

MM32-LINK Programmer User Manual

Introduction to MM32-LINK programmer

MM32-LINK programmer, a development tool designed for MCU of Cortex-M full series of MindMotion Microelectronics, is used as a learning, research and development and mass production tool for teaching and research, design and development, and production and manufacture.

General

MM32-LINK is a development tool incorporating the simulator and programmer.

- It supports Win 10, Win 7 and Windows XP operating systems, requiring no driver software in Win10 environment.
- It supports the code programming through MCU of MM32 Cortex-M full series, enabling automatically matching the target chip.
- It supports the online ICP SWD programming.
- It supports the online ICP automatic programming machine interface.
- It supports the offline ICP and APM (automatic programming machine) interface.
- In the online/offline ICP/APM programming mode, the 128 KB programming time is less than 3 seconds, and the 16 KB programming time less than 0.5 seconds.
- It supports the Micro USB high-speed communication interface, with power supply.
- It has programming adapter options: ICP-Adapter, ISP-Adapter, APM-Adapter.

MM32-LINK programmer series

The MM32-LINK programmer product series consists of the MM32-LINK programmer host, ICP offline programming adapter, ISP offline programming adapter and APM online/offline programming adapter.



Figure 1 MM32-Link Programmer Product Series



Figure 2 MM32-Link Programming Adapter

Connection between programmer and target object

1. Connection between MM32-LINK programmer and MM32-MiniBoard

Connection mode: online ICP

Target MCU: MM32L373

Connection interface: fully-connected 20-core simulation socket

Available signal: +5V/+3.3V, GND,

SWDIO, SWCLK,

nRST and Boot0



2. Connection between MM32-LINK programmer and MM32-MiniBoard

Connection mode: online ICP

Target MCU: MM32L073

Connection interface: fully-connected 20-core simulation socket

Available signal: +5V/+3.3V, GND,

SWDIO, SWCLK,

nRST and Boot0



3. MM32-LINK/ programmer connected with MM32-MiniBoard through ICP-Adapter offline programming adapter

Connection method: offline ICP

Adapter: ICP-Adapter (programming adapter)

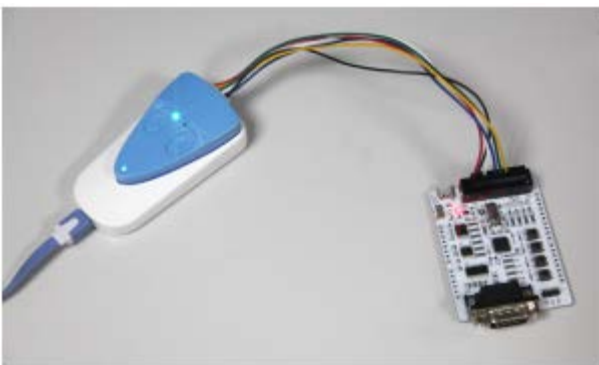
Target MCU: MM32L373

Connection interface: 6-core programming socket

Available signal: +5V/+3.3V, GND,

SWDIO, SWCLK,

nRST and Act. (Boot0)



4. MM32-LINK/ programmer connected with MM32-MiniBoard through ICP-Adapter offline programming adapter

Connection method: offline ICP

Adapter: ICP-Adapter (programming adapter)

Target MCU: MM32L073

Connection interface: 6-core programming socket

Available signal: +5V/+3.3V, GND,
SWDIO, SWCLK,
nRST and Act. (Boot0)



5. MM32-LINK/ programmer connected with MM32-MiniBoard through APM-Adapter offline programming adapter

Connection method: offline ICP

Adapter: APM-Adapter (programming adapter)

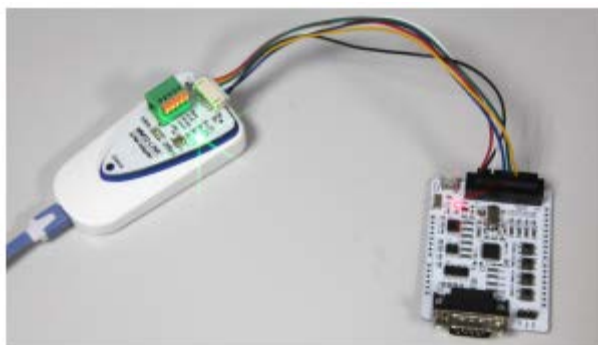
Target MCU: MM32L373

Connection interface: 6-core programming socket

Automatic programming machine (APM) interface
signal:

nSTART, nPASS, nFAIL,
EOF and GND

Available signal: +5V/+3.3V, GND,
SWDIO, SWCLK,
and nRSTv



6. MM32-LINK/ programmer connected with MM32-MiniBoard through APM-Adapter offline programming adapter

Connection method: offline ICP

Adapter: APM-Adapter (programming adapter)

Target MCU: MM32L073

Connection interface: 6-core programming socket

Automatic programming machine (APM) interface
signal:

nSTART, nPASS, nFAIL,
EOF and GND

Available signal: +5V/+3.3V, GND,
SWDIO, SWCLK,
and nRST

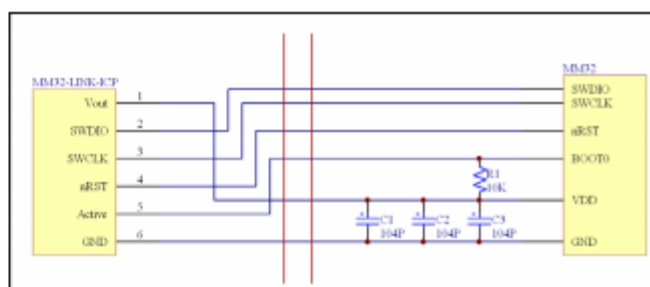
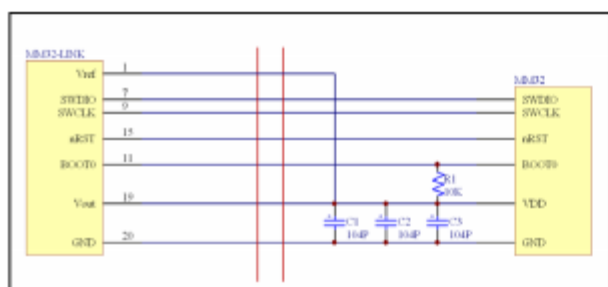
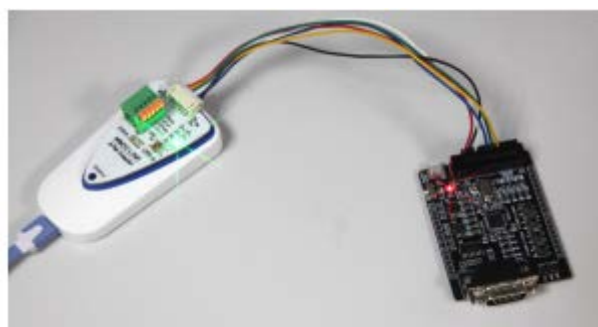


Figure 3 Reference for ICP Programming Connection Mode of 20-Core Expansion Socket (Left) and 6-Core Adapter Socket (Right)

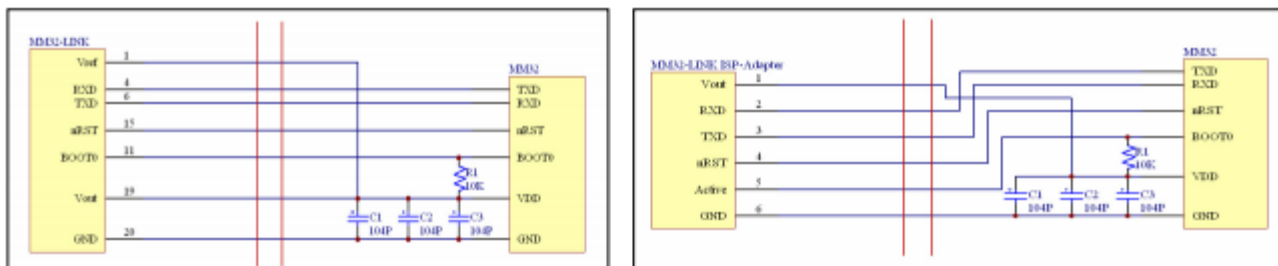


Figure 4 Reference for ISP Programming Connection Mode of 20-Core Expansion Socket (Left) and 6-Core Adapter Socket (Right)

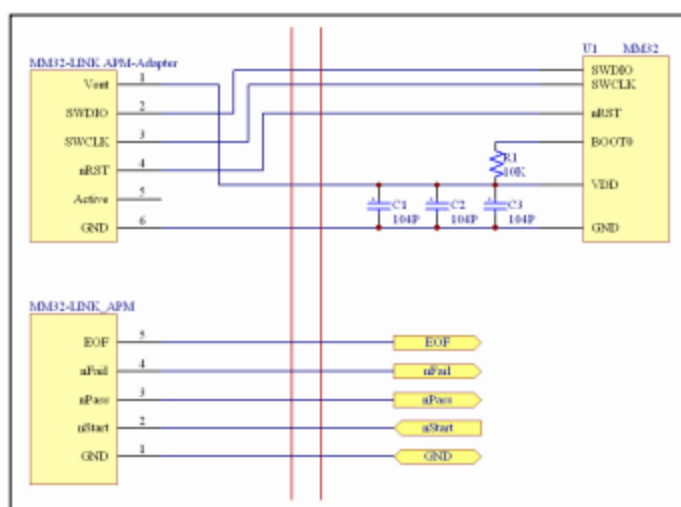


Figure 5 Reference for APM Programming Connection Mode of 5/6-Core Adapter Socket

Status indicator

The meaning of simulation and programming state of MM32-LINK programmer indicator for V1.10 firmware version is as shown in the following table:

LED status	Simulator state	Programmer status	Remarks
Red		Incorrect programming	
Green	USB enumeration succeeded	Correct programming	
Yellow	Target system in reset state	Target MCU detected	
Red flashing	USB enumeration in process		
Green flashing			
Yellow flashing		Programming	
Red flashing briefly		Detecting target MCU	Not supported by V1.00 firmware

Note: The meaning of the state of V1.00 firmware is different.

