MELSEC-Q PLC MODBUS MASTER PROGRAM

USER GUIDE

May 14, 2003

CONTENTS

1. GENERAL DESCRIPTION

Melsec Q Series PLC Modbus Master program makes it possible that Mitsubishi QnA, QnAS and Q series PLC can act as a Modbus master to communicate with Modbus slave device in RTU mode.

In order to be the master, a communication module “QJ71C24” or “QJ71C24-R2” is needed when the PLC is Q series, while module “A1SJ71QC24N”, “A1SJ71QC24” , “AJ71QC24N” or “A1SJ71QC24-R2”, etc., is needed.

The program consists of two parts. One is the PLC ladder logic program, another is parameter setting program(Windows Application). The two software should work together.

The parameter setting program is different according to communication way between the setting program and the PLC, see following.

Setting Program	Interface	Note
MBSETUSB	USB Interface, only Q02HCPU or above	MX-Component ActiveX needed
MBSETCPU	Through CPU Programming port using SC09 for QnA/QnAS or QC30R2 for Q series	
MBSETCOM	Through RS232/422/485 of the communication module	Can use the same port for Modbus master, don’t need MX Component ActiveX

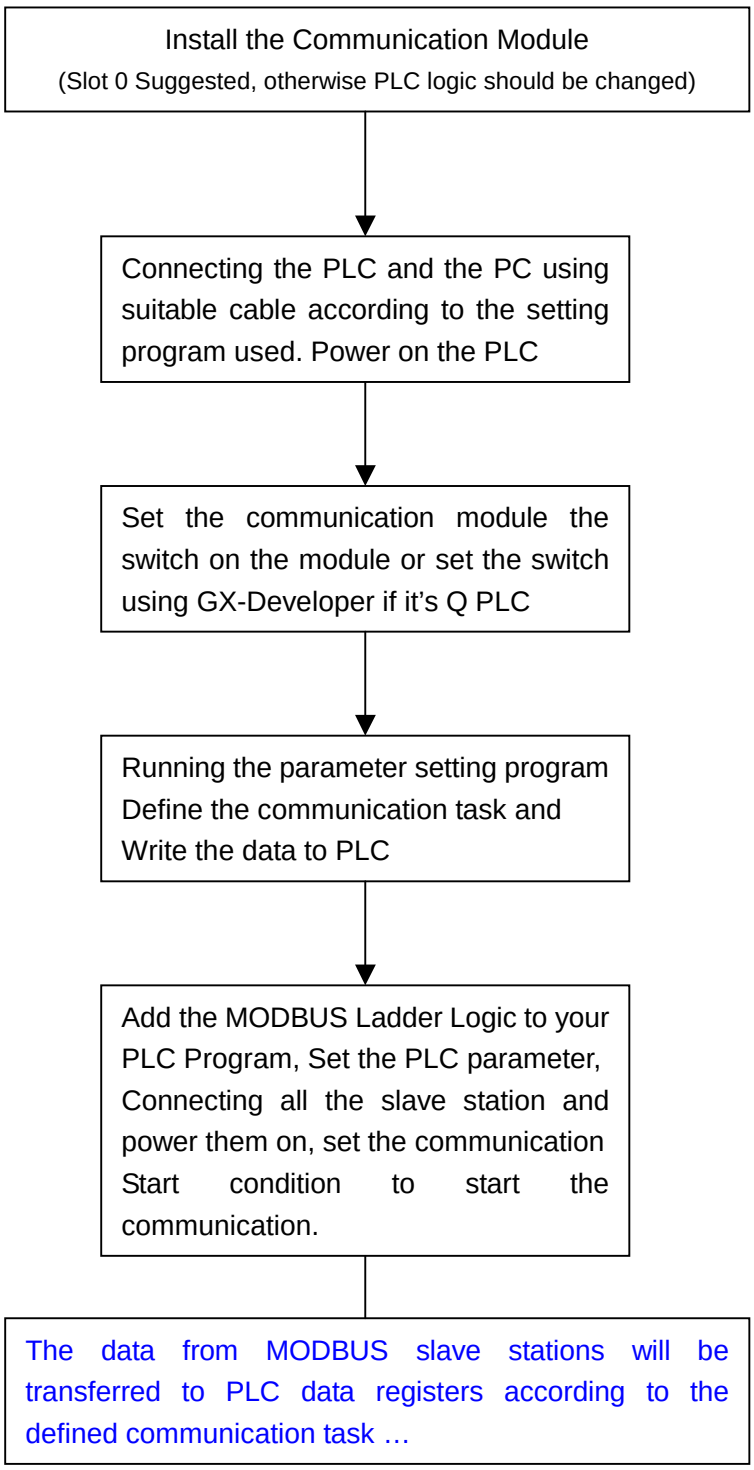
MX-Component ActiveX control is a software product from Mitsubishi Electric. To order the product you can contact with Mitsubishi FA products authorized dealer, Shanghai Syslink Automation System Co., Ltd. Contact information is:
Web. http://www.syslink.com.cn
Email. info@syslink.com.cn

