XHSC 小华半导体
XIAOHUA SEMICONDUCTOR

32-bit Microcontrollers

XH-Link-Writer

Programmer

user manual

Rev1.0 August 2023

Applicable objects

Product Series	Product Model	Product Series	Product Model
HC32F460	HC32F460PETB HC32F460PEHB HC32F460KETA HC32F460KEUA HC32F460JETA HC32F460JEUA HC32F460PCTB HC32F460KCTA HC32F460JCTA	**HC32F4A0**	hc32f4a0tihb hc32f4a0sitb hc32f4a0sihb hc32f4a0ritb hc32f4a0pitb hc32f4a0pihb hc32f4a0sgt8 hc32f4a0sghb hc32f4a0rgtb HC32F4A0PGTB
HC32L110	HC32L110C6PA HC32L110C6UA HC32L110B6PA HC32L110B6YA HC32L110C4PA HC32L110C4UA HC32L110B4PA	**HC32L130/136**	HC32L136K8TA HC32L136J8TA HC32L130J8TA HC32L130J8UA HC32L130F8UA HC32L130E8PA
HC32L072/073	HC32L072PATA HC32L072KATA HC32L072JATA HC32L072FAUA HC32L073PATA HC32L073KATA HC32L073JATA	**-**	-

declaration Ming Dynasty (1368-1644)

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1 summary

XH-Link-Writer is an online programming environment for XHSC's Cortex-M series MCUs. It follows ARM's CMSIS-DAP standard and supports all of XHSC's Cortex-M series MCUs to provide users with a compact, portable, safe, reliable and easy-to-use programming tool.

The XH-Link-Writer system is shown in Figure 1-1, which mainly consists of XH-Link-Writer software and XH-LINK motherboard, and the target MCU connects to XH-LINK via SWD or UART.

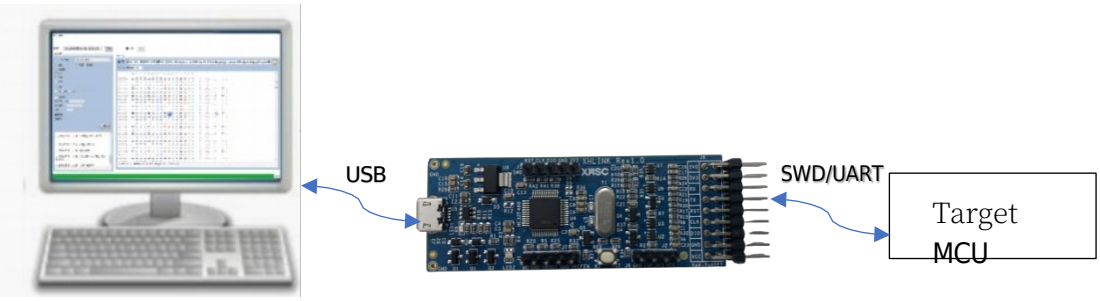

Figure 1-1 XH-Link-Writer System Connection Diagram

1.1 XH-Link-Writer Features

XH-Link-Writer supports the following functions:

1) Chip programming parameters are configurable:
   - Chip Model Selection
   - Programming Actions
   - Sheet Erase/Page Erase
   - read protection
   - Rolling Code Function
   - reset function
   - Programming speed (1M/ 5M/ 10M)
2) Chip programming parameter configurations can be saved for quick use at next startup.
3) The programming interface supports SWD.

1.2 XH-LINK Features

XH-LINK supports the following functions:

1) Functions for online debugging
   - Supports 3.3V or 5V self-powered environments on target boards;
   - It can be debugged directly in Keil, IAR Embedded Workbench and other integrated development environments (IDE);
   - Supports Serial Wire Debug (SWD) interface.
2) USB to Serial Function
   - Supports virtual serial ports with USB CDC combo devices;
   - Debugging and virtualizing serial ports can be accomplished with a single USB cable;
   - Configurable baud rate, parity, data bits and stop bits for the USB virtual serial port.
3) Hardware reset button function
4) LED power and operating status indication

1.3 XH-LINK Pin

The XH-LINK programming interface pins are described in Table 1-1.

Table 1-1 Debug Interface Description

Programming Emulation Interface pinout	functionality	note
5V0	5.0V power output	Outputs 5.0V, which can be left blank for debugging or used to power the target MCU system.
3V3	3.3V power output	Outputs 3.3V, which can be left blank for debugging or used to power the target MCU system.
RX	UART Data Receive Pin	Connect the target board MCU UART data transmission pins.
TX	UART Data Transmit Pin	Connect the target board MCU UART data transmission pins.
RST	Target Board MCU Reset Control Pin	Connect the target board MCU reset pin
CLK	SWD interface clock signal pin	Connect the target board MCU SWD serial line clock pin
DIO	SWD interface data signal pin	Connecting the target board SWD serial line data input/output pins
GND	structural particle: used before a verb or adjective, linking it preceding the verb or adjective	Connect the target board MCU ground pin
VCC	SWD/UART/RST Signal Enhancement Driver	Leave this pin blank for debugging, external 3.3V for enhanced driving.

2 XH-Link-Writer Description

2.1 Programming method

XH-Link-Writer currently supports SWD programming mode, which uses the DIO/ CLK/ GND/ RST pins to connect to the MCU.
system, 3V3/5V0 is connected according to
the power supply need of MCU. The SWD
wiring method of the chip is shown in
Figure 2-1.

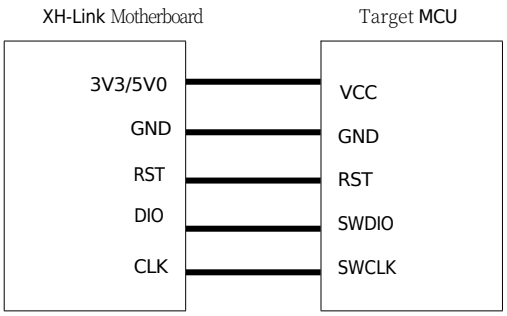

Figure 2-1 SWD Wiring Method

2.2 elec trici ty sup ply

The target MCU system can either be externally powered or powered by the XH-LINK motherboard, which can output 3.3V and 5.0V.

2.3 software interface

Double-click "XH-Link-Writer.exe" to open the software, the software interface as Figure 2-2.