MM32-LINK software

The MM32Program, the MM32-LINK programming software (hereinafter referred to as the programming software), supports Windows10, Win8.1/Win7 and Windows XP 32/64-bit operating systems. In Windows10 operating system, MM32-LINK requires no USB driver.

The MM32Program programming software is dynamically connected with the MM32-LINK programmer in real time, to intelligently display the real-time status of the programmer and programming objects.

Software installation

MM32-LINK programmer software is composed of two parts: the device driver and device application, and its installation steps are as follows:

1. In case of Win10 operating system, the MM32-LINK programmer, requiring no driver, is directly connected with the PC host through the USB interface.
2. In case of the Windows XP/7/8 operating system, the USB driver provided with MM32-LINK shall be installed.
3. After the installation of USB driver, the MM32-LINK shall be connected with the computer through USB cables.
4. The MM32-LINK application installation package can be downloaded from the company website, and then the installation program setup.exe is run for installation.
5. After the installation of device driver and application program, the programming software is run, and the main dialog box of programming software will pop up on the screen.
6. If the MM32-LINK programmer is connected with the computer correctly, a green indicator light and MM32-LINK are displayed at the lower left of the programming software, indicating that the driver and application programs are installed correctly and the programming software is connected with the MM32-LINK programmer normally.

System status

1. When the connection status on the left side of the status bar at the bottom of the software's main interface dialog box is displayed by a green status indicator, it indicates that the device has been connected correctly; the device name is displayed on the right side of the indicator.
2. The connection state of the device can be changed by double-clicking the device name area. In case of the yellow indicator, it indicates that it is temporarily disconnected from the device; the indicator will be changed to green through double-clicking the area again; the indicator will be in red if the programmer is not connected.
3. The operation result and the MCU name of the project are displayed on the right side of the device connection status area. The indicator displays the status of connection with the target object and operation results in gray, yellow, green and red in real time. Specifically, gray indicates the unconnected target object, yellow indicates the connected target object, green indicates the current operation result is correct and red indicates the current operation result is incorrect.
4. The operation result indicator in gray indicates that the programmer is not connected to the target object, and all operations on the target object are prohibited at this time. Only when the indicator of the device is in yellow, green or red are the operation keys allowed to be operated in the programming interface.

Interface of MM32-LINK programming software

MM32-LINK programmer interface consists of the main window, target information window and project information window.

Main window

In addition to supporting the MM32-LINK programmer, the MM32-LINK programming software will support MM32-LINK/ISOL programmer and subsequent products of MM32 of MindMotion. The main interface of programming software is as shown in the following figure:

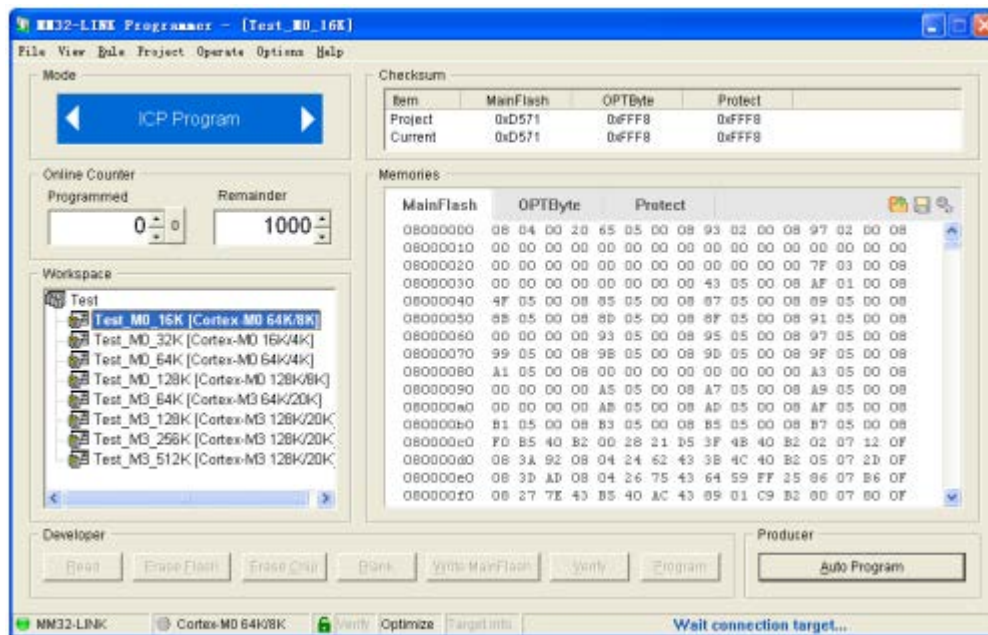


Figure 6 Main Interface of Programming Software



Figure 7 Target Information Window of Programming Software



Figure 8 Project Information Window of Programming Software

Main window of the MM32-LINK programming software supports the dialog mode and minimization mode.

Operation mode

Click the triangle keys on the left and right sides of the mode switching area, to cycle the programming mode from left to right or from right to left as shown in the following figure, namely, the ICP programming mode, ISP programming mode, offline data downloading mode and automatic programming machine programming mode.



Figure 9 Schematic Diagram of Mode Switching of MM32Program (Programming Software)

When the programming adapter is inserted into the 20-core interface of the programmer and is detected, the programming mode is automatically switched to the offline adapter programming mode, not allowing the user to switch to other programming modes through the software. When the programming adapter is unplugged, the software will automatically return to the previous programming mode.

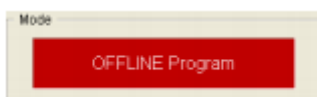


Figure 10 Offline Adapter Programming Mode of Programming Software

Programming counter

According to the current programming mode, the programming counter is automatically switched to the online programming counter or the offline programming counter, as shown in the following figure:



Figure 11 Programming Counter

The successfully-programmed count value is displayed on the left side of the programming counter, and the remaining count value to be programmed on the right side. The count value of the online programming counter can be modified through the keyboard and mouse. In case of the off-line programming counter, the user shall not modify it.

Workspace window

MM32-LINK programming software provides a group of multi-project workspace managers, allowing to open, save, save as and close the workspace through the file menu or the right-click menu of the workspace window. In addition, the workspace window supports drag-drop operations, allowing to open or add workspace files and project files by dragging them into the window.

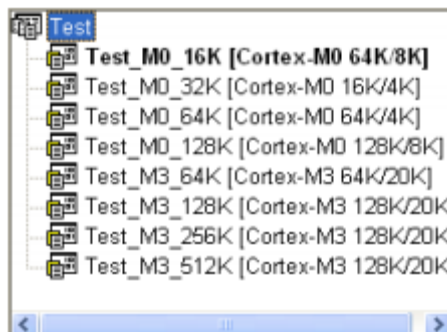


Figure 12 Workspace Window

File check sum window

The file check sum window enables dynamically monitoring the project file and the project display buffer, to display the check sum of data in each memory area. If the check sum of the project is the same as that of the currently-displayed buffer data, it indicates that no programming data is modified. During the batch programming, the operation lock can be used for locking, to prevent misoperation of data display buffer area.

Checksum			
Item	MainFlash	OPTByte	Protect
Project	0000	0000	0000
Current	0000	FFF8	FFF8

Figure 13 Check Sum Window

Programming data display window

MM32-LINK programming software enables dynamically and automatically matching the display window according to the specifications and parameters of the selected programming chip; in the data window, files in Hex format or other files (as binary format files) can be dragged to the window for data loading, as shown in the following figure:

Memories			
MainFlash	OPTByte	Protect	
08000000	FF FF FF FF FF FF FF FF	FF FF FF FF FF FF FF FF	
08000010	FF FF FF FF FF FF FF FF	FF FF FF FF FF FF FF FF	
08000020	FF FF FF FF FF FF FF FF	FF FF FF FF FF FF FF FF	
08000030	FF FF FF FF FF FF FF FF	FF FF FF FF FF FF FF FF	
08000040	FF FF FF FF FF FF FF FF	FF FF FF FF FF FF FF FF	
08000050	FF FF FF FF FF FF FF FF	FF FF FF FF FF FF FF FF	
08000060	FF FF FF FF FF FF FF FF	FF FF FF FF FF FF FF FF	
08000070	FF FF FF FF FF FF FF FF	FF FF FF FF FF FF FF FF	
08000080	FF FF FF FF FF FF FF FF	FF FF FF FF FF FF FF FF	
08000090	FF FF FF FF FF FF FF FF	FF FF FF FF FF FF FF FF	
080000a0	FF FF FF FF FF FF FF FF	FF FF FF FF FF FF FF FF	
080000b0	FF FF FF FF FF FF FF FF	FF FF FF FF FF FF FF FF	
080000c0	FF FF FF FF FF FF FF FF	FF FF FF FF FF FF FF FF	
080000d0	FF FF FF FF FF FF FF FF	FF FF FF FF FF FF FF FF	
080000e0	FF FF FF FF FF FF FF FF	FF FF FF FF FF FF FF FF	
080000f0	FF FF FF FF FF FF FF FF	FF FF FF FF FF FF FF FF	

Figure 14 Programming Data Window

Programming operation key window

MM32-LINK programming software keys have different functions in different programming modes, and are classified by the operating objects into the developer operating keys, producer operating keys and mass production provider operating keys, as follows:



Figure 15 Developer Operating Key

Functional description:

1. Read: the read key; it is used, according to the page selection in the main interface memory window, to read data in the corresponding area of the target object and copy it to the memory window for display.
2. Erase Flash: It is used to erase Flash data. If the target object is MCU, it is used to erase the data of the main Flash; in case of the OFFLINE Download Data mode, only the Flash data in the code area will be erased when the data is downloaded to Flash in the programmer.
3. Erase Chip: It is used to erase all data of the chip. Namely, the target objects will not be distinguished, and all the data in the code area, OPTByte area and data protection area will be erased.
4. Blank: Blank check; it is used to check if the data is null.
5. Write: write operation; this operation key is used to dynamically update the key operation functions according to the page selection in data window.
6. Verify: comparison operation; the operation key is used to verify the data in the corresponding memory area according to the page selection of the data window.
7. Program: serial programming; the operation key is set according to Project | Options, enabling serialization operations.

