displayed and the programming will stop.

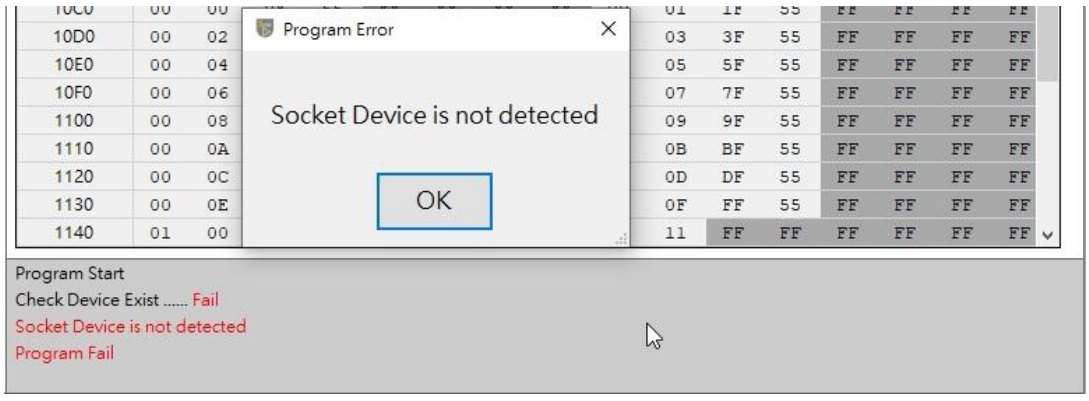


Figure 75 SQ710x Program Device: Socket device not detected message box

b. Check that the communication mode of the device matches the configuration settings. If there is a mismatch, an error window will be displayed and the programming will stop.

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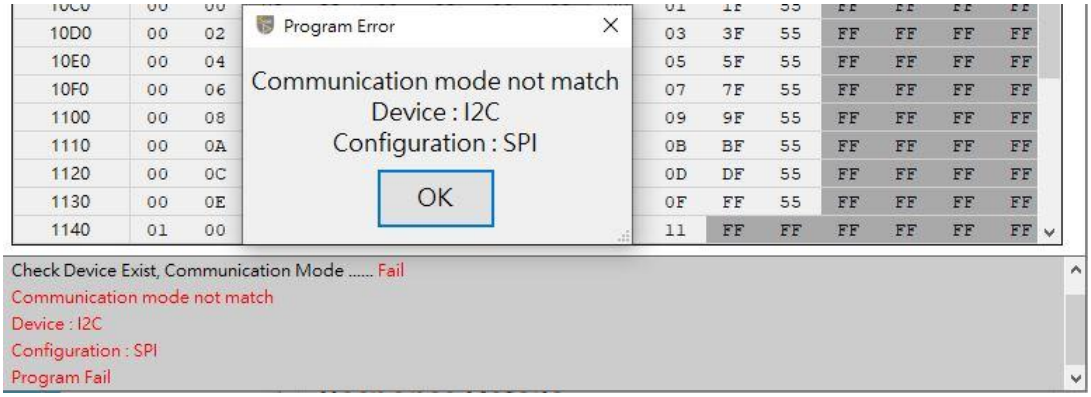


Figure 76 SQ710x Program Device: Communication mode not match message box

c. Check if the device is locked. When the Configuration is locked, an error window will be displayed and the programming will stop. When only the Small zone is locked, ask the user whether to continue programming other parts except the Small zone.

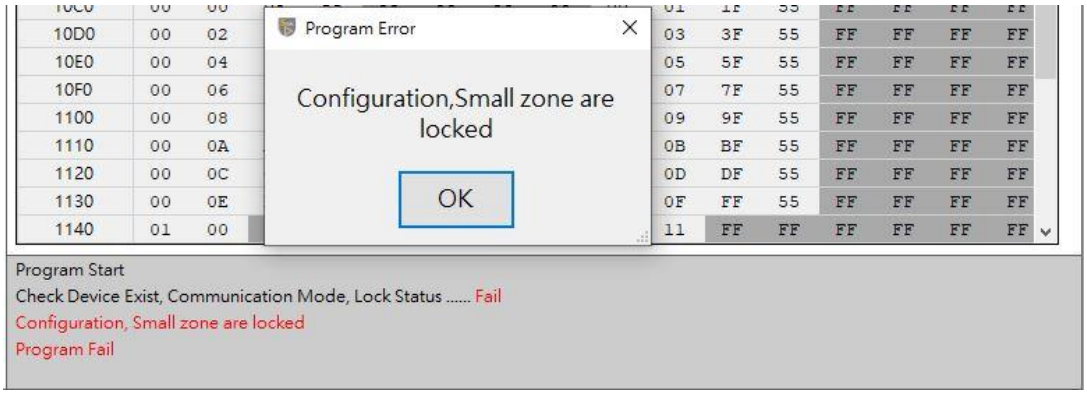


Figure 77 SQ710x Program Device: Zone Locked message box

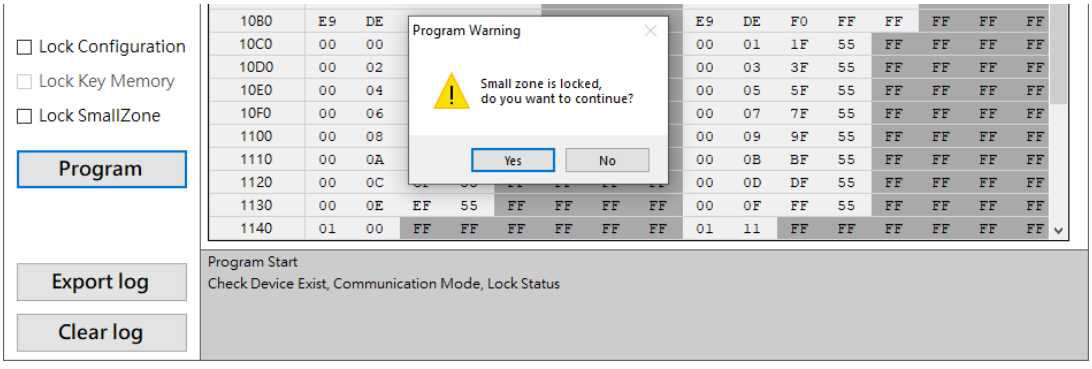


Figure 78 SQ710x Program Device: Small zone locked, continue dialog.

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d. Check whether the enable status of Key AES256 matches the setting in Configuration, if there is a mismatch, an error window will be displayed and the programming will stop.

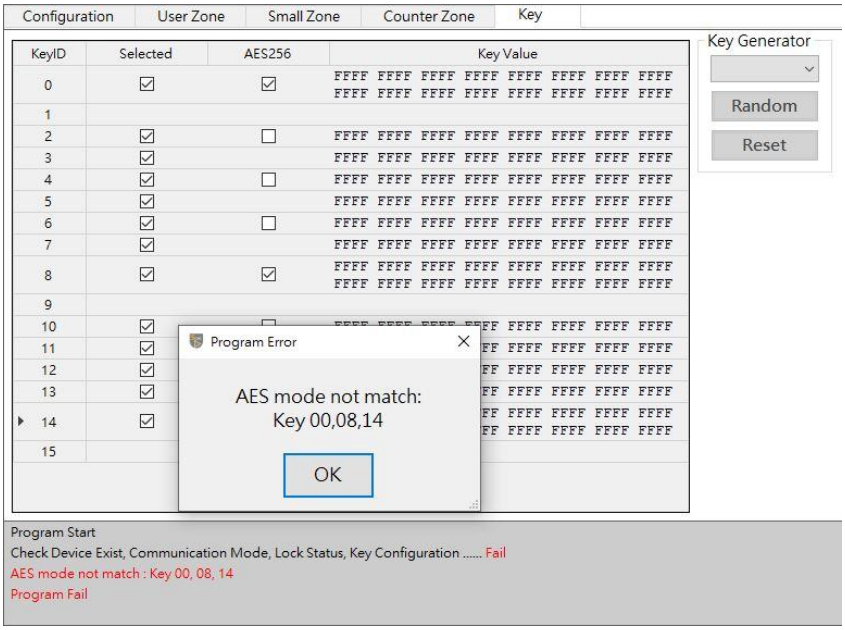


Figure 79 SQ710x Program Device: AES mode not match message box

e. Write Key AES256 settings to Key configuration memory.
f. Write Key Value.
g. Write Counter Zone, Small Zone and User Zone.
h. Finally, write Configuration.
i. Check whether the user has checked the Lock options, and lock according to the lock options.
j. Program is complete.

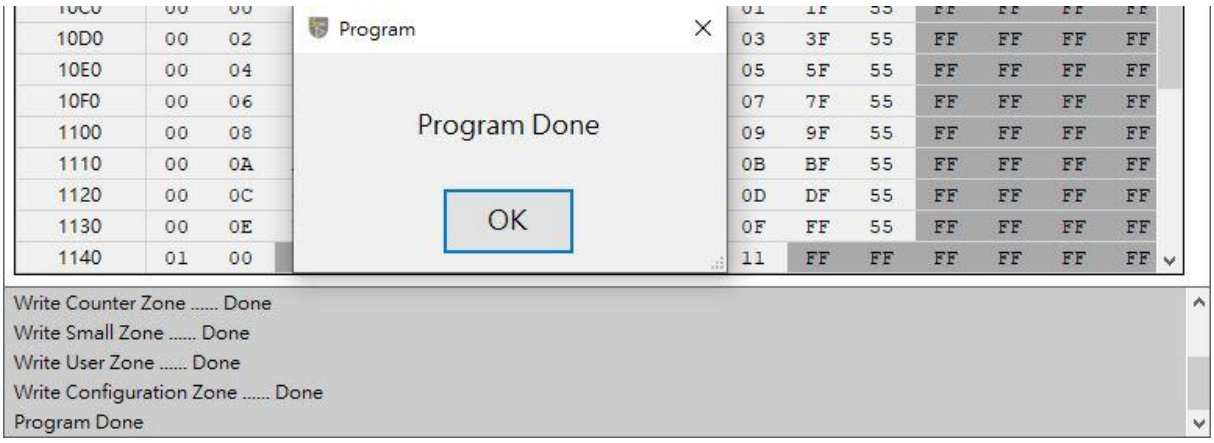


Figure 80 SQ710x Program Device: Progarm Done message box

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3. Export log: Users can click this button to export the content of the Log Window into a .log file.

