iMQ

MQ-LINK User Manual V2.51

iMQ Technology Inc.

No.: TDUM02- TE001-EN Name: MQ-LINK User Manual

Contents

1.	Change History
2.	MQ-Link Hardware Introduction7
3.	iMQ i87-IDE Software Installation and MQ-Link Firmware Update
	3.1 iMQ i87-IDE Software Installation83.1.1 Precautions83.1.2 Install IDE Software Tool93.1.3 Uninstall IDE Software Tool143.2 MQ-Link Firmware Update193.2.1 Automatic Firmware Update193.2.2 Manual Firmware Update20
4.	iMQ i87-IDE Software Function Description23
	4.1 General Description 23 4.2 Software Interface 23 4.3 Main Menu 25 4.3.1 File Menu 25 4.3.2 Edit Menu 25 4.3.3 View Menu 26 4.3.4 Project Menu 30 4.3.5 Build and Debug Menu 30 4.3.6 Window Menu 31 4.3.7 Settings Menu 32 4.3.8 Help Menu 37 4.4 Background on Debugging 38 4.5 IDE Project Management 39
5.	iMQ i87–IDE Debugger
	5.1 New Project

MQ Technology Inc. No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51
5 1 4 Complet	e New Project	4'
•	ogram	
	ty Settings	
• •	Options	
	options	
-	rams	
•	Code setting	
-	Mode	
-	ject and Corresponding Chip List	
•	lanagement	
•	Breakpoints	
-	akpoints	
	h	
	Watch and Adding Variables	
	rtial Variable Name Format	
	es Flash Program Setting	
5.10 SQ70 Sell	es Flash Program Setting	
6. iMQ i87–IDE Write	r Function	
6.1 Open Writer F	unction	
6.2 Writer Functio	n Introduction	
6.2.1. IC Type	Selection	68
6.2.2. Package	Pin Selection	68
6.2.3. Extra Fi	unction Selection	69
6.2.4. Rolling	Code	69
6.2.5. Pin Sett	ing	70
6.2.6. Load Pr	ogramming File	70
6.2.7. Confirm	n Settings and Start Programming	70
6.3 Writer Error M	lessage	
6.4 Open Downlo	ad Only Function Menu	
	Selection	
	e Pin Selection	
	ogramming File	
	nming	
-	r	
	Writer Function	

iMQ	Technology Inc.		
No.	: TDUM02- TE001-EN	Name: MQ–LINK User Manual	Version: V2.51
	6.5.2 EEPROM Fil	e Generator	
7.	iMO i87–IDE Error Me	ssage	
	••••		_
8.	Other Supplementary	Notes	
	8.1 Lightweight Adju	stment	
	8.2 Other Reference	Documents	
	8.3 MQ-Link Hardwa	re Signal Voltage Switching 5V/3.3V.	
	8.4 Preparations Befo	ore SQ7617 EEPROM Write	

No.: TDUM02- TE001-EN Name: MQ-LINK User Manual

1. Change History

Version	Approved Date	Description	
V2.51	2023/05/16	 English version establish Remove "5.9.3 How to enable and disable FreeRun and observe variable values ". 	
V2.5	2022/12/15	 Adjusted the original chapter "5.11.2 SQ7617 EEPROM programming" to "6.5 EEPROM Writer", and added support for Flash ROM of some MQ MCU. Adjust the original "5.11.1 Preparations before SQ7617EEPROM Program" chapter to "8.5 SQ7617 Preparation before EEPROM Program". 	
V2.4	2022/01/24	 Added "5.10 SQ76 Series Flash Program Settings". Added "5.11 SQ7617 EEPROM Writer Settings". 	
V2.3 2021/04/07 1. Added "6.4 Opening the Download Only function instructions.		1. Added "6.4 Opening the Download Only function menu" instructions.	
V 2.2	2020/3/2	 Revise "CH2 Hardware Introduction", and remove the i87-IDE hardware introduction from the content. Amended "3.1.1 Installation and Use Precautions ". Add "5.9.3 How to enable and disable FreeRun and observe variable values ". "8. Other Supplementary Notes" removes the precautions for using the MQ8603 multi-programming function. 	
 V 2.1 V 2.1 2019/12/17 A 2019/12/17 A 2019/12/17		1 "5.9.1 Variable Observation Function" updated Figure 5- 21 and Figure 5-22; added example 5. Use the mouse to select the variable to be observed in the IDE editing window,	
V2.0	2019/11/5	1. Change the file name from " i87-IDE User Manual " to " MQ-LINK User Manual ".	

<u>iMQ Te</u>	iMQ Technology Inc.				
No.: T	DUM02	2- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51	
V1.9 2018/05/04 Configuration Menu". 2. Modify item 7. Observation Menu".		2. Modify item 7. Observation variable descrip View Menu". 3. "5.7.1 Chip Items and Corresponding Debu	otion in " 4.3.3		
v	1.8		 "4.3.7 Configuration Menu" added W instructions. "5.6 Pin Settings" update. "5.7.1 Chip Items and Corresponding Debu Table" updated. Added "6. iMQ i87-IDE programming functi 	ıg Target Chip	

2. MQ-Link Hardware Introduction

MQ-Link is an IDE dedicated to MCU products (see Figure 2.1). MCU firmware on the host computer can directly download into the Flash on MCU through MQ-Link, and then execute debug functions, this will greatly increase the efficiency of user firmware development. There are two slots on the MQ-Link. The left port of the MQ-Link in Figure 2.1 is a Mini USB port, which can be connected to a PC (host computer); the right port is connected to the Evaluation Board(EV board) or the user's PCBA (Please see Figure 2-2). For the pin position definition of the slot, please refer to the label on the Q-Link (reserve 6 pins including VCC, OCDIO, OCDCK, RESET, GND, and MODE pin position).

When Connect to the user PCBA, pay attention to the following:

- 1. Because the MQ-Link default power supply is 5V (can be modified to 3.3V), so when connecting, do not plug in an external power supply on the PCB board.
- 2. Note that the OCDIO, OCDCK, RESET, and MODE pins of the IC must be confirmed to be floating before connecting to the MQ-Link, to avoid the circuit on the PCB from affecting the MQ-Link debugging signal.

Two LEDs on the front of the MQ-Link. When connected to the host computer, the green LED will start to flash, indicating that it is working (Active); if the red LED is on or the green LED is always on\not on, it means an error (Error). Note that since the label is located above the LED, the light from the LED will show through the label.

For the host computer software used by MQ-Link, please refer to the following chapters of this manual.



Figure 2.1 Front view of MQ-Link



Figure 2.2 Connection between MQ-Link and EV Board (there is a product chip on the EV Board)

3. iMQ i87-IDE Software Installation and MQ-Link Firmware Update

3.1 iMQ i87-IDE Software Installation

3.1.1 Precautions

MQ-Link uses the iMQ i87-IDE host computer software; please refer to the instructions in the following chapters. Also, please note the following:

1. When using IDE software for program debugging, do not disable MCU "External Reset" pin, otherwise, IDE will not work normally.

2. When writing the assembled program, please be sure to use the correct assembly format that conforms to the i87 standard; if the format is not in compliance, the IDE may not work properly.

3. One should notice that the I/O port of MQ-LINK does not have a pull-down resistor. If you want to use the iMQ MQ8S series MCU(which has a pull-down resistor), whether each MCU has the function of a pull-down resistor (refer to MCU product specifications), please also connect an external pull-down resistor on the Target board.

Note 1): The MQ-LINK external pull-up resistor only provides the pull-up function, and there is no "Enable/ Disable " pull-up resistor function.

3.1.2 Install IDE Software Tool

As shown in Figure 3.1, move the cursor to the IDE software installation file (the file name usually contains version and date, for example, the V3.87 version released on November 25, 2022, the installation file name is "iMQ_IDE_v3.87(20221125).exe") click mouse right button. Please note that if there is a message indicating that you need to execute as a system administrator, please use "Run as administrator" to install; if not, click "Open" to install.

Note): As shown in Figure 3.1, move the cursor to the location of the "iMQ_IDE_V3.87(20221125).exe" installation file, and click the mouse right button. Please note that if there is a message indicating that you need to execute as a system administrator, please use "Run as administrator" to install; if not, click "Open" to install.



Figure 3.1

Windows system will pop up an alarm dialog, and click the "Yes" button, as shown in Figure 3.2.

User Account Control × Do you want to allow this app from an unknown publisher to make changes to your device?			
iMQ_IDE_v3.87(20221125).exe Publisher: Unknown File origin: Hard drive on this computer Show more details			
Yes	No		

Figure 3.2

After that, select the file path to be installed and the name to be displayed in the Start menu, as shown in Figure 3.3 and Figure 3.4.

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51
	🖁 Setup - iMQ i87-IDE — 🗆 🗙	
-	Select Destination Location Where should iMQ i87-IDE be installed?	
	Setup will install IMQ i87-IDE into the following folder.	
	To continue, dick Next. If you would like to select a different folder, dick Browse.	
	C:\MQ\MQ IDE Browse	
	At least 83.3 MB of free disk space is required.	
	Next > Cancel	
	Figure 3.3	

뤻 Setup - iMQ i87-IDE	-		×
Select Start Menu Folder Where should Setup place the program's shortcuts?			
Setup will create the program's shortcuts in the following S	tart Me	nu folder.	
To continue, click Next. If you would like to select a different folder,	click Br	owse.	
IMQ i87-IDE	E	Browse	
< Back Nex	:t >	Car	ncel

Figure 3.4

Move the mouse cursor to "Create a desktop icon" and check it. After the installation is complete, the IDE execution shortcut will automatically generate on the desktop of the computer. Then move the cursor to the "Next" position and press the left mouse button. Figure 3.5.

No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51
👸 Setu	p - iMQ i87-IDE — 🗌	×
	ct Additional Tasks hich additional tasks should be performed?	
	elect the additional tasks you would like Setup to perform while installing iMQ i87-1 en dick Next.	IDE,
A	dditional shortcuts:	
	☐ Create a desktop shortcut	
	< Back Next >	Cancel

Figure 3.5

Move the cursor to the "Install" position, and press the left mouse button to start the installation, as shown in Figure 3.6.

🔀 Setup - iMQ i87-IDE			~
B Setup - INIQ 187-IDE	_		×
Ready to Install			\sim
Setup is now ready to begin installing iMQ i87-IDE on your compute	r.	(
Click Install to continue with the installation, or click Back if you wan change any settings.	nt to revie	ew or	
Destination location: C:\jMQ\jMQ IDE		^	
Start Menu folder: iMQ i87-IDE			
Additional tasks: Additional shortcuts: Create a desktop shortcut			
<		>	
< Back In	stall	Car	icel

Figure 3.6

After the installation is complete, click "Finish".



Figure 3.7

After that, a shortcut icon of the IDE will appear on the desktop of the computer, as shown in Figure 3.8.