Enabling of the developer operation key depends on the following two situations:

1. Connected programming objects
2. Locking operation interface of operation lock

After the developer operation key is clicked, the programmer will immediately run according to the selected key function. However, after the producer operation key is clicked for execution, a dialog window will pop up, waiting for signal triggering, thus performing the programming operation.



Figure 16 Producer Operation Keys

Functional description:

1. Auto Program function is activated in ICP/ISP programming mode. In case of the correct programming operation, the programming counter will automatically increase.
2. In APM programming mode, the key is defined as Detect START & Chip Connect. If the startup signal of the automatic programming machine is detected by the MM32-LINK programmer and the signal of connection between the MM32-LINK programmer and the target object is valid, the programming operation command will be automatically executed.

After the above operation commands are executed, the programming operation on the target object will be executed by MM32-LINK programmer immediately. However, the data preparation in offline programming mode shall be completed in the OFFLINE Download Data and OFFLINE Program mode. At this time, the mass production provider operation keys pop up, as shown in the following figure:



Figure 17 Mass Production Provider Operation Keys

1. Download: download the offline configuration and data of the project; If the system is provided with the password protection function, relevant password shall be entered during the operation.
2. Set Count: set the programmer counter and configure the function of manual/automatic programming mod; if the system is provided with password protection function, the relevant password shall be entered during the operation.

Status display

The MM32-LINK programming software status is displayed at the top and bottom of the window respectively. The software name, software version, project name and modification flag are displayed on the top.



Figure 18 MM32-Link Status Display

The following items are displayed from left to right at the bottom:

1. Device status area
 - a) The status indicator in green indicates that the device is connected correctly
 - a) The status indicator in red indicates that the device is not connected
 - c) The status indicator in yellow indicates that the device is in standby state
 - d) The device name is displayed on the right
2. Operation results and project MCU information
 - a) The status indicator in gray indicates that the target object is not connected
 - b) The status indicator in yellow indicates that the target object is connected, waiting for operation
 - c) The status indicator in green indicates that the operation result is correct
 - d) The status indicator in red indicates that the operation result is incorrect
 - e) The project MCU and Flash in programmer are displayed
3. Operation lock
 - a) Green indicates the operation
 - b) Red indicates the locking operation
4. Verification method
 - a) Quick verification method
 - b) Standard verification method
5. Optimization
 - a) Enable online programming optimization
 - b) Disable online programming optimization
6. Target information
 - a) Display the target information window

- b) Close the target information window
- 7. Prompt information and process bar
 - a) Display prompt information
 - b) Display the operation process

Target information window

Under the main window of MM32-LINK programming software, click View | Target Info or double-click the Target Info area of the bottom status bar, to pop up the Target Information window, which can be attached to the left and right sides and the upper and lower edges of the main window according to the option settings.

According to whether a programming adapter is inserted, the following items will be displayed in the adapter type box of the target information window: no programming adapter, ICP programming adapter, APM programming adapter, ISP programming adapter and Flash Memory information window.

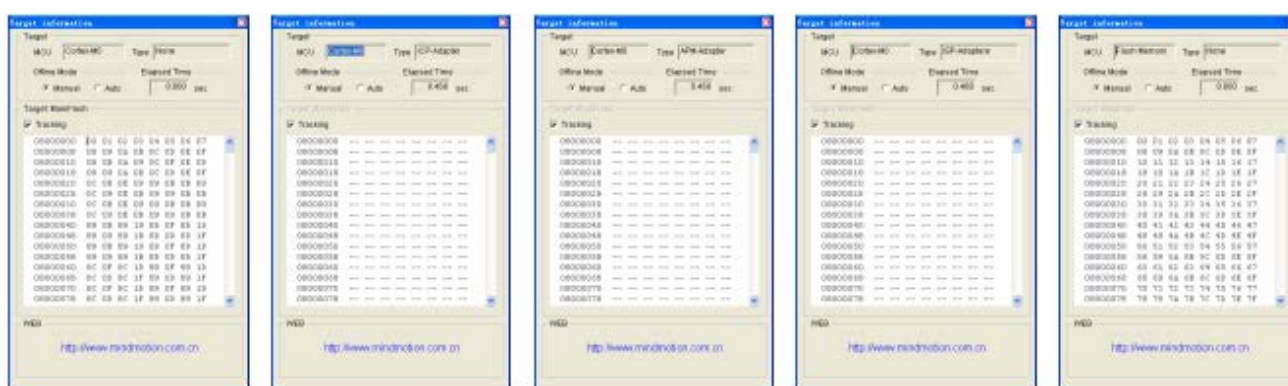


Figure 19 Target Information Window

In the online programming mode, the data of the programming object will be displayed in the target memory window; when the offline programming mode is selected for the programming adapter, "—" will be displayed in the data window.

The following items will be displayed in the target information window:

1. MCU core name of programming target object
2. Adapter type name
3. Manual/automatic programming operation mode in offline programming status
4. Programming time
5. Memory data of target object

Project information window

Click View | Project Info under the main window of MM32-LINK programming software, to pop up Project Information window, which can be attached to the left and right sides of the main window according to the Options | Environments setting.

The following items will be displayed in the project information window:

1. Project name
2. Project MCU model
3. Project MCU core type
4. Project creation time
5. Project memory information

6. Online/offline programming counter



Figure 20 Project Information Window

Option settings

MM32-LINK programming software is used for the personalized operation customization and user configuration through a set of commands for system environment setting, hardware option setting and password protection setting. The activation of option setting menu is checked, as shown in the figure below:

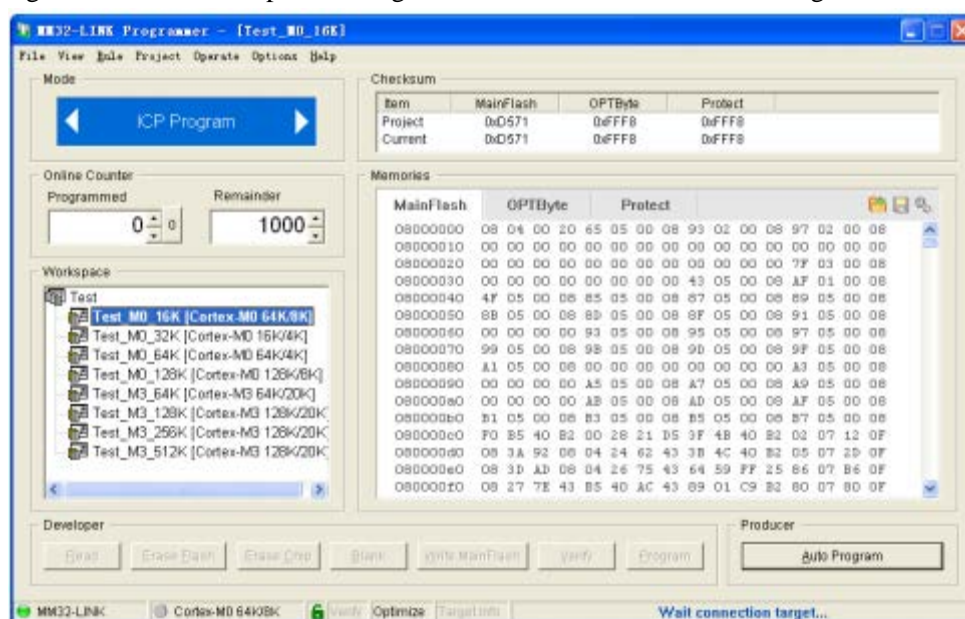


Figure 21 MM32-Link Option Menu

Environment settings

In the MM32-LINK programming software, the system environment settings dialog box is opened through Options | Environments. The system environment includes the workspace, default setting of project path, programming data source, miscellaneous setting, software startup setting and upgrade setting of MM32-LINK programmer application, etc.

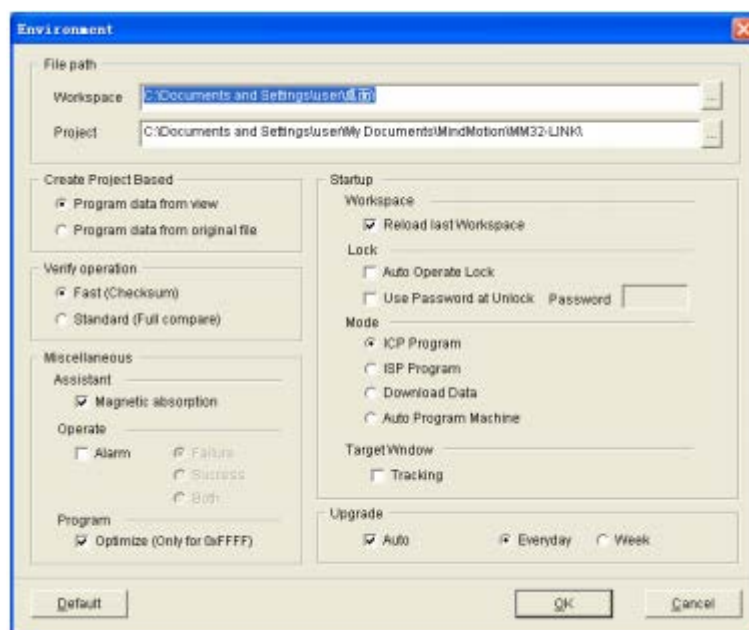


Figure 22 MM32-Link Environment Setting Dialog Box

Functional description:

1. Workspace document path, with the default path of the desktop.
2. Project file path, with the default path of (My) Document\MindMotion\MM32-LINK.
3. In the process of creating a new project, the online programmed data is from the cache of project view or the original file, in which the former is usually selected. If it is required to match up with the debugger or special processing for programming data is needed, the data from the original file can be selected.
4. Verification method: This option is only used for verification commands in developer mode. For ICP/ISP/APM on-line programming mode, the programming software supports the quick verification and complete data verification methods.
5. The enabling option of attachment function of the target information window and the project information window: If it is selected and the target information window and the project information window are dragged to the two sides or upper and lower edges of the main window through the mouse, the window will be attached to the main window, moving with the main window.
6. Voice enabling option: The prompt tone is emitted in case of operation error, success or both.
7. Programming optimization option.
8. Startup option
 - a) When the programming software is running, the last workspace file is automatically loaded.
 - b) When the programming software is running, the developer mode key and editing function are automatically locked.
 - c) Whether password protection is used from the locked operation state to the permissive state.
 - d) It is switched to the set mode when the programming software is running.
9. Upgrade option: When the permissive automatic upgrade function is set, the programming software will regularly collect upgrade information from the Internet network, excepting any privacy information of the user.