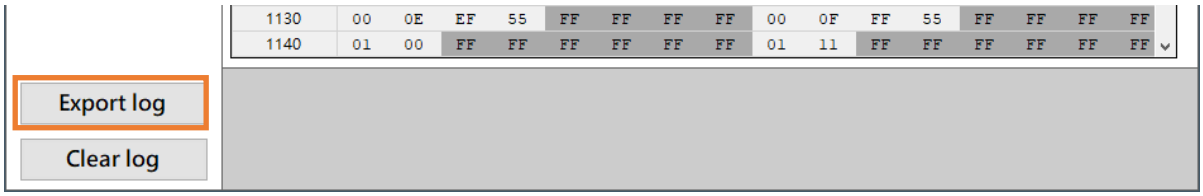


Figure 81 SQ710x Program Device:Export log

Select the save path and file name, the default file name is "Log_YYMMDD.log" (YYMMDD is the current date)

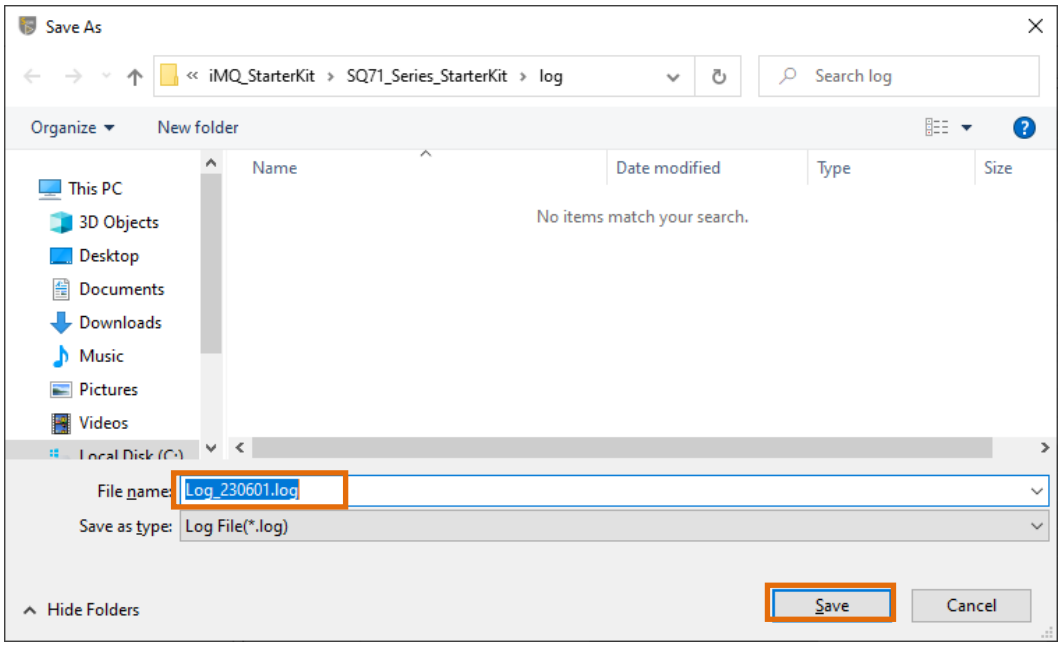


Figure 82 SQ710x Program Device:Export log dialog

4. Clear log: Users can click this button to clear the content of the Log Window.

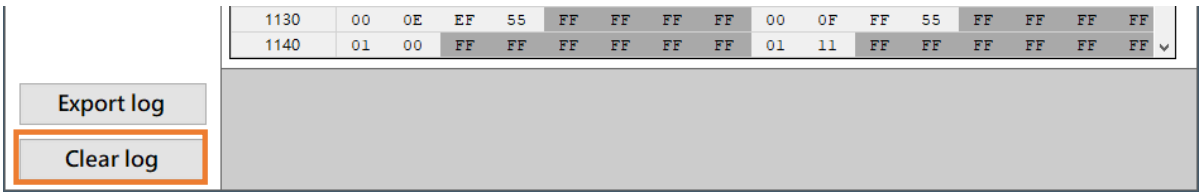


Figure 83 SQ710x Program Device: Clear Log

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4.1.4.3 Menu Bar

There is a File menu on the menu bar, as shown in the figure below:

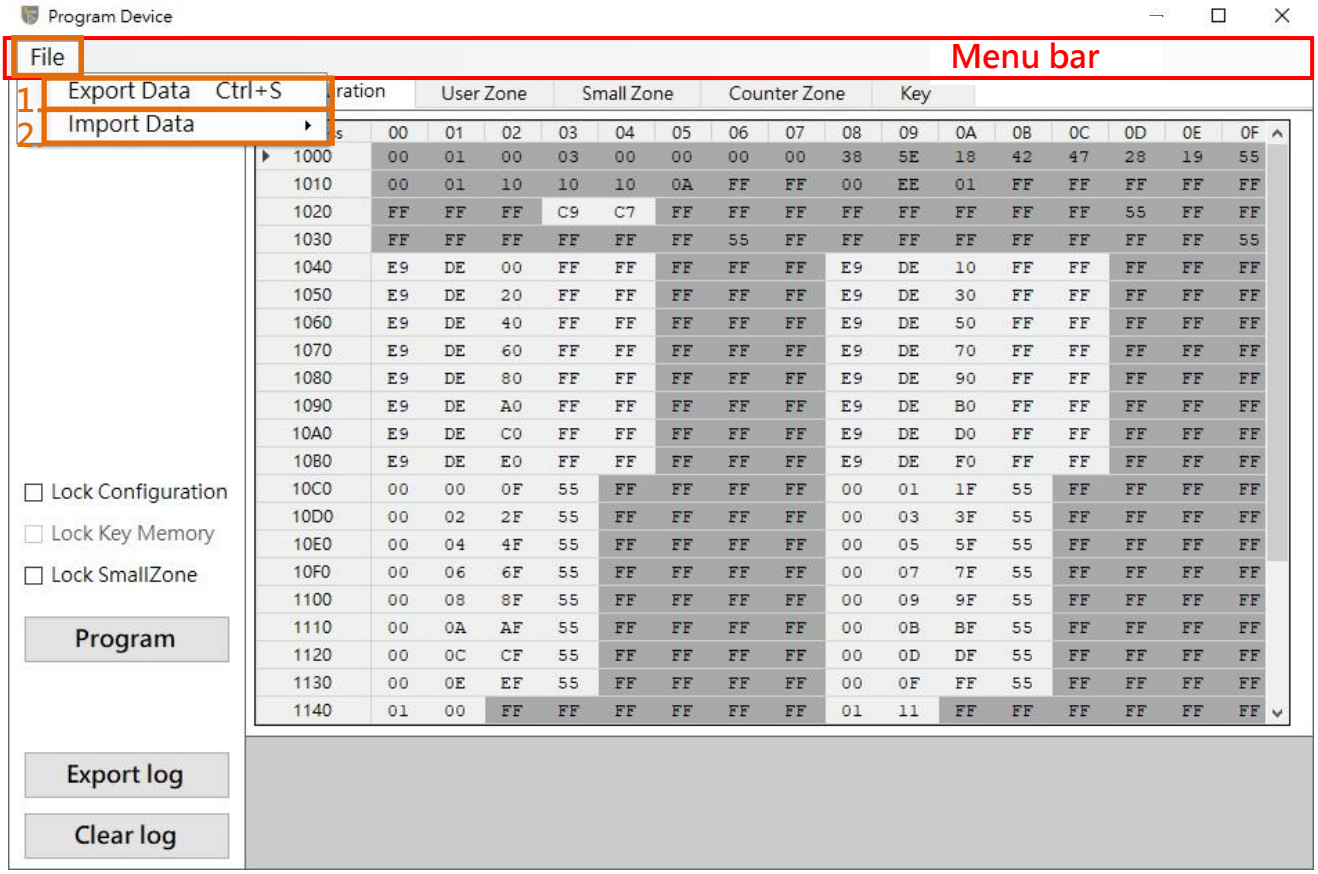


Figure 84 SQ710x Program Device: Menu bar

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1. Export Data

After clicking Export Data, all the data in the memory configuration (Configuration, User Zone, Small Zone, Counter Zone and Key Value) can be exported into a file in .Json format (The file extension is .jsfw).

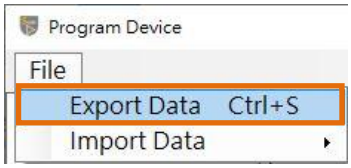


Figure 85 SQ710x Program Device: File menu/Export Data

Select the save path and file name, the default file name is "SQ710x_YYMMDD.jsfw" (YYMMDD is the current date)

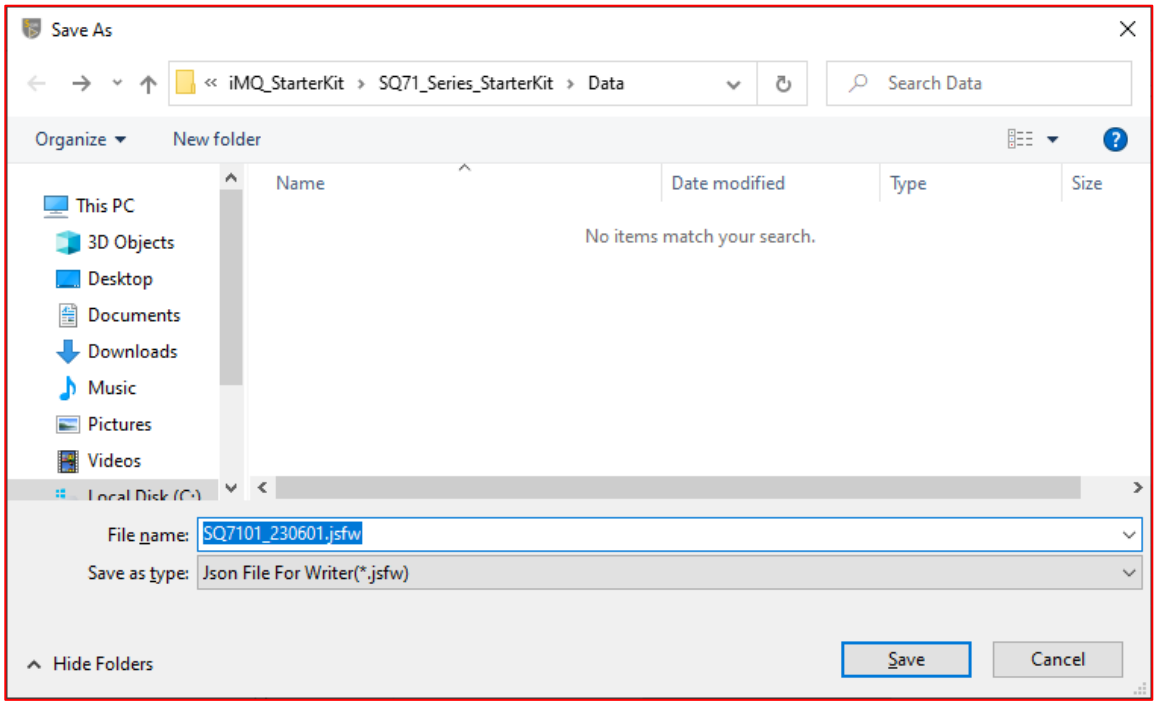


Figure 86 SQ710x Program Device: Export Data dialog

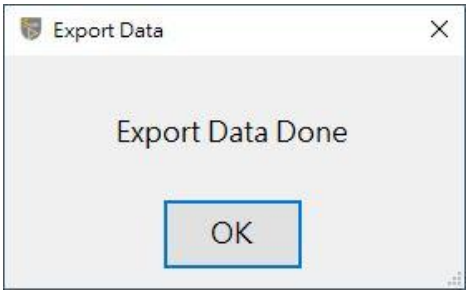


Figure 87 SQ710x Program Device: Export data done message box

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2. Import Data

After clicking Import Data, select the source of the memory configuration data to be imported.

a. **Socket Device: Import memory configuration data from the currently connected Socket Device.**

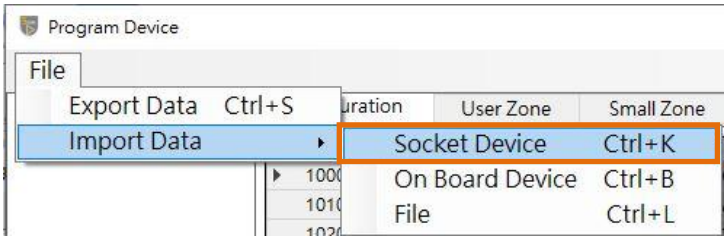


Figure 88 SQ710x Program Device: File menu/Import Data/Socket Device

b. **On Board Device: Import memory configuration data from the On Board Device (This feature is currently not supported, it is reserved to be enabled in the future).**