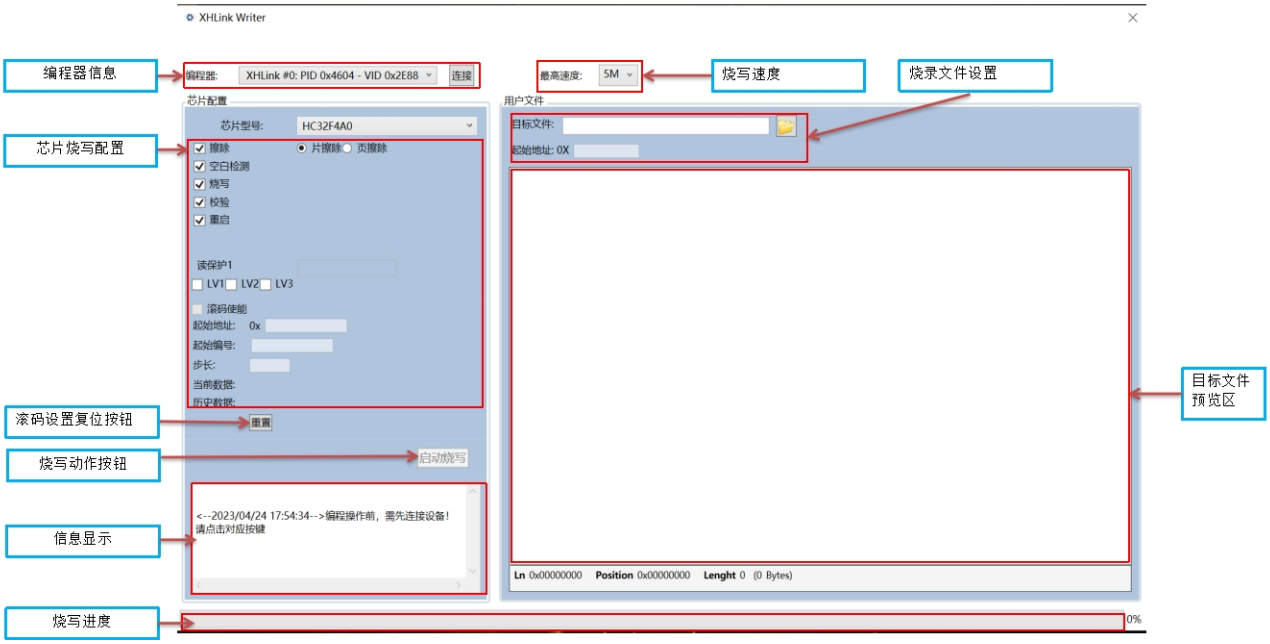

Figure 2-2 Software Interface

XH-Link-Writer functions and features are listed below:

- The programmer is automatically recognized and displayed in the list, you need to click the "Connect" button before programming.
- Chip configuration area can set the target MCU model, after manually selecting the MCU model, the target file selection/read protection setting/roll code enable setting need to be reconfigured, and the MCU model can be saved to the configuration file.
- Erase: Erase supports two ways: slice erase and page erase, slice erase is to erase the whole MCU flash, page erase is to erase according to the position of the flash page occupied by the programmed target file, slice erase is enabled by default, and the settings can be saved to the configuration file after modifying.
- Blank Detect: Check whether the whole chip flash is in blank state (all are 0xFF) make sure the flash erase is valid, enable by default.
- Burn: Program the target file to MCU flash, enabled by default.
- Verify: verify whether the data programmed to flash is the same as the burn target file, enabled by default.
- Reboot: let MCU run automatically after reset after successful firmware programming, and you can save the settings after modifying them.
- Read protection 1: Read protection is applied to the flash area to prevent untrusted users from reading the flash data, after protection, the flash data can be read by password, the protection level supported by different MCU models is different, the protection level can be saved to the configuration file, the password will not be saved, and you need to enter the password again to reopen the software.
- After the roll code function is enabled, you need to set the roll code parameters. Rolling code parameters include rolling code start address, start number, step size, enable status/history burn number and step size can be saved to the configuration file.
- Rolling code start address: the address where the rolling code number is written to the MCU flash, occupies 4 bytes of space, the address must be within the valid range of MCU flash and does not overlap and conflict with the firmware itself, the start address can be saved to the configuration file.
- Rolling code start number: the size occupies 4 bytes of space, the format is decimal input, the effective range is 0 to 4294967295 (hex 0xFFFF FFFF) to reach the maximum value of the automatic return to zero, the current data burned can be saved to the configuration file.
- Rolling code step: the step value between each number, the set data can be saved to the configuration file, the effective range of the step is 0 to 999.
- Roll Code Current Data: Displays the number of this programmed write, which can be saved to the configuration file as historical data.
- Roll Code History Data: Displays the number of the last successful write.

- Reset Button: When the user does not need to use the saved roll code configuration information settings, the roll code function is no longer enabled after the reset and can be re-enabled when needed.
- The message prompting area displays operation prompting and operation progress information.
- Burning speed is the maximum frequency of SWD clock, there are three settings of 1M/ 5M/ 10M for selection, the higher the rate, the shorter the theoretical burning time.
- The target file area is the path of the firmware file to be burned into the MCU system, you can choose hex and bin format files, if you choose bin format, you need to set the legal and valid starting address, it is recommended to use hex format, XH-Link-Writer automatically recognizes the firmware address.
- Click the Start Burn button to start the burn action.
- The bottom burn-in progress area shows the progress of the burn-in in real time, with percentage formatting alerts.

