

# RS-M8194H

## Motion Control Module

### Quick Start Manual

(Version 3.1)



**ICP DAS CO., LTD.**

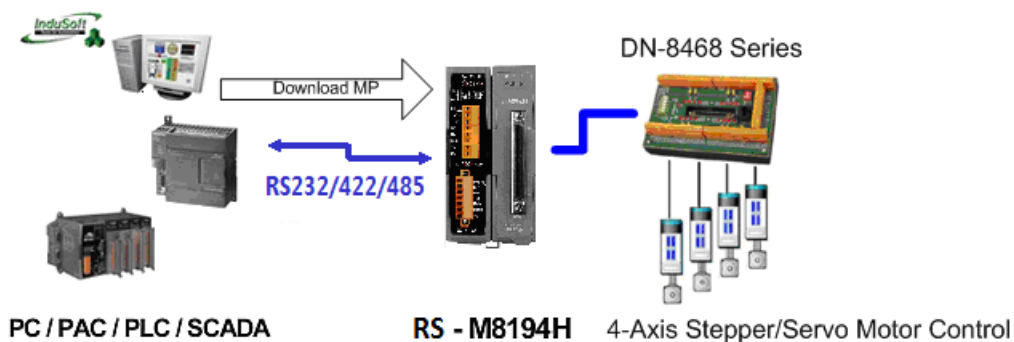
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# 1 RS-M8194H Features

RS-M8194H is a RS-232/485/422 serial based 4-axis stepping/pulse-type motion controller and uses Modbus RTU as a communication protocol between master and slave. Any master device (PC, PAC, PLC, HMI) which supports Modbus RTU can exchange data with the RS-M8194H controller. This intelligent motion controller also has a variety of built in motion control functions, such as 2/3-axis linear interpolation, 2-axis circular interpolation, T/S-curve acceleration/deceleration, various synchronous actions and automatic homing.

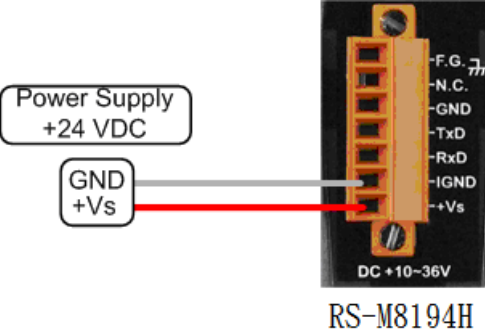


The EzMove utility is provided for configuring the RS-M8194H and assisting the user in writing macro programs and in getting familiar with the RS-M8194H and its motion commands. Furthermore it can be used for motion monitoring and tracking of the motion path.

# 2 Hardware Wiring

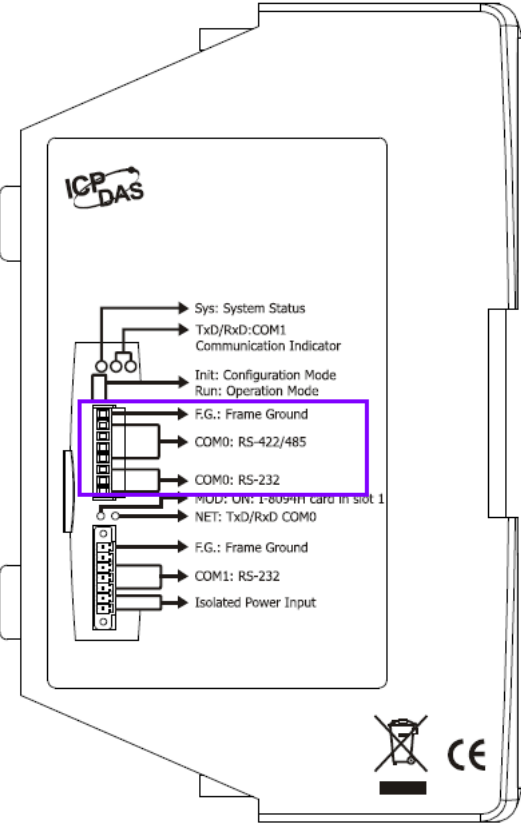
## ■ Power Connection

Connect the power supply +Vs (24 VDC) and GND pin to the RS-M8194H +Vs and IGND pin.