Establish relation between IDE project files and IDE software In the IDE project file, double-click .pmt file, and follow the dialog step to establish an open .pmt file and iMQ 187-IDE software relation, as shown in Figure 3.9.



iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

3.1.3 Uninstall IDE Software Tool

Open "Settings" in the Start menu, as shown in Figure 3.10. After the screen shown in Figure 3.11 appears, click the "Apps" button.

	Recently added	Productivity
	MQ i87-IDE	•3 ••
	#	🜔 🔺 🖉 💼
	3D Viewer	Microsoft 365 S Mail
	c	
	Calculator	💽 🔼 💉
	🛗 Calendar	Microsoft Edge Photos Microsoft To
	Camera	Explore
	Clock	
	Cortana	📕 😇 Đisnep+
8	F	Microsoft Store Spotify - Musi
	Preedback Hub	
	G	Microsoft Movies & TV Solitaire Collection Play
	🧖 Get Help	Jointaire Collection Proy
@<	Google Chrome	
Ċ	Groove Music	
	✓ Type here to search	H 🗖 💽 🗐 🖻

Figure 3.10

Settings							-	×
			Find a setting		Q			
	口	System Display, sound, notifications, power		Devices Bluetooth, printers, mouse		Phone Link your Android, iPhone		
		Network & Internet Wi-Fi, airplane mode, VPN	4	Personalization Background, lock screen, colors		Apps Uninstall, defaults, optional features		
	8	Accounts Your accounts, email, sync, work, family	A ₽	Time & Language Speech, region, date	⊘	Gaming Xbox Game Bar, captures, Game Mode	2	
	Ģ	Ease of Access Narrator, magnifier, high	Q	Search Find my files, permissions	A	Privacy Location, camera, microphone		
			Fig	ure 3.11				

After the program list in Figure 3.12 appears, click the installer of iMQ i87-IDE (the name

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

usually includes the version, such as iMQ i87-IDE version V3.87), and press "Uninstall" to confirm the removal of the program. (Figure 3.13)



Figure 3.12





After the program is removed, the words "iMQ i87-IDE was successfully removed from your computer" will appear in the window. After pressing the "OK" button, the installed i87-IDE software will be removed, as shown in Figure 3.14.



Figure 3.14

Then go to the "Program Files" subdirectory of the IDE installed disk(for example "C" disk), move the cursor to the subdirectory "iMQ" (Figure 3.15), click the right button of the mouse, and then Figure 3.16 will appear. Move the cursor to "Delete" and press the left button to complete the removal of all iMQ i87–IDE items.

🟪 🖸 📙 🖛 🛛 Manage Local	Disk (C:) $ \Box$ \times
File Home Share View Drive Tools	~ 🧃
\leftarrow \rightarrow \checkmark \uparrow \blacksquare \rightarrow Thi \rightarrow Local \checkmark \circlearrowright	
🗄 Documents 🖈 ^ Name	Date modified Type
📰 Pictures 🖈 🔄 Download	5/3/2023 12:06 AM File folder
Download iMQ	5/8/2023 2:18 AM File folder
Local Disk (C:)	12/7/2019 1:14 AM File folder
Music Program Files	5/2/2023 7:47 PM File folder
SQ7615 Program Files (x86)	5/2/2023 7:06 PM File folder
Users	5/2/2023 7:19 PM File folder
OneDrive - Person	5/2/2023 7:39 PM File folder
💻 This PC	
🧊 3D Objects	
E. Desktop	
Documents	
🕹 Downloads 🗸 🧹	
7 items	

Figure 3.15



Figure 3.16

3.2 MQ-Link Firmware Update

3.2.1 Automatic Firmware Update

The firmware update is to adapt for new MCU support and to have the best performance and features.

After the MQ-Link hardware is connected to the IDE software of the host computer, it will check the MQ-Link firmware version; if the firmware version does not match with the IDE software it will automatically update the firmware.



3.2.2 Manual Firmware Update

Open the IDE software, and connect the MQ-Link hardware to the host computer through a USB cable. The dot on the lower left turns green to indicate that MQ-Link is connected and the following operations can be performed, In the IDE menu bar "settings", select "Firmware Upgrade...", will pop up the Firmware upgrade dialog, as shown in Figure 3.17.





Click the "Browse(B)" button in the dialog box to select the firmware file to be upgraded, as shown in Figure 3.18 and Figure 3.19.

ÎMQ iMQ i87-IDE				- 🗆 X	<
: <u>Fi</u> le <u>V</u> iew <u>P</u> roject <u>S</u> ett		⊜ ∮: ≇ ∉ ∃	e : 🙀	- AA : :	
FileView 9	x				
⊡ iMQ Project					
Source Files	Firmware OS Upgrade				
Header Files Object Files Library Files	Firmware File Path:		Browse(B)	-	
LCF File					
Debug File					
	Progress:				
		Download	Abort!		
				4	; ,
	Now in Bootloader mo			1	^
	Now In Doolloader mo	de. Ready for 00 op	grade.		
	Hardware Removed. Hardware detected:				
	IMQ OCDE OS v3.8.7	BT V1.0.0 MQ-Lin	k00354		l
	iMQ i87-IDE v3.87(202				
	Firmware Download S IMQ OCDE OS v3.8.7		k00354		
					1
					12

Figure 3.18 i87-IDE firmware upgrade dialog box

: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.5
ÎMQ iMQ i87	IDE	- 🗆 X
i Ele Viev i ≧ œ FieView □ iMQ Proj □ Source - Heade - Objec - Library - LCF Fil - Debug		× #4 : :
	2 Download! Abort! IMQ OCDE OS v3.8.7 BT V1.0.0 MQ-Link00354 IMQ 07JDE v3.87(20221125) Firmware Download Succeeded! IMQ OCDE OS v3.8.7 BT V1.0.0 MQ-Link00354 Hardware detected: IMQ OCDE OS v3.8.7 BT V1.0.0 MQ-Link00354 Hardware in OS mode. Switching to Bootloader mode	4 ×



Click the Download icon indicated by the red arrow 2 in the dialog box in Figure 3.19. After clicking, a dialogue as shown in Figure 3.20 will appear. Please click OK directly to continue the firmware upgrade process.

	=			
MQ iMQ i87-IDE - [C:\Download\S	[7615\main.c]		- 0	\times
iMQ Eile Edit View Projec	t <u>B</u> uild <u>D</u> ebug <u>S</u> ettings <u>W</u> indow Pro	tect <u>H</u> elp		- 8×
: 🏠 🚅 🔛 🕼 🎽 🚔 🔲 .	: 🖻 💼 l o o 🗩 l 🎒 🥊 🗐 🗄	1 G I 🦬	- 🦀 🛤 🙀 🖬	(i
: 🏥 🔲 🔯 📔 Debug Version				
FileView 4	main.c			4 Þ 🗙
⊡. new.pmt ⊕. Source Files	2 // 档案名称 · main.c	*****	******	****
-	irmware OS Upgrade	×		
Object Files Library Files = LCF File	Firmware File Path:	Browse(B)		
Debug File	C:\iMQ\iN iMQ i87-IDE	×	*****	****
Code Generation Tool Generation Tool Generation Tools	About to Upgrade Firmwar	re QS, Are you sure?		
	Progress		*/	
	0	Cancel	*/	
	Download	Aborti		•
	Output Window			ąх
	Switching to Bootloader mode			^
	Hardware detected: IMQ OCDE OS v3.8.7 BT V1.0.0 MQ-Lini	k00354		
	Hardware in OS mode.			
	Switching to Bootloader mode			~
			W: PC:	

Figure 3.20 Dialog box for confirming firmware file download

After clicking OK, there will be a few seconds to wait for the upgrade. Afterward, if the dialog box information shown in Figure 3.21 appears, it means that the firmware upgrade has been completed. Otherwise, please repeat the above operations until the firmware version is upgraded successfully.



Figure 3.21 i87-IDE firmware upgrade successful dialog box

4. iMQ i87-IDE Software Function Description

4.1 General Description

iMQ i87-IDE is an integrated development environment that can complete functions such as code editing, compiling, and debugging during the development and debugging of various MCU application systems. Currently supported hardware is MQ68xx, MQ69x, and SQ series ICs. The software has two modes: Compile Mode and Debug Mode. The menus will be different in different modes. In the debug mode, the source code can also be edited, modified, and compiled.

When the software is running in the editing mode, the user uses the editing and compiling functions of the software, such as opening or creating new files, copying, pasting, cutting, setting editing bookmarks, etc., without hardware support. When you click the "Debug" button or the shortcut key F5, the software runs in the debug mode. After that, the user can perform various debugging actions, such as running, single step, and variable observation and modification.

4.2 Software Interface



Figure 4.1 IDE software interface

The operation of the IDE interface is shown in Figure 4.1, which is divided into 6 parts, as follows. Different parts have different mouse right-click menus.

1. Project Title - The project title shows the path and name of the currently open file.

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

- 2. Main Menu From the main menu, you can view information about the software, or complete all operations.
- **3.** Shortcut Toolbar The shortcut toolbar contains icons for some commonly used operations to speed up operations without the need to execute menu commands; the functions are the same as the commands in the menu.
- **4. Project Window** The Project (Project) window contains sub-windows such as Project, General Registers, Special Registers, and Stack.
- **5.** Source program window The source program window displays the source program interface, and the user can edit and modify the source program, and set breakpoints, and bookmarks in this window.
- **6. Status bar** The status bar displays the running status of the current tool and displays common information such as PC and running time.

4.3 Main Menu

In different modes, the main menu will be different, but the functions are the same. The main menu is divided into **File, Edit, View, Project, Build, Debug, Settings, Window, help, and** other submenus.

4.3.1 File Menu

The "File" menu includes: New, Open, Close, Save, Save As, Print, Print Setup, Recently Files, Recently Projects, and Exit. Among them, the recently files (projects) are used to reserve the names of the four recently opened files (or projects), and the user can directly open them here to speed up the operation.

4.3.2 Edit Menu

The "Edit menu includes: Undo, Redo, Cut, Copy, Paste, Delete, Select All, Comment Selection, UnComment Selection, Find, Find Next, Find Previous, Replace, Go To Line, Find in Files, Match Brace, Select To Brace, Read Only, Toggle Bookmark, Next Bookmark, Previous Bookmark, Clear All Bookmarks. Some of the special features are as follows:

1. Comment Selection – After you select a text block by dragging the mouse in the editor, execute this function from the main menu or right-click the menu, and you can set each line where the text block is located as a comment. The symbols used for comments depend on the language. The .asm file uses ";" as the comment symbol, and the C or C++ source file uses "//" as the comment symbol.

2. UnComment Selection – It is used to remove the comment mark of the text block that has been set as a comment. If the selected text block is an ordinary text, this command will not have any action.

3. Go To Line – each source code line has a corresponding line number, you can use this function to quickly jump to the code line you specify.