3 Driver Installation

This software requires Microsoft.NET Framework v3.5, if you do not have Framework 3.5 installed, the following error will occur or the software will not run, as shown in the figure:

Figure 3-1 Cannot Run

Check whether Framework 3.5 exists in "C:\Windows\Microsoft.NET\Framework" as shown below:

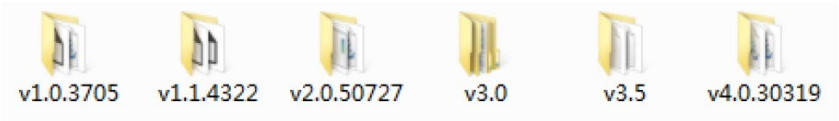

Figure 3-2 Framework3.5

If the operating system is not installed, please go to the Microsoft official website to download and select the appropriate version to download as follows:

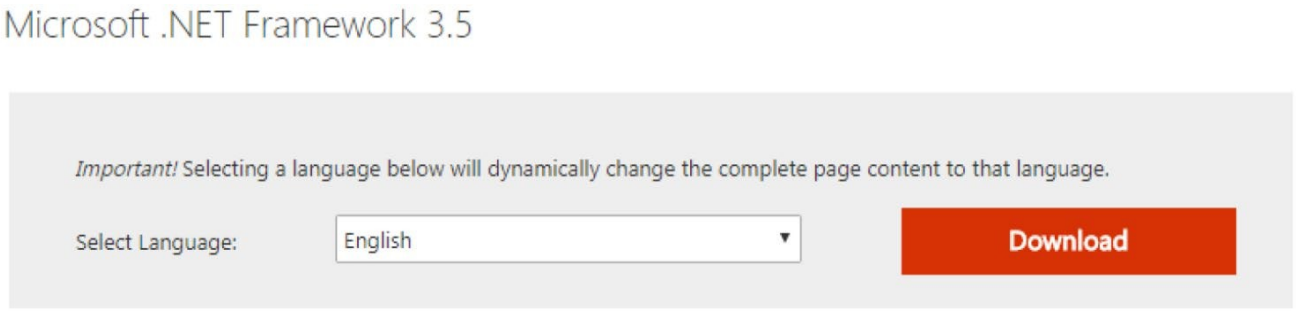

Figure 3-3 Framework 3.5 Download

The file directory of the folder where the XH-Link-Writer software is located is shown in Figure 3-4:

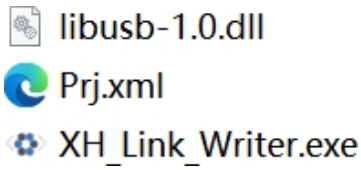

Figure 3-4 XH-Link-Writer File Directory

"Prj.xml" user configuration file. It is used to save user-related settings. "XH-Link-Writer" is the executable program file.

"libusb-1.0.dll" is a window dll file.

4 procedure

The MCU model HC32F460JETA is used as an example to illustrate the hardware connection and software settings.

4.1 hardware connection

Take the EV_F460_LQ100_Rev2.0 EVB board as an example, the XH-Link-Writer programming hardware interface DIO/ CLK/ GND/ RST is connected to the DIO/ CLK/ GND/ RST on the J21 pin of the EVB, and the EVB uses the 3.3V power supply from XH-LINK, and the 3.3V on the J21 is connected to the 3.3V programming hardware interface. The actual connection is shown in Figure 4-1 below.

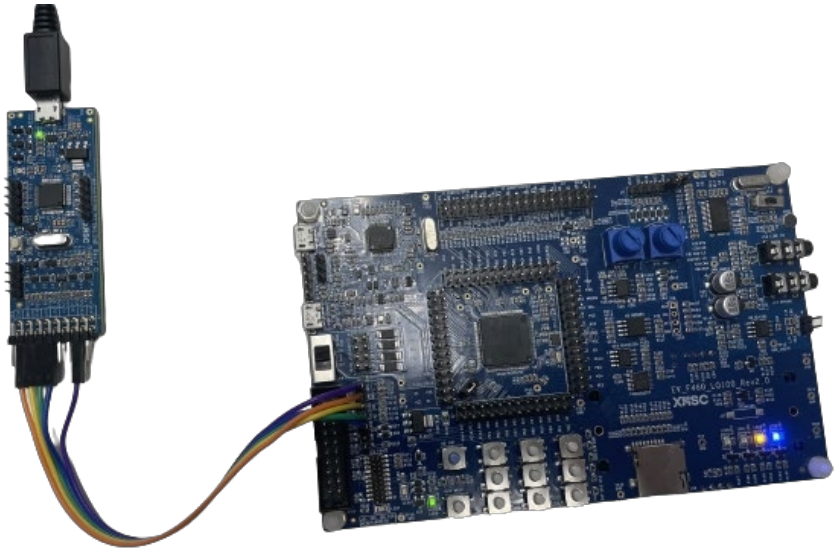

Figure **4-1 XH-LINK/ EV_F460_LQ100_Rev2.0 SWD** Interface Connection

4.2 Double-click to open the XH-Link-Writer.exe software and connect to it

The maximum speed is 5M by default, select XH-LINK programmer in the programmer list, click "Connect" button, the message will be "Device open successfully", as in Figure 4-2.

Note: Clicking the "Connect" button will change to "Disconnect" if it succeeds. If "Disconnect" does not appear when you click "Connect" consecutively, you can manually press the *XH-LINK* reset button and try to connect again.