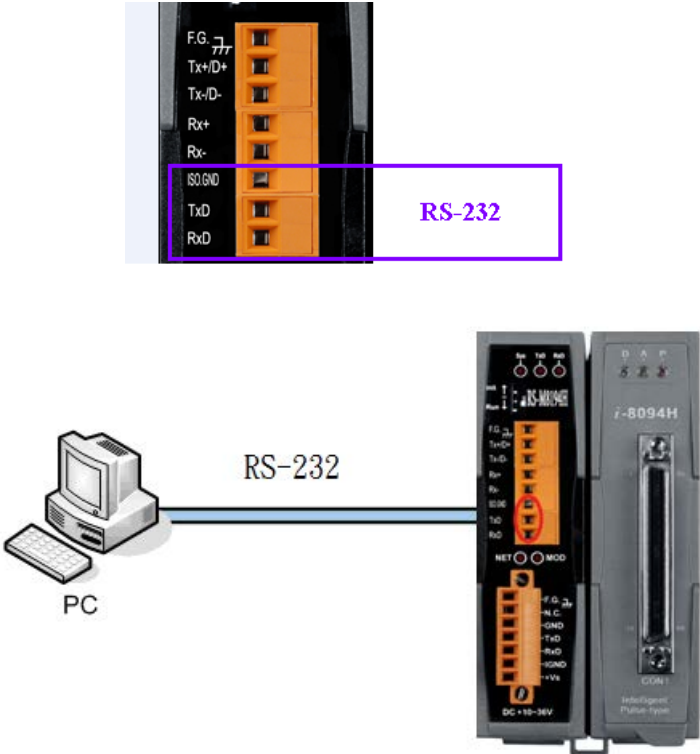
## ■ Methods of connecting PC to RS-M8194H

There are three ways to establish a connection between PC and RS-M8194H:



a. RS-232:

CA-0910 is used to connect PC with the RS-M8194H. The Tx, Rx and GND pins of CA-0910 has to be connected to the Rx, Tx and GND ports of RS-M8194H marked with the red circle.



b. RS-422 :

Connecting PC to RS-M8194H via I-7561; the wiring is as show below:

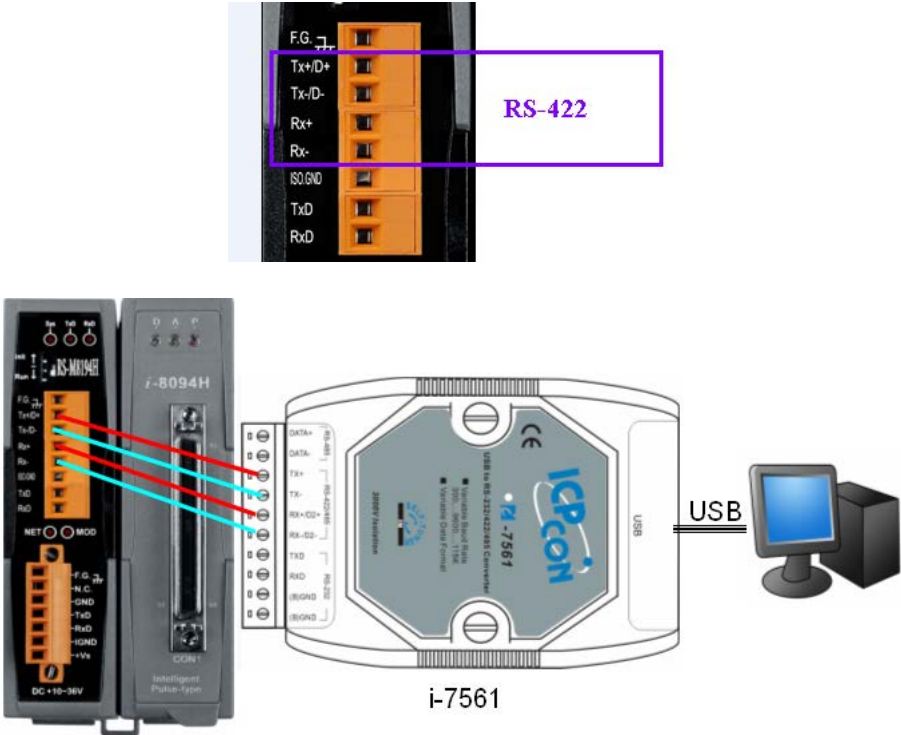


Figure 1: Use i-7561 converter to connect the RS-M8194H (RS-422) to the PC

c. RS-485 :

Connect PC to RS-M8194H via I-7561; the wiring is as show below:

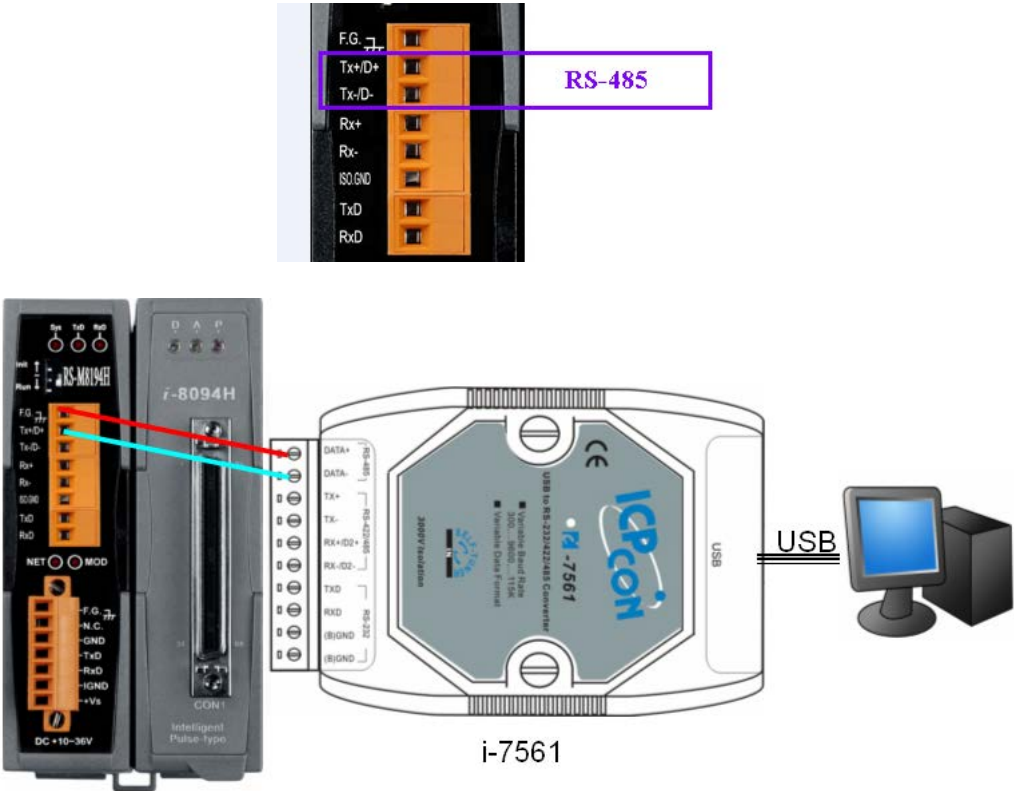


Figure 2: Use i-7561 converter to connect the RS-M8194H(RS-485) to the PC

### 3 Toolkit Installation

Execute the RSM8194H\_Vx\_x\_Setup.exe installation program which is on the product CD. Follow the prompts to complete the installation process. The default installation path is C:\ICPDAS\RS-M8194H\.

Installation folder \ICPDAS\RS-M8194H\ RS-M8194H (Vx.xx)		description
\Demo Programs	\Demo	VS2008 c++ example
\Firmware & Libraries	\Firmware	<ul style="list-style-type: none"> <li>▪ RS-M8194H firmware ;  <ul style="list-style-type: none"> <li>XY represent Ver. X.Y</li> <li>○ RM94H_XY.EXE</li> <li>○ autoexec.bat</li> </ul> </li> <li>▪ i-8094H firmware: <ul style="list-style-type: none"> <li>○ i8094H.exe</li> <li>○ autoexec.bat</li> </ul> </li> </ul>
	\Libraries	Libraries for <ul style="list-style-type: none"> <li>▪ VS2008 c++</li> </ul>
\Software Tools	\EzMove_Utility	EzMove Utility
	\EzMove_Utility \Demo	Macro Program (MP) examples
	\OCX	OCX for EzMove Utility
	\Language	Language file for EzMove utility
\Manual	RS-M8194H_Manual_vx.xx.pdf	RS-M8194H instruction manual
	RS-M8194H_QuickStart_vx.xx.pdf	RS-M8194H quick start
	EzMove Utility_vx.x.pdf	EzMove instruction manual
	FAQ	FAQ

## 4 Serial Communication Parameter Settings

Execute the EzMove Utility, and click Menu [Setting] → [RS-M8194H Setting] → [By COM Port] → [Communication Configuration], to open the following window:

RS-M8194H Communication Configuration

COM Port:  
COM Port: COM1 Closed

RS-M8194H Communication Setting:

	Current:	New:
Baudrate:	115200	115200
Data Bit:	8	8
Parity:	0	0
Stop Bit:	1	1

Modbus RTU Setting:

Slave ID:	1	1
Silent Time [ms]:	3	3
User Silent Time [ms]:	0	0
Modbus Port:	0	0

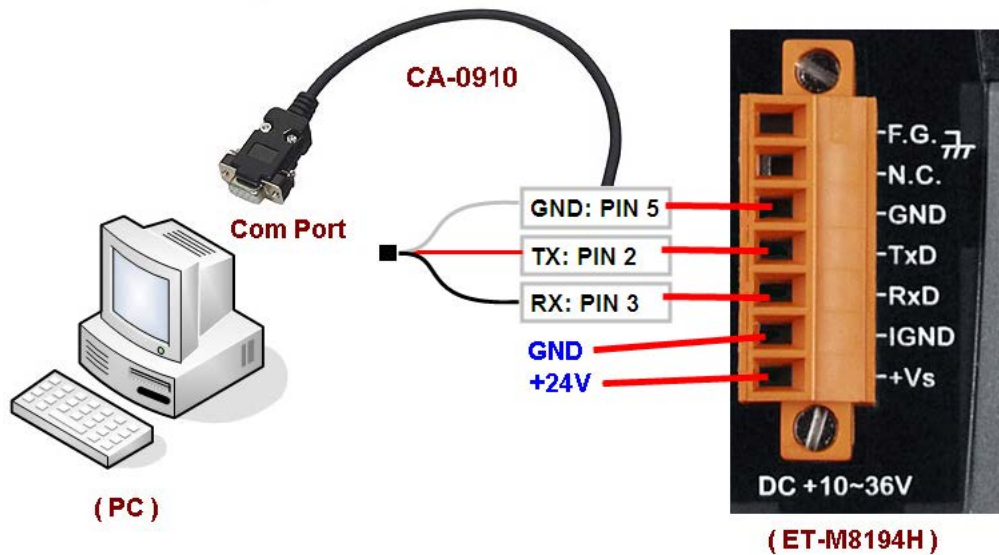
Attention:  
First set RS-M8194H module into configuration mode by setting the dip switch of the RS-M8194H to the INIT position then power OFF/ON the module.  
After the configuration data has been written to the RS-M8194H module set the dip switch back to RUN mode and power OFF/ON the module.