4. Match Brace – if brackets are used in the source code, such as {}, [] in c language, if there are many contents in the brackets, or there are many nesting layers of brackets, it is usually more difficult to locate the other side of the brackets Trouble, using the bracket matching function can help you quickly locate the other side of the bracket. The method of use is to position the editing cursor on one side of the bracket and then execute this function, and the editing cursor will immediately jump to the other side of the bracket.

5. Select bracket content – you can quickly select the content between a pair of brackets: put the editing cursor on one side of the brackets, and then execute this function, you can see that the content between the brackets has been selected. Then you can copy, cut, delete, etc.

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

6. Read-only – It is a toggle key, which can quickly set or cancel the read-only attribute of the file editing window. Read-only attributes are displayed in the status bar. Check here if you find that you cannot modify the file.

7. Advanced Bookmarks – The following are shortcuts for setting, canceling, and navigating to bookmarks 0 to 9:

Set/Cancel Bookmark n: Press "Ctrl+n" Navigate to bookmark n: press "Alt + n" (where n = 0 ~ 9)

4.3.3 View Menu

The view menu includes **Full Screen**, **Project**, **status bar**, **toolbars**, **Output**, **Debug Window**, and **Display Line Numbers**. It is used to call up various windows for observation.

1. Project Bar- Create a new project, open a project, and save a project in sequence.

2. Status Bar- Displays basic status information such as operating mode, program counter, running time, etc.

3. Toolbars – including Standard bar, Find bar, and Text bar. (Figure 4.2)

Standard bar: open file, create new file, save file, save all.

Find bar: search content input area, search, find next, find previous. Enter the content you want to find in the search input area and press "Enter". If a match is found, the cursor will be positioned at the first match; Find Next "F3" and Find Previous "Shift + F3" are used to find and position the next or previous match respectively. If you need more search conditions, you can click the Find button to set the search settings and execute the search in the search dialog box.





Note): You can also search directly in the file, specify the search content, extension rules, and search directory to find files containing the specified content in the specified directory.

3. Debug Window -

ComReg window– In the Common register window, the hexadecimal value is displayed according to the address, see Figure 4.3. Among them, the gray background color is the register whose value has not changed, and the red background color is the register whose value has changed. It is divided into 5 levels, and the change of the register within 5 steps can be recorded. The earlier the change, the lighter the register color. When the mouse clicks on a register, its background color will be displayed as white. At the same time, the address and binary value of the register will be displayed at the bottom of the window. The

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

value of the register can be directly modified.



Figure 4.3 Common registers

SpecialReg window– in the special register window, the hexadecimal value of the register content is displayed after the special register name, when the mouse moves over the value, the binary result will be displayed, which is more convenient For observations, see Figure 4.4. At the same time, the address and a brief description of the register will be displayed at the bottom of the window. You can directly modify the value in the special register window, or click "..." in the value box to view the function description of the corresponding bit of the special register, and then configure the register according to the function.

SpecialReg	中
SYSCRO	40
PMR	00
RSTFLG	09
RTCCRO	80
RTCCR1	00
RTCSEC	00
RTCMIN	00
RTCHR	00
RTCDAY	00
RTCWDAY	00
RTCMONTH	OR
RTCYEAR	042
RTCALMIN	8.Bin:00000000
RTCALHR	80
RTCALDAY	80
RTCALWDAY	80
RTCTMRCR	00
D TOTI (D TO	

Figure 4.4 Special Registers

Dump Memory window- used to view chip memory data. Enter the specified address, and display a maximum of 64 pieces of data including the specified address.

SRAM / SFR Address										Fla	ash Ad	ldress				
Address																
c000				(nput	addre	ess									
Address	0	1	2	3	4	5	6	7	8	9	A	В	С	D	E	F
0xC000	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
0xC010	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
		FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
0xC020	FF															

Figure 4.5 Memory observation window

Assembly window – The Assembly window displays the reverse generation of assembly code from machine code. This window provides the function of directly modifying assembly instructions or machine instructions, see Figure 4.6.

Assemble				φ×
Address	Disassembly	Opcode	•	~
46	LD (IY),C	F5 7A		
48	INC IX	34		
49	INC IY	35		
4A	DEC WA	38		
4B	JRS F, 0x0044	B7		
4C	CALL 0x0051	FD 51 0	0	
4F	JR 0x004F	FC FE		
51	CLR (0x3A).0	C8 3A		
53	LD (0x1000),0x63	F1 00 1	0 F9	
58	LD WA,0x1000	48 00 1	0	
5B	PUSH WA	50		
5C	CALL 0x00CB	FD CB 0	0	
5F	POP DE	D2		
60	LD WA,0x03E8	48 E8 0	3	
63	LD (0x1013),WA	F1 13 1	0 68	
67	LD (0x29),0x4E	0A 29 4	E	
6A	NOP	00		
6B	NOP	00		
60	NOP	00		~
FileView	ComReg SpecialR	Assemble	ChipIr	nfo

Figure 4.6 Assembly window

Watch window- The Watch window can observe various variables, including user-defined variables, special register variables, program labels, etc. If you use a high-level language such as C language, you can also observe complex data such as arrays and structures Structure, see Figure 4.7.

iMQ Technology Inc. No.: TDUM02- TE001-EN Name: MQ-LINK User Manual Watch # × Name Value Address

Name	Value	Address	^
- abuffer	Array	1015	
- [0]	0x0000	1015	
- [1]	0x0000	1017	
- [2]	0x0000	1019	
- [3]	0x0000	101B	
- [4]	0x0000	101D	
[5]	0x0000	101F	
[6]	0x0000	1021	
- [7]	0x0000	1023	
- 181	0v0000	1025	
Find In Files Result 🛛 🐺 W	/atch Dump Memory		

Figure 4.7 Observation variables

Note): Quick Start: In debug mode, double-click the blank line under Name, enter the variable name to be observed, and after confirmation, you can see the corresponding address and value in the name and value fields, unless the entered variable name is invalid or Not within the scope, you can change the observation properties of the variable through the right-click menu, such as switching the number system represented and setting all variable properties, etc., as shown in Figure 4.8.

Symbol	abuffer	OI
Size	16 bits 💌	Can
Format	Hex]
Endian	Little-Endian 💌	1
ANTT - 11	a	
– All Variable	es Setting	
	es Setting un Watch Enable	
🗖 Free-R	2	

Figure 4.8 Watch Window property setting

<u>R</u>eFresh <u>D</u>elete <u>C</u>lear All <u>Export</u> Properties

Symbol window – The symbol window saves the debugging information of the symbol table. The symbols in the symbol table can be directly added to the watch window through the right-click menu, and the observed variable is based on the symbol table. If you want to confirm a variable name or symbol If the name can be observed, you can open the symbol window to check whether the symbol exists in the symbol window, if not, then it cannot be observed, see Figure 4.9.

iMQ reserves the right to change the information in this document without prior notice. Please contact iMQ to obtain the latest version of product specification before placing your order. Use of iMQ devices in life support is entirely at the buyer's risk, and the buyer agrees to defend, indemnify and hold harmless iMQ from any and all damages, claims, suits or expenses resulting from such use.

Version: V2.51

TDUM02- TE001-EN	Name: M	Q–LINK User	Manual		Version: V2.51
	Symbol			φ×	
	Symbol Name	Address	Туре	^	
	L2	0x4F	Variable		
	L2	0x67	Variable		
	L2	0xE8	Variable		
	L5	0x76	Variable		
	move_n_data	0x44	Variable		
	move_t_data	0x31	Variable		
	non_n_data	0x4C	Variable		
	non_t_data	0x39	Variable		
	p_dummy	(SP)+0x03	Variable		
	r_dummy	0x102B	Variable		
	r_tmp	0x1000	Variable		

Find In Files Result & Watch Symbol

Figure 4.9 Symbol window

4.3.4 Project Menu

iMQ T No.: T

> The project menu includes **new project**, **open project**, **close project**, **save project**, **save project as, project properties**, and **pin setting**. Project property is used to open the project property dialog box, which is used to modify project properties, such as changing compile options of assembler and C compiler, etc. For the specific set of project properties, see "5.4 Project Property Settings".

4.3.5 Build and Debug Menu

The Build menu includes **Release Ver., Debug ver.(**compile debug version, compile release version), **link, View link Map,** and **Download Only.**

The Debug menu includes **Start debug, End debug, Go, C Step Over, Run to Cursor, A Step In, A Auto Step, Pause, Reset,** and **Trace**. These functions, as the name suggests, are the same as general debug functions. Here are a few important commands.

1. C Step Over – Execute one C program line downwards, and jump into the subroutine to perform a single step when encountering a subroutine.

2. A Step Over – Execute one assembly program line downwards, and jump into the subroutine to perform a single step when encountering a subroutine.

3. A Auto Step – Automatically execute assembly single-step operations continuously. Using this function, you can intuitively observe the running track of the program, and the interval between single steps is 1 second.

4. Reset – Perform a reset operation, not a power-on reset, similar to the reset caused by the RST reset pin, but only modify the PC pointer and SFR.

4.3.6 Window Menu

The Window menu includes New Window, Close All Documents, Tile Horizontally, Tile Vertically, Split Window, Window File List, and ReMap All Windows. It mainly completes some operations such as tiling and splitting of the source program editing window.

4.3.7 Settings Menu

The Setting menu includes IDE Config..., Set Compile..., and Firmware Upgrade.

IDE Config...: IDE parameter settings include general settings (General), color and output window font settings (Colors and Fonts), grammar settings (Languages), etc. The following are some commonly used pages:

1. General - general settings (as shown in Figure 4.10)

Maximize window – Whether to maximize the window when starting the software. Open Last Project – Whether to open the last project when starting the software. System language – software interface language, you can choose English or Chinese Check File Modification–Checks if the file has been modified by an external program. Mini Toolbar – Whether to display the mini editing toolbar.

Copy on Mouse Selection – Whether to automatically copy the selected text. **Save All Documents Without Prompting** – Automatically save all documents on exit.

Preferences		×
General Colors and Fonts H Languages File Filters File Associations	General On Startup ✓ Maximize Window Open Last Project System Language English ✓ Mini Toolbar Copy On Mouse Selection On Exit ✓ Save All Documents without Prompting Debug ✓ Use Log File Other ✓ Check build version while enter debug	
	Ok Apply Cancel Help	

Figure 4.10 General settings (General)

2. Colors and Fonts - color and output window font settings (as shown in Figure 4.11)

Preferences		\times
General	Colors and Fonts	
Colors and Fonts B: Languages File Filters File Associations	Color Caret Color Goto line Color Selected Text Foreground Color Selected Text Background Color Highlight Current Line Enable Right Edge Warning Bookmark Line Selected Text Packground Color	
	Right Edge Ok Apply Cancel	

Figure 4.11 Colors and Output Window Font Settings (Colors and Fonts)

Caret Color - Sets the caret color.