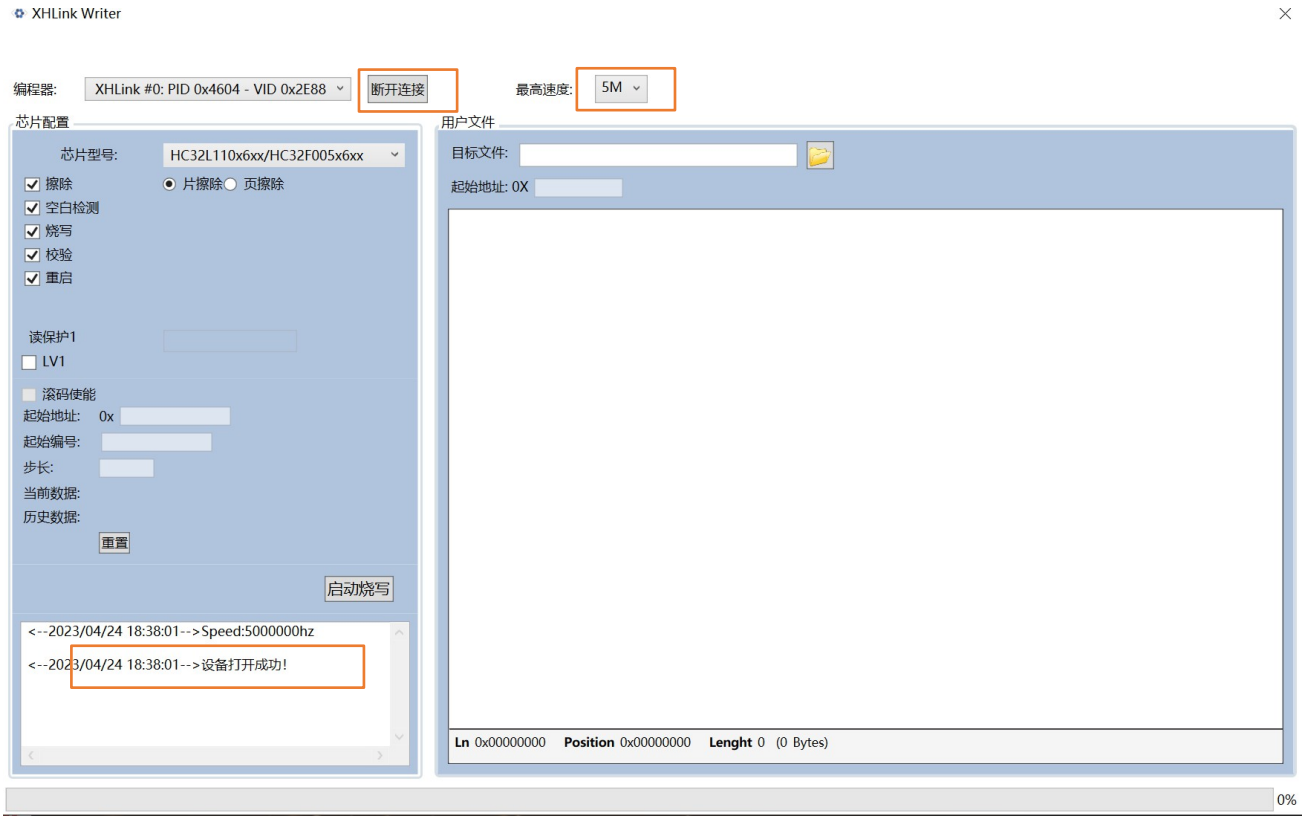

Figure 4-2 Successful Connection

4.3 Configuration Target **MCU** Model

Select an **MCU** model corresponding to the programming target board from the Chip Model drop-down box, e.g. **HC32F460xExx/ HC3245xxExx**, as shown in Figure 4-3.

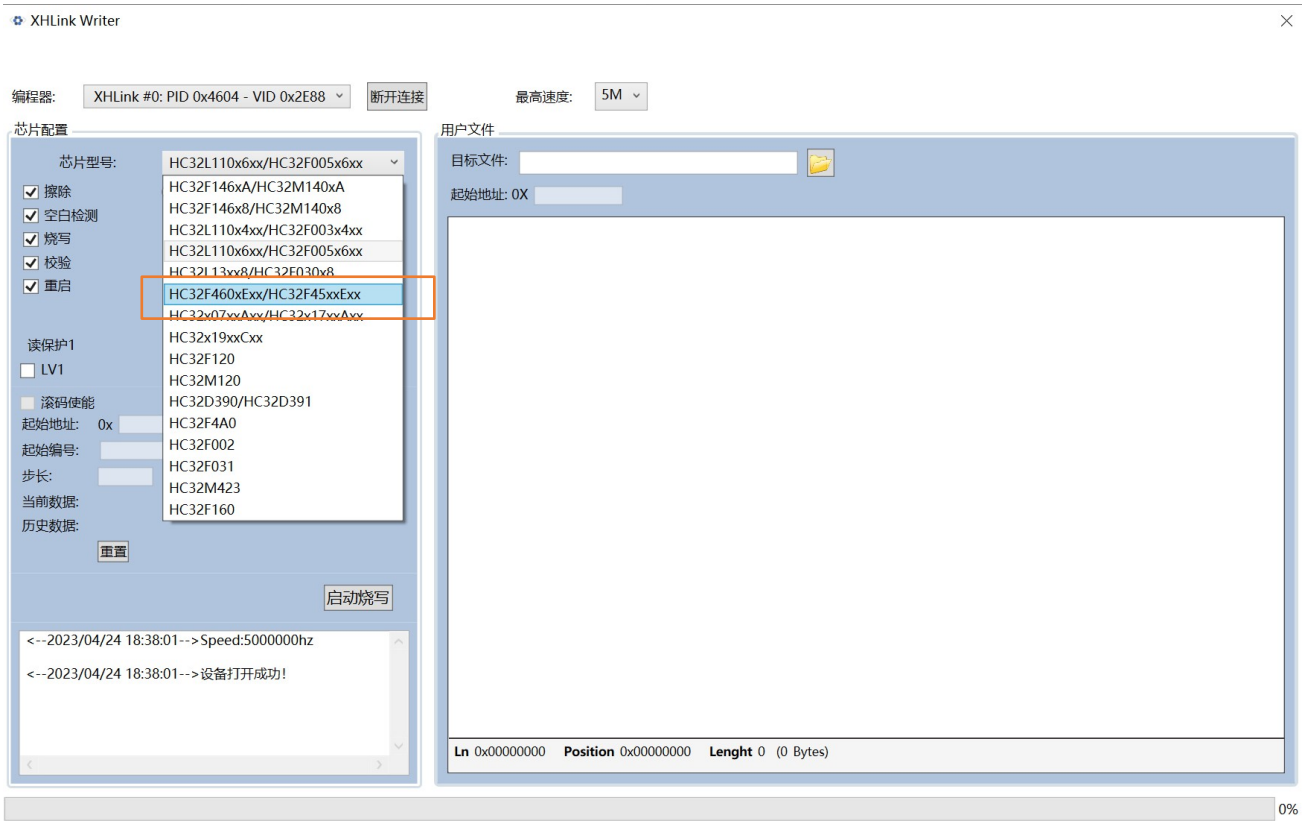

Figure 4-3 MCU Model Selection

4.4 Configure burn process settings

The erase mode adopts default chip erase, and the blank detect/burn/check/restart function is enabled, as shown in Figure 4-4.

Note: *MCU* models *HC32F460xExx/ HC32F45xxExx or HC32F4A0* must be selected for chip erase in order to burn successfully when using *XH-Link-Writer* again after read protection.