2. SPECIFICATIONS

No.	Item	Specification	Note
1	Function code Supported	1: Read Coil, 00001 - 65535	
		2: Read Input Discrete, 10001 - 165535	
		3: Read Holding Register, 40001 - 465535	
		4: Read Analog Input, 30001 - 365535	
		5: Write Single Coil, 00001 - 65536	
		6: Write Single Register, 40001 - 465535	
		16: Write Multiple Register, 40001 - 465535	Max 48 words per task
2	Task Numbers	Max 90	
3	Points can be read In one task	01: Max 512 Bits	The points should be the times of 16
		02: Max 512 Bits	
		03: Max 100 Words	
		04: Max 100 Words	
		16: Max 48 Words	
4	Modbus Protocol	RTU	
5	Communication Parameter	Baud rate: from 300 to 115200	Default: 9600
		Data bits: 8, Stop Bit:1 Parity bit: 1 or none	Default: N,8,1
6	Interface	RS232 / R422 / RS485	
7	Module/PLC Supported	QJ71C24, QJ71C24-R2	MELSEC-Q
		AJ71QC24(N), AJ71QC24(N)-R2, AJ71QC24(N)-R4,	QnA
		A1SJ71QC24(N), A1SJ71QC24(N)-R2	QnAS
8	Parameter Setting Program	MBSETUSB.EXE / USB Interface Q02HCPU or Above	MX-Component ActiveX Needed
		MBSETCPU.EXE / CPU Programming Port QnA/QnAS/Q Series all CPU	
		MBSETCOM.EXE / Communication Module QnA/QnAS/Q Series all CPU QJ71C24/ QJ74C24-R2/ A(1S)J71QC24(N)-R2(4)	Don't need MX-Component Available soon

3. PROCEDURE TO BUILD UP THE COMMUNICATION

3.1 Setting Procedure



3.2 Communication Module Setting

3.2.1 QJ71C24 / QJ71C24-R2

Since there is no hardware switch on Q series RS232/422/485 communication module, all the setting is through GX-Developer. To start the setting follow the procedure:

[GX -Developer] – [PLC Parameter] –[I/O Assignment setting] – [Switch setting]

Switch number	Description	
Switch 1	b15 – b08: CH1 Baud rate	b07 – b00: CH1 transmission setting
Switch 2	CH1 Protocol	
Switch 3	b15 – b08: CH2 Baud rate	b07 – b00: CH2 transmission setting
Switch 4	CH2 Protocol	
Switch 5	Station Number	

Baud rate	b15 – b08	Baud rate	b15 – b08
50	0FH	19200	07H
300	00H	28800	08H
600	01H	38400	09H
1200	02H	57600	0AH
2400	03H	115200	0BH
4800	04H	-	-
9600	05H	-	-
14400	06H	-	-

Bit	OFF 0	ON 1
B0:	IND.	LINK
B1: Data Bit	7	8
B2: Parity Bit	NO	YES
B3: Odd/Even	ODD	EVEN
B4:Stop Bit	1	2
B5:Sum Check	NO	YES
B6: w during run	N0	YES
B7: Editable	N0	YES

The blue color is the default value. **9600,N,8,1** SW1(SW3) = **05C2H or 05F2H**
The protocol of the channel selected for Modbus master should be set to **06H**.

For detail setting information please refer “Q Corresponding Serial Communication Module User’s Manual Basic” and “GX-Developer operating manual”.

After the switch setting is write to PLC, please reset the PLC to make the setting effective.

The PLC Ladder Logic supposes the QJ71C24[R2] is in the first slot(slot 0), if the module is not in slot 0, some instruction of the Ladder Logic need to be modified, see the Ladder Logic description for detail.