Goto Line Color – Sets the color of the jump target line using the goto positioning dialog. **Selected Text Foreground Color** – Sets the selected text foreground color.

Selected Text Background Color – Sets the selected text background color.

Highlight Current Line – Sets the color used for the current line highlight.

Enable Right Edge Warning - Sets the right margin warning line color.

Bookmark Line - Sets the line color of the bookmark.

Breakpoint Line - Sets the color of the line where the breakpoint is located.

Debug Step – Sets the PC line color when stepping.

Right Edge - Specifies the number of characters which the right margin warning line.

Output Font – Sets the font and font size used by the output window.

3. Languages – grammar settings, used to modify and add grammar files, it is not recommended for users to modify. Under it, there are three syntax setting dialog boxes Default, Cpp, and Assembler. Users can modify the options, and customize the editing settings such as the syntax keywords used in a certain language. The following is a preliminary interface introduction in Cpp (C/C++) language:

No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual		Version: V2.51
Preferences General Colors and Fonts Languages Default Copp Assembler File Associations	Cpp Margins Line Numbers Bookmark Margin Fold Margin Indent Indent Size Tab and Backspace (Un)Indent Indentation Guides Tabs Tab Size Pressing Tab inserts Spaces	View Word Wrap Whitespace End Of Line Auto Indentation Style Off Follow Previous Line Follow Language Scoping	
	Ok	Apply Cancel	Help

Figure 4.12 Language Settings (Languages) - the primary interface, taking C/C++ as an example

Line Numbers – Whether to display line number margins Bookmark Margin – Whether to display the bookmark margin Fold Margin – Whether to display the folding margin Word Wrap – word wrapping Whitespace – whether to display spaces End Of Line – Whether to display line endings Indent — Indent amount Auto Indentation Style – Automatic indentation style Tabs – TAB width setting

The following is an introduction to advanced dialog boxes in Assembler language, including dialog boxes such as Code, Color, Font, and Keywords. First is the Code dialog.

o.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.5
Preferences General -Colors and Fonts -Languages -Default -Code -Code -Code -Color -File Filters -File Associations	Code Syntax Highlighting Brace Matching OnSave Ensure Final New Line Convert Tabs To Spaces Trim Trailing Spaces	
	Ok Apply Cancel	Help

Figure 4.13 Language Settings (Languages) - Code dialog box, taking Assembler as an example

Syntax Highlighting – Whether to use the syntax highlighting function Brace Matching – Whether to use the bracket matching function Fold Ensure Final New Line – Ensure that there is a blank line at the end of the text Convert Tabs To Spaces – convert TAB to spaces when saving Trim trailing spaces – Trim trailing spaces when saving Auto completion – not implemented

The Color dialog box is used to set the color of various components of the source code (such as spaces, comment blocks, single-line comments, numbers, keywords, strings, etc.) of the corresponding language. You can set foreground and background colors. "Reset All Colors" is used to restore the default settings. (See Figure 4.14)

The Font dialog box is used to set the font for various components of the source code (such as spaces, comment blocks, single-line comments, numbers, keywords, strings, etc.) of the corresponding language. "Apply to all styles" applies the current settings to all source code components. "Bold" is bold; "Italic" is italic; "Underline" is underlined. (See Figure 4.15)

As for the Keywords dialog box, if you need to add new keywords, you can add them here. It should be noted that lowercase letters should be used and spaces should be used to separate them. (See Figure 4.16)



Figure 4.14 Language Settings (Languages) - Color dialog box, taking Assembler as an example

Preferences General Colors and Fonts	Font
	Style Number Apply to all Styles Courier 16 Century 6 Control Sans MS 9 Consolas 10 Constantia 11 Cooper Black 12 Corbel 14 Conter 18
	Sample Text Area Bold
	Ok Apply Cancel Help

Figure 4.15 Language Settings (Languages) - Font dialog box, taking Assembler as an example
o.: TDUM02- TE001-EN	Name: MQ-LINK Us	ser Manual	Version: V2.51
Preferences			×
General 	Keywords Keyword Type <u>epu instructions</u> fpu instructions registers directives directive operands ext instructions	Keyword List Id ldw push pop xch cmp add addc sub subb and or xor inc dec daa das mul div neg shlc shrc role rorc shlca shrca swap rold rord set clr test cpl di ei jrs jr jp callv call ret reti retn swi nop sleep	
		Ok Apply Cancel H	lelp

Figure 4.16 Languages - Keywords dialog box, taking Assembler as an example

4.3.8 Help Menu

The help menu includes **About IMQ-IDE**, which is mainly used to display the iMQ i87-IDE software version and copyright information.

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

4.4 Background on Debugging

The general flow of debugging using the IDE is shown in Figure 4.17.

The files that can be used for debugging by the IDE can only be object files, not source code. The object file is generated by compiling the source code through a compiler (including an assembler), and contains machine code and various debugging information, such as variable names and their addresses, associations between machine code and source code, tags, and so on.

iMQ i87-IDE currently supports abs files and hex files.



Figure 4.17 Debugging process

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

4.5 IDE Project Management

The user needs to set some necessary information during the debugging process. The IDE software manages the above information through the concept of project management and stores it in the project properties.

Before using the IDE to debug, the project must be established first. There are three types of projects:

- Empty Project
- C Template Project
- Asm Template Project

Selecting to create "C Template Project" and "Asm Template Project" will generate "startup", "main", "headfile", "interrupt table" and "LCF" files corresponding to the MCU as shown in Figure 4.18.



Figure 4.18

If you choose to create an "Empty Project", only "LCF" files will be generated, as shown in Figure 4.19.



Figure 4.19

A complete project file generally includes the following:

File information: source program file or debug code file name and path **Compiler settings**: the type of compiler used and its configuration

Debug settings: chip type, etc.

Window and other information: observe the setting of variables and breakpoints, the adjustment of user windows, ... etc. When user exits, the information will be fully saved and reproduced the next time the project is opened.

5. iMQ i87-IDE Debugger

This chapter discusses how to use the IMQ OCDE debugger for development.

5.1 New Project

This IDE software provides a new project wizard for users to use.

5.1.1 Select Project Type

First, click the "Project" menu on the main menu and select "New Project". The pop-up window is as follows, select "Empty Project", "C Template Project" or "Asm Template Project". For the differences between the three projects, please refer to "4.5 iMQ i87-IDE Project".

step 1: Select the project type	
Empty Project C Template Project	Project Info Name new.pmt Path C:\Examples\ Tips: Create a general project, Add your source file into it, then select a compiler to build it. You can download to hardware emulator to debug your project if you build it success.
	< Back Next > Cancel

Figure 5.1 New project window

Fill in the project file name and path in turn. The project of iMQ i87-IDE is a file with a suffix of *.pmt to distinguish it from general project files (*.prj). After the setting is complete, click "Next" to continue.

5.1.2 Select Chip Manufacturer and Chip

The following window appears. In the drop-down menu of "Manufacturer", select the chip manufacturer, i.e. iMQ. Select the chip series in the "Series" on the right, i.e. i87. And Then select the chip model in the box below.

The user should pay attention to whether the chip model selected for the project can match the current hardware. After the setting is complete, click "Next" to continue (as shown in Figure 5.2).



Figure 5.2 Select chip model

New Project	(Step2): Select Chi	р			×
Vendo	r IMQ	•	Serial	i87(Old Product Nar	ne) 💌
MQ MQ	8601	e%M e%M			
<u></u>					
			< Back	Next >	Cancel

Figure 5.3 Select the chip model (compatible with the old product model)

5.1.3 Selecting Compiler

Use the drop-down menu to select a compiler. As shown in Figure 5.4.



Figure 5.4 Select the compiler

The compiler type currently supported by iMQ i87-IDE is "iMQ i87 C and Asm compiler". After the setting is complete, click "Next" to continue.

5.1.4 Complete New Project

At this time, a project summary window will pop up, which displays the information about the current project (as shown in Figure 5.5). Click Finish to finish and save the newly created project. You can see that the IDE has added some default files to your project. The file name corresponds to the one selected when building the project.



Figure 5.5 Complete the new project

5.2 Add Source Program

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

Click the right mouse button on the "Source Files" (source file) item on the left side of the main screen of the IDE, and a menu will pop up. Users can select "Add File". If there is no source code, you can select "New File", save it, and add it to the project.

In the "Header Files" of the project, you can also create or add header files. The header files added by the user should be placed in the same directory as other source files. Please refer to Figure 5.6. If necessary, you can add *.rel object module files under "Obj Files", or add library files that have been obtained by users in other ways under "Library Files" below.

Once complete, you can double-click a source file name to open the file editing window. When editing, we can use bookmarks to mark the places of focus, especially when the program is large, it is very convenient to jump to the bookmark.

IDE provides two bookmark functions: a common bookmark and an advanced bookmark. Use Ctrl+F2 to set or delete ordinary bookmarks on the line where the cursor is located, and use a single F2 to quickly jump between multiple labels. The advanced bookmark is a bookmark with a number, and the jump is in place in one step: use Ctrl+number (0~9) to set or delete (you can also execute the corresponding menu item repeatedly), and use Alt+number (0~9) to locate.



Figure 5.6 Options for creating or adding source programs (left) and header files (right)

5.3 Set Compiler

Since the embedded compiler is used, there is no need to set the compiler path. If you want to explicitly specify the compiler path, you must ensure that the corresponding compiler exists under the path. In the menu bar select "Settings" -> "Set Compiler...", and the system will pop up a "Compiler Settings" dialog, as shown in Figure 5.7.

Compiler Setting	×
□- IMQ i87 C and Asm Compiler La <mark>187 C Compiler Driver(OCI87.exe)</mark>	-
Path: C.VIMQVIMQ IDEVecolsVi87VainVCC187.exe	Ň

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

Figure 5.7 Set compiler path

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

5.4 Project Property Settings

Click "Project" on the main menu, and then select "Project Properties" to open the "Option" dialog. This setting item includes two parts: "General" and "Build Option".

5.4.1 General Options

The "General" options are mainly set as shown in Figure 5.8, and there are the following types:

IC Type Setting – IC Type Setting

IC Vendor - Select the manufacturer name of the chip.

IC Serial - Select the series the chip belongs to.

IC Type – Chip Model

Trace Setting - Trace settings, this option has no effect

ption			
General Build Option			
IC Type Setting			
IC Vendor	IMQ		
IC Serial	i87		
IC Type	SQ76	15044	
Trace Setting	1		

Figure 5.8 General Options for project properties

5.4.2 Build Options

The buil option mainly completes the selection and configuration of the compiler, as shown in Figure 5.9.