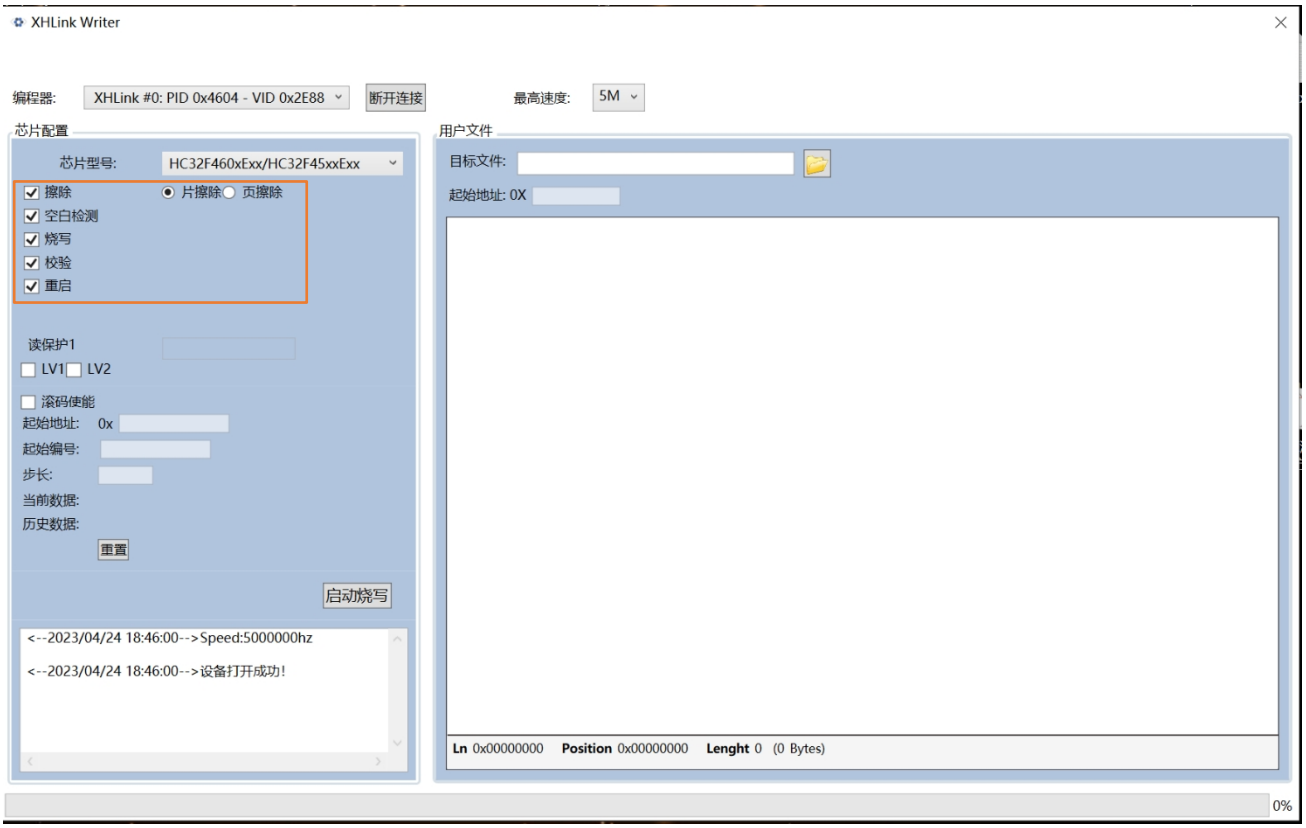

Figure 4-4 Burning Flow Configuration

4.5 Rolling Code Function Setting

Check Rolling Code Enable, set Rolling Code Address to **0x1000**, Rolling Code Start Number to **1**, and Step Length to **1**, as in Figure 4-5.

Note: When there is a conflict between the roll code start address and the address in the firmware size range, there will be a prompt message box to confirm to prevent overwriting the valid data of the firmware; when there is historical data, it will be automatically rolled and burned with the value of the historical number/step setting, when it is necessary to reset it, it can be done in the following two ways:

- After reselecting the **MCU** model, set the parameters after checking the Roll Code Enable.
- After clicking the Reset button, set the parameters after checking the Rolling Code Enable.