3.2.2 A1SJ71QC24[N][-R2]

The setting of A1SJ71QC24, A1SJ71QC24N, A1SJ71QC24-R2 is through the DIP switch on the module, see following table.

Baud rate	SW9	SW10	SW11	SW12		Bit	OFF 0	ON 1
300	OFF	OFF	OFF	OFF		SW1:	IND.	LINK
600	ON	OFF	OFF	OFF		SW2: Data Bit	7	8
1200	OFF	ON	OFF	OFF		SW3: Parity Bit	NO	YES
2400	ON	ON	OFF	OFF		SW4: Odd/Even	ODD	EVEN
4800	OFF	OFF	ON	OFF		SW5:Stop Bit	1	2
9600	ON	OFF	ON	OFF		SW6:Sum Check	NO	YES
19200	OFF	OFF	OFF	OFF		SW7: w during run	N0	YES
38400	OFF	ON	ON	OFF		SW8: Editable	N0	YES
14400	ON	ON	ON	OFF				
28800	ON	OFF	OFF	ON		MODE	**6**	
57600	OFF	ON	OFF	ON				
115200	ON	ON	OFF	ON				

The blue color is the default value. **9600,N,8,1**
The mode of the channel selected for Modbus master should be set to **06**.

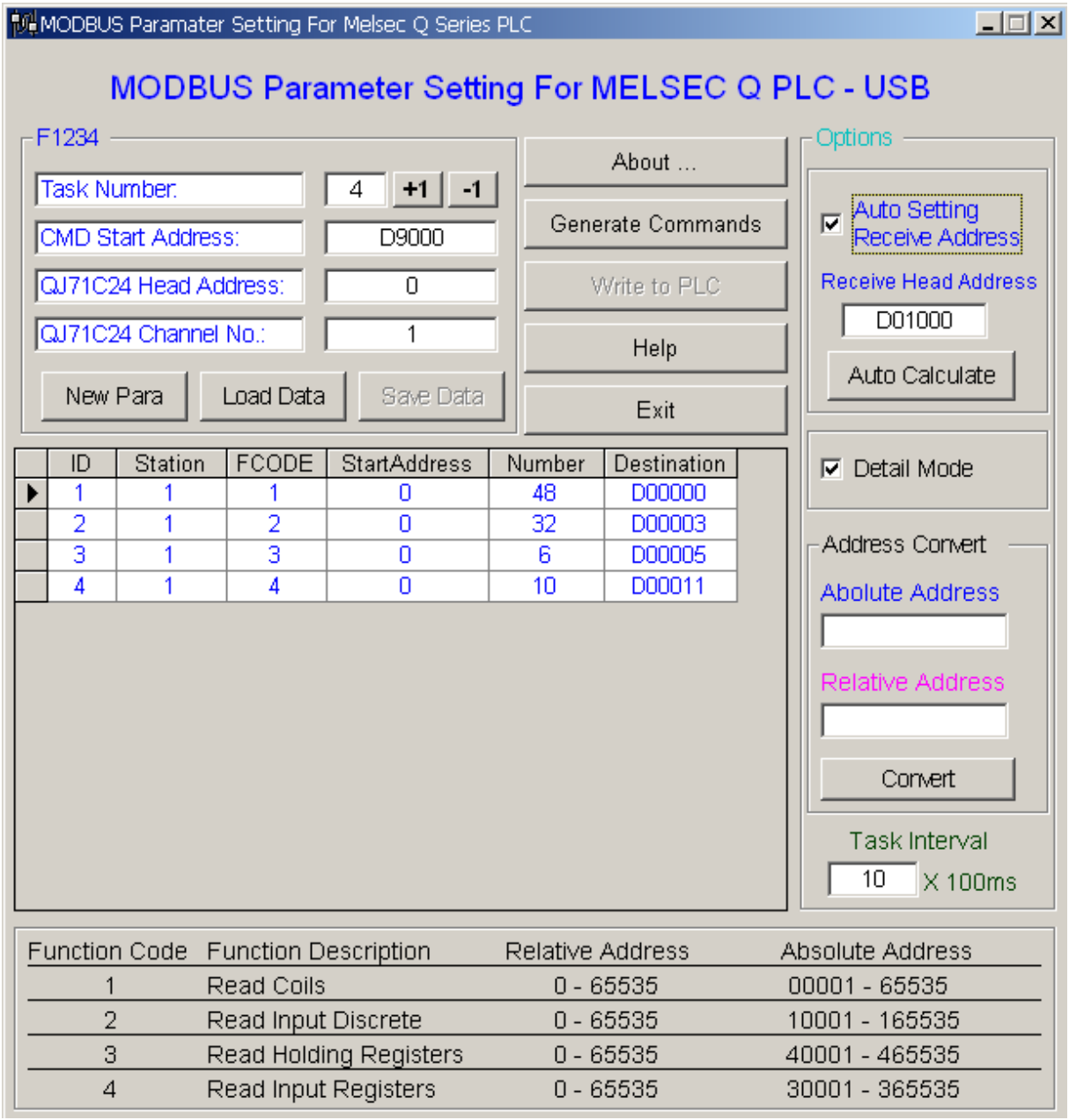
For detail setting information please refer “A1SJ71QC24/AJ71QC24 Serial Communication Module User’s Manual” and “GX-Developer operating manual”.