Default Setting

Read Setting Write New Setting

1. Power off the RS-M8194H.
2. Connect the RS-232 serial port of the PC to the RS-M8194H device by using the RS-232 cable (CA-0910). The Tx, Rx and GND pins of the CA-0910 cable have to be connected to the corresponding Rx, Tx and GND ports of COM1 of the RS-M8194H. The 9-pin, D-sub connector has to be plugged into the RS232 COM port of the desktop/laptop.





3. Set the DIP-switch to “Init”, then power up the RS-M8194H.



4. Select on the configuration window the COM Port to which the RS-M8194H is connected to and then click the **Open** button.
5. Click the **Read Setting** button to read the current serial configuration of the device.
6. Enter your new serial parameter setting.
7. Click the **Write New Setting** button to download the parameter setting to the RS-M8194H.  
To restore the factory default setting just click **Default Setting** and **Write New Setting**.

8. Set the DIP-switch back to the “Run” position and power off/on the RS-M8194H.



( Dip Switch -- Run )

**ATTENTION!!!**

Remove the RS-232 cable (CA-0910) from the RS-M8194H after configuration to prevent the device to be affected by noises.

## 5 RS-M8194H LED Description



### LED description:

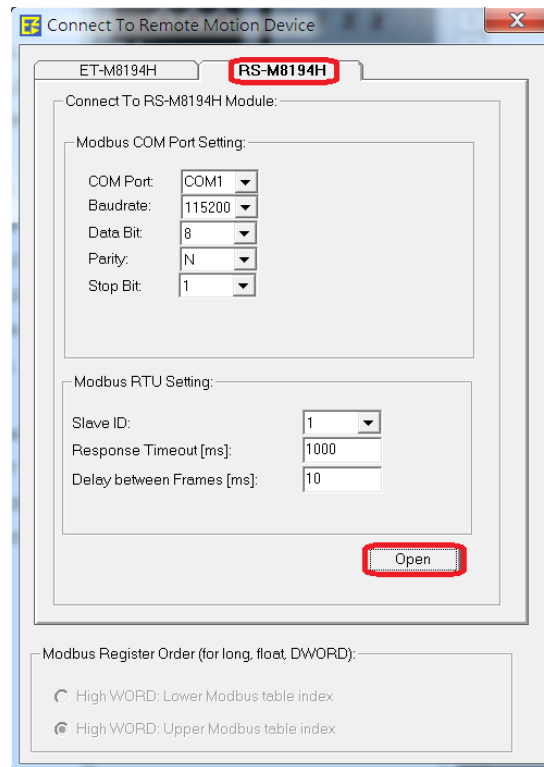
LED	Status	Description
Sys	On	Device is switched on and firmware is running.
	Flashing	Device is switched on and firmware is not running.
	Off	Device is switched off.
Tx	Flashing	Data is transmitted by the RS-M8194H via RS-232.
	Off	No data is sent by the RS-M8194H via RS-232.
Rx	Flashing	The device is receiving data via RS-232.
	Off	No data is being received.
NET	Flashing	Data transmitting.
	Off	No serial communication.
MOD	On	Module i-8094H is plugged into RS-M8194H device.
	Flashing	A module different than i-8094H is plugged into RS-M8194H device.
	Off	No module is plugged into the RS-M8194H device.

### LED description of the i-8094H module:

- P is the power indicator,
- A is the FRnet indicator, and
- D is the pulse output indicator.

## 6 Connect to RS-M8194H

For the first time connection click EzMove [menu] -> [Connect] -> [Connect To Remote Device...]. Select the “RS-M8194H” tab in the dialog box as shown in Figure 3 below. Choose the COM port setting of the RS-M8194H and press **Open** to connect to the RS-M8194H. For disconnection, you can press **Closed** in the “Connect” dialog box, or press the **Connect/Disconnect** Button on the Toolbar.



**Figure 3: First time serial connection**

After a successful connection the Utility saves all the connection data to a local file in the directory of the Utility. The next time it is only necessary to click the **Connect** button on the main toolbar to establish a serial connection with the RS-M8194H module.

# 7 MODBUS Data Display

The MODBUS message window in the EzMove shows the request sent by PC and the response messages received from the RS-M8194H. The "Write Multiple Register" tab displays messages of Function Code 16, and "Read Holding Register" tab displays messages of Function Code 03.