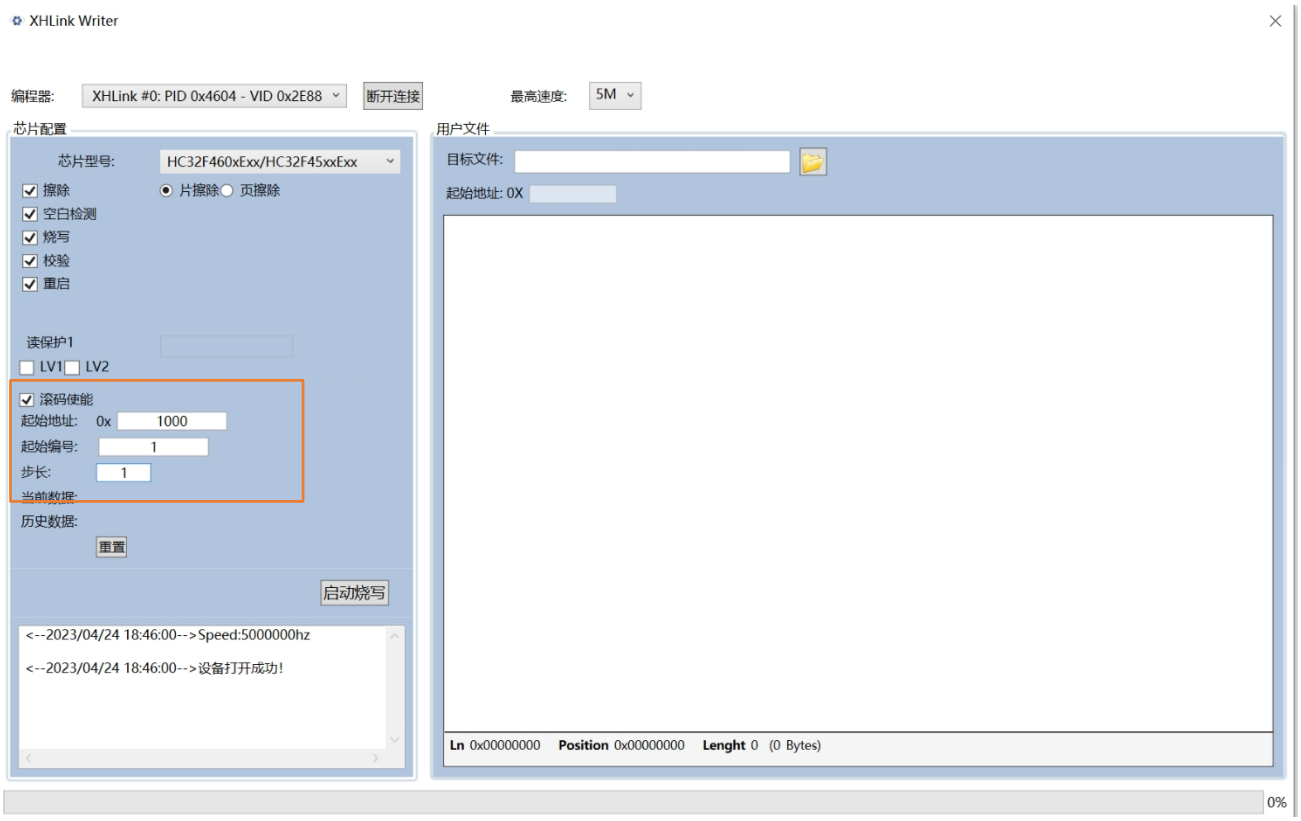

Figure 4-5 Roll Code Setting

4.6 Setting up the burn target file

The target file format supports hex and bin formats, when the target file is in hex format, there is no need to configure the start address, as in Figure 4-6; when the target file is in bin format, the start address is configured in hexadecimal by default, as in Figure 4-7. You can preview the firmware data after setting.