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

First, select the type of compiler you want to use from the drop-down list. Next, make the following compile settings:

Path Setting - path setting

Include Path – Path to include files used by the compiler, reserved for other compilers Library Path – The library file path used by the compiler, reserved for other compilers Linker Path – the linker file path used by the compiler, reserved for other compilers Assemble Setting – assembler settings

C Compiler Setting - C language Compiler Settings

Linker Setting – Linker Settings

C Code static analysis - Enable or disable C language source code check

Option					×
General	Build Option				
	C and Asm Compiler				•
- Pat	hs Setting				
	ude Path				
	ary Path				
Link	er Path				
	emble Setting				
	ompiler Setting				
	ker Setting				
+ Co	ode static analysis	3			
Defa	aultSet		ОК	Cancel	Apply

Figure 5.9 Build options for project properties

5.5 Compile Programs

After the above settings are completed, you can start compiling the program. There are two types of compilation in iMQ IDE: compiling release version and debug version. If you choose to compile the debug version, the system will automatically add _DEBU macro definition when compiling. The compile command can be invoked through the shortcut toolbar or menu bar. The compilation result will appear in the "Build Results" window.

If there is an error in the program, double-click the error line or warning line in the build result to directly locate the relevant line of the source code. Some errors, because they have nothing to do with a specific line of code, the compiler cannot locate them, such as link errors, etc.

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

5.6 Pin Setting

MQ series MCU may need pin settings of the different packages, select external high/low speed crystal oscillator or rolling code. The time to use this setting is to write the package pin information of the chip into the IC when using the i87 IDE to program the chip so that the function settings of each pin are correct to the IC package. If you use the flash writer (Writer 300) to program the chip, you don't need to consider this function. Taking MQ6801 as an example, the setting method is:

Taking MQ0001 as an example, the setting method is.

1. Click the menu "Project -> Pin Setting" to open the Pin Setting dialog box.



Figure 5.10 Select the pin function in the project menu

2. After opening the dialog box, you can choose the packages of MQ6801 with DP016, SP016, SP16N, SS016, DP020, SP020, and SS020.



Figure 5.11 Select the package

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

3. After selecting the pin package, click the drop-down list to set the pin function.

The leftmost side "ext low OSC" determines whether the external input clock source uses a high-frequency or low-frequency crystal oscillator. If "ext low OSC" is checked, it is an external low-frequency clock input, and if it is not checked, it is an external highfrequency clock input.

Pin Setting & Writer						-	×
Writer Mode	VSS 💌	1	U	20	VDD 💌		
IC Type :	P00/XIN	2		19	P40/AIN0/KWI0		OK CANCEL
MQ6801	P01/XOUT	3		18	P41/AIN1/KWI1		
SP020	P10/RESETB 💌	4		17	P42/AIN2/KWI2		
ext low OSC 2	P71/TC01/PWM01B	5		16	P43/AIN3/KWI3	1	
Protect 3	P90/TX 💌	6		15	P44/AIN4/KWI4		
	P91/RX 💌	7		14	P45/AIN5/KWI5		
Rolling Code	P72/TCA0/PPGA0 💌	8		13	P74/DVOB/AIN8		
C Dec C Hex	P80/TC02/PWM02B	9		12	P46/AIN6/KWI6		
Rolling 0 Start	P81/TC03/PWM03B	10		11	P46/AIN6/KWI6 P70/TC00/PWM00B		EEPROM Write
Increase 0 Step						_	
Rolling 0 End					Slow_Pro	ogram	
# Rolling Code Address : 0x7E43 ~ 0x7E46 (Little Endian)							

And if you check Protect, It can protect Flash content information.

Figure 5.12 Pin setting and external clock source setting

4. After completing the setting, click "OK". It will pop up a "Type and Setting" dialog box, click "Yes" to save the setting, and the system will automatically save the setting file to the project path, and the file name is "<project name >.cfg". When the Pin Setting dialog box is opened next time, the system will read the last setting file from the project path.

💽 Pin Setting & Writer								\times
Writer Mode IC Type : MG6801 V Pin Count : SP020 V ext low OSC Protect	VSS P00/XIN P01/XOUT P10/RESETB P71/TC01/PWM01B	▼ ▼ ▼ Type and	1 2 3 4 5 Setting	1	8 P41/AIN1/KWI1 7 P42/AIN2/KWI2	• • •	ОК	CANCEL
Rolling Code	P90/TX P91/RX P72/TCA0/PPGA0 P80/TC02/PWM02B P81/TC03/PWM03B	Please c	onfirm th	Yes	No No Protocological Protocological No	-	EEPROM Wri	te
Start 0 Increase 0 Step 0 Rolling 0 # Rolling Code Address : 0x7E43 ~ 0x7E46 (Little Endian) 0	1 03/ COS/ 11100					Slow_Program		

Figure 5.13 Complete the settings

5.6.1 Rolling Code setting

This function can burn data to a specific area. Take MQ6812 Figure 5.14 as an example, in

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

the pin setting screen: 1. Select PinCount 2. Check RollingCode 3. Select DEC (decimal)\HEX (hexadecimal) 4. Enter the rolling code start in the Rolling Start box Initial value (an example is 0x12345678) 5. Enter the increment of the rolling code value (this example increments by 1 each time) 6. The End value of rolling code (take this picture as an example, when the value is greater than 0x12345678A, it will not continue to increment) 7. Rolling code Code programming destination address 8. Click OK. The IDE will generate a CFG file to record the settings under the project path, and it will be burned into the chip when the chip is programmed. Currently, the IDE supports rolling code settings for MQ series MCU, for example, MQ6801, MQ6811, MQ6812, MQ6815, MQ6821, MQ6822, MQ6825... and other products.



Figure 5.14 MQ6812 pin configuration diagram

After entering the debugging, you can use the memory observation window to confirm the burning data of the rolling code, as shown in Figure 5.15.

Address																
7e43																
Address	0	1	2	3	0x12	3456	57 9 (I	itțle	End	ian)	A	В	с	D	E	F
0x7E40				78	56	34	12	55	55	55	55	55	55	55	55	55
0x7E50	7F	55	55	55	55	55	55	55	55	55	55	55	55	55	55	55
0x7E60	55	55	55	OF	9F	55	55	55	55	55	55	55	55	55	55	55
0x7E70	55	55	55	55	55	55	55	55	17	55	55	55	55	55	55	55

Figure 5.15 Rolling code storage address

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

5.7 Enter Debug Mode

After the above preparations are completed, click "Debug -> Start Debug" on the main menu, or directly click the icon on the shortcut toolbar to enter the debugging mode.

If you disable "Check build version while entering debug in the menu bar "Settings -> IDE Config..." (as shown in Figure 5.16). When you click "Start Debugging", it will not check whether the compiled version is the "debug version" or "Release Version".

Preferences		×
	General	
Colors and Fonts C-Languages File Filters File Associations	On Startup Very Maximize Window Open Last Project System Language English On Exit Very Save All Documents without Prompting Debug Very Use Log File Other Check build version while enter debug Check Start debug C	
	Ok Apply Cancel H	elp

Figure 5.16

If "Check build version while enter debug" is enabled (as shown in Figure 5.17), the "debug version" will be checked when entering debugging. If the current compiled version is the "release version", a confirmation window will pop up (as shown in Figure 5.18).

Preferences		×
Preferences General Colors and Fonts B Languages File Filters File Associations	On Startup Editor Image: Im	×
	Viber Check build version while enter debug Ok Apply Cancel Help	

Figure 5.17

No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51
	Check Build Condition	_
	Current Version is RELEASE version. Recommend DEBUG version to enter debug mode.	
	Rebuild to DEBUG version and enter debug mode	
	Using current version and enter debug mode Exit	

Figure 5.18

If the HEX file is older than the original code file, the IDE judges that it needs to be recompiled to update the HEX file. At this time, it will automatically compile it into a "debug version" and then enter the debug mode.

If the MQ-Link hardware is not connected or there is a problem with the connection, the software will prompt "Fail to connect".

If the MQ-link hardware is connected, but the MCU device does not exist or is not connected, then when entering debug mode may hold MQ-Link hardware(the "Active" LED not blinking). If this situation happens, the user needs to re-plug the USB cable into Host PC.

After entering the debugging mode, you can start debugging the program, modify the source code according to the debugging situation, and then recompile. Commonly used debugging methods are generally:

1. Set a breakpoint, then go run until the program stops at the breakpoint.

2. Focus on the area to do a single step, observe variables, etc.,

5.7.1 Chip Project and Corresponding Chip List

When entering the debugging mode, the IDE software will compare the projected chip with the connected chip. The following table shows some of the chip projects and the corresponding connectable target chip/evaluation board.

Chip project name	Connectable chip	Evaluation board
MQ6801020	MQ6801 Family chip	MQ6801 EVBoard
MQ6801016	MQ6801 Family chip	MQ6801 EVBoard
MQ6801—16N——	MQ6801 Family chip	MQ6801 EVBoard
MOC011 010	MQ6801 Family chip,	
MQ6811010	MQ6811 Family chip	MQ6801 EVBoard

: TDUM02- TE001-EN	ame: MQ-LINK User Manual	Version: V2.5
MQ6812032	MQ6812 Family chip	MQ6812 EVBoard
MQ6812028	MQ6812 Family chip	MQ6812 EVBoard
MQ6821020	MQ6812 Family chip, MQ6821 Family chip	MQ6812 EVBoard
MQ6821016	MQ6812 Family chip, MQ6821 Family chip	MQ6812 EVBoard
MQ6832 — 032	MQ6832 Family chip	MQ6832 EVBoard
MQ6832 — 016	MQ6832 Family chip	MQ6832 EVBoard
MQ6815048	MQ6815 Family chip	MQ6825 EVBoard
MQ6815044	MQ6815 Family chip	MQ6825 EVBoard
MQ6825048	MQ6825 Family chip	MQ6825 EVBoard
MQ68 3 5048	MQ68 3 5 Family chip	MQ6835 EVBoard
MQ6 9020 28	MQ6 902 Family chip	MQ6807 EVBoard
MQ6801	MQ6801 Family chip	MQ6801 EVBoard
MQ6801_16PinPackage	MQ6801 Family chip	MQ6801 EVBoard
MQ6811_10PinPackage	MQ6801 Family chip, MQ6811 Family chip	MQ6801 EVBoard
MQ6812_28PinPackage	MQ6812 Family chip	MQ6812 EVBoard
MQ6812_32PinPackage	MQ6812 Family chip	MQ6812 EVBoard
MQ6821_16PinPackage	MQ6812 Family chip, MQ6821 Family chip	MQ6812 EVBoard
MQ6821_20PinPackage	MQ6812 Family chip, MQ6821 Family chip	MQ6812 EVBoard
SQ7615—044	SQ7615 Family chip	SQ7615 EVBoard
SQ7655—032	SQ7653 Family chip	SQ7655 EVBoard
SQ7705.ADM—064	SQ7705 Family chip	SQ7705 EVBoard
SQ7705.USR—064	SQ7705 Family chip	SQ7705 EVBoard

5.8 Breakpoints Management

5.8.1 Program Breakpoints

Program breakpoint is the most commonly used breakpoint, that is, it is set at a certain address in the program, and once the program runs here, it will stop. The i87 IDE uses the breakpoint management window to manage various breakpoints in a unified manner. Double-click the program breakpoint item in the "BreakPoint" window, and you can quickly jump to the corresponding program line, which is very convenient for positioning. In the window, breakpoints can be edited, such as adding, deleting, enabling or disabling, adding judgment conditions, and so on.