Option settings

The function of the option setting dialog box of MM32-LINK programming software is the same as that of the MM32-LINK emulator. When MM32-LINK is used as a programmer, the user shall make the following settings:

1. The power output is selected to be 3.3V/100 mA or 5V/100 mA.
2. The function of automatic adapter detection option shall be enabled.

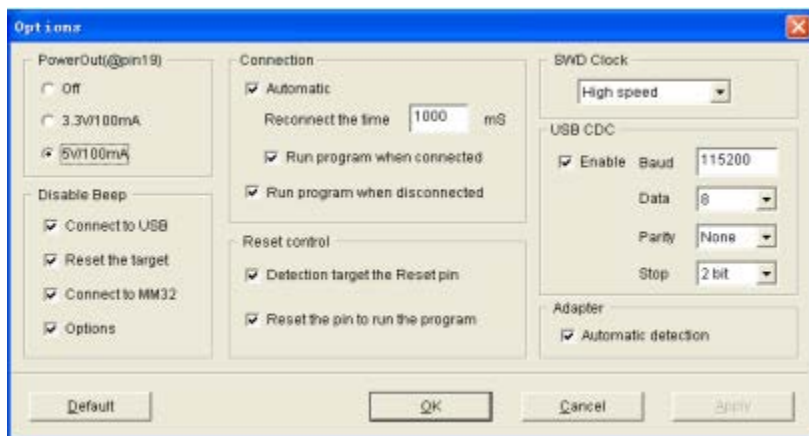


Figure 23 Option Setting Dialog Box

Password setting

The relevant password setting window of MM32-LINK programming software will pop up, depending on whether the password is set or not. By default, the password protection function is disabled, and the following dialog box will automatically pop up:

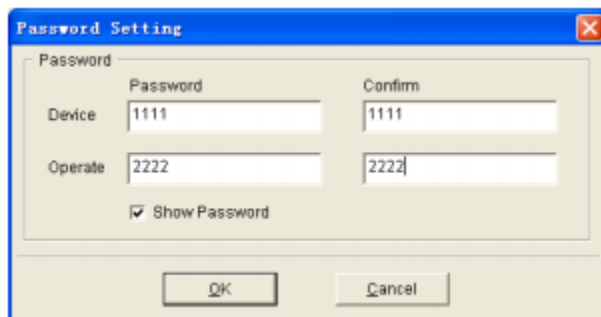


Figure 24 Password Setting Dialog Box

When the password protection needs to be set, in this dialog box, the user can enter the device protection password/confirmation password and the operation protection password/confirmation password, and the display password option is the display password. The user shall remember the device protection password. If forgetting the device protection password, the user shall contact the original factory, to clear the password protection function.

When the modify password dialog box pops up, with the programming software, the user can carry out the following operations:

1. Password protection disabling function. The password protection can be disabled through verifying the device password entered by the user, as shown in the following figure:



Figure 25 Password Protection Disabling Dialog Box

3. Device password/operation password modification function. The device password/operation password can be modified through verifying the device password entered by the user. When "*" is displayed in the password box, the original password will not be changed, as shown in the following figure:

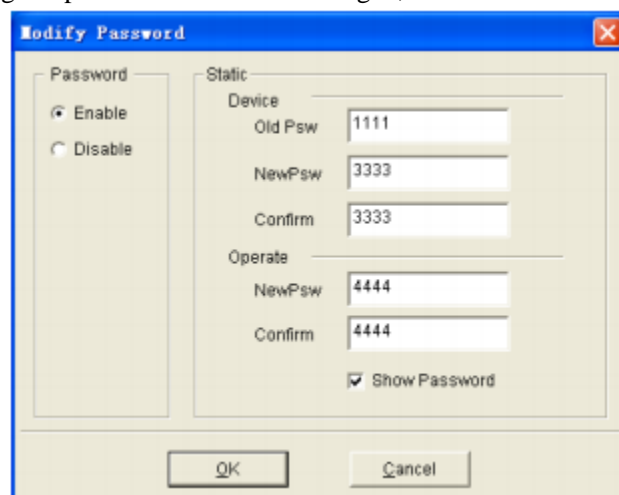


Figure 26 Modify Password Dialog Box

4. The password shall be figures or characters at least in 4 digits.

Project management

All operations of MM32-LINK programming software on target objects are based on project implementation. If no project is created, MM32-LINK programming software will not support any programming operations. Project management functions include commands of creating new projects, adding existing projects, activating projects, modifying projects, reloading project data, removing projects, saving projects, saving projects as and closing project.

Creating project

In order to realize a programming operation, a new project shall be created. The steps is as follows: click the Project | New, to execute the command, or right click in the workspace window, to pop up the right-click menu, as shown in the following figure:

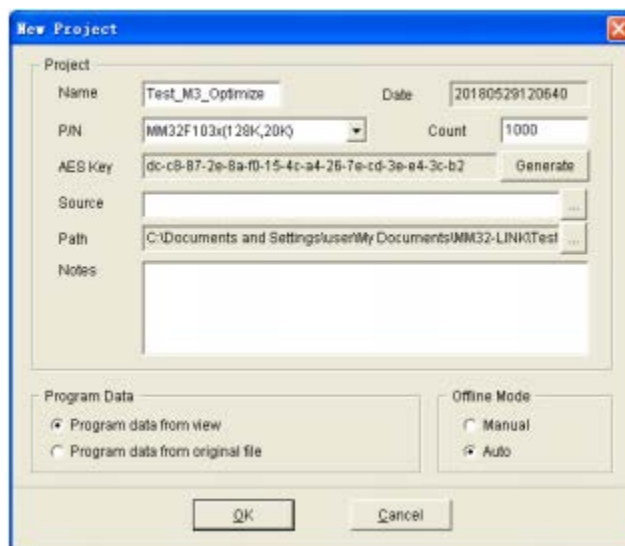


Figure 27 New Project Dialog Box

Enter the project name in the New Project window; select the name of target object (MCU), and then enter the initial value of the programmed quantity in the programmed quantity edit box; If the offline programming is required, a set of AES Key values shall be generated by clicking the Generate key, to protect the programming data of Flash in MM32-LINK; if the programming data comes from a file in the online programming mode, the path of the data file shall be entered or selected, attentively, after the project is created, the file can be dragged to the data area of the main window, with the project information remarked. After the complete project information is entered, the new project successfully created by clicking OK.

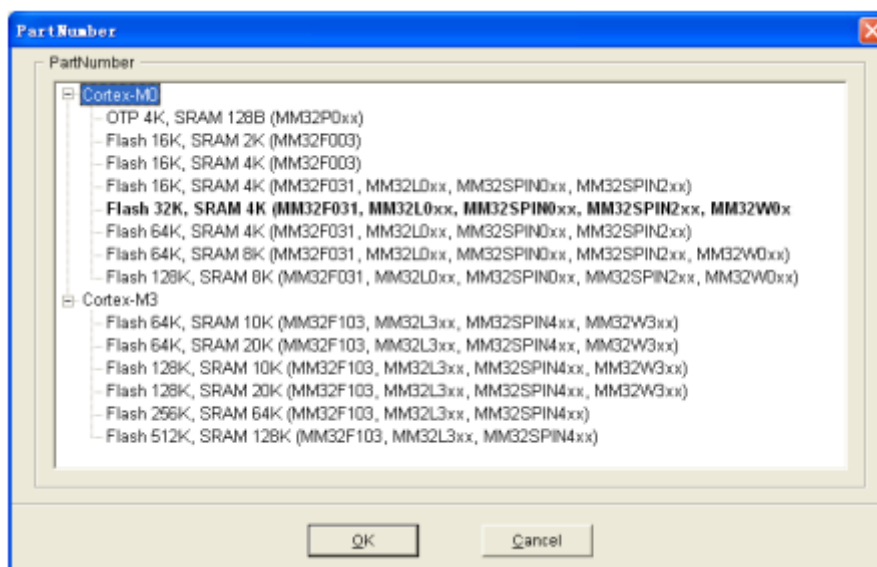


Figure 28 Programming Target Chip Selection Box

Program target chip selection box: It is classified by the programming target core into Cortex-M0 and Cortex-M3. They, under the two classified nodes, can be selected by the user according to Flash capacity and SRAM size. In the process, the programming operation shall be carried out according to the following rules. If the rules are not met, a red warning light will appear in the status bar at the bottom of the software, to prompt "selection or operation error".

1. The correct chip core shall be selected. Otherwise, a prompt box will pop up during the operation, prompting that the chip core selected for the programming project is different from the target programming chip core.
2. The appropriate Flash capacity and SRAM size shall be selected. If the Flash/SRAM size of the project is no greater than the target programming chip size during the programming process, the system enables the programming operation, prompting no errors or warning.
3. The programming software automatically matches the model and version of the target chip.



Figure 29 Prompt Box for Mismatch between Program Target Chip and Project Target Chip



Figure 30 Workspace Window

Activating project

Click Project | Active command, or right-click in the workspace window to pop up the right-click menu, activating the project. After the activation, the operation command and programming data are related to the activated project.