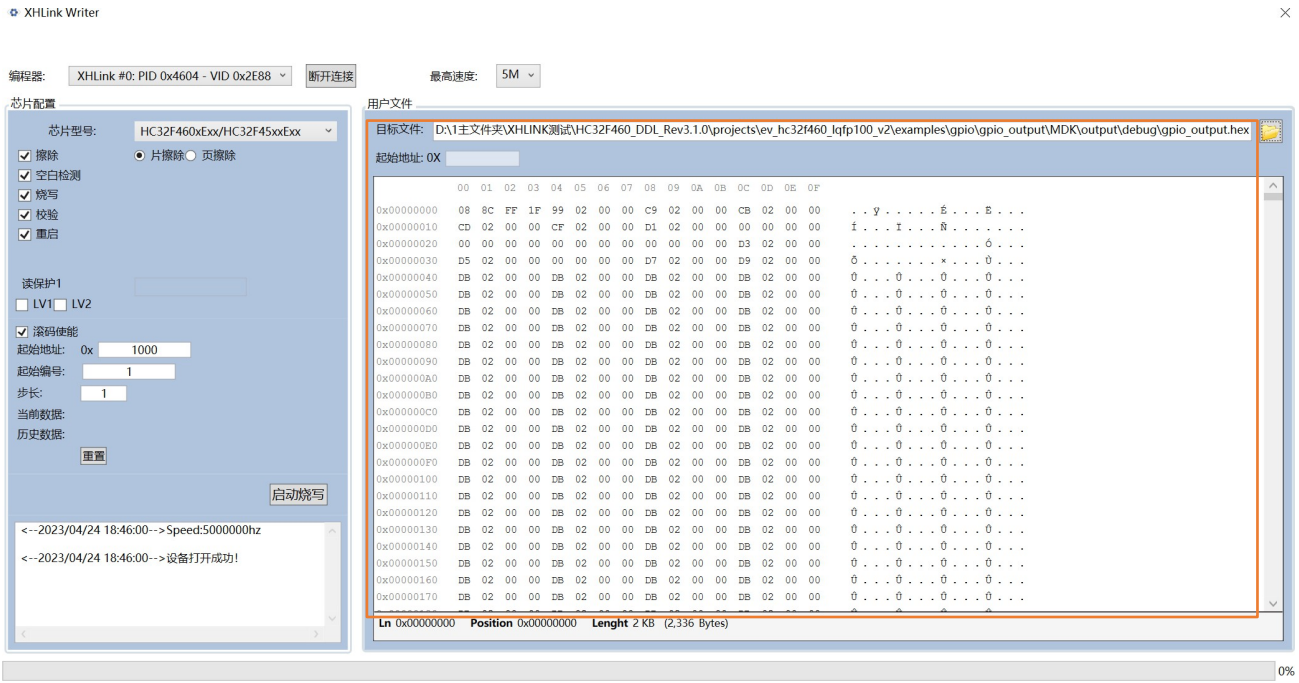

Figure 4-6 Hex Format Burn File Settings

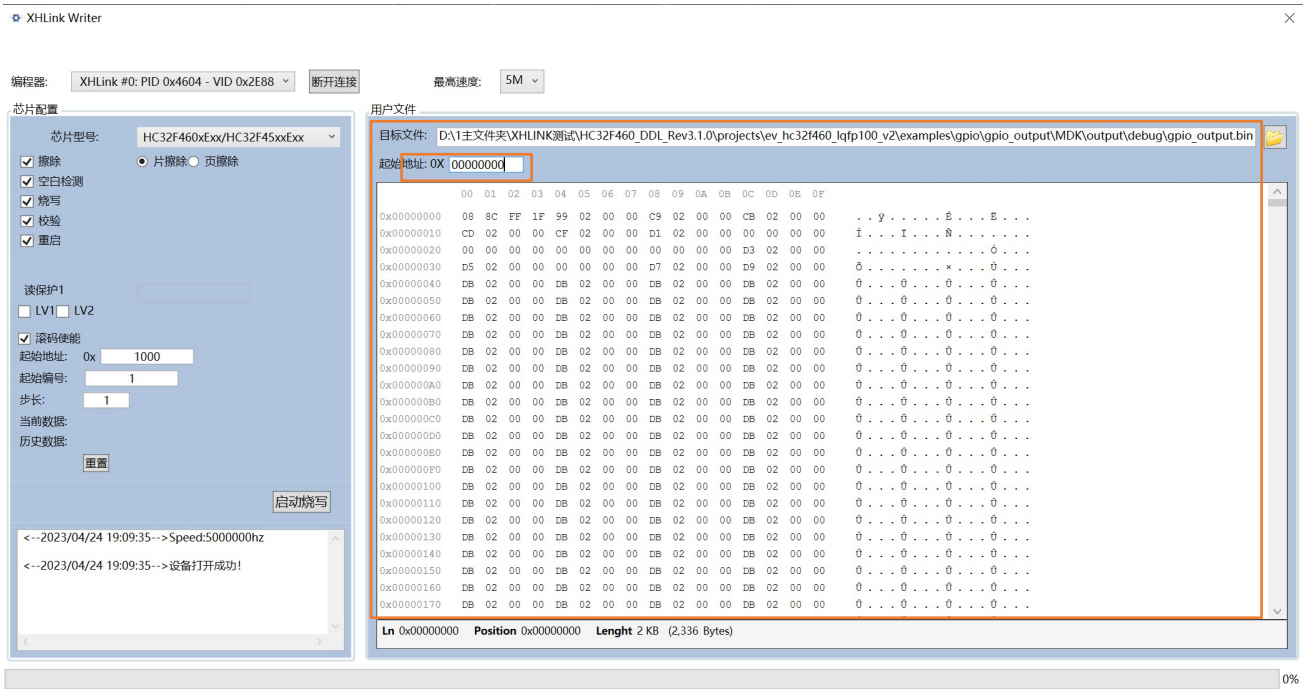

Figure 4-7 Bin Format Burn File Settings

4.7 Read Protect 1 Setting

Depending on the MCU model, different levels of read protection can be supportedXH-Link-Writer automatically recognizes the level of support up to Lv3, Lv1 requires the password to be set to a length of 96 bits, i.e., 12 characters, as shown in Figure 4-8.

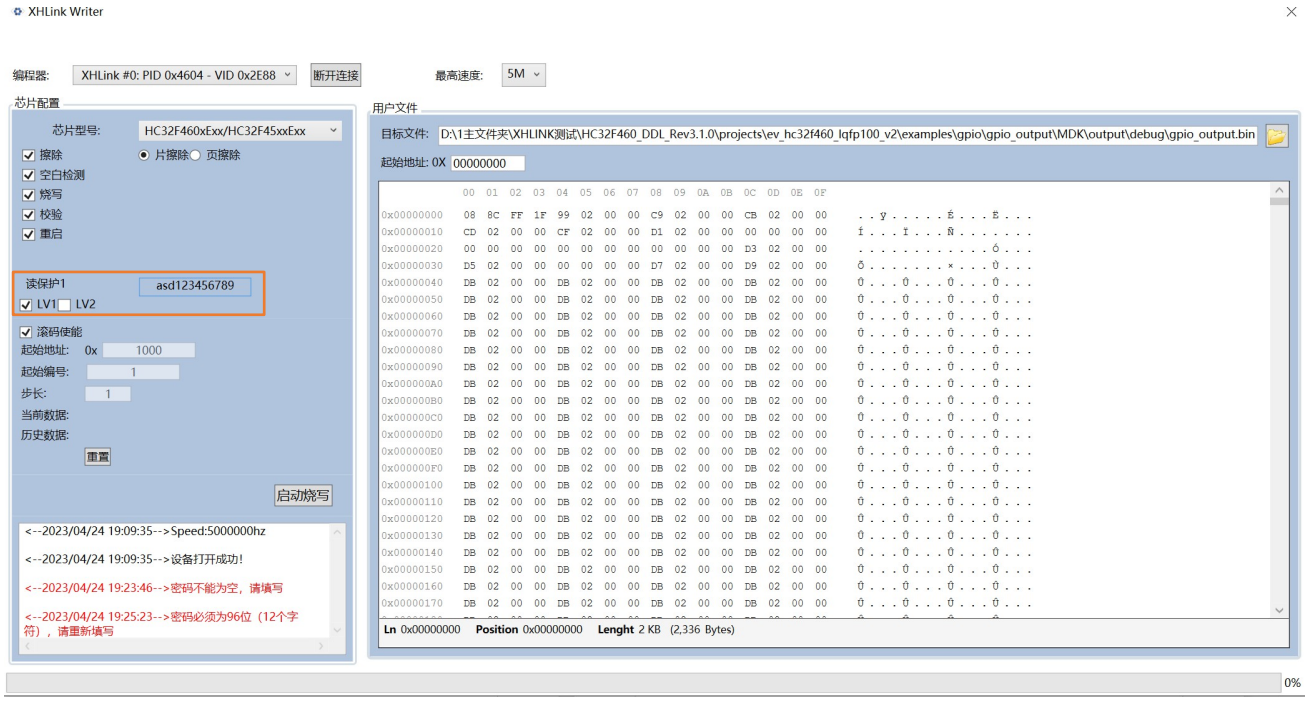

Figure 4-8 Read Protection Settings

4.8 Initiate burn-in

After clicking the "Start Burning" button, the progress bar at the bottom of XH-Link-Writer displays the percentage of burning progress in real time, and the information area displays the successful information of burning and programming as well as the connection time, as shown in Figure 4-9.