After the switch setting changed, please reset the PLC to make the setting effective.

The PLC Ladder Logic suppose the A1SJ71QC24[N][-R2] is in the first slot(slot 0), if the module is not in slot 0, some instruction of the Ladder Logic need to be modified, see the Ladder Logic description for detail.

3.3 Define the Communication Parameter

The parameter setting program **MBSETXXX.EXE**(XXX = USB, CPU, COM) is used to defined necessary parameter and communication task for the MODBUS communication. The software is easy to use. See following screen shot.



The title of the software indicates the communication mode between the software and the PLC, in the graphic it's USB.

To use the software, see following procedure:

- Input the task number you will define
  Input the head address of the communication module(Default 0, slot 0)
  Input the channel number(Default 1)
- Click “New Para” button, the task list will appear with its default value
- Modify the data in task list
- Click the “Generate Commands” button to generate the communicate parameter
- Click “Write to PLC” button to write the parameter to PLC

Other function of the software.

- ✧ After click the “Generate Commands” button, you can save what you have defined to a file through click the “Save Data” button, the software will pop a message box let you input a file name(Please don’t input the extension name)
- ✧ You can use the “Load Data” button to load the parameter files you saved before, and you can modify the data and save it again
- ✧ The “+1” and “-1” button beside the task number input box is used to add one or minus one task in the task list. For example suppose you have defined one parameter with 4 tasks and save it to file “T4”, if you want to add more tasks in your application, just load your saved file “T4”, Click the “+1” button(you can click many times as you need), modify the new task data, generate the command and write it to PLC again, you will get the new data.

See the task list, each task has six items.

ID:	the serial number of the task
Station:	the modbus slave station number, 0 to 255
Function Code:	Modbus protocol function code, valid range from 1 to 4 For the description of supported function code see the bottom of The windows
Start Address:	The relative address of the data to read, valid range from 0 to 65535
Numbers:	Read numbers in one task, if digital value is read(Function 1, 2) The number should the integer times of 16 and can’t be over 512 The Max registers can be read in one task can’t be over 100. The program will automatically recalculate the value if the input value is invalid.
Destination:	The head address of PLC data register used to save the data from slave station. Please be careful when you define the address yourself in case of data overlapped. Better use the “Auto Calculate ”function.

In the right part of the windows, there are some options which can help you to simplify the parameter setting.

Auto Setting Receive Address:

After you defined all the task, fill the receive head device for example “D1000”, then click the “Auto Calculate” button, the software will automatically calculate the destination data register address for you, and fill them in your defined task list automatically.

Detail Mode:

To hide or unhide the supported function code description in the bottom of the window.

Address Convert:

Since in the task the program use relative address, while in MODBUS device Absolute address is used, so this option can help to convert the Modbus Absolute address to relative address.
For example, if you fill the address 40010, click the calculate, you will get the relative address 9.

Task Interval:

The interval to poll the Modbus slave data. The unit is 100 ms.
Default value is 10, It means the polling interval is 1 second.

The usage of MBSETCPU.EXE and MBSETCOM.EXE is the same as described above, expect that MBSETCPU.EXE and MBSETCOM.EXE add the selecting of Com port parameter used in computer.

The usage of MBSETXXX.EXE need a valid license file, otherwise some function of the program will be disabled.