Adding project

Click Project | Add Existing command, or right-click in the workspace window to pop up the right-click menu, adding the project; the opened project is activated after clicking the open key.

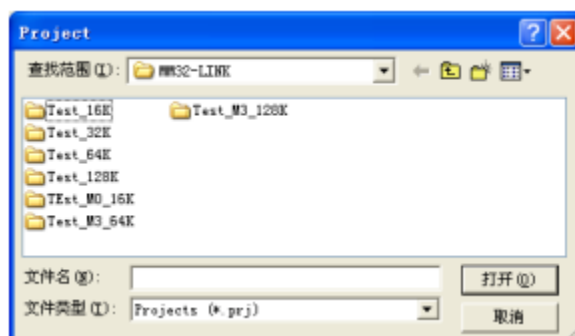


Figure 31 Adding Existing Project to Workspace

Removing project

Click the Project | Remove command, or right-click in the workspace window to pop up the right-click menu, removing the project. During the operation, the project is removed from the workspace, leaving the project file and path unchanged. If the removed project is the currently-activated project, the first project in the workspace will be activated.

Saving project

Save the project by clicking hot key "Ctrl-S", which is very convenient, or click the Project | Save or the right-click menu, to save the project. During the operation, the data of all programming data areas is saved to the project folder. After the project is saved, the file check sum is the same as the check sum of the display buffer area.

Saving project as

It is usually used for updating and upgrading the version of programming data by clicking Project | Save command, or by right-clicking in the workspace window, to pop up a right-click menu. After executing the command, the dialog box prompts "Enter the project name".

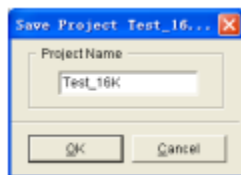


Figure 32 Project Save As Dialog Box

Click OK to save as a new project and activate it at the same time.

Reloading project data

The process of overwriting the display buffer data with the project file data is defined as the reloading of project data, which is usually used to restore the misoperation.

Closing project

Click Project | Close command, or right-click in the workspace window to pop up the right-click menu, closing the project. After the operation, all operation commands will be disabled.

Project options

The project option window has three functions: serialization/automatic programming option configuration, reset pin connection and control, Boot0 pin and control.

Serialization/automatic programming configuration option supports the self-adaption chip function

1. Either Erase flash or Erase chip shall be selected.
2. Blank is bound to the erase option, and the programming operation time is not increased when being selected.
3. Program shall be selected.
4. The verification option is bound to Program, and the programming operation time will not be increased when being selected.
5. OPTByte can be set by the user.
6. Protect can be set by the user.

Reset can be used to select pin reset, software reset or the unconnected target object reset pins.

The function of Boot0 pin is valid in ICP mode: Boot0 is in high level, Boot0 is in low level or not connected.



Figure 33 Project Options Dialog Box

Workspace

The MM32-LINK programming software provides not only abundant project operation commands but also a set of management commands, including opening workspace, saving workspace, saving workspace as, and closing workspace.

A group of related items, such as hardware version, software version, time, region and products, are saved in a workspace, to improve the production management level and reduce human errors. According to the above requirements, the programming software supports project management and workspace management functions.

Opening workspace

Click File | Open Workspace command or click the right-click menu in the work window to open the workspace.

Saving workspace

Click File | Save Workspace command or click the right-click menu in the work window to save the workspace.

Save workspace as

Click File | Save Workspace as command or click the right-click menu in the work window to save the current workspace as a new one.

Closing workspace

Click File | Close Workspace command or click the right-click menu in the work window to close the current workspace, as shown in the following figure.



Figure 34 Contents Displayed in Window after Closing Workspace

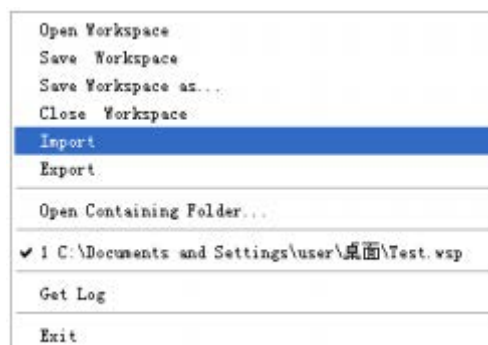
Menu

The menu of MM32-LINK programming software includes the main menu and right-click menu. In the main menu, commands can be executed by clicking the mouse or keyboard; the right-click menu is a menu that appears by right clicking in the window where the cursor is located.

File

The functions of file menu are managed by the workspace, and they are used to open the folder in which the files are saved, and to set the log of recently opened workspace and programmer by classification. The menu functions are as follows:

1. Open Workspace
2. Save Workspace
3. Save Workspace as
4. Close Workspace
5. Import
6. Export
7. Open Containing Folder (open the folder of workspace file)
8. Get Log (get MM32-LINK programmer operation log)
9. Exit (exit from the environment)



View

The View menu has three functions:

1. Target Info (displaying or closing the target object information window)
2. Memory Map (displaying or closing the main memory code mapping window, this function not available yet)
3. Project Info (displaying or closing the project information window)



Rule

The programming rule function is only applicable to the online programming mode, as follows:

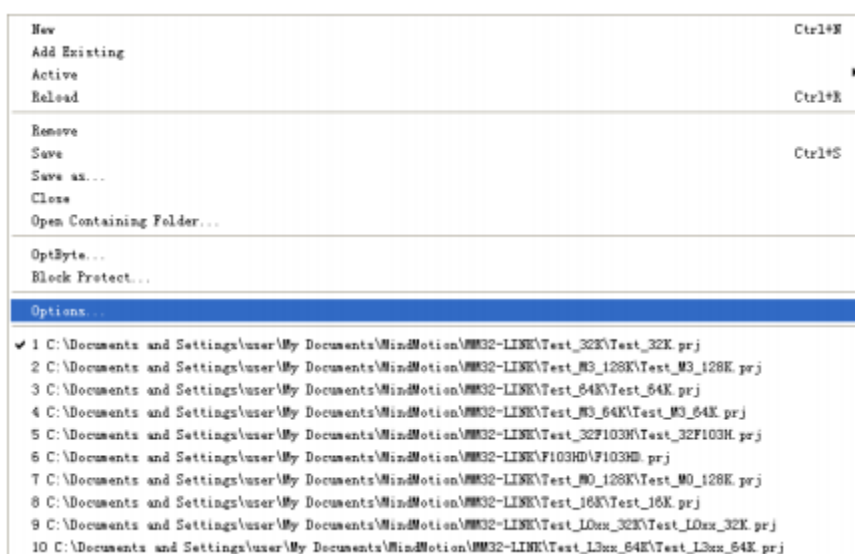
1. From File: Copy the data in the rule file to the address area specified by the rule, and increment the programming counter by one for each successful operation. obtain the offset of the file data according to the rule (it is equal to the product of the

- counter and the sum of the lengths)
2. Time/Date: Copy the time and date strings to the address area specified by the rule
 3. Group: copy the string to the address area specified by the rule
 4. Serial No.: Save the serial number to the address area specified by the rule, and add the number by one for each successful programming.
 5. Chip UID: Copy the UID of the chip continuously or discretely into the designated address area
 6. Script: Programming rules come from scripts
 7. Active: Rule settings dialog box



Project

The project menu is opened, as shown in the following figure:



In the menu:

1. New: create a new project
2. Add Existing: add an existing project to the workspace
3. Active: activate projects in the list
4. Reload: reload project programming code
5. Remove: remove the project from the workspace
6. Save: save the project
7. Save as: save the project as
8. Close: close the project
9. Open Containing Folder: open the folder in which the project is saved
10. OptByte: option byte edit box
11. Block Protect: block protection edit box
12. Options: project options

Operate

MM32-LINK programmer operation commands include the operation commands for the target object and the operation commands for the programmer; the direct operation commands for the target object are given in ICP/ISP/APM programming mode; the commands for downloading offline programming data are given in OFFLINE Download Data and Offline Program modes.

1. Connect Device: Connect MM32-LINK, with the shortcut in the device name area at the bottom left of the main window
2. Lock Operate: lock operation and enable operation, with the shortcut of Ctrl+L
3. Read: read data operation; the source data depends on the programming mode, and the page selection of the selected memory window (the same below)
4. Erase Flash: Erases the memory of main Flash area; this command is specifically used for the main Flash
5. Erase Chip: erase all data of the chip, including main Flash, OPTByte, and Protect
6. Blank: blank check, with the active area the same as that of Read
7. Write: write data operation, with the active area the same as that of Read
8. Verify: Data verification, with the active area the same as that of Read
9. Program: Serialization programming; serialize and complete Erase/Blank/Write/Verify/Encryption Sequence at one time. For sequence configuration, see Project Options
10. Auto Program: automatic producer programming operation
11. Download: download offline programming data and configuration; enable the operation in Offline Download Data/Offline Program mode
12. Set Count: Set the offline programming counter; enable the operation in Offline Download Data/Offline Program mode

✓ Connect Device	
Lock Operate	Ctrl+L
Read	F2
Erase Flash	F3
Erase Chip	F4
Blank	F5
Write MainFlash	F6
Verify	F7
Program	F8
Auto Program	
Download	
SetCount	

Options

Software, hardware and password setting menu of MM32-LINK programmer system:

1. Environments...: system environment configuration dialog box
2. Options...: programmer configuration dialog box
3. Password: setup/modify/disable/enable password dialog box, which automatically matches the corresponding dialog box according to the password status of the MM32-LINK programmer.