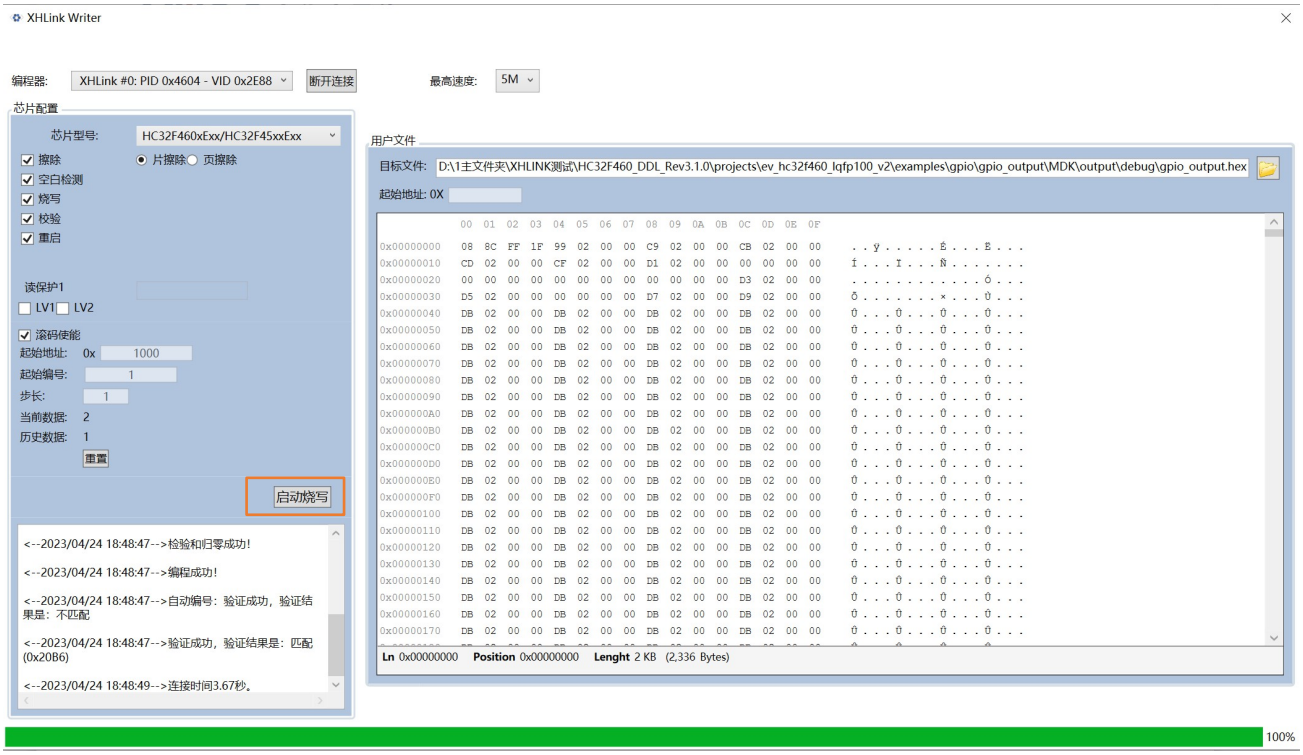

Figure 4-9 Starting Burn-in

4.9 Softwar e Exit

You can exit the software by clicking the x button in the upper right corner, and then there will be a message window to confirm whether you want to save the configuration of this burning, click the OK button, the configuration information is saved to the Prj.xml file, and the next time you open the XH-Link-Writer software, it will automatically load the configuration information saved the last time; click Cancel and it will not be saved, as shown in Figure 4-10.

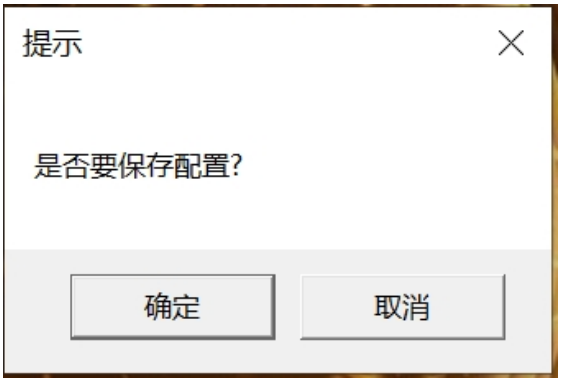

Figure 4-10 Save Configuration Prompt

5 MCU emulation and debugging

XH-LINK motherboard follows the CMSIS-DAP standard of ARM, and after connecting the MCU target board with the hardware SWD interface, you can debug and download the firmware by using the integrated development environments such as Keil, IAR Embedded Workbench, and so on; for detailed steps, you can refer to "UM_Cortex-M Emulator User's Manual_RevX.XX.pdf".

6 MCU ISP Programming

XH-LINK motherboard supports UART interface, with "xhsc.exe" software, you can upgrade MCU firmware by ISP, please refer to the detailed steps.

Cortex-M Inline Programmer User's Manual_RevX.XX.pdf.

7 error handling

Table 7-1 Tips

7.1 draw attention to sth.

Alerts	descriptive	deal with
Device turned on successfully	Connecting to XH-LINK Successful	-
Device shutdown	Disconnect XH-LINK Success	-
Connect the device before programming operations! Please Click the corresponding button	After opening the software, please connect the XH-LINK device first.	-
The Bin file address is not specified!	When the target file is selected as a bin format file, you need to manually input the burner. starting address	-
Target chip Halt failed!	The chip is in a protected state	-
Auto-numbered addresses overlap with user codes. Whether to continue the operation	Rolling code start address and firmware valid address overlap, ask whether to continue auto-numbering	Click "Yes" to continue auto-numbering, otherwise stop. Stop Write Number
Target chip not found!	The chip is in a protected state or the body is abnormal	Unprotecting or checking the body is abnormal
Blank check successful! Check result: XX	Flash Blank check results	-

7.2 incorrect

Table 7-2 Errors

error message	descriptive	deal with
Please select the file to be burned!	Burn target file not selected	Selection of burn target files
The file path is incorrect or the file is invalid!	The path to the selected destination file does not exist or the file is invalid or has been	Reselect the target file and ensure that the target file

	invalidated by the occupancy	Effective and unoccupied
Hex file format error!	hex file format error	Verify that the hex file is correct
Lost connection with the device! Please restart!	XH-Link-Writer cannot connect to the programmer.	Press the XH-LINK reset button
Password cannot be empty, please fill in	The password field can be entered with a password	Enter the correct password
Parameter can not be empty, please fill in ! or parameter Length over 5	When the Rolling Code Enable option is checked, the starting address should be filled in correctly.	Correctly fill in the legal starting address
The start number parameter cannot be greater than 0xFFFF FFFF, please fill in again	Rolling code write start number setting value out of range	Fill in legal and correctly formatted values
Bin file address is illegal, please re-fill	Illegal bin file start address value	Correctly fill in legal and correctly formatted values
Parameter cannot be empty, please fill in ! or parameter Length over 3	Rolling code auto-coding step is too long	Setting the legal step value
File Error! Length exceeds selected chip Flash size.	Burned file size exceeds the selected chip Flash size.	Re-select the correct burn file or re-select the Choosing the right target MCU
Page Erase Chip Failure	Page Erase Method Erase Failure	Check the hardware connections, check the burn-in process, taste the Try re-powering.
Verification is successful, the result is: no match	Firmware post-burn calibration	Check the hardware connections, check the burn-in process, taste the

error message	descriptive	deal with
deploy sth.		Try re-powering.
Verification was unsuccessful	Firmware post-burn calibration	Check the hardware connections, check the burn-in process, taste the Try re-powering.
The test and zeroing were unsuccessful!	Failure to test and zero	Check the hardware connections, check the burn-in process, taste the Try re-powering.
Programming doesn't work.	Programming Failure	Check the hardware connections, check the burn-in process, taste the Try re-powering.

Version Revision Record

version number	revision date	revision
Rev1.0	2023/08/07	First Edition Release.