Read Holding Register														Write Multiple Register													
Request Sent														Response:													
No.	TxD	PID	FldL	UID	FC	St. Addr.	No.Reg.	BC	Reg. 1	Reg. 2	Reg. 3	Reg. 4			No.	TxD	PID	FldL	UID	FC	St. Addr.	No.Reg.					
102	07 47	00 00	00 0F	01	10	1F 40	00 04	08	0A 4E	00 01	00 00	03 20			102	07 47	00 00	00 06	01	10	1F 40	00 04					
103	07 48	00 00	00 0B	01	10	1F 40	00 02	04	0A DB	00 01					103	07 48	00 00	00 06	01	10	1F 40	00 02					
104	07 49	00 00	00 0F	01	10	1F 40	00 04	08	0A 4E	00 02	FF FF	FC E0			104	07 49	00 00	00 06	01	10	1F 40	00 04					
105	07 4A	00 00	00 0B	01	10	1F 40	00 02	04	0A DB	00 02					105	07 4A	00 00	00 06	01	10	1F 40	00 02					
106	07 4B	00 00	00 0F	01	10	1F 40	00 04	08	0A 4E	00 01	FF FF	FC E0			106	07 4B	00 00	00 06	01	10	1F 40	00 04					
107	07 4C	00 00	00 0B	01	10	1F 40	00 02	04	0A DB	00 01					107	07 4C	00 00	00 06	01	10	1F 40	00 02					
108	07 4D	00 00	00 09	01	10	1F 40	00 01	02	0A CA						108	07 4D	00 00	00 06	01	10	1F 40	00 01					

Read Holding Register														Write Multiple Register																
Request Sent														Response:																
No.	TxD	PID	FldL	UID	FC	St. Addr.	No.Reg.							No.	TxD	PID	FldL	UID	FC	BC	Reg. 1	Reg. 2	Reg. 3	Reg. 4	Reg. 5	Reg. 6	Reg. 7	Reg. 8	Reg. 9	F
756	07 2F	00 00	00 06	01	03	00 5A	00 10							756	07 2F	00 00	00 23	01	03	20	00 00	00 64	00 00	00 64	00 00	00 00	00 00	00 00	00 00	
757	07 30	00 00	00 06	01	03	00 5A	00 10							757	07 30	00 00	00 23	01	03	20	00 00	00 64	00 00	00 64	00 00	00 00	00 00	00 00	00 00	
758	07 31	00 00	00 06	01	03	00 5A	00 10							758	07 31	00 00	00 23	01	03	20	00 00	00 64	00 00	00 64	00 00	00 00	00 00	00 00	00 00	
759	07 32	00 00	00 06	01	03	00 5A	00 10							759	07 32	00 00	00 23	01	03	20	00 00	00 64	00 00	00 64	00 00	00 00	00 00	00 00	00 00	
760	07 33	00 00	00 06	01	03	00 5A	00 10							760	07 33	00 00	00 23	01	03	20	00 00	00 64	00 00	00 64	00 00	00 00	00 00	00 00	00 00	
761	07 34	00 00	00 06	01	03	00 5A	00 10							761	07 34	00 00	00 23	01	03	20	00 00	00 64	00 00	00 64	00 00	00 00	00 00	00 00	00 00	
762	07 35	00 00	00 06	01	03	00 5A	00 10							762	07 35	00 00	00 23	01	03	20	00 00	00 64	00 00	00 64	00 00	00 00	00 00	00 00	00 00	

## 8 Initialization Table

The Initial Table includes all the commands which are required to initialize the motion chip after power on. It is important that the motion chip setting corresponds to the servo drive setting otherwise the system will not be able to function properly. The Initial Table interface provides an easy and convenient way to enter the initial parameters.

Click on [Menu] -> [Setting] -> [Initial Table], to open the Initial Table.

Function	Parameter	X-Axis	Y-Axis	Z-Axis	U-Axis
Pulse Output Signal	Pulse Output Mode	0	0	0	0
Max Pulse Output Rate	Data (8000 to 4,000,000 PPS)	8000	8000	8000	8000
Hardware Limit Switch (HLMT)	Active Level (forward)	Low Active	Low Active	Low Active	Low Active
	Active Level (reverse)	Low Active	Low Active	Low Active	Low Active
Hardware Limit Stop Mode	Stop Mode	Abrupt Stop	Abrupt Stop	Abrupt Stop	Abrupt Stop
Near Home Sensor	Trigger Level	High Active	High Active	High Active	High Active
Home Sensor	Trigger Level	High Active	High Active	High Active	High Active
Software Limit	Enable Software Limit	Disable	Disable	Disable	Disable
	Software Limit (forward)	100000	100000	100000	100000
	Software Limit (reverse)	-100000	-100000	-100000	-100000
	Position Counter Type	Logic Pos	Logic Pos	Logic Pos	Logic Pos
Set Encoder Parameters	Encoder Input Type	A Quad B	A Quad B	A Quad B	A Quad B
	A Quad B Input Signal Division	1/1	1/1	1/1	1/1
	Trigger Level for Z Phase	High Active	High Active	High Active	High Active
Servo Driver Setting	On/Off	Off	Off	Off	Off
Servo Alarm Setting	Enable Servo Alarm	Disable	Disable	Disable	Disable
	Trigger Level	High Active	High Active	High Active	High Active
In-Position Signal	Enable In-Position Input	Disable	Disable	Disable	Disable
	Trigger Level	High Active	High Active	High Active	High Active
Digital Filter	Input Ports	1	1	1	1
	Filter Time Constant	2	2	2	2
Variable Ring Position Counter	Enable Variable Ring Counter	Disable	Disable	Disable	Disable
	Maximum Value	10000	10000	10000	10000
Triangle Profile Prevention	Enable Triangle Prevention	Disable	Disable	Disable	Disable

## 9 IO Status Table

This interface displays the IO status of all the FRnet modules (128 DI and 128 DO), the daughter board and the motion chip state. The individual FRnet DO state can be set by clicking the corresponding DO button.