Help

The Help menu has four options:

1. Device info: programmer information
2. Upgrade: programmer upgrade command
3. Quick guide: quick start guide
4. About

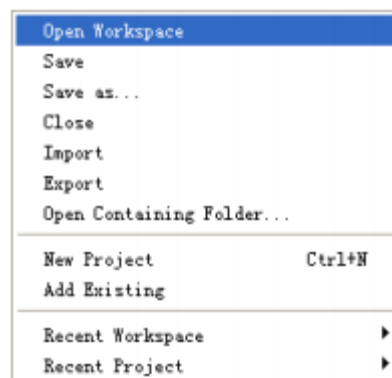


Right-click menu of workspace window

The right-click menu in the workspace window includes three forms: the position of cursor located in the workspace, position of active project and position of inactive project. Its basic functions are:

About the right-click menu of workspace

1. Open Workspace
2. Save: save workspace
3. Save as: save workspace as
4. Close: close workspace
5. Import: import file to the workspace
6. Export: export workspace to file
7. Open Containing Folder: open the folder of workspace file



About the right-click menu of project

8. New: create a new project
9. Add Existing: add an existing project to the workspace
10. Save: save the project
11. Save as: save the project as
12. Close: close the project
13. Modify: modify the project
14. Reload: reload project data
15. Remove: remove the project
16. Active: activate the project
17. Open Containing Folder: open the folder of project file



Right-click menu in memory window

The functions of right-click menu in memory window include:

1. Load...: load data files into the current memory window, supporting Hex and Bin formats
2. Save...: save the data of current memory window into the file, supporting Hex and Bin formats
3. Edit...: visually edit the data in current data window
4. Fill with 0x00: fill data window with "0x00"
5. Fill with 0xFF: fill the data window with "0xFF"
6. Fill Regular Data: fill the data window with regular data
7. 1x Units: displayed in bytes
8. 2x Units: Displayed in word
9. 4x Units: Displayed in double words
10. 8x Units: displayed in 8 bytes
11. Little Endian: display data in a little end way
12. Big Endian: display data in a big end way
13. Goto: point to the address
14. Find: inquire data



MM32-LINK operation

This section describes the operation methods of MM32-LINK programming software in password management, project management, online programming and offline programming.

Password management

MM32-LINK Programmer supports the password protection function, to protect the security of offline data. The password protection includes device password and operation password, in which the device password is the highest-level password, enabling and disabling the password protection, allowing to modify the user password. Moreover, the function is also used to view offline programming logs and clear all project data; the password is saved in the memory of MM32-LINK programmer, and the user shall remember the password that has been set.

The password setting operation method is as follows: click Options | Password in the on-line state, to set the password protection status of software tools. In case of no password, the following window will pop up:

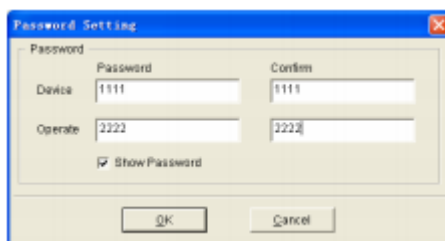


Figure 35 Password Setting Dialog Box

The following window will pop up if the password has been set:

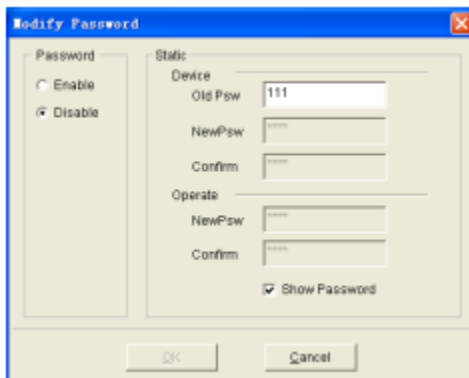


Figure 36 Modify Password and Password Disabling Dialog Box (1)

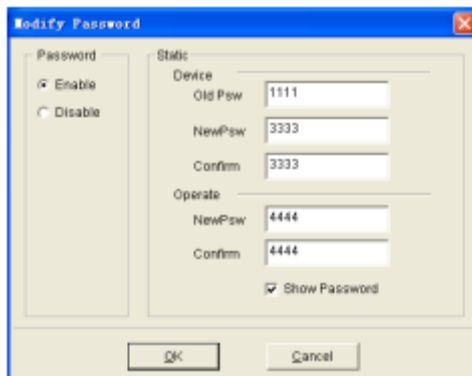


Figure 37 Modify Password and Password Enabling Dialog Box (2)

Project management

All operations of MM32-LINK programming software are based on project management described in this section, which is the core of MM32-LINK programming operations.

When using the MM32-LINK programming software for the first time, the user can use:

1. Project | New Project command to create a new project
2. Project | Add Existing command to add an existing project
3. File | Import command to import workspace file

For the first two, the save workspace dialog box, with the extension name of mmws, will pop up in the software, to save the workspace file:

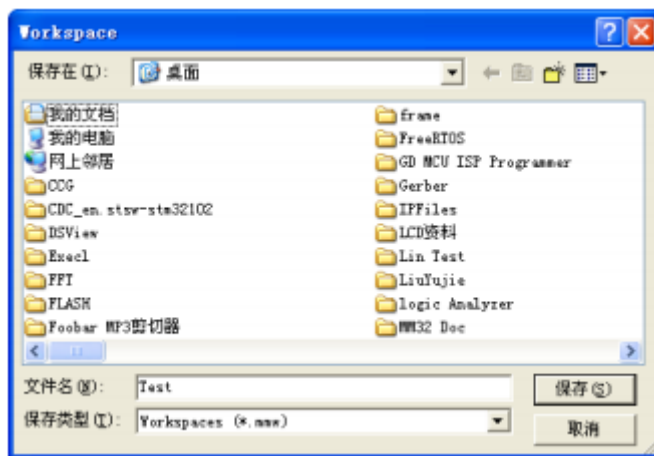


Figure 38 Save Workspace Dialog Box

The default workspace file saving path is the desktop. The user can set the workspace file saving path and the project file saving path in the Options | Environment dialog box.

After the workspace path is saved, the new project dialog box will pop up:

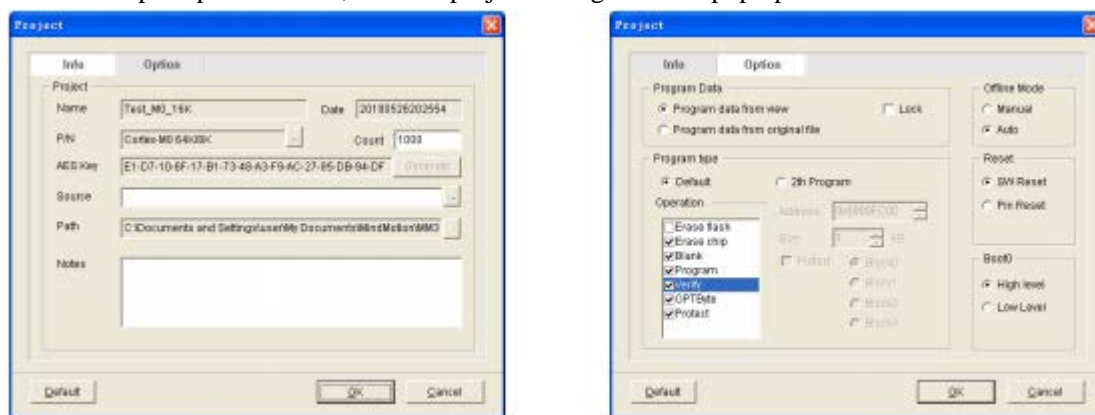


Figure 39 New Project Dialog Box

When creating a new project, enter or select the following items in the Project Information tab:

1. Project name (required)
2. Model of target MCU (required)
3. Select and modify the program counter value for batch programming
4. Source of programming data
5. Remarks

6. During the online programming, the data come from the current project memory buffer or the original data file

7. Offline programming methods

Enter or select the following items in the Project Information tab:

1. Source of programming data
2. The main window operation lock of software
3. Enabling programming sequence options
4. Secondary programming setting options
5. Offline programming mode
6. Reset mode
7. Boot0 level setting

In case of an existing project to be added, a window will pop up:

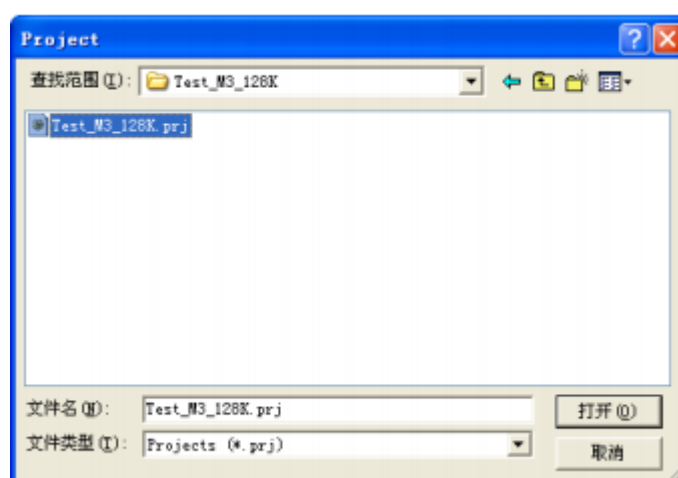


Figure 40 Add Existing Project Dialog Box

After a new project is confirmed and an existing project is added, the new project or those added by the user is added in the workspace window. At this time, the MM32-LINK programmer project operation has been completed. Subsequently, the user may load and save programming data, and visually edit the security configuration.

1. Data loading: Click the right-click menu of the memory window, to display file open dialog box in the upper right corner of MM32-LINK programming software, and select the file, then click Open to load the programming file. The user can also drag the selected file to the memory window, to load the programming file.
1. Data saving: Click the right-click menu of the memory window, to display file save dialog box in the upper right corner of MM32-LINK programming software, and enter the file name, then click Save to save the file.