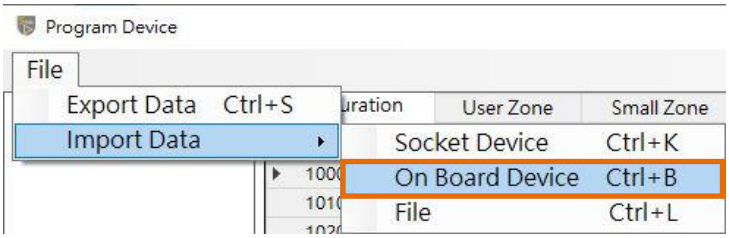


Figure 89 SQ710x Program Device: File menu/Import Data/On Board Device

c. **File: From the previously exported .Json format file (The file extension is .json/.jsfw) Import data.**

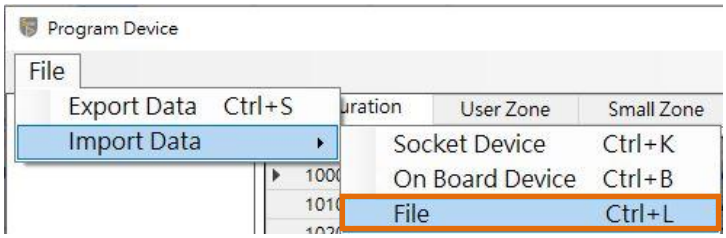


Figure 90 SQ710x Program Device: File menu/Import Data/File

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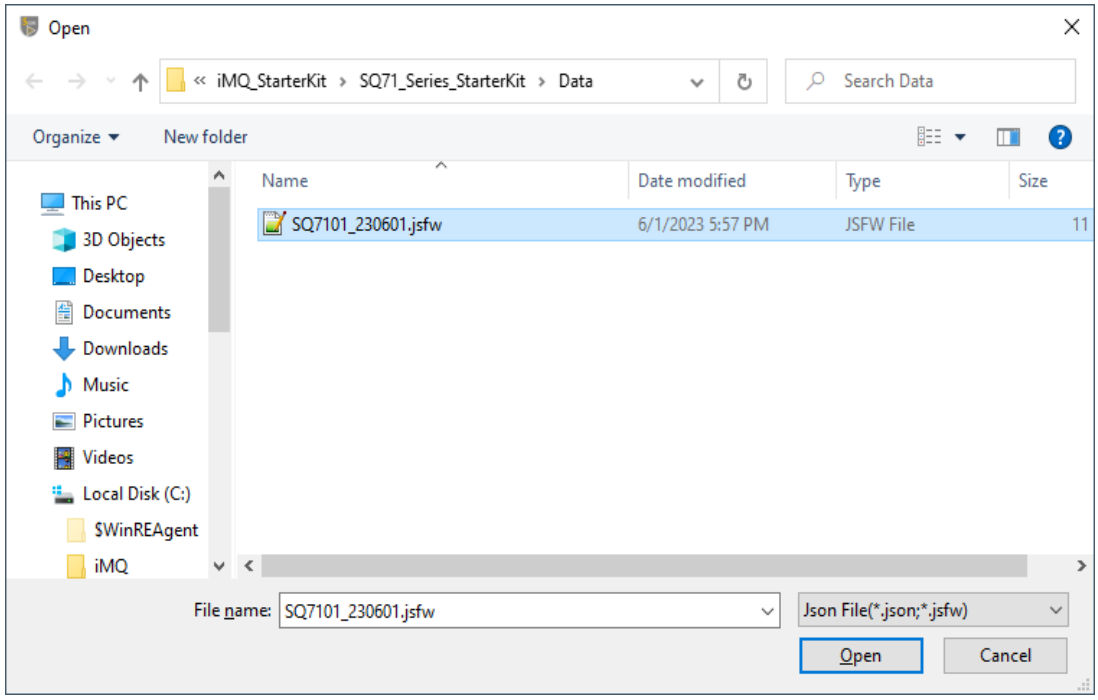


Figure 91 SQ710x Program Device: Import file dialog

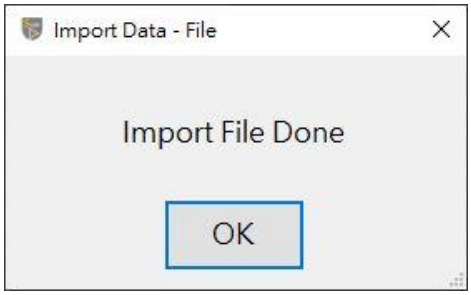


Figure 92 SQ710x Program Device: Import file done message

If the import data fails to be read, an error message will be displayed, and the address where the error occurred and related information will be recorded in the Log Window. In addition, the fields that failed to be read will be displayed in red fonts for users to identify and modify.

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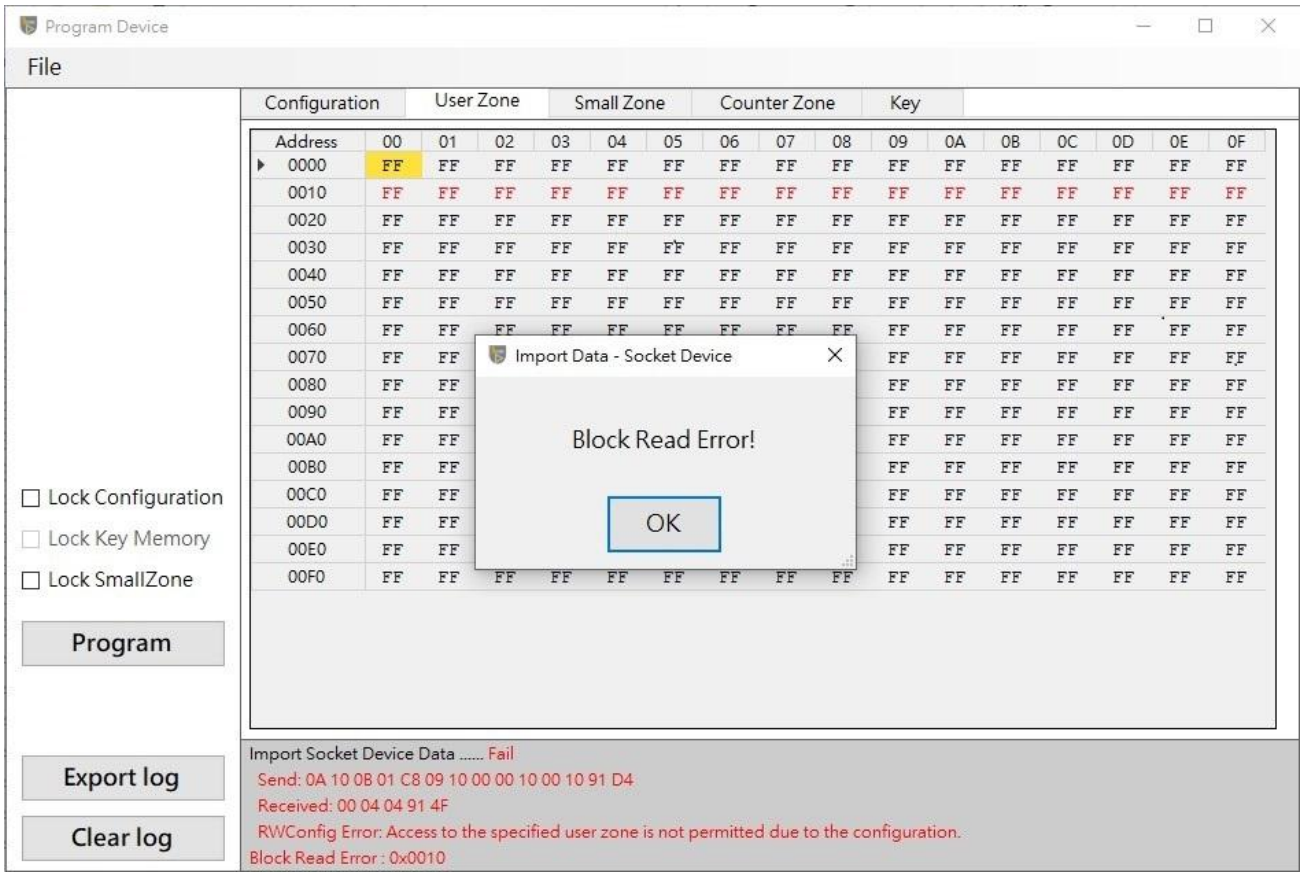


Figure 93 SQ710x Program Device: Import Data: Block Read Error message box

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4.1.4.4 Log Window

Log Window will automatically record the operation status, programming status and error information. User can use the mouse to select, copy, select all, or clear the contents of the Log Window or use the Export log button to export the Log file, or use the Clear log button to clear the contents of the Log Window