Click on the [menu] -> [Tools] -> [IO Status] to open the DIO Status table. Press [Enable] / [Disable] to switch on/off the status polling timer.

The screenshot shows the 'DIO Status' window with the following sections:

- FRnet DO (Click LED to set DO):** A grid of 128 DOs (DO 0 to DO 15) organized into 8 groups (0-7).
- FRnet DI:** A grid of 16 DI signals (DI 0 to DI 15) organized into 2 groups (8-15).
- Polling:** A control panel with a 'Time Interval' set to 100 [ms] and an 'Enable' button.
- Daughter Board DI Signal:** A 4x4 grid for signals: Near Home, Home, Index, IN3, MPG (+), MPG (-), In Position, and Alarm, with columns X, Y, Z, U.
- Motion Chip Status:** Two 4x4 grids for signals: Soft Limit (+/-), HW Limit (+/-), Home Error, Alarm, Emergency, and Stop Cmd, with columns X, Y, Z, U.

# 10 Macro Programs

## 10.1 Editing Macro Programs

EzMove provides a simple editor for writing and downloading macro programs to the RS-M8194H.

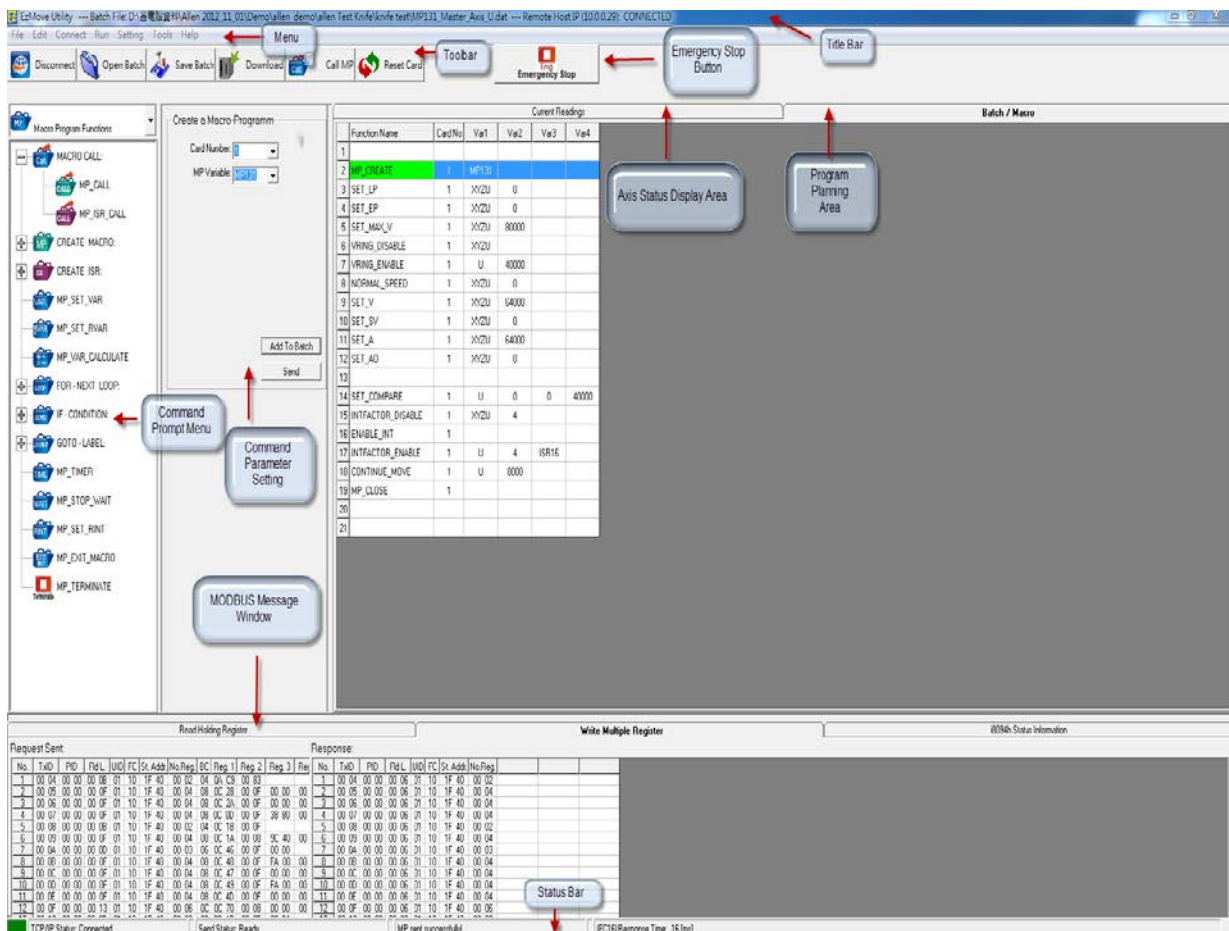


Figure 4: Main EzMove Utility

In the following, a rectangular trajectory in the X-Y plane is used as an example to demonstrate how to use the EzMove to download and run macro program. This example does not require the RS-M8194H module to be connected to any motor drives. After setting up the connection between PC and RS-M8194H, Click “Program Planning Area” (Batch / Macro) tab on the right-hand side (Figure 4). There are two ways to add a command to the editor:

- a. Use the "Command Prompt Menu" and "Command Parameter Setting":



Every Macro program has to start with the MP\_CREATE command. The following four steps (Figure 5) show how to add this command to the Macro program editor. Use the mouse to follow the steps in the sequence as indicated in the figure. The MP93 is the name of the macro program.