On the OPTByte option page, click the tool key in the upper right corner of the memory window or the right-click menu, to edit OPTByte data:

1. ReadProtect: read protection option
2. Watchdog: watchdog option
3. Stop: stop mode option
4. Standby: standby mode option
5. DataX: user data
6. Write protection setting

- a) User-edited data
- b) Quick setup

The OPTByte data visual editing dialog box is as shown in the following figure:

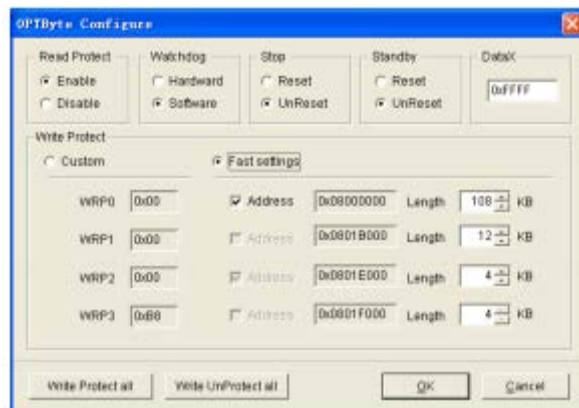


Figure 41 OPTByte Data Visual Editing Dialog Box

The definition of ReadProtect, Watchdog, Stop, Standby and DataX options in the figure are consistent with that of chip OPTByte, and will not be described in detail. The attention shall be paid to the following points when the write protection option is used:

1. If the user's OPTByte data exists and the number of write protection sections set is greater than 4, the Write Protect function will be defined as the Custom mode, allowing the user to modify it in the edit boxes of WPR0-WPR3.
2. Otherwise, the visual editing dialog box will be defined as the Fast Settings mode:
 - a) In the Fast Settings mode, only the first option button in front of Address can be modified. Once being checked, it means the Write Protect; if the button state is changed, the subsequent option buttons will be automatically changed to the state that the next is the reversed state of the current button.
 - b) If the Length of the write protection area is changed, the address or length of the next protection area will be affected; the length of the last protection area cannot be modified.
 - c) Write Protect All / Write UnProtect All key function is defined as the enabled write protection or disabled write protection in full address space.

On the Protect option page, click the tool key in the upper right corner of the memory window or the right-click menu, to edit Protect data, as shown in the following figure:

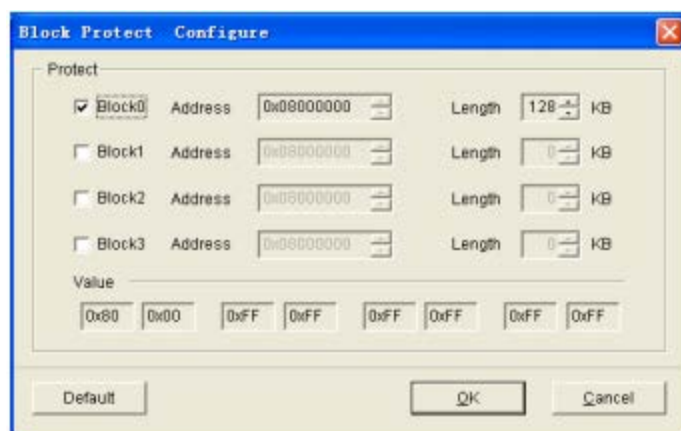


Figure 42 Block Protect Data Visual Editing Dialog Box

The dialog box protection settings define four protection blocks, all of which can be customized by the user according to the program requirements. The visual editing operation function is defined as:

1. The address of the protection block shall be arranged from small to large.
2. The address ranges of protection blocks cannot overlap with each other, but may be discontinuous.
3. The protect requirement depends on the selection keys in front of the four blocks; the address range set is protected once being checked, otherwise, the protection is invalid.
4. If the user data is invalid, the original data will be changed through the visual dialog box.
5. The protection scope of default key covers the single-block full-address space.

Programming rules

In the online programming mode of MM32-LINK programmer, after the automatic programming is initiated and the programming operation is successful, the data in the target area defined by the rules will be modified by the programming software according to the programming rules. The functions of the programming rules are as follows:

1. Enable or disable the programming rules.
2. Modify the data in the target area according to the user rule file (four sets of provision settings preset through the software). Considering that the rule file is a stream file of any format, copy the contents of the file to the area defined by the target address according to whether the Count (counter) and the selected presetting is enabled or not.
3. In terms of time and date rules, copy the time and date to the area defined by the target address according to the enabling condition and selected format.
4. In terms of Chip UID rule, copy UID to the area designated by the target address in a continuous or discrete manner.
5. In terms of the group, copy a specific string to the area designated by the target address.

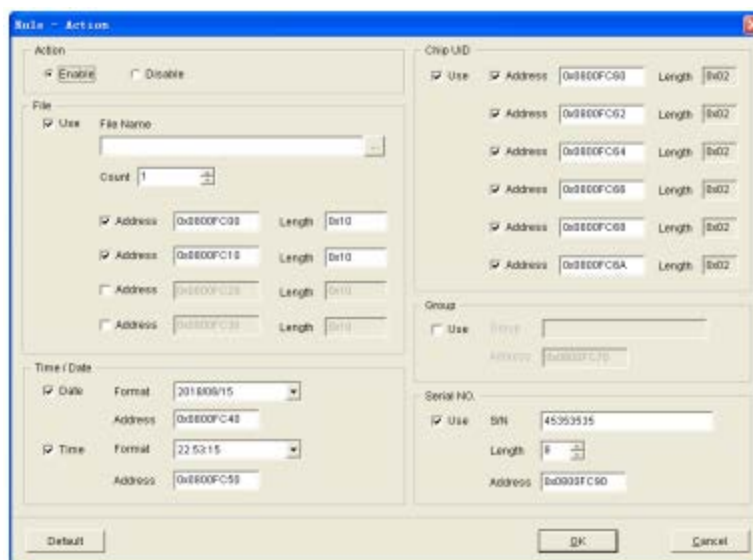


Figure 43 Programming Rules Dialog Box

6. In terms of rule of serial No., save the serial number specified by the user to the area specified by the target address, and add the number by one for each successful programming through the automatic mode.
7. Click the View | Rule Map, to display the saved data of programming rules. The data is synchronized with the automatic programming result, and the value displayed in the window will be the next data to be programmed.



Figure 44 Programming Rule Data Window

ICP/ISP/APM online programming

For the connection method of ICP/ISP/APM online programming for MM32-LINK programmer, refer to the Chapter "Connection between Programmer and Target Object". In the operating system environment, follow these steps:

1. Run the programming software MM32Program.exe, to pop up the main window of the programming software on the screen. If the MM32-LINK programmer has been connected, the green indicator and the word "MM32-LINK" appear on the left side of the figure below.



Figure 45 System Status Bar

2. If the programmer has been connected with the target object, a yellow indicator will appear on the second column on the left of the above figure; if the target object is not connected, a gray indicator will appear; if the MCU type of connected target object fails to match the project MCU type, the following window will pop up:



Figure 46 Prompt Dialog Box for Detecting Mismatch between Target MCU and Project MCU

3. After passing the above-mentioned second test, enable the developer key, prompting that the user is allowed to carry out:

- a) Read (read operation)
- b) Erase Flash: erase flash operation

- c) Erase Chip: erase chip operation
- d) Blank: blank operation
- e) Write: write operation
- f) Verify: verification operation
- g) Program: serialization programming operation



Figure 47 ICP/ISP/APM Operation Command Key

4. In case of programming in the producer environment, it is recommended to double-click the operation lock in the status bar, to disable modification of programming data and misoperation of the target object. In order to facilitate subsequent operations, the following settings shall be made in Options | Environments (software menu):

- a) Enable the Reload Last Workspace option
- b) Enable the Auto Operate option
- c) Enable the Use Password at Unlock option and set the password

See the following figure for the option settings in producer programming mode:

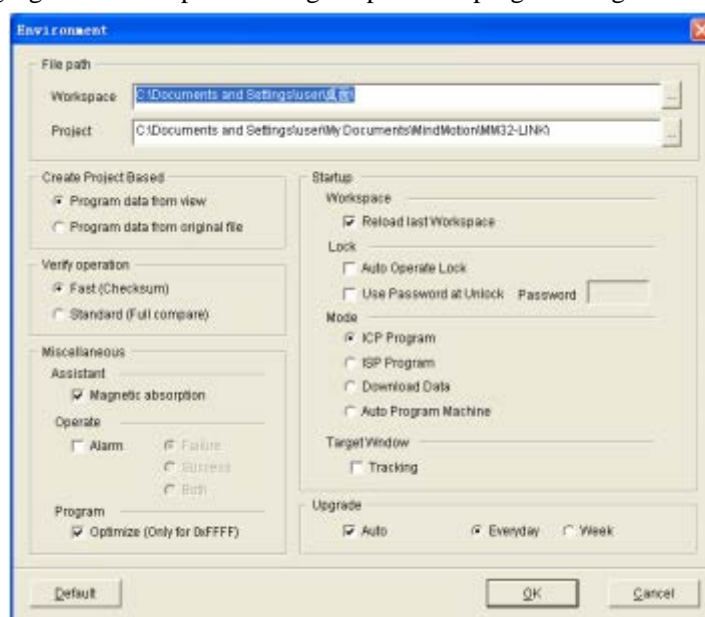


Figure 48 Option Settings in Producer Programming Mode

5. In ICP/ISP producer mode and APM mode, the producer operation keys and functions are different:

- a) Auto Program key appears in ICP/ISP producer mode
- b) Detect START & Chip Connect key appears in APM producer mode



Figure 49 Programming Operation Key in Producer Mode

- c) After the programming key is clicked, the prompt dialog box appears, with the message "waiting for the programming operation":

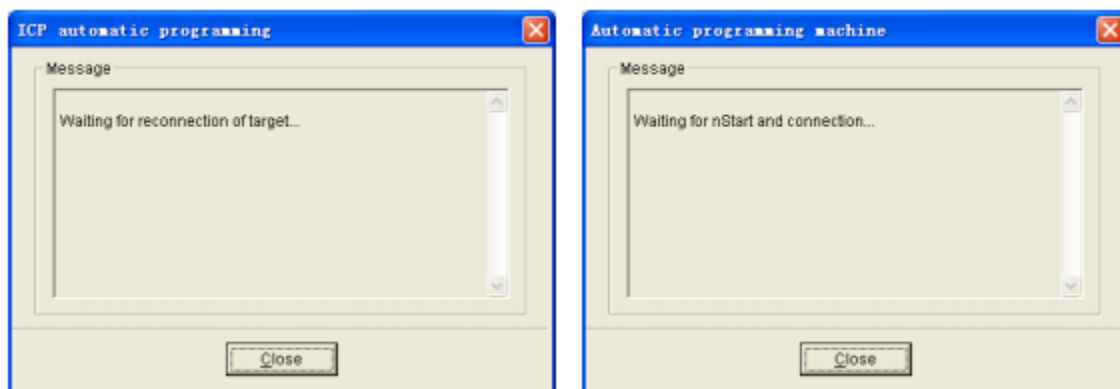


Figure 50 Programming Operation Dialog Box in Producer Mode

- d) In ICP/ISP programming mode, the automatic programming operation can be achieved by replacing the target object
- e) In APM programming mode, the programmer enables the automatic programming after waiting for the start signal from the automatic programming machine and the successful connection to the target object
- f) After the programming is correct, the programmed quantity of the online programming counter will automatically increase and the remaining quantity will automatically decrease



Figure 51 Online Programming Counter

Offline data download and configuration

In the Offline Download Data/Offline Program mode, click the producer operation key (Download, the following figure), to pop up the offline data download dialog box. The user can set the programming mode and set the counter in the dialog box.