Figure 5.19 Program breakpoint example

5.8.2 Data Breakpoints

The data breakpoint function is to generate a breakpoint when writing/reading the specified address or to generate a breakpoint when the program executes the specified address. Click the right mouse button in the "breakpoint window" and select "Add" -> "Data Break" to set the data breakpoint.



Data Breakpoint Settings	×
Condition Address Setting: rel: == v addr: 0×0000 mask: 0×0000	
Data Setting: rel: == _ data: 0×00 mask: 0×FF	
Operation: C Read C Write C Fetch @ All C Disable	
OK Cancel	

Figure 5.20 Data breakpoint function dialog

.: TDUM02- TE001-	EN Name: MQ	-LINK User Man	ual	Version: V2.51
1.	Relationship (rel)): The default is	"==".	
2.	Address: specifie	ed address		
3.	data: specified d	ata		
4.	Mask : If a bit ma	sk is 1, then the	bit is 0 or 1 all valid; the	mask is 0. It does no
	affect the addres	s\data setting.		
	Example: addres	s mask	condition valid address	
	0xf123	3 0x000f	0xf120 ~ 0xf12f	
	0xf123	3 0x0003	0xf120~ 0xf123	
	0xf123	3 0xf123	0xf123	
	data	mask	condition valid data	
	0x45	0x0f	0x40~0x4f	
	0x45	0x00	0x45	
5.	Operation : Set th	ne conditions for	the establishment of the	action
	Read : When the o	chip reads the sp	pecified data at the specifi	ed address, a
	breakpoint is trig	ggered.		
	Example: Add	dress: 0x0040	Mask: 0x001f	
	Dat	a: 0x08	Mask: 0x0f	
	Оре	eration: read		
	The action of thi	s setting is that	when the chip reads from	0x0040~0x005f to
	0x8~0xf, a break	cpoint will be ge	nerated.	
	Write: Trigger a l specified addres:		the chip writes the specif	fied data at the
	Example: Ad	ldress: 0x0040	Mask: 0x001f	
	Da	ata: 0x08	Mask: 0x0f	
	Op	peration: write		
	The action of thi	s setting is that	when the chip writes from	0x0040~0x005f to
	0x8~0xf, a break	kpoint will be ge	nerated.	
	Instruction Fetch triggered.	: When the chip	runs to the specified addr	ress, a breakpoint is
	Example: A	ddress: 0xf000	Mask: 0x0010	
	-	Deration: Fetch		

Operation: Fetch

The action of this setting is that when the chip runs to 0xf000 or 0xf010, a breakpoint will be generated.

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

5.9 Variable Watch

5.9.1 Variable Watch and Adding Variables

iMQ i87-IDE provides a variable watch function. You can manually enter the variable name in the "watch window" to add the variable; the case of the input variable name must be consistent with that in the source program. If the variable is invalid, the system will prompt "Symbol not found".

For C language, this software not only supports its basic data types, such as char, unsigned char, int, short int, long, unsigned long, float, etc. but also supports various complex variable formats such as multidimensional arrays, structures, pointers, etc. Several viewing methods, such as binary, decimal, hexadecimal, ASCII codes, etc. If you see a variable value displayed as a strange symbol, don't worry, it's because the variable's display attribute is set to ASCII code, just change its attribute to HEX or Decimal.

The following uses C language as an example to illustrate the method of adding observation variables:

1. Create or open an existing project, edit the source program, enter debug mode, and open the watch variable (as shown in Figure 5.21). then Watch Variables.

2. The general method of adding watch variables is: to double-click the blank line in the watch window name field to enter the editing state and enter the variable name. But the conventional method is error-prone, it is recommended to use the following simple method.

3. The simple way to add observation variables is: Open the symbol window, which lists all symbols, including special register names, address labels, user-defined RAM variable names, etc., and you can easily add them to the watch by using the right-click menu select "Add watch".

Watch					ąΧ
Nam	e	Value	Address		
	VAR200.struVarArray[1].struUnionVar.bits.b2	0x00	11BC(bit15:bit15)		
+	VAR200.struVarArray2[1][2][3]	Array	1576		
Ξ.	VAR1	Struct	10D5		
¢	bits	Struct	10D5		
	– b7	0x00	10D5(bit7:bit4)		
	– b6	0x00	10D5(bit3:bit3)		
	– b3	0x00	10D5(bit2:bit0)		
	– b2	0x00	10D5(bit15:bit15)		
	– b1	0x00	10D5(bit14:bit14)		
	b0	0x00	10D5(bit13:bit13)		
	byte	0	10D5		
+	oneDim	Array	101D		
Find I	n Files Result Watch BreakPoint			1	
				ACTIVE	PC:

Figure 5.21 Variable watch window

4. The method to modify the display property of the value is: to right-click on the

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

Value field, and the field will display red, select "Property", and select the type you want from the "Data Format" drop-down list (as shown in Figure 5.22).

Watch Proper	ties		×
Symbol	bits		OK
Size	8 bits	•	Cancel
Format	ASCII	-	
Endian	Little-Endian	•	
_ All Variable	s Setting		
🔽 Free-Ru	ın Watch Enable		
🗖 Apply .	All Variables Format		
Format	Hex	-	

Figure 5.22 Watch Item Properties

5. Use the mouse to select the variable to be observed in the IDE editing window. Note: When using the mouse to make a selection, the selection must start from the front end of the variable name, as shown in the figure below :

Step 1: Use the mouse to select variables from the beginning

Step 2: Press the right mouse button and the popup menu window will appear and select " Add Watch"

Step 3: The selected variable will appear in the "Watch window "



Figure 5.23 Use the mouse to select the variable to be watched

6. Manually enter the name of the variable to watch. In the "Watch Window ", you can directly input the variable name by keyboard manually.



Figure 5.24 Manually enter the variable name directly in the "Watch Window "

5.9.2 Allow Partial Variable Name Format

5.9.2.1 Simple Arrays

Variables not only allow full variable names but also partial variable names, for example, a three-dimensional array of integers

Int threeDim[][][];

It can manually enter the range of variables to be observed in the watch window. Several formats are allowed:

- 1. threeDim[1][2][3] -- watch single variable value
- 2. threeDim -- all variables of all dimensions can be observed
- 3. threeDim[1] -- all variables under threeDim[1] can be observed

4. threeDim[1][2] -- all variables under threeDim[1][2] can be observed

W	/atch			
1	Name	Value	Address	
	threeDim[1][2]	Array	10C3	
	Ė [1]			
	⊡ [1,2]		1000	
	- [1,2,0] - [1,2,1]	0	10C3 10C5	
	- [1,2,2]	õ	1005	
	- [1,2,3]	0	10C9	
	[1,2,4]	0	10CB	
Fi	ind In Files Result 🐺 Watch	BreakPoint Symbol		

Figure 5.25 Manually enter the range of variables to be observed in the "Watch window"

5.9.2.2 Simple Structure (Union)

The same is true for structures, such as a Union structure

```
typedef union
    struct {
        unsigned char b7:4:
        unsigned char
                         b6:1;
        unsigned char
                         ЪЗ: 3;
        unsigned char
                         b2:1;
        unsigned char
                         b1:1
        unsigned char
                         b0·1·
    }bits;
unsigned int byte;
} BIT8_LIST_1;
BIT8_LIST_1 VAR1;
```

Figure 5.26 Enter the structure variable to be observed in the "watch window"

1. It can only enter the root variable name (here VAR1) to "watch Window" to observe

lo.: TDUM02- TE001-EN	Name: MQ-LINK	User Manual	Version: V2.51
the values	of all elements in	the complete variable sti	ructure
Name	Value	Address	
	5 0x00 3 0x00 2 0x00	10D5 10D5 10D5(bit7:bit4) 10D5(bit3:bit3) 10D5(bit15:bit15) 10D5(bit15:bit15) 10D5(bit14:bit14)	

Figure 5.27 Enter the structure variable name in the "Watch window "

ACTIVE

PC:

2. It can enter variable names such as

Find In Files Result Watch BreakPoint | Symbol |

VAR1.byte VAR1.bits.b1 \rightarrow The value of a single-bit value To observe the value of the specified variable element

32 unsig 33 unsig 34 unsig 35 unsig 36 - }bits; 37	iri:		
Watch			
Name	Value	Address	
VAR1.byte	0	10D5	
VAR1.bits.b1	0×00	10D5(bit14:bit14)	

Figure 5.28 Enter the structure field name in the "Watch window "

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

3. It can also enter part of the variable name to observe the interesting part of the structure, for example

VAR1.bits \rightarrow Only observe the bits part of the structure

25 27 28 30 31 32 33 34 35 36 37 38 39 40 41 41 43	<pre>typedef union { struct { unsigned o unsigned o unsigned o unsigned o unsigned o unsigned i unsigned i unsigned i lbits: unsigned int l BIT8_LIST_1 [MAR]; </pre>	har b6:1: har b3:3: har b2:1: har b1:1: har b0:1:		-
				•
: 🗄 🗖	⊒ □ < # ¶ ⊊			
Watch				д Х
Name		Value	Address	
E . V	'AR1.bits	Struct	10D5	
-	b7	0x00	10D5(bit7:bit4)	
	b6	0x00	10D5(bit3:bit3)	
	b3	0x00	10D5(bit2:bit0)	
	b2	0x00	10D5(bit15:bit15)	
	b1	0x00	10D5(bit14:bit14)	
	ьо	0x00	10D5(bit13:bit13)	
Find In	Files Result Watch Bre	eakPoint Symbol		

Figure 5.29 Enter part of the structure name in the "Watch window "

5.9.2.3 Complex Structure (Union)

A complex structure, including structure in structure, structure array, etc., can also input part of the name to observe the part of interest.



Find In Files Result Watch BreakPoint | Symbol |

Figure 5.30 Enter the Complex structure variable in the "Watch window"

5.10 SQ76 Series Flash Program Setting

SQ76 series products (SQ7613, SQ7615, SQ7617, and SQ7653... etc.) download the firmware by default to the entire flash area, and you can also choose the area to be downloaded when downloading firmware in debug mode.

When the project is started, the "Flash configuration" option will appear below the FileView, and the setting screen will appear by double-clicking the mouse :



Figure 5.31

Here can select two firmware sections to write in. When the checkbox of Flash Program Area-1 or Flash Program Area-2 is checked, you can specify the area to be programmed, such as the setting in the figure below.