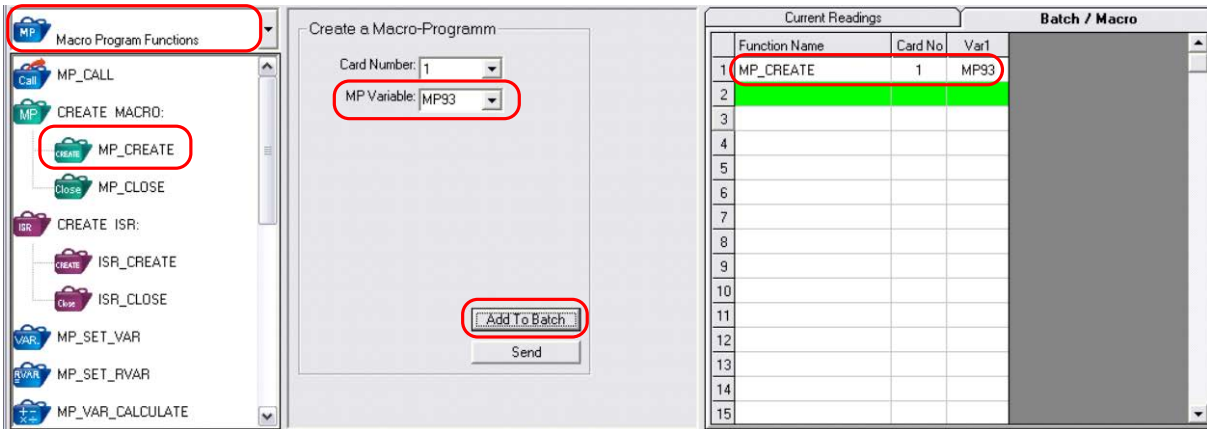


Figure 5: Adding a command to the Macro program editor

b. Use the drop-down menu in the “Program Planning Area”.

After the MP\_CREATE function, click on the next row in the “Function Name” field. Enter SET\_MAX\_V or choose the name from the drop-down menu to complete the function name part; then move the cursor to Var1 field and select XYZU; move to Var2 field and enter 8000. The second statement is now complete.

Current Readings			Batch / Macro	
	Function Name	Card No	Var1	Var2
1	MP_CREATE	1	MP93	
2	SET_MAX_V	1	XYZU	8000
3	SET_MAX_V			
4	SET_NHOME			
5	SET_OUT			
6	SET_PRESET			
7	SET_PULSE			
8	SET_PULSE_MODE			
9	SET_SLMT			
10	SET_SV			

Follow the similar steps described above to complete the macro program definition in the following table:

	Function Name	Card No	Var1	Var2
1	MP_CREATE	1	MP93	
2	SET_MAX_V	1	XYZU	8000
3	NORMAL_SPEED	1	XYZU	0
4	SET_V	1	XYZ	200
5	SET_A	1	XYZ	1000
6	SET_SV	1	XYZ	20
7	SET_AO	1	XYZ	0
8	SET_LP	1	XYZU	0
9	FIXED_MOVE	1	Z	100
10	MP_STOP_WAIT	1	Z	
11	MP_TIMER	1	2000	
12	FIXED_MOVE	1	XY	100
13	MP_STOP_WAIT	1	XY	
14	FIXED_MOVE	1	Z	-100
15	MP_STOP_WAIT	1	Z	
16	FIXED_MOVE	1	Y	800
17	MP_STOP_WAIT	1	Y	
18	FIXED_MOVE	1	X	800
19	MP_STOP_WAIT	1	X	
20	FIXED_MOVE	1	Y	-800
21	MP_STOP_WAIT	1	Y	
22	FIXED_MOVE	1	X	-800
23	MP_STOP_WAIT	1	X	
24	MP_CLOSE	1		

The macro program will take 23 lines where MP\_CREATE statement defines the starting address and does not take memory space. According to the internal configuration of RS-M8194H, each MP has its own size limitation. The size limit of all MP programs can be displayed in the menu [Help] -> [FLine Table]. MP93 is capable of accommodating 32 function lines and is chosen for the example.