Figure 52 Developer Operation Keys



Figure 53 Offline Data Download Dialog Box

After the Download key is clicked, the operation password will be required in case of password protection:

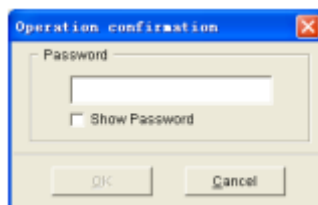


Figure 54 Password Input Dialog Box

In case of no password protection, the offline data downloading and configuration dialog boxes will pop up:

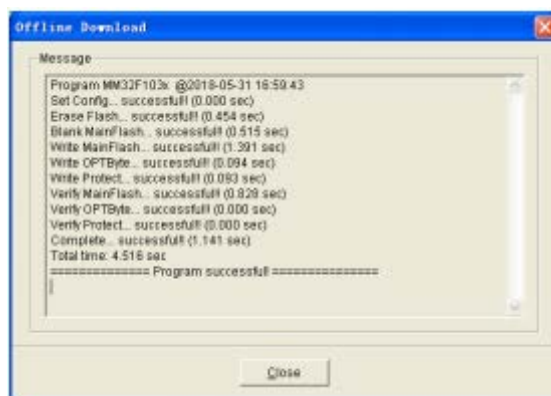


Figure 55 Password Input Dialog Box

After "correct" is prompted in the dialog box, the offline programming operation can be started.

When the password protection is disabled, the relevant operations can be performed, including read, erase, chip erase, blank write, verify, etc. If the password protection (if any) is enabled, the developer operation keys will be disabled.

Setting offline programming counter

During the off-line operation of MM32-LINK programming software, the programming counter can be set without changing the downloaded data and configuration. Click the Producer Mode Set Count key, to pop up the dialog box:

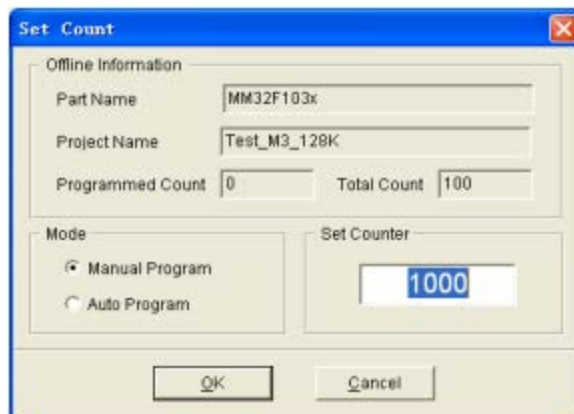


Figure 56 Offline Programming Quantity Setting Dialog Box

The setting range of the programming counter is 10 ~ 999999. For password protection tips, please refer to the Section "Offline Data Download".

Offline programming in ICP/ISP mode

The hardware configuration of the ICP/ISP offline programming adapter for MM32-LINK programmer is as follows:

1. There are 2 LED indicators, of which the green indicator represents the automatic programming mode, and the red indicator represents the manual programming mode.
2. There are 2 buttons, the mode switching button on the left and the manual programming button on the right. In the automatic mode, the manual button is disabled.
3. A 6-core programming signal interface is connected to the target object. Please refer to the appendix for connection method and pin definition.

The offline ICP/ISP programming of MM32-LINK programmer shall be carried out according to the following steps:

1. Insert ICP or ISP offline programming adapter into the 20-core socket of MM32-LINK programmer.
2. Connect the 6-core socket of the offline programming adapter with the target object.
3. The initial state of the LED indicator is determined by the offline data download configuration and setting offline programming counter options.
4. The user can switch between automatic/manual modes by pressing the mode switch button as needed.
5. In case of automatic programming mode, the operation can be achieved by replacing the target object.
6. In case of the manual mode, the user shall press the manual programming button each time for programming.

APM offline programming

The offline APM programming of MM32-LINK programmer shall be carried out according to the following steps:

1. Insert the programming adapter into the 20-core socket of MM32-LINK programmer.
2. Connect the 6-core socket of the programming adapter with the target chip. See appendix for the definition of connection.
3. Connect the 6-core socket signal of the programming adapter with the corresponding signal (same name) of APM equipment. See appendix for the definition of connection.
4. The blue, green, red and yellow LED indicators on the programming adapter respectively represent start programming, programming successful, programming failed and busy signal.
5. The key function on the programming adapter is to simulate the automatic programming machine starting programming and inputting signals.

Offline programming monitoring

When MM32-LINK programmer is in the offline programming mode, MM32-LINK programming software can be used as a window of offline programmer, to monitor offline programming process and collect relevant information.



Figure 57 Offline Programming Counter

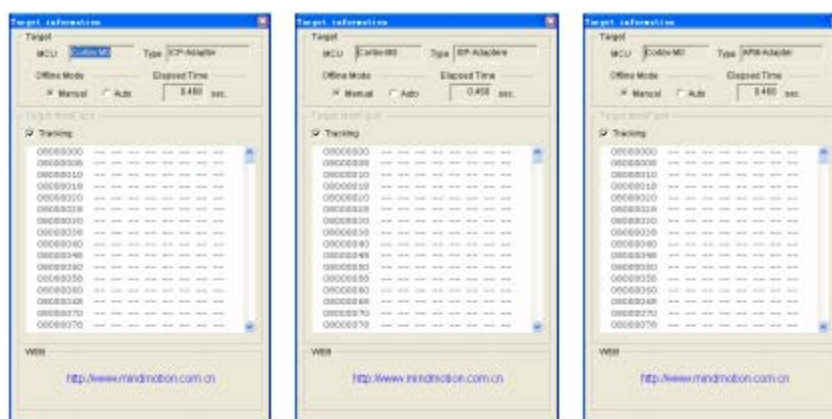


Figure 58 Target Object Information Window

Appendix

Pin signal of MM32-LINK emulator/20-core socket of programmer

Pin	Signal	Function	Pin	Signal	Function
1	Vref	Target voltage detection	2	Vref	Target voltage detection
3	res	Reserved	4	RXD	USB
5	res	Reserved	6	TXD	USB
7	SWDIO	Debugging data	8	Key 1	Key 1
9	SWCLK	Debugging data	10	Key 2	Key 2
11	res	Reserved	12	ID0	Adapter ID
13	ID1	Adapter ID	14	GND	Power ground
15	nRST		16	GND	Power ground
17	res	Reserved	18	GND	Power ground
19	Vout	Power output	20	GND	Power ground

Pin signal of MM32-LINK emulator/6-core socket of ICP-Adapter

Pin	Signal	Function
1	Vout	Programmable power output: 0V/3.3V/5.0V
2	SWDIO	Programming data line, connected to the SWDIO/TMS of the target chip
3	SWCLK	Programming clock line, connected to the SWCLK/TCK of the target chip
4	nRST/VPP	The reset/programming voltage output, connected with the reset pin of the target chip
5	Act.	Input/output pins, usually connected to Boot0 (for Flash MCU).
6	GND	Power ground

Pin signal of MM32-LINK emulator/6-core socket of ISP-Adapter

Pin	Signal	Function
1	Vout	Programmable power output: 0V/3.3V/5.0V
2	RXD	Programming data line, connected to the RXD of the target chip
3	TXD	Programming clock line, connected to the TXD of the target chip
4	nRST	The reset/programming voltage output, connected with the reset pin of the target chip
5	Boot0	Output pin, connected with the Boot0 pin of the target chip
6	GND	Power ground

Pin signal of MM32-LINK emulator/6-core socket of APM-Adapter

Pin	Signal	Function
1	Vout	Programmable power output: 0V/3.3V/5.0V
2	SWDIO	Programming data line, connected to the SWDIO/TMS of the target chip
3	SWCLK	Programming clock line, connected to the SWCLK/TCK of the target chip
4	nRST/VPP	The reset/programming voltage output, connected with the reset pin of the target chip
5	N/C	Unconnected

6	GND	Power ground
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Pin signal of MM32-LINK emulator/5-core socket of APM-Adapter

Pin	Signal	Function
1	EOF	Programming end signal; output (active high), held until the end of the next start programming signal
2	nFAIL	Programming error signal; output (active low), held until the end of the next start programming signal
3	nPASS	Programming effective signal; output (active low), held until the end of the next start programming signal
4	nSTART	Start programming signal; input (active low), with the hold time greater than 10 ms
5	GND	Power ground

Modification history

Date	Revision tag	Update record
15/05/2018		Initial version
20/05/2018	Rev 1.0	Additional contents
27/05/2018	Rev 1.1	Additional contents
31/05/2018	Rev 1.2	First draft completed
01/06/2018	Rev 1.3	Adding OPTByte, Block Protect, Password operation instructions and modifying text errors
15/06/2018	Rev 1.4	Adding programming rules
23/09/2018	Rev 1.5a	Updating the programming chip selection box, supporting chip programming of full series of Flash architectures