Tips.

1. In order to increase the communication refresh rate, don’t define too much tasks
2. If the read numbers is too long please increase the communication interval.
3. The bit data read from Modbus slave station also saved in PLC data registers. One data register can save 16 bits. If you read 10001 to 10016 and the destination is D0, the D0.0 is 10001, D0.1 is 10002, … , D0.15 is 100016.

3.4 PLC Parameter setting and Ladder Logic Description

3.4.1 Polling Ladder Logic

The polling ladder logic program name is called “MODBUS”, You can use following way to add the program to your application.

- ✧ Open the project “MODBUS” you get
- ✧ Reconfigure the transfer setup if needed(Default is USB)
- ✧ Change the PLC type if needed (Default is Q02HCPU)
- ✧ Write the Program “MODBUS” to PLC, if you have the same name program rename it first
- ✧ Close the project and open your own project
- ✧ Read the “MODBUS” program from PLC to your own project
- ✧ Modify the PLC parameter of your project.

- ✓ The “MODBUS” program should be set to scan
- ✓ Remember to set D9000 to D9999 to Latch.

To Start the MODBUS Polling, Please [SET M8010]

The Following devices have been used in MODBUS program, please don’t use in your program.

- ◆ ***T2000***
- ◆ ***Z0, Z1, Z2***
- ◆ ***W0 to W9F***
- ◆ ***D9000 to D9999***
- ◆ ***M8000 – M8191***

If the communication module is not in slot 0,following instruction need to be changed.

Original Instruction	New Instruction
ZP.CSET "U0" K1 W0 W3 M8100	ZP.CSET "UX" K1 W0 W3 M8100
GP.OUTPUT U0 W4 W0A M8102	GP.OUTPUT UX W4 W0A M8102
G.INPUT U0 W10 W20 M8104	G.INPUT UX W10 W20 M8104
X3(CH1) / XA(CH2)	XX3(CH1) / XXA(CH2)

The X is the module head address, for example, if the module address starts from 100H to 11FH then X = 10.

3.4.2 Write Data to Modbus Slave Ladder Logic

The program version 1.1 or later supports single coil or register write command and multiple register write command.
The Write Data Ladder Logic consists of two PLC program, one is “CRC16”, which is used to calculate the CRC code, another is “MBWRT”. The way to add the two program to your project is the same as that of “MODBUS” program. Do not forget to add the two program to PLC parameter – “Program”, and set the program type as following.

Program Name	Type
CRC16	Standby
MBWRT	SCAN

To write data to Modbus slave, just move Station number, Function Code, Device, Value to following device, then **SET M8120**. Set once, write once.

Item	PLC Device	Description
Station Number	D10100	0 - 255
Function Code	D10101	5: Write Single Coil 6: Write Single Register 16: Write Multiple Register, ***See next Table***
Device	D10102	When Function code = 5 Range:0000 - FFFFH .Absolute Address. 00001 - 65535
		When Function Code = 6 Range:0000 – FFFFH. Absolute Address. 40001- 465535
Value	D10103	When Function Code = 5 0 = 0000H 1 = FF00H
		When Function Code = 6 The value of D10103 will be written to slave When Function Code = 16 the value has no meaning.

When D10101 = 16, Write multiple register			
Data Register	Description	Data Register	Description
D10300	Number of data to Write	D10400	Write multiple Command
D10301	Data1	D10401	
D10302	Data2	D10402	
…	…	…	
D10348	Data48, max 48 points each time	D10499	

The Following devices have been used in MBWRT program, please don't use in your program.