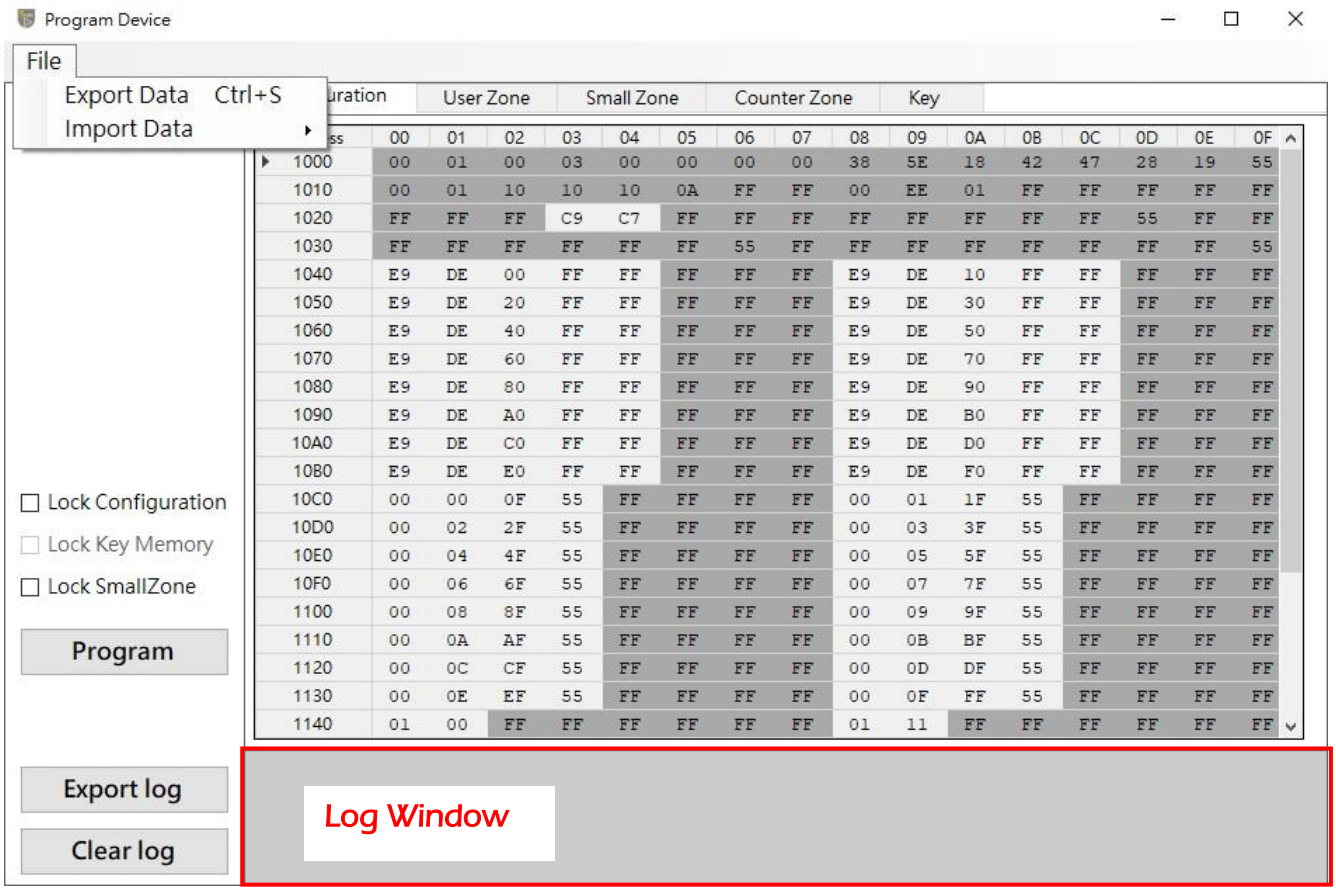


Figure 94 SQ710x Program Device: Log Window

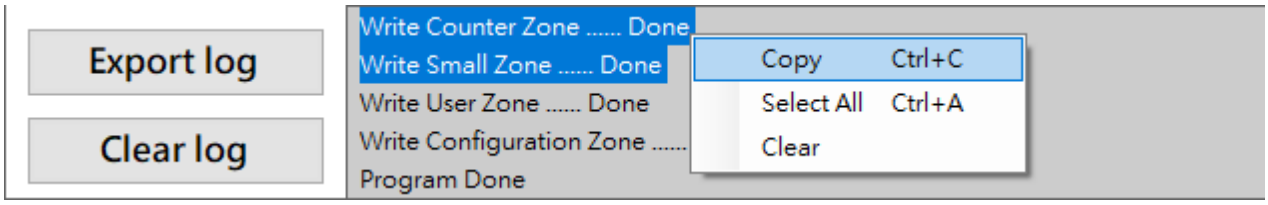


Figure 95 SQ710x Program Device: Copy contents of Log Window

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5. SQ713x/SQ713xS/SQ719x

5.1 StarterKit Software Function Description

5.1.1 Software Introduction

SQ713x/SQ713xS/SQ719x device[x= 1:I2C, 3:SPI, 5:SWI(SQ713x only)] is a hardware-based key storage with a secure hardware accelerator that can implement AES/ECC encryption functions, SHA hash algorithm, ECDH key exchange, ECDSA digital signature, and TRNG.
The Starter Kit program is a Windows program for learning how to configure, access memory, test commands, security test, and lock areas for the EVB board.

5.1.2 StarterKit initialization

It will take some time to initialize the StarterKit HW and StarterKit GUI runtime environments. If an error or problem occurs, an error or warning message box may appear.

5.1.2.1 The Program Re-Entry Warning

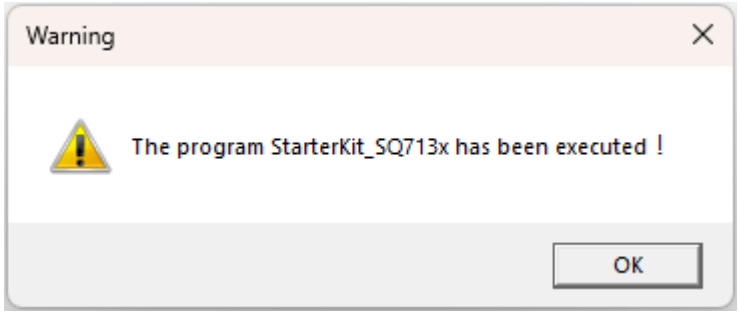


Figure 96 Warning message 1

When you see this message during initialization, the root cause is that the program is already running and resident in memory

5.1.2.2 StarterKit Not Found Warning

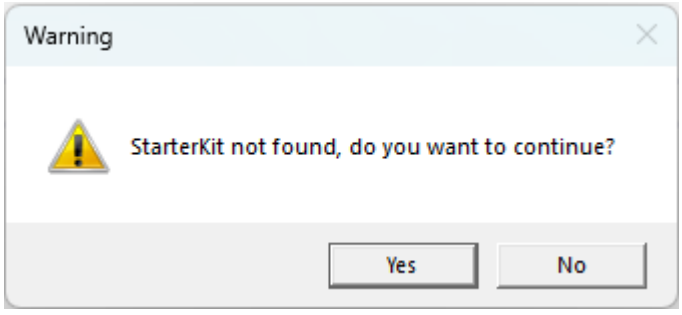


Figure 97 Warning message 2

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When you see this message during initialization, the root cause could be

No power

DIP switch error

USB disconnection

PCBA failure

5.1.2.3 Device Is Not Responding Warning

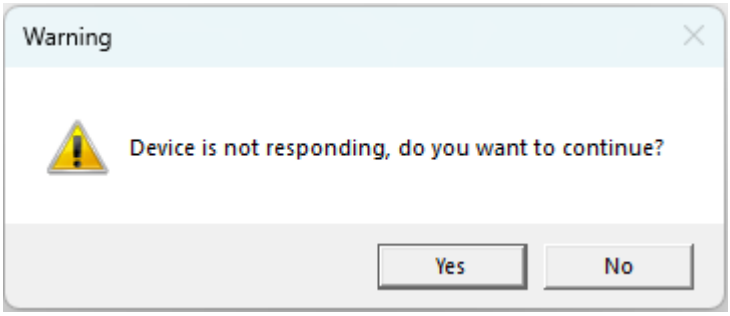


Figure 98 Warning message 3

When you see this message during initialization, the root cause could be

There is no chip on the StarterKit

Chip failure

PCBA failure

5.1.2.4 StarterKit Cannot Be Initiated Error

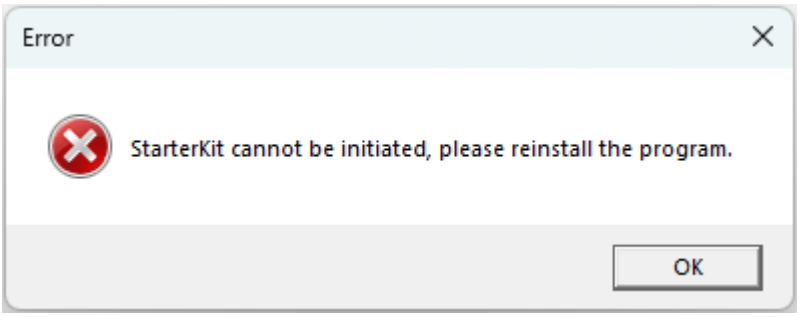


Figure 99 Error message 1

When you see this message during the initialization process, the root cause is that the program was installed incorrectly. You must reinstall the program.

5.1.2.5 Device Boot Failure

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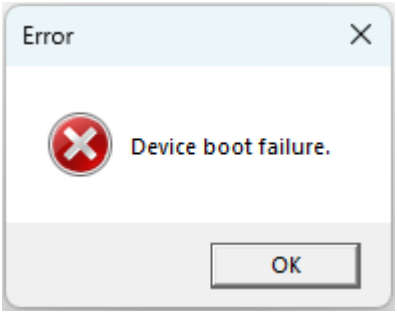


Figure 100 Error message 2

When you see this message during the initialization process, the root cause is that the device firmware is not functioning properly during boot up time and you must re-update the device firmware or contact FAE for support.

5.1.3 StarterKit Main Screen

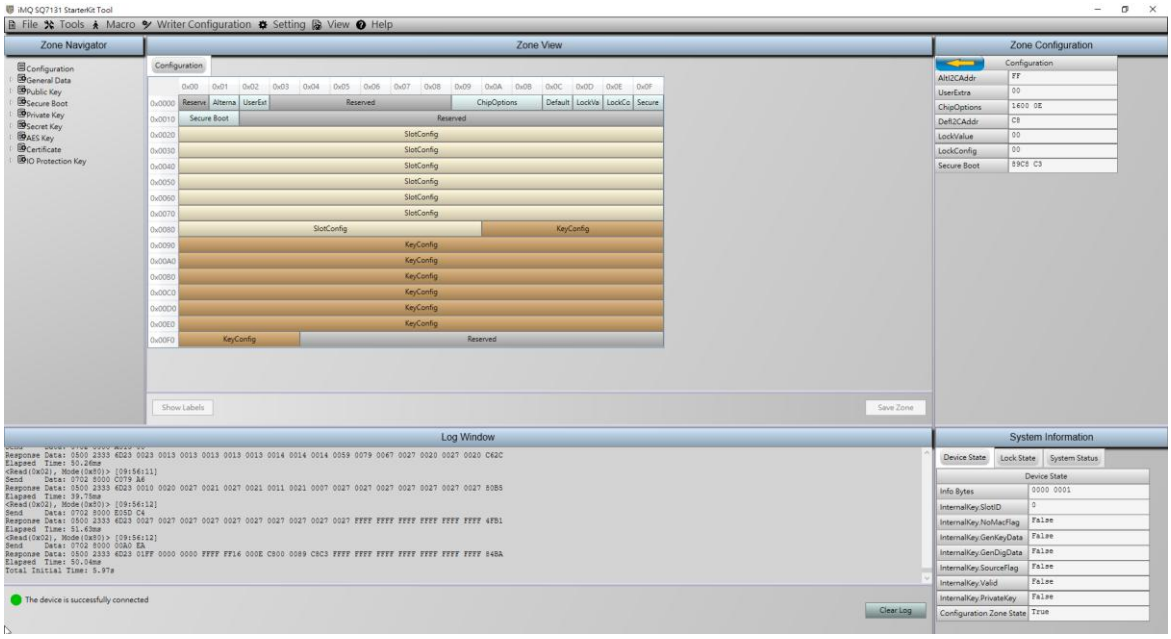


Figure 101 Main screen

5.1.3.1 Main Menu

Main menu includes eight main items, File; Tools; Macro; Writer Configuration; Secure Communication; Setting; View; Help.

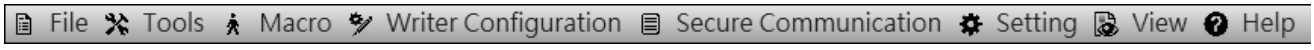


Figure 102 Main menu

5.1.3.1.1 File

File item includes 5 sub items, Export/Import Zone; Export/Import Log; Exit.

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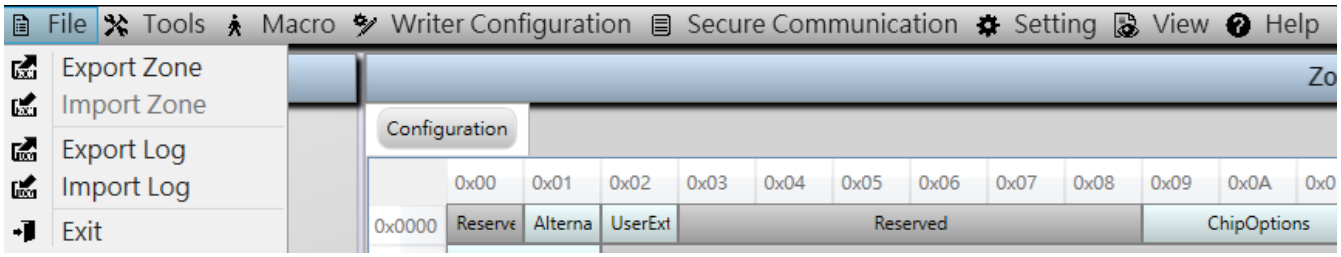


Figure 103 File sub menu

Export/Import Zone: Export/Import the byte data of the current area to/from a Json file in the zone view window.