No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51
	Flash Configuration X	
	🔽 Flash Program Area-1	
	Start End 0x 4000 0x 8000	
	🔽 Flash Program Area-2	
	Start End 0x A000 0x C000	
	OK Cancel	

Figure 5.32

It is to select the program codes in the areas $0x4000 \sim 0x8000$ and $0xA000 \sim 0xC000$ in the original compiled firmware to be programmed into the chip, while the rest of the firmware will not be programmed (the original area in this area of the chip code will be maintained and will not be erased).

6. iMQ i87–IDE Writer Function

This chapter will help you understand the operation of the writer mode function in the IDE.

6.1 Open Writer Function

There are two ways to open the writer mode:

For All series chip in "Tool -> Writer" in the initial menu to open it, as shown in Figure 6.1.

MQ iMQ i87-IDE					×
Eile View Project Settings	Tool <u>H</u> elp				
: 🖀 🚅 🖬 🕼 l 🆀 ਛ l 🐰	Writer	?	: :	德 三	34
: 🛗 🗖 👸	Download only				
FileView 4 ×	EEPROM Generator	_			
⊡ iMQ Project					
Source Files					
Header Files					

Figure 6. 1 Writer mode

🖬 Writer Mode	×
Writer Mode IC Type : Select Pin Count :	OK CANCEL CheckSum H16 Checksum Info Checksum iMQ Checksum
Load H16	AUTO

Figure 6.2 Writer initial page

For MQ68/69 series chip, there has a second way is "Project -> Pin Setting"



iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

Figure 6.3 Pin Setting menu

After entering the "Pin Setting" dialog, check Writer Mode in the upper left corner to switch the writing mode, (as shown in Figure 6.4). and it will switch to general writer mode dialog (as shown in Figure 6.5).

Pin Setting & Writer					×
Writer Mode	VSS 💌	1 U	20 VDD	•	OK CANCEL
MQ6801 -	POO/XIN 💌	2	19 P40/AINO/KWIO		
Pin Count :	P01/XOUT	3	18 P41/AIN1/KWI1	•	
SP020 💌	P10/RESETB	4	17 P42/AIN2/KWI2	•	
ext low OSC	P71/TC01/P₩M01B ▼	5	16 P43/AIN3/KWI3	-	
Protect	P90/TX 💌	6	15 P44/AIN4/KWI4	-	
	P91/RX 💌	7	14 P45/AIN5/KWI5	•	
Rolling Code	P72/TCA0/PPGA0 💌	8	13 P74/DVOB/AIN8	•	
C Dec C Hex	P80/TC02/PWM02B ▼	9	12 P46/AIN6/KWI6	•	
Rolling 0 Start	P81/TC03/PWM03B ▼	10	11 P77/IN T4	•	EEPROM Write
Increase 0 Step					
Rolling 0 End				🔲 Slow_Program	
# Rolling Code Address : 0x7E43 ~ 0x7E46 (Little Endian)					

Figure 6. 4 Check Writer Mode

🔟 Pin Setting & Writer	x
Vitier Mode IC Type : Select. Pin Count :	OK CANCEL CheckSum
	Load H16

Figure 6.5 Switch to general Writer Mode

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

6.2 Writer Function Introduction

This section divides the Writer programming interface into 11 blocks, as shown in Figure 6.6, and each functional block will be divided into subsections for explanation.

🎫 Pin Setting & Writer				×
Writer Mode 5	VSS 🔹	1 U 20	YDD 🔽	OK CANCEL
IC Type : 1 MQ6801 -	POO/XIN 💌	2 19	P40/AINO/KWIO	
Pin Count :	P01/XOUT		P41/AIN1/KWI1 -	CheckSum H16 CheckSum 0x0FE0BF
2 SP020 -	P10/RESETB		P42/AIN2/KWI2 - 8	Info CheckSum 0x0000F7
3 ▼ ext low OSC	P71/TC01/PWM01B		P43/AIN3/KWI3	iMQ CheckSum 0x0FE1B6
	P90/TX 🔹		P44/AIN4/KWI4	CFG File iMQ File
4 ▼ Rolling Code	P91/RX		P45/AIN5/KWI5 🗾 9	Load CFG Load iMQ
• Dec C Hex	P72/TCA0/PPGA0		P74/DVOB/AIN8 P46/AIN6/KWI6	Save As Save As
Rolling 1	P80/TC02/PWM02B		P46/AIN6/KWI6 P77/INT4 10	EEPROM Write
Start I Increase 2			1 1	1 PASS:1,Fail:0,Count:1
Step 2 Rolling 3				12 AUTO
End # Rolling Code Address :	6		Slow_Prog	ram A010
0x7E43 ~ 0x7E46 (Little Endian)	Load H16 D:\Examp	ples\MQ6801\new.h16		

Figure 6.6 Writer function

6.2.1. IC Type Selection

In the first area, all currently supported IC models can be selected, as shown in Figure 6.7.

ІС Туре :
MQ6812 -
MQ6801 MQ6811 MQ6812 MQ6815 MQ6821 MQ6825 MQ6902 MQ6903 MQ6905
Select

Figure 6.7 Select the pre-programmed IC model

6.2.2. Package Pin Selection

After selecting the IC model, you can pre-program the package pins of the IC model in the second area. For example, MQ6801 has different package pins such as SP016 and SS016, as shown in Figure 6.8.

iMQ Technology Inc.

No.: TDUM02- TE001-EN

Name: MQ-LINK User Manual



Figure 6.8. Select Package Pins

After selection, according to different package pins, the 3rd to 5th functional blocks will appear, as shown in Figure 6.6.

6.2.3. Extra Function Selection

The third area is the extra function selection area, which mainly has the following four functions, as shown in Figure 6.9, ticking "ext low OSC" means using an external low-frequency clock. "Protect" can protect Flash content. "P80 High Driving" and "P81 High Driving" are to set P80 or P81 from general I/O to high driving I/O. Note that MQ6812 series P80 and P81 are preset as high driving I/O. If you want to switch to Generally I/O can be unchecked it. In addition, the increase or decrease may vary due to different IC models. Not all IC models can set the above 4 functions.



Figure 6.9 Functional block

6.2.4. Rolling Code

The fourth area can set the rolling code value and can choose Dec (decimal) or Hex (hexadecimal) representations. "Rolling Start" is the starting value of the rolling code. "Increase Step" is the incremental value of the rolling code. "Rolling End" is the end value of the rolling code. As shown in Figure 6.10, the rolling code value starts counting from 1 and increments by 2 each time, and the final rolling code value is 3. Note!! The maximum range of the rolling code is 0~4294967280 (decimal) or 0~0xFFFFFFFF (hexadecimal).

iMQ Technology Inc.				
No.: TDUM02- TE001-EN	Name: MQ-LIN	Name: MQ-LINK User Manual		Version: V2.51
		🔽 Rol	ling Code	
		0 I	Dec 🔘 Hex	
		Rolling Start	1	
		Increase Step	2	
		Rolling End	3	
		0x7	ng Code Address : E43 ~ 0x7E46 .ittle Endian)	

Figure 6.10. Rolling code setting

6.2.5. Pin Setting

In the fifth area, only the IC model of MQ6801 can switch some specific pins to different functions according to the user's application, as shown in Figure 6.11, taking MQ6801 SP020 as an example. The rest of the remaining IC models do not support this function, and only the picture of the IC model will appear, as shown in Figure 6.12.



Figure 6.11. Pin setting switch

Figure 6.12. IC Diagram

6.2.6. Load Programming File

Press the Load H16 button to load the H16 programming file after selecting the path, as shown in Figure 6.13.



Figure 6.13 Load H16 file path

6.2.7. Confirm Settings and Start Programming

After setting areas 1 to 6 or by loading old or newly saved settings in area 9, press the OK button, and a window will appear for final confirmation, as shown in Figure 6.14, confirming that it is correct and then clicking "Yes".

iMQ Technology Inc. No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51
	Type and Setting $ imes$	
	Please confirm the setting and Pin Define !	
	Yes No	

Figure 6.14 Confirmation window

Then, the currently stored Checksum information will be displayed in the eighth area, as shown in Figure 6.15, "H16 Checksum" is the checksum value loaded into the programming file H16. "Info Checksum" sets the checksum value for zone 1~7 for the user. "iMQ Checksum" is the check value of the sum of the above two values, and this information is used for checking the programming result.

CheckSum	
H16 Checksum	0x1FC5C7
Info Checksum	0x0000C1
iMQ Checksum	0x1FC688

Figure 6.15 CheckSum information

Finally, you can press the "AUTO" button in the 12th area. After programming, if the PASS window appears, the programming is successful, as shown in Figure 6.16. If it fails, please refer to Section 6.3 for an explanation of error messages. The 11 area is to record the number of successes, failures, and total of the current programming, as shown in Figure 6.17.



Figure 6.16 Programming success

PASS:2,Fail:1,Count:3

Figure 6.17 Programming record

6.3 Writer Error Message

	error message	description
--	---------------	-------------

iMQ Technology Inc.

No.: TDUM02- TE001-EN Name: MQ-LINK User Manual

Version: V2.51

Rolling Code over your Setting, please reset	The Rolling Code has reached the upper limit
your Rolling Code!!	and needs to be reset
Enter PROM Mode Fail!!	Failed to enter PROM Mode, it may be because
Enter PROM Mode Fail. Please check your device	the IC is not placed properly, or there is a
or try it again !!	transmission problem, you can try again
Check Info Block Error, error code=0x02 Program InfoBlock Error, error code=0x02, Please try again !!	The possible reasons are that the IC on the programmer is not placed properly, the transfer board is incorrect, the packaging is bad (open short), the IC version is incorrect, or there is no IC to be programmed.
ProgramRollingCode Error, error code=0x05, Please try again !!	This error code will appear when the frequency of the internal crystal oscillator (HIRC) after trimming cannot be within the specification, or the frequency cannot be measured.
Check Info Block Error, error code=0x06	This error code will appear when the frequency of the internal crystal oscillator (HIRC) after trimming cannot be within the specification, or the frequency cannot be measured.
Program InfoBlock Error, error code=0x09, Please try again !!	After data is written into the MCU internal memory data block (Info Block), the comparison with the original data fails. Or this error code will appear when the usage times of the OTP MCU internal memory data block (Info Block) exceeds the limit.
Check Info Block Error, error code=0x0A	The number of pins of the IC does not match the setting of the programming file
Check Info Block Error, error code=0x0E	This IC failed the CP test IC.
Match Fail!!Please check IC Type or Device !!	The reason is that the programmed IC does not match the configuration or the device is not properly placed
Blank Check Fail!!	If the Blank Check fails, it may be because there is not enough space in the Program Memory for programming, or there is a problem with the OTP.
Erase Fail!!	An error occurred while wiping the IC
Write Fail!!	An error occurred during IC programming
Verify Fail	The Flash content in the programmed IC does not match the loaded H16
Program Info Block Fail!!	An error occurred while writing to the InfoBlock


6.4.1. IC Type Selection

In the first area, all currently supported IC models can be selected, as shown in Figure 6.20.