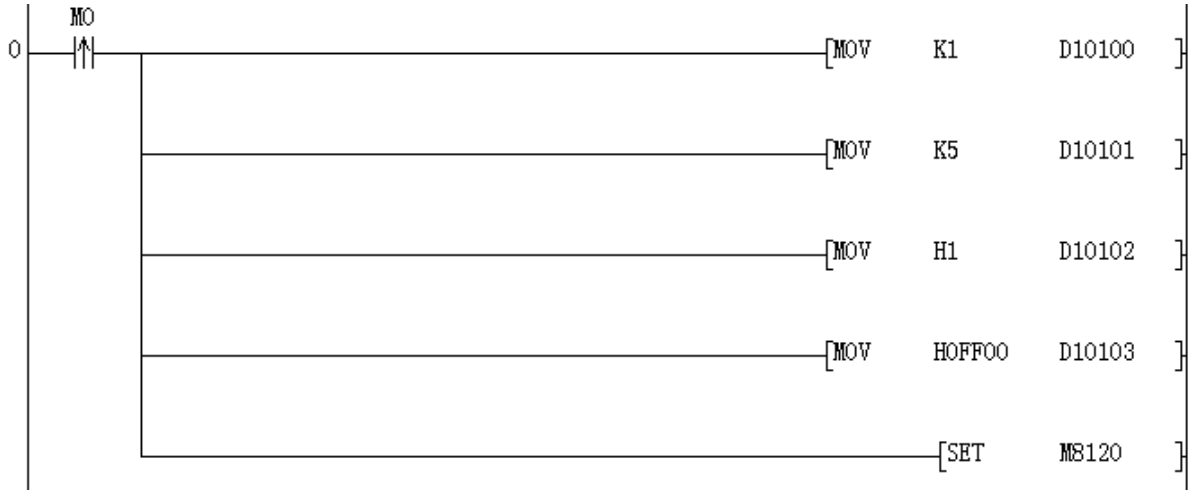
- ***T2000 – T2003***
- ***Z0, Z1,Z2,Z3,Z4,Z5***
- ***D10000 to D10499***
- ***M8000 – M8140***

If the communication module is not in slot 0, following instruction need to be changed.

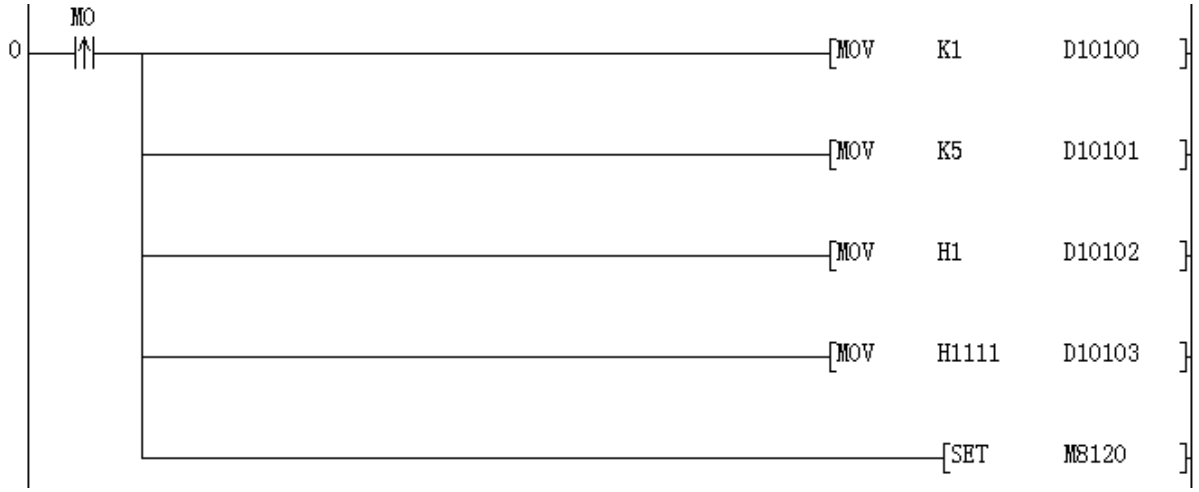
Original Instruction	New Instruction
G.OUTPUT U0 D10200 D10110 M8113	G.OUTPUT UX D10200 D10110 M8113
G.INPUT U0 D10203 D10120 M8114	G.INPUT UX D10203 D10120 M8114
X3(CH1) / XA(CH2)	XX3(CH1) / XXA(CH2)

The X is the module head address, for example, if the module address starts from 100H to 11FH then X = 10.

Examples:



Above code set Modbus slave 1 coil 00002 to 1.



Above code write data 4369(H1111) to slave 1 register 40002.

Above code write data in D10301 and D10302 to slave 1 register 40001 and 40002, 2 words.

4. APPENDIX

If you have any problem or suggestion when you use Modbus Master program for Mitsubishi QnAS and Q series PLC, please do not hesitate to contact us. Following is the contact information.

Allen

Email. allen@syslink.com.cn
Phone. 86 21 51096030, 13301658340

Alert: The telephone number maybe changed, always visit http://www.syslink.com.cn for newest information.