Export/Import Log: Export/Import the text data of the current area to/from a Json file in the log window.

Exit: Exit the program immediately.

5.1.3.1.2 Tools

Tools item includes two sub items, Crypto Calculator; Command Builder; Import StarterKit FW File and StarterKit FW Update.

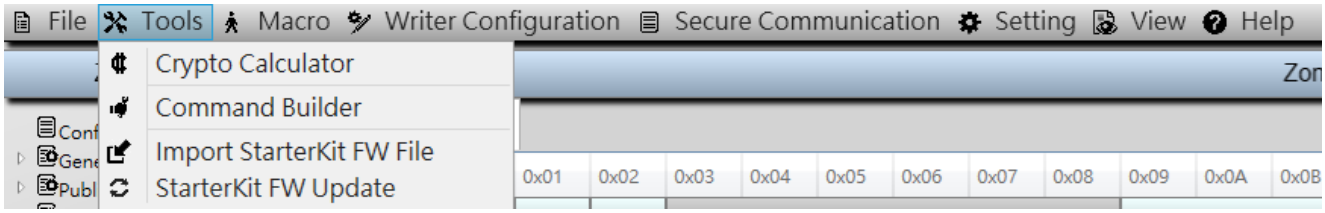


Figure 104 Tools sub menu

Crypto calculator: This function can perform trial calculations on cryptographic functions.

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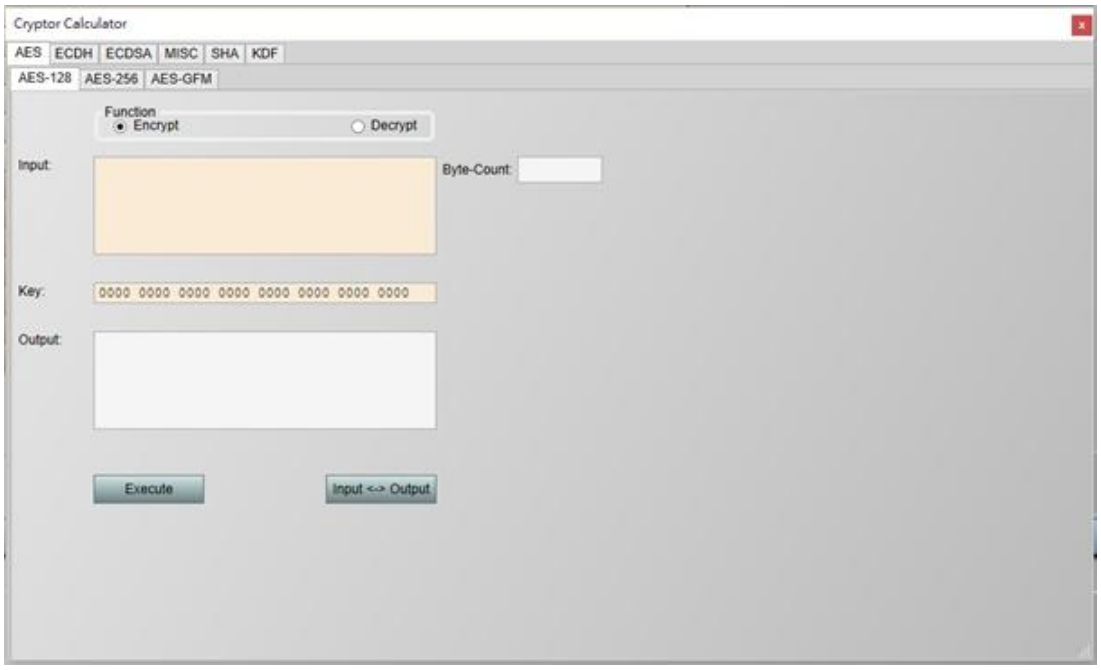


Figure 105 Cryptor Calculator

Command builder: This function can communicate and test commands with SQ713x/SQ713xS/SQ719x device through USB HID protocol (Refer to SQ713x/SQ713xS/SQ719x Datasheet for command usage).

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Figure 106 Command Builder

Click Execute button to execute the command

Click Clear Details button to clear the content of Send Details/Response Details.

Click Export Macro button to export the command to be a Json file as a macro.

Click Import Macro button to import an existed macro file to compose the command.

Import StarterKit FW File and StarterKit FW Update: (Refer to 2.2)

5.1.3.1.3 Macro

Macro item includes two sub items, Generate Macro by Log; Run Macro.

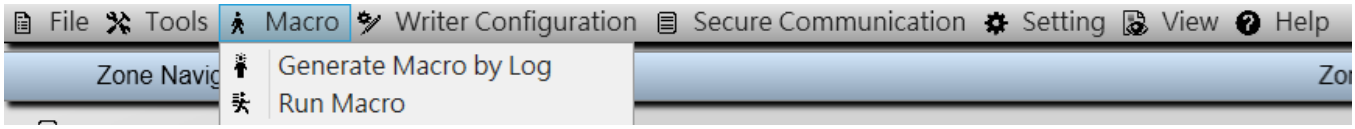


Figure 107 Macro sub menu

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Generate Macro by Log: This function generate a Json file as a macro from the contents of the log window.
Run Macro: This function loads a macro file and executes its instructions in sequence.

5.1.3.1.4 Writer Configuration

Writer Configuration item includes a sub item, Writer Configuration Utility (SQ713xS does not support).

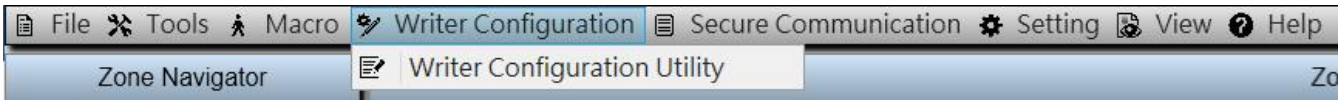


Figure 108 Writer Configuration sub menu

Writer Configuration Utility: This function is a utility for one time chip configuration. (How to configure, please refer to SQ713x/SQ719x Datasheet)

Configuration Zone tab list the modifiable parameters in configuration zone.

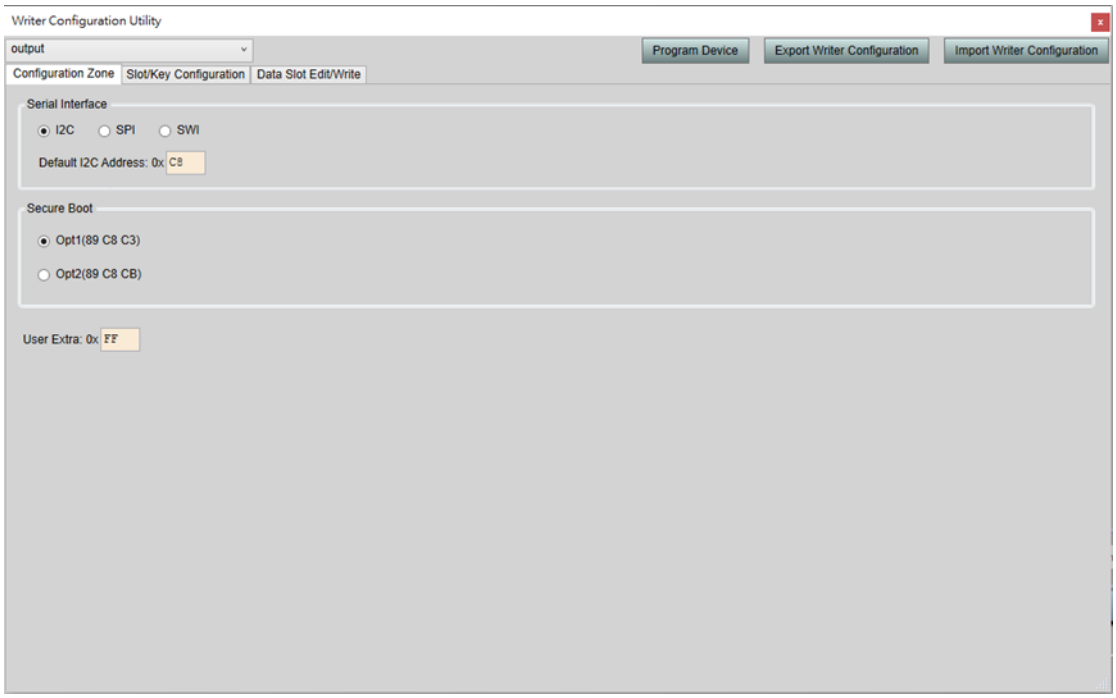


Figure 109 Writer Configuration Utility/Configuration Zone

Click “Program Device” button to start programming the connected device.
Click “Export Writer Configuration” button to export the configuration data to a Json file.
Click “Import Writer Configuration” button to import the configuration data from a Json file.

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Slot/Key Configuration tab list the slot options, most of them can be changed. Except option2 of slot1 is persistent latched, all other option2 are locked and the lockable of option1 are opposite.

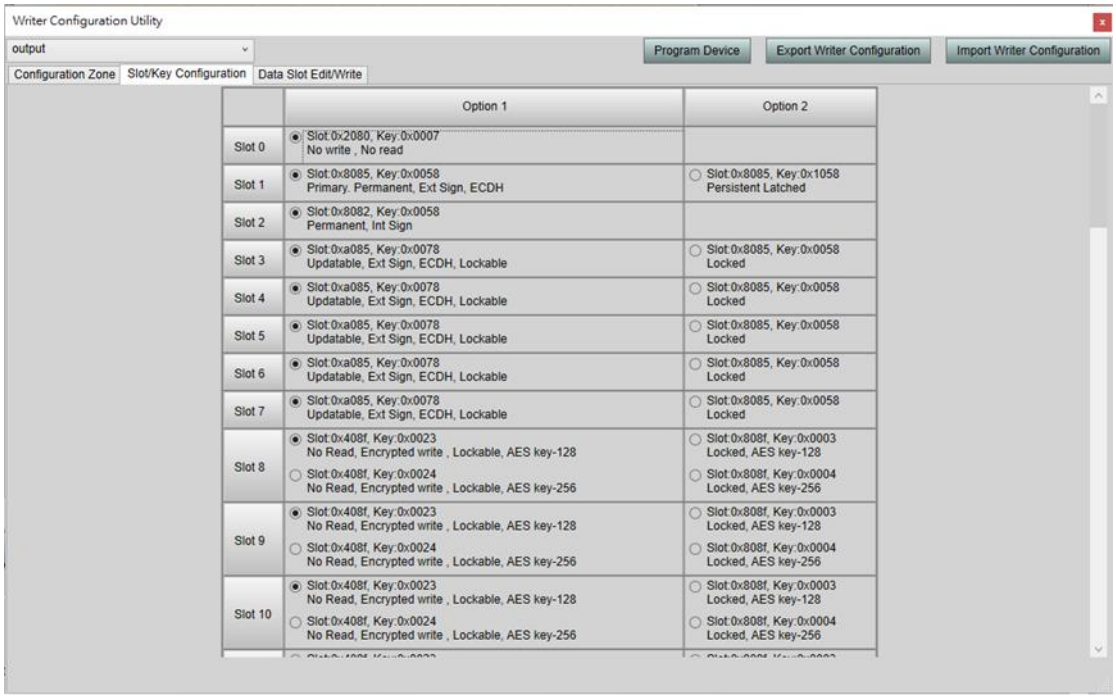


Figure 110 Writer Configuration Utility/SlotKey Configuration

Data Slot Edit/Write tab provides a user interface to edit slot data and check the slots to write. In left navigator window, click on the item to read the associated data and update the slot contents on the right data grid window. The user can edit the data in the data grid. When the user ticks the checkbox of the item, it means that the slot data will be written to the device when the device is programmed.