IC Type :	
MQ6812	-
MQ6801 MQ6811 MQ6812 MQ6815 MQ6821 MQ6825 MQ6825 MQ6902	
MQ6903 MQ6905 Select	

Figure 6.20 Select the IC model

6.4.2. Package Pin Selection

After selecting the IC model, you can program the package pins of the IC model in the

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

second area. For example, MQ6801 has different package pins such as SP016 and SS016, as shown in Figure 6.21.

ІС Туре :
MQ6801 -
Pin Count :
Select 👻
SP016 SS016 DP016
SP020
SSO20 DPO20 SP16N Select

Figure 6.21. Select Package Pins

6.4.3. Load Programming File

Press the Load H16 button in the third area, and after selecting the path, the H16 programming file can be loaded, as shown in Figure 6.22.

Load H16 C.\uMQ\uMQ IDE\Works\tetsMQ6212\new.h16
--

Figure 6.22 Load H16 file path

The current Checksum information will be displayed in the fourth area, as shown in Figure 6.23, "H16 Checksum" is the checksum value of the loaded programming file H16.

-CheckSum	
H16 Checksum	0x0099A6
Info Checksum	
iMQ Checksum	
iMQ Checksum	

Figure 6.23 CheckSum information

6.4.4. Programming

Press the AUTO button in the sixth area to start programming. If the PASS window appears, the programming is successful, as shown in Figure 6.24. And the fifth area is to record the number of successes, failures, and total count of the current programming, as shown in Figure 6.25.



Figure 6.24 Programming success

PASS:2,Fail:1,Count:3

Figure 6.25 Programming record

Name: MQ-LINK User Manual

6.5 EEPROM Writer

6.5.1 EEPROM Writer Function

The EEPROM writer function can program the SQ series EEPROM and MQ series user info ROM area.

There are two ways to start the EEPROM writer:

Note: This chapter uses SQ7617 as an example.

(1) After opening the project, the option "EEPROM Writer" will appear at the bottom of the FileView window, double-click with the left mouse button :



Figure 6. 26 FileView window

iMQ Technology Inc.		
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual	Version: V2.51

(2) Open the Writer dialog from Writer mode (menu Tool \rightarrow Writer or Download only), and follow the steps below:

- (i) Select IC Type
- (ii) Select Pin Count and it will appear
- (iii) The button of "EEPROM Write":

📑 Download Only Mode		×
IC Type : SQ?617 1 Pin Count : LQ044 2 Load H	SQ7617	CheckSum H16 Checksum Info Checksum MQ Checksum EEPROM Write 3 AUTO

Figure 6.27 Set IC Type, Pin Count, EEPROM Write

EEPROM Writer dialo	og box that ca	an be opened using	the above two methods
---------------------	----------------	--------------------	-----------------------

SQ7617 EEPROM Writer		×
Load File		
		^
		~
		0
	Write	Cancel

Figure 6.28 Load the file to be written into EEPROM

Press the "Load File" button to load the file to be written into the EEPROM Press "Write" to write the loaded file into SQ7617 EEPROM.

6.5.2 EEPROM File Generator

The EEPROM writer uses a fixed format as follows:

This file can be edited by the general editor or by IDE "EEPROM Generator" tool.

EEPROM writer file format:

##########	######	########	########	############
# 0x0000:	AREA-1			
#########	######	########	########	###########
FF FF FF F	F FF FF	FF FF FF	FF FF FF	FF FF FF FF
FF FF FF F	F FF FF	FF 16 00	0E C8 00	00 89 C8 C3
#########	######	########	########	###########
# 0x0110:	AREA2			
##########	######	########	########	###########
0A 11 22 3	3 44 55	66 16 00	0E C8 00	00 89 C8 C3
0B 22 FF F	F FF FF	FF 16 00	0E C8 00	00 89 C8 C3
FF FF FF F	F FF FF	FF FF FF	FF FF FF	FF FF FF FF

Format specification:

: Those starting with this will be ignored

0x0110 : Specify the starting address of this block, followed by Area-2 as a comment, which

can be any string

0A 11 : Fixed 16 Byte data to be programmed (Hex format)

Open "Tool->EEPROM Generator" to generate the EEPROM file, as shown in Figure 6.29.



Figure 6.29 Open the "EEPROM Generator" tool

iMQ Technology Inc.	
No.: TDUM02- TE001-EN	Name: MQ-LINK User Manual

	7 Address	00	01	02	03	04	05	06	07	08	09	0A	OB	0C	0D	0E	OF
Description :	4000	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5
Uesr Data 2	4010	A5	A5	A 5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A 5	A5
Start Address :	4020	A5	A5	A 5	A5	A5	A5	A5	A5	A 5	A5	A5	A5	A 5	A5	A 5	A5
0x 4000	4030	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A 5	A5	A5	A5
Data Size :	4040	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A 5	A5	A 5	A5
0x 60	4050	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5	A5
Initial Value: 0x A5																	
Add Delete Import																	
0x3000~0x30FF: Uesr Data 1																	
0x4000~0x405F: Uesr Data 2																	

Figure 6.30 EEPROM Generator tool

- 1. Description: section area description
- 2. Start Address: section starting address(must 16 bytes alignment)
- 3. Data Size: section size(must multiple of 16)
- 4. Initial value: section initial value
- 5. Add, Delate, Import: add/delete a section. It can add multiple sections in one EEPROM file.
- 6. Section display area.
- 7. Section editor area: It can edit section content.
- 8. Generate EEPROM file: generate single/multiple section data into EEPROM file.

The generated EEPROM file is as Figure 6.31.

iMQ Technology Inc.

No.: TDUM02- TE001-EN

Name: MQ-LINK User Manual

SQ/61/_EE.txt - 記事本
檔案(F) 編輯(E) 格式(O) 檢視(V) 說明

0x3000: Uesr Data 1

F7 F
F7 F
F7 F
F7 F
F7 F
F7 F
F7 F
F7 F
F7 F
F7 F
F7 F
F7 F
F7 F
F7 F
F7 F

0x4000: Uesr Data 2

A5 A
<u>A5 A5 A</u>
A 5 A 5 A 5 A 5 A 5 A 5 A 5 A 5 A 5 A 5
A 5 A 5 A 5 A 5 A 5 A 5 A 5 A 5 A 5 A 5
A5 A
A5 A
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

Figure 6.31 Multiple section EEPROM File

-EN Name: MQ-LINK User Manual

# 7. iMQ i87-IDE Error Message

pop-up window error message	description		
Empty Hex File or Invalid Hex Data on 0xfffa, 0xfffb. 0xffff expected.	<ol> <li>Code compilation failed</li> <li>0xfffa and 0xfffb in the code are values other than 0xff</li> </ol>		
Program Device Failed. Cannot enter debug mode.	<ol> <li>The debugger failed to connect to the target chip</li> <li>The programming code failed</li> </ol>		
Fail download.	Programming code failed		
Program Fail File CheckSum: "Number" Chip CheckSum: "Number"	After programming, the CHECKSUM comparison failed		
Load h16 file failed. Exit PROM Mode.	Failed to read the programed file		
Enter PROM Mode failed.	The debugger failed to connect to the target chip		
Error occur while sending PSW to OCD board!	Password transmission error before entering debug mode		
Can't find Password from Hex file	The code file is not generated the debug password, and there is no manual setting		
Enter debug mode failed!	Failed to connect to debug mode		
Can't Find IC Serail NO. in "Chip Type".ini	The IDE software does not support the chip name in the project file		
Unsupported CHIP	The IDE software does not support the chip name in the project file		
CopyFile "filename" failed	<ol> <li>When saving the project, the code file is missing.</li> <li>When creating a new project, the example code file is missing.</li> <li>When creating a new project, the target address is above 2 subdirectories.</li> </ol>		
The file had existed in this project already!	When adding a code file, a file with the same path and name already exists		
Project IC Type and .Cfg file mismatch.	The configuration file (.CFG) does not match the chip of the project file		
Fail to load dll file: "file name", Please make sure that it is exist!	The dynamic library file in the bin folder is missing		
Only support one event/data breakpoint.	This chip only supports 1 data breakpoint		
Read Info Table Fail!	A data inconsistency error occurred when reading the chip info table		

# iMQ Technology Inc. No.: TDUM02- TE001-EN Name: MQ-LINK User Manual version: V2.51 programming the chip Info Table fail After download!

Into Table fail Arter download:programming the chipTrim code corrupted!After programming the chip, the Trim Code is<br/>lostTrim Code CRC Check Fail!Chip Trim Code Abnormal

# 8. Other Supplementary Notes

## 8.1 Lightweight Adjustment

When debugging, if the general register window and the special register window are not opened, all the memory of the MCU will not be read out during debugging. In this way, when automatic single-stepping is performed, the execution time can be saved.

# 8.2 Other Reference Documents

Under the path where the IDE software is installed (the installation path is customized by the user, please refer to "3.1.2. The procedure for installing i87-IDE tool software"), if the user customizes the installation directory in C:\iMQ IDE, enter C:\iMQ IDE \tools\i87\manual, you can see the following three files:



Figure 8.1 Other reference files in the IDE software installation subdirectory

The contents of these three documents are briefly described as follows, and users can refer to them by themselves:

file name	Description of content
i87_assembler_reference_01.pdf	Explain the assembly syntax and the relevant .lst
	file content after C language compilation
i87_compiler_reference_01.pdf	Meaning of Error Messages During Compilation
i87_compiler_usersguide_01.pdf	Explain the process of compiling the program,
	and related files

# 8.3 MQ-Link Hardware Signal Voltage Switching 5V/3.3V



Figure 8.2 Diagram on MQ-Link PCBA

Remove the MQLink shell, solder a 0-ohm resistor to R2 or R3, and set the MQLink signal voltage to 5V or 3.3V

MQLink signal voltage	R2	R3
5V	Solder 0-ohm resistor	open circuit
3.3V	open circuit	Solder 0-ohm resistor

# 8.4 Preparations Before SQ7617 EEPROM Write

SQ7617 allows external programming of EEPROM. At this time, both Pin12 and Pin13 of SQ7617 must be connected to Vcc with a pull-up resistor of 4.7~10K. This pull-up resistor can be added by the user or provided by the I2C Adapter Board (as shown in the figure below -- provided by iMQ).



Figure 8.3 I2C Adapter Board and EVB connection diagram

Pin6 and pin8 of MQ-Link should be connected to pin13 (SDA) and pin12 (SCL) of SQ7617, and SQ7617 can also be connected through iMQ I2C Adapter Board pin6, pin8. When there is no I2C Adapter Board, you can also directly connect pin6 and pin8 of MQ-Link to pin13 (SDA) and pin12 (SCL) of SQ7617.

Note: EEPROM programming function, refer to " 6.5 EEPROM Writer " setting for details



Figure 8.4 Connect MQ-Link Pin6, pin8 to SQ7617pin13 and pin12