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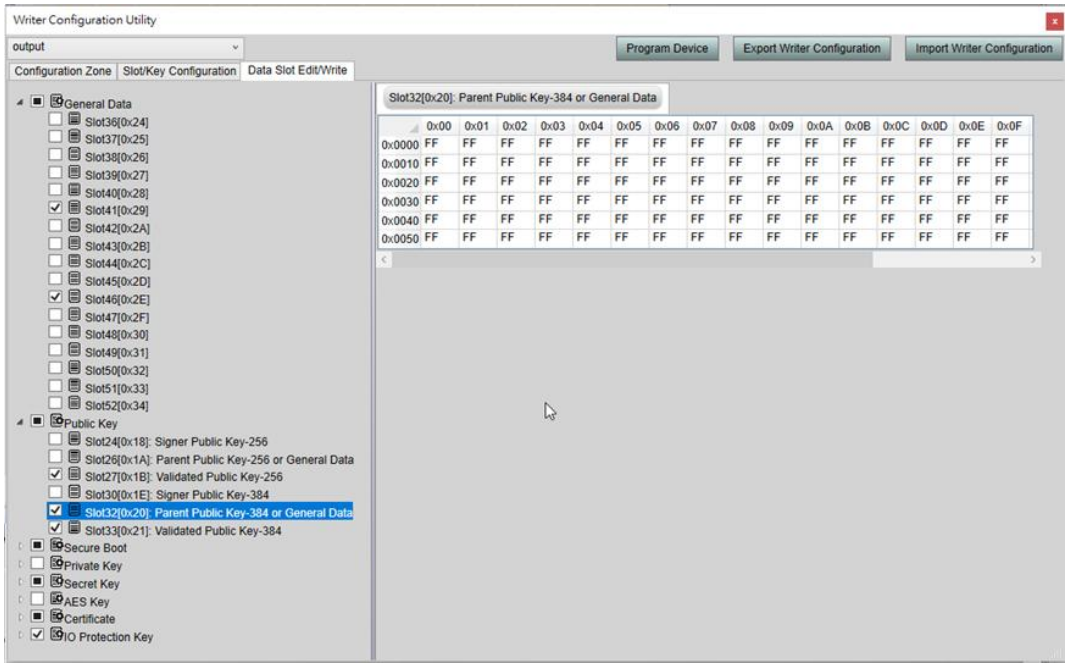


Figure 111 Writer Configuration Utility/Data Slot EditWrite

Due to the limitation of one time configuration, if the user tries to program the device on the same chip for the second time, the message "The configuration zone is locked and device programming cannot be performed!" will appear and stop the programming process immediately.

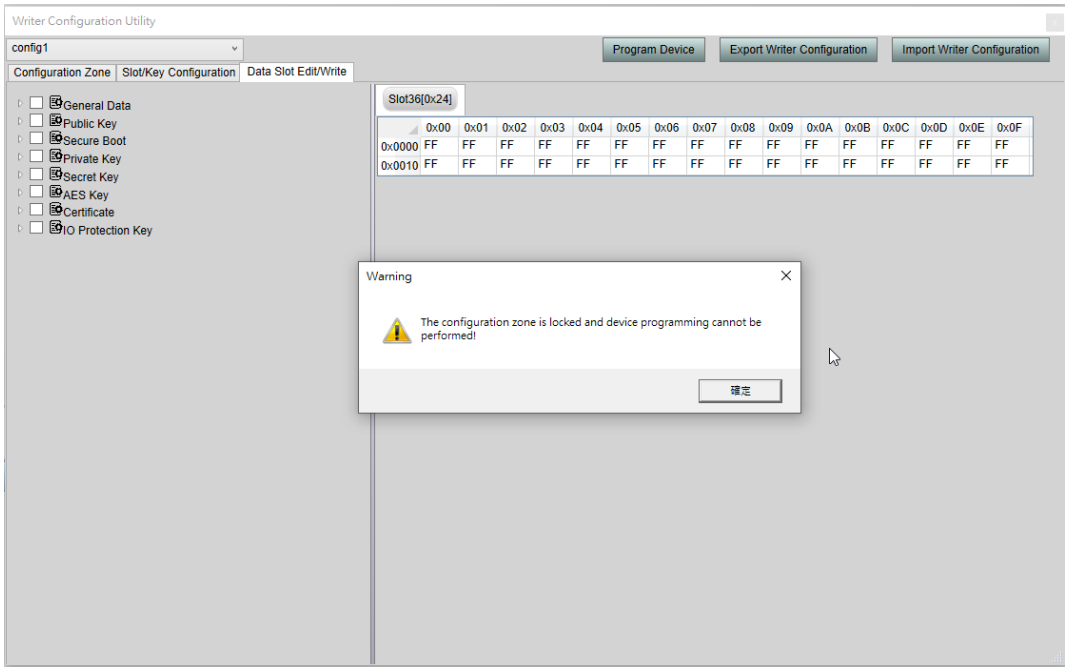


Figure 112 Programming device twice inhibition message

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5.1.3.1.5 Secure Communication

Secure Communication item includes a sub item, Build (Only SQ713X and SQ719X are supported).

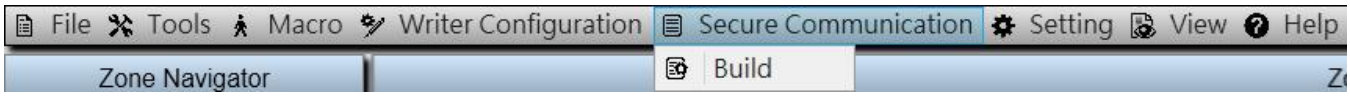


Figure 113 Secure Communication sub menu

The SQ713X and SQ719X support mutual authentication with the host and the establishment of a secure communication channel to protect confidential data transmission and storage.

Secure Communication: This function uses the iMQ StarterKit Tool as the host to perform provisioning and mutual authentication with the current device, and finally establishes a secure communication channel. After this operation, the Configuration Zone and Data Zone will be locked.

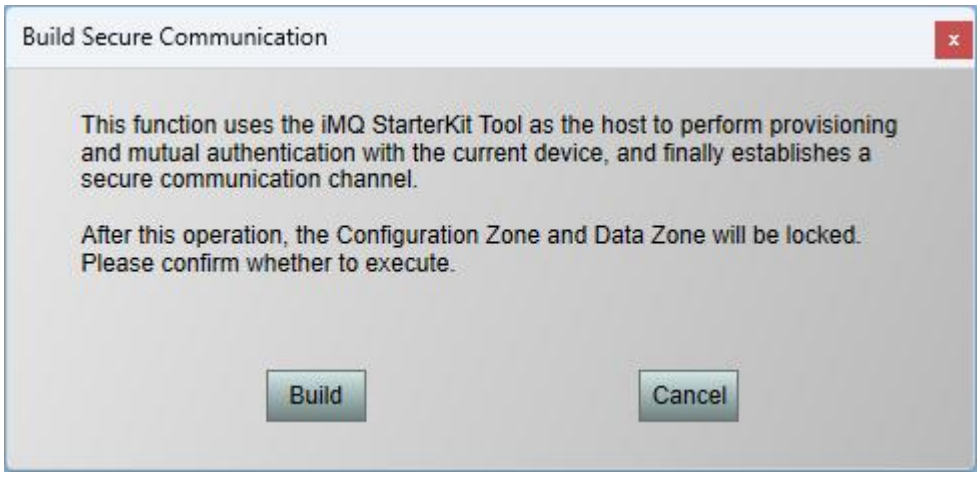


Figure 114 Build Secure Communication message

Click "Build" button to start build secure communication.

When the host and SQ713X/SQ719X have authenticated each other, a secure communication will be established. After this connection is established, all command transmissions will be encrypted and decrypted using AES-CBC.

5.1.3.1.6 Setting

Setting item includes a sub item, I/O Setting.

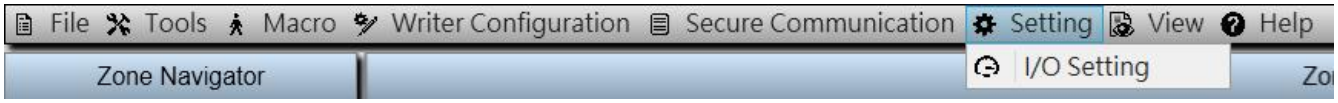


Figure 115 Setting sub menu

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I/O Setting: This function can adjust the I/O frequency at runtime.
Depending on the interface between the host and the chip, one of the following three I/O setting dialog boxes will pop up.

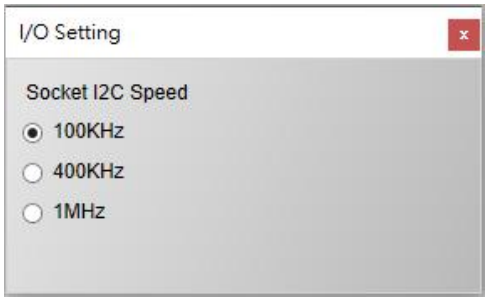


Figure 116 I2C I/O Setting

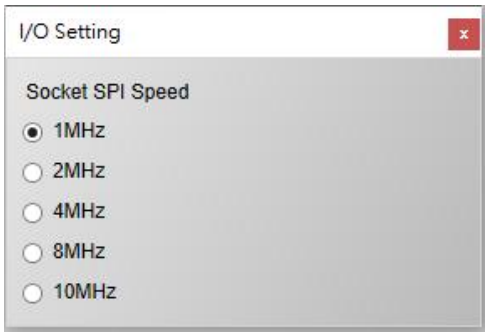


Figure 117 SPI I/O Setting

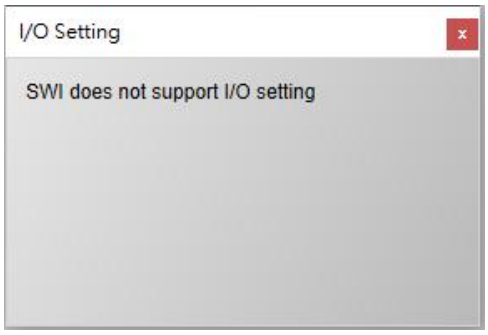


Figure 118 SWI does not support I/O Setting

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5.1.3.1.7 View

View item includes a sub item, Restore Default Layout.



Figure 119 View sub menu

Restore Default Layout: Executing this function will reset the height and width of all screens to their default values.

5.1.3.1.8 Help

Help item includes a sub item, About.



Figure 120 Help sub menu

About item displays a dialog to show the product and company information.



Figure 121 About dialog

5.1.3.2 Main Windows

This program includes five main windows: zone navigator, zone view, zone configuration, system information and log window.

5.1.3.2.1 Zone Navigator Window

Zone navigator window collects zone slots in tree view for user to search and select a zone slot easily.

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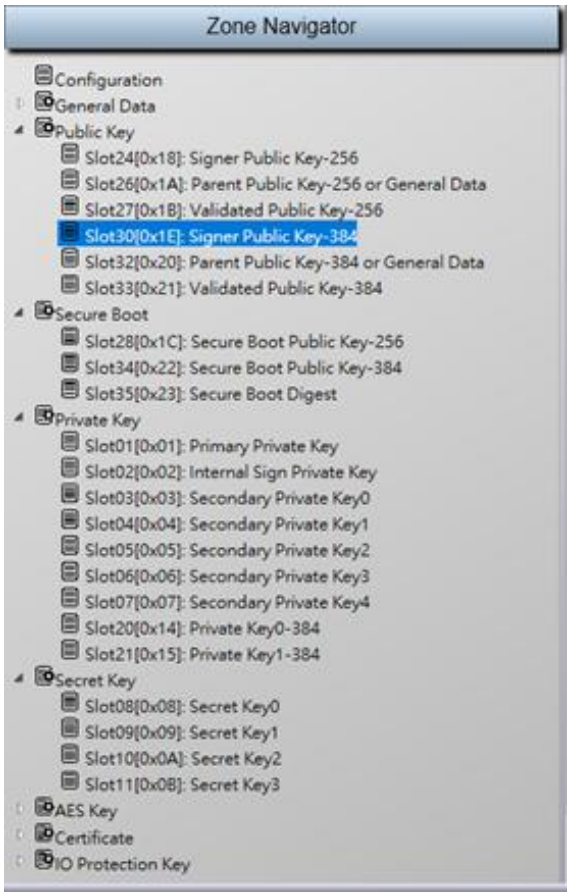


Figure 122 Zone navigator window

5.1.3.2.2 Zone View Window

Zone view window displays the selected slot zone data, some of them are editable and savable, some of them are not editable and non-savable (please refer to the datasheet definition). It can also export/import data to/from secondary storage. Configuration zone has two types of views, one is label view and the other is data grid view, it can export only.

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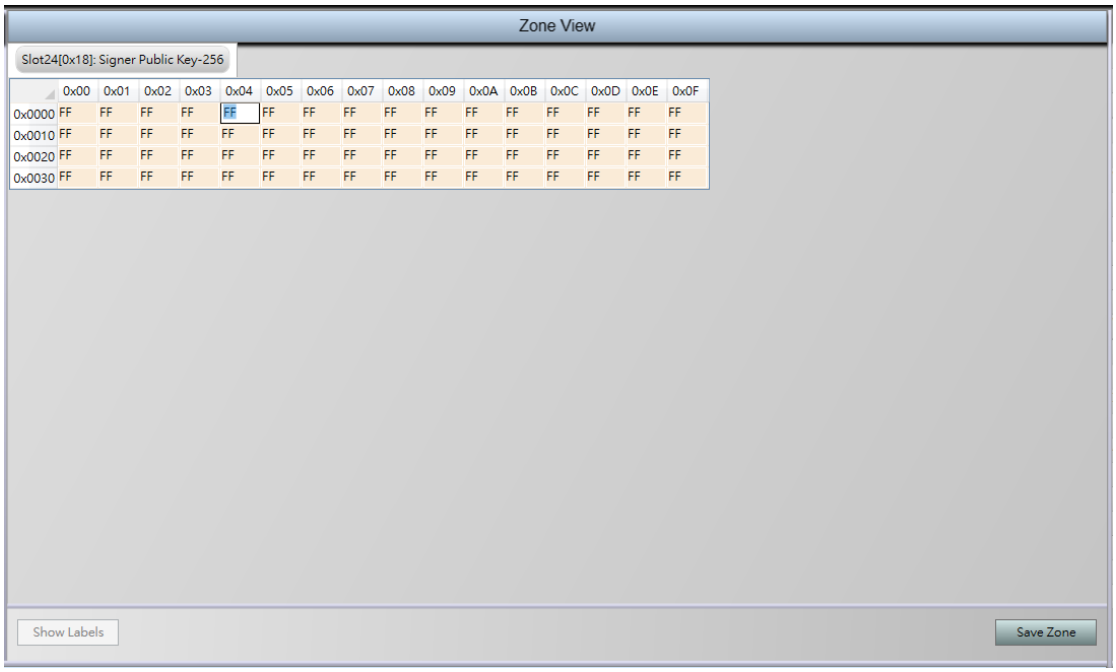


Figure 123 Editable and savable data grid view

Click the "Save Zone" button to save the data grid's data to the relevant slot.

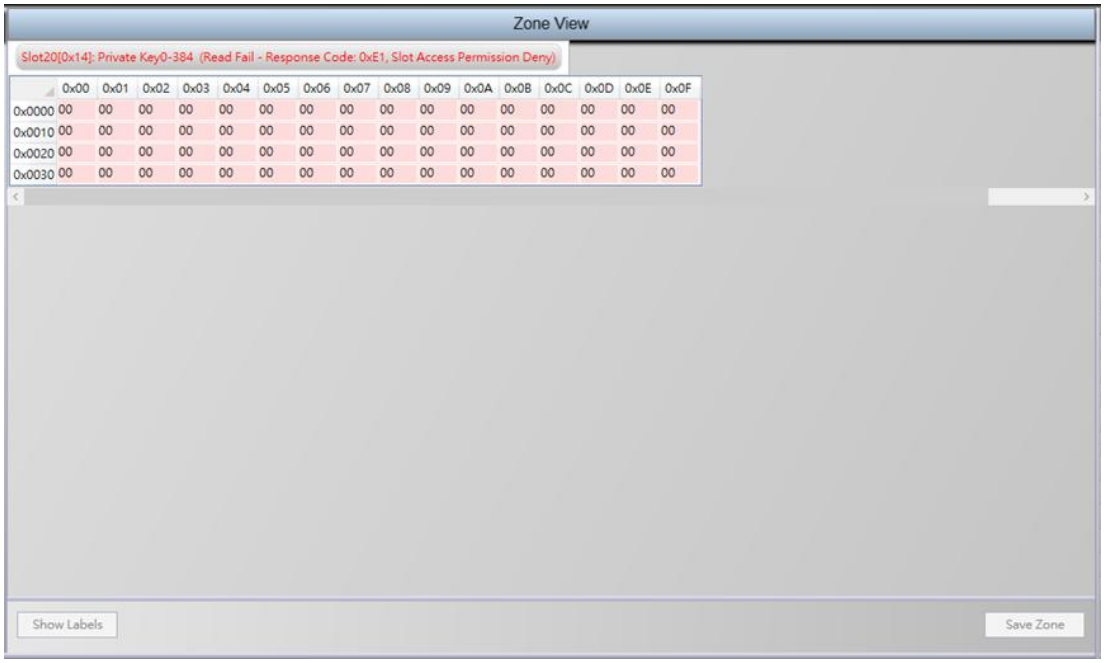


Figure 124 Non-editable and non-savable data grid view

5.1.3.2.3 Configuration Label View

User can click on any label to switch to the data grid view and the cursor will focus on the corresponding cell of the label.

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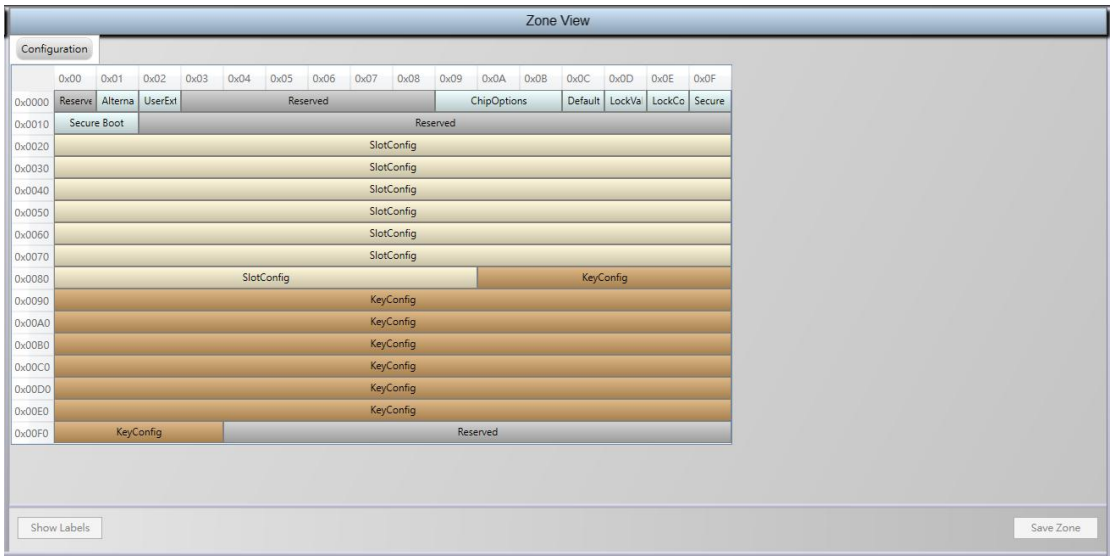


Figure 125 Configuration label view

5.1.3.2.4 Configuration Data Grid View

When the cursor focuses on any cell in the data grid, the label next to the "Show Label" button displays the data grid byte offset, the label name, and the byte index within the label. Click "Show Labels" button can switch back to Configuration Label View.

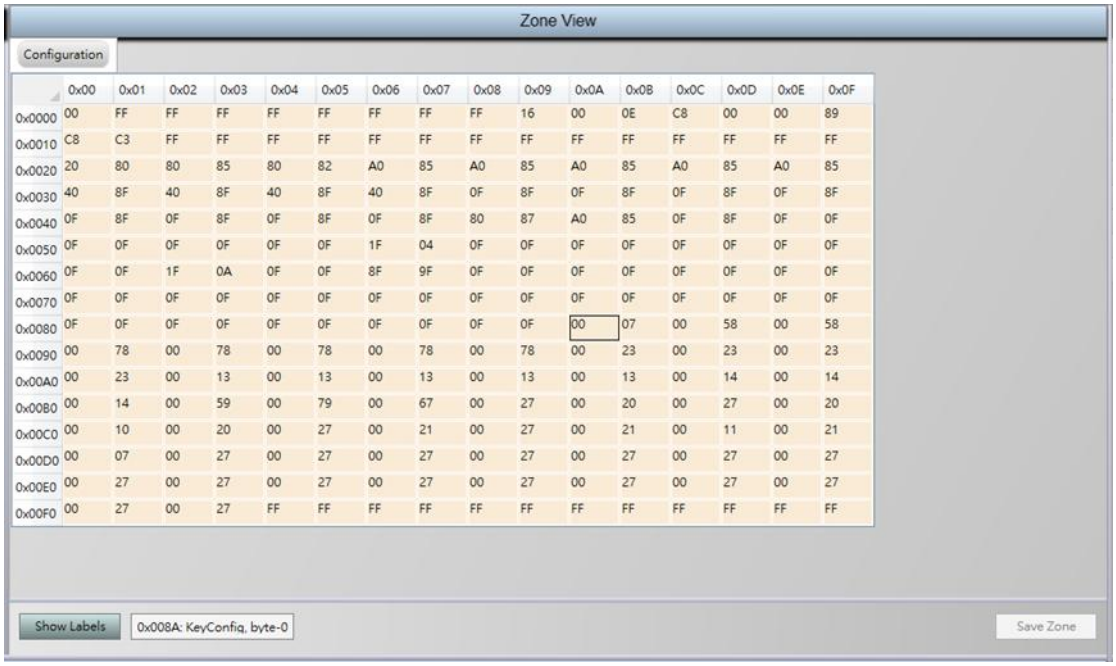


Figure 126 Configuration data grid view

5.1.3.2.5 Zone Configuration Window

Zone configuration window displays the selected zone slot configuration.

Zone configuration of Configuration Zone:

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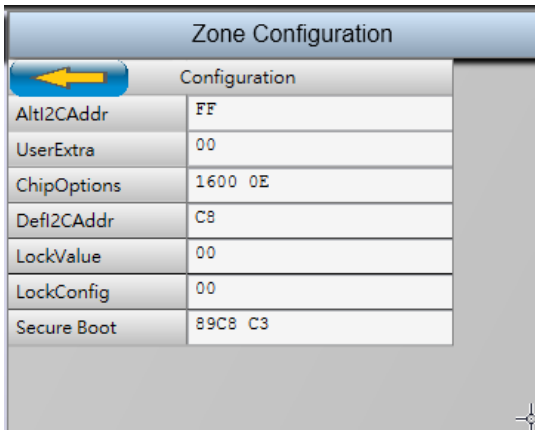


Figure 127 Zone configuration window (Configuration zone)

Zone configuration of Data/Key Slot Zone:

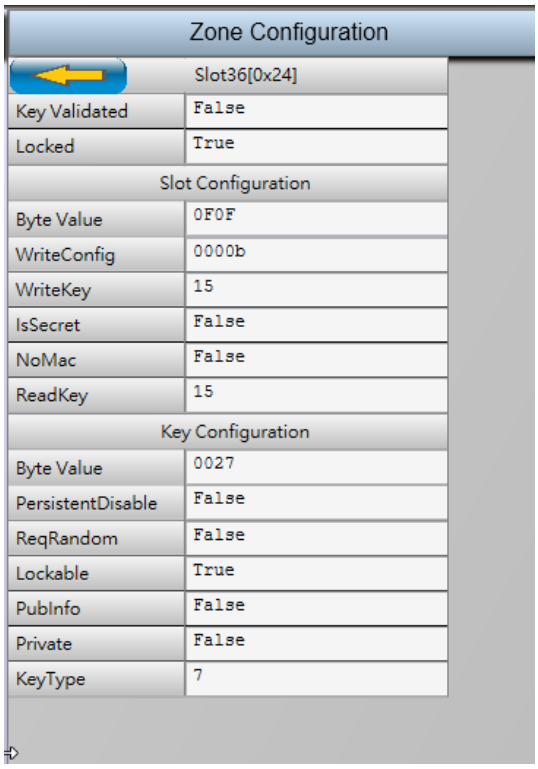


Figure 128 Zone configuration window (Slot zone)

The button can be dragged and clicked to switch the configuration area between data grid mode and description mode, data grid mode contains relevant configuration information of the current data zone, the description mode contains relevant description of the current data zone.

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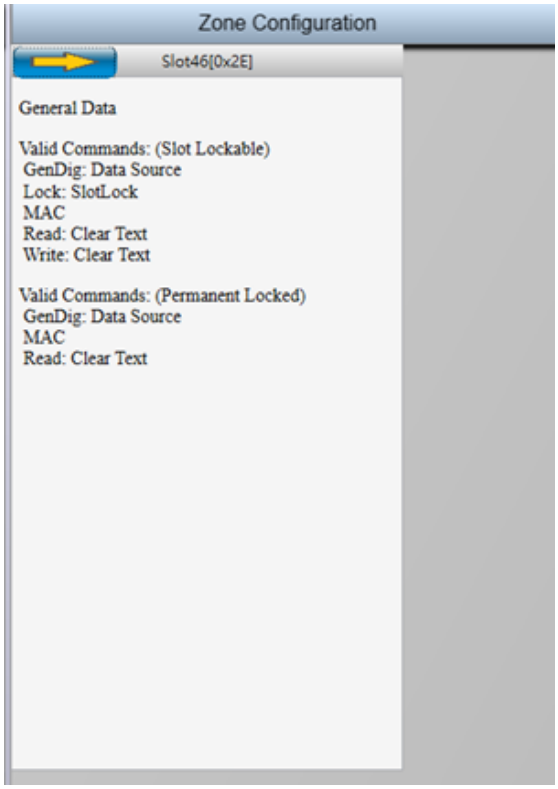


Figure 129 Zone description of Data/Key Slot Zone

5.1.3.2.6 System information window

The Device Status tab of the System Information window displays the current status of the device.

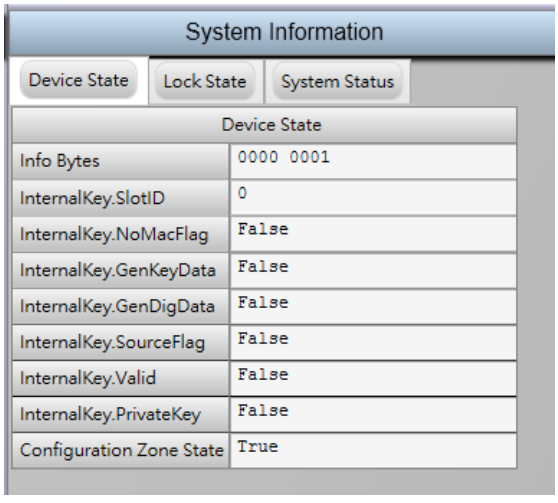


Figure 130 System information window/Device state

Lock state tab of the System Information window displays configuration zone lock state and data zone lock state

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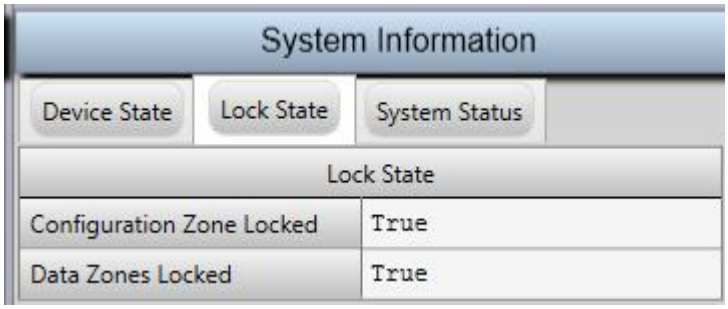


Figure 131 System information window/Lock state

System status tab of the System Information window displays system and device information.

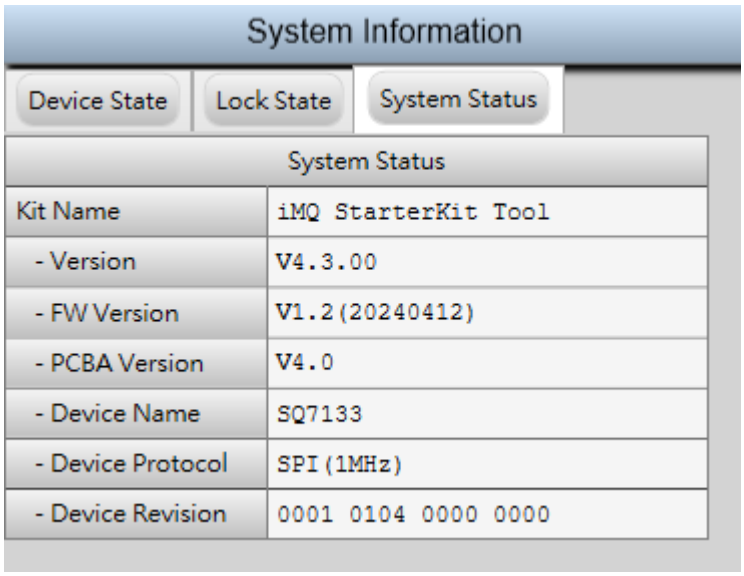


Figure 132 System information window/System status

5.1.3.2.7 Log window

Log window displays communication log data.

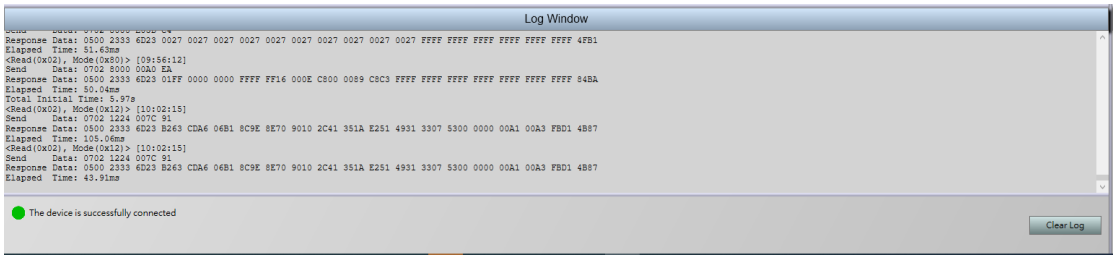


Figure 133 Log window

Click "Clear Log" button to clear the content of Log Window.

Device connection status: Green light on indicates successful device connection; red light on indicates device connection failure.

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6. HQS600x
Appendix A: Hardware settings precautions for prototyping SQ7515

To develop general functions and Security Processor for SQ7515, the following hardware is required:

- Starter Kit (Left)
- SQ7515 EVB (Middle)
- MQ-Link (Right)



Starter Kit SQ7515 EVB MQ-Link

Figure 148 SQ7515 hardware settings

A.1 Security Processor application development for SQ7515

1. Confirm that P42 (reset) and GND on the SQ7515 EVB is shorted (EVB V1.1 uses Jumper to complete).
2. Confirm that the slide switch on the SQ7515 EVB switch to the system setting.
3. Use MQ-link to connect SQ7515 EVB for power supply, and connect the other side of MQ-link to PC as power source (Before this step, the EVB is power off).
4. The Starter kit is connected to the SQ7515 EVB, and the other end of the Starter kit is connected to the PC.
5. Open the GUI software on the PC and start setting the Security processor key or Config.



Figure 149 EVBV 1.1 Add a Reset grounding jumper

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A.2 Host Processor application development for SQ7515 (using IDE)

1. Confirm that P42 (reset) and GND on the SQ7515 EVB is open (EVB V1.1 uses Jumper to complete).
2. Confirm that the slide switch on the SQ7515 EVB switch to the IDE setting.
3. Connect the MQ-link to the SQ7515 EVB, and connect the other side of the MQ-link to the PC.
4. Open the IDE software and develop the application.

Note 1: If you want to execute the StarterKit GUI to develop the Security Processor after executing the IDE first, the system must be powered on again(according to the setting in A.1).

Note 2: For IDE software function description, please refer to "MQ-LINK User Manual."

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Change history

Version	Approved Date	Description
V2.3	2025/10/17	1. Add a new Secure Communication section and modify the related figures.
V2.2	2025/06/09	1. Modify the figure to reflect the correct version number and message
V2.1	2025/01/07	1. Modify figure description of chapter 5 and chapter 6 2. Adding uninstall previous version before installation in section in section 2.1 3. Added firmware update in section 2.2 4. Update the menu item's figures as the icon changes.
V2.0	2024/10/1	1. Add figure 10~21. 2. Add 2.2.1, 2.2.2, 2.2.3 for StarterKit firmware update
V1.9	2024/01/29	1. Update figure 18, 19 2. Add 2.2 StarterKit firmware update
V1.8	2023/12/12	1. Update SQ713x for screen shot change 2. Update HQS600x for screen shot change 3. Add Programming device twice inhibition message figure 92
V1.7	2023/11/01	1. Reorganize the structure of the manual and move common parts to earlier chapters (CH1, CH2, CH3) 2. Renumber figures 3. Change some pictures
V1.6	2023/10/17	1. Added SQ713x user manual in CH2; HQS600x user manual in CH3 2. Rearrange chapter numbers for SQ710x in CH1
V1.5	2022/11/23	1. "SQ71 Series Secure Starter Kit User Manual" rename to "Secure Starter Kit User Manual" 2. "CH3 StarterKit software installation" updated 3. "CH4.2.1 Build Command" updated 4. "CH4.2.2 Menu bar" updated
V1.0	2021/01/15	First release

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