## 10.2 Macro Program Download and Execution

### Step 1: Download a macro program to the RS-M8194H

After connecting, users can press the toolbar **Download** button to download a macro program from the editor to the non-volatile memory of the i8094H. The program will not be executed after the download has finished.

### Step 2: Display the motion path

Click on the [menu] -> [Tools] -> [Graph] to open the Graph window. On the “Axis Status Display Area”, users can set the polling time interval. After pressing **Enable** the polling of motion status (e.g. encoder position) starts.

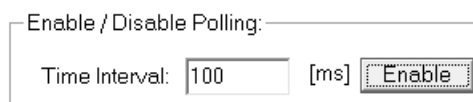


Figure 6: Polling timer setting

### Step 3: Run the macro program

After pressing the toolbar **Call MP** Button, selecting a macro program number (e.g. MP93) and clicking the **Send** button the selected macro starts to execute.

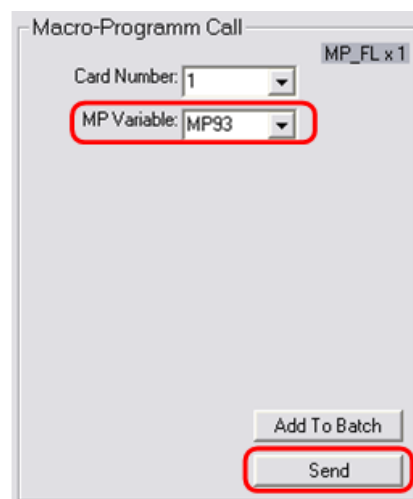


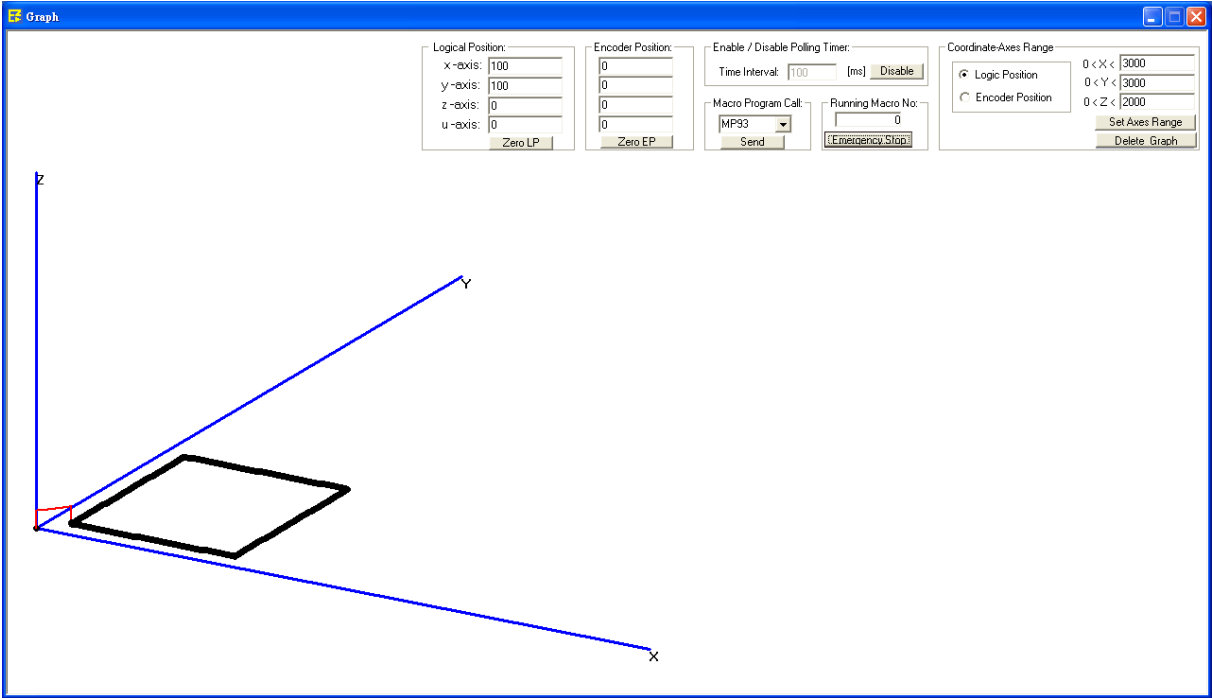
Figure 7: Macro program execution call

Users can add an MP\_CALL statement after MP\_CLOSE command in the editor to immediately execute the macro program after downloading (Figure 8).

Current Readings			Batch / Macro	
	Function Name	Card No	Var1	Var2
18	MP_STOP_WAIT	1	Y	
19	FIXED_MOVE	1	X	800
20	MP_STOP_WAIT	1	X	
21	FIXED_MOVE	1	Y	-800
22	MP_STOP_WAIT	1	Y	
23	FIXED_MOVE	1	X	-800
24	MP_STOP_WAIT	1	X	
25	MP_CLOSE	1		
26				
27	MP_CALL	1	MP93	
28				

Figure 8: Macro program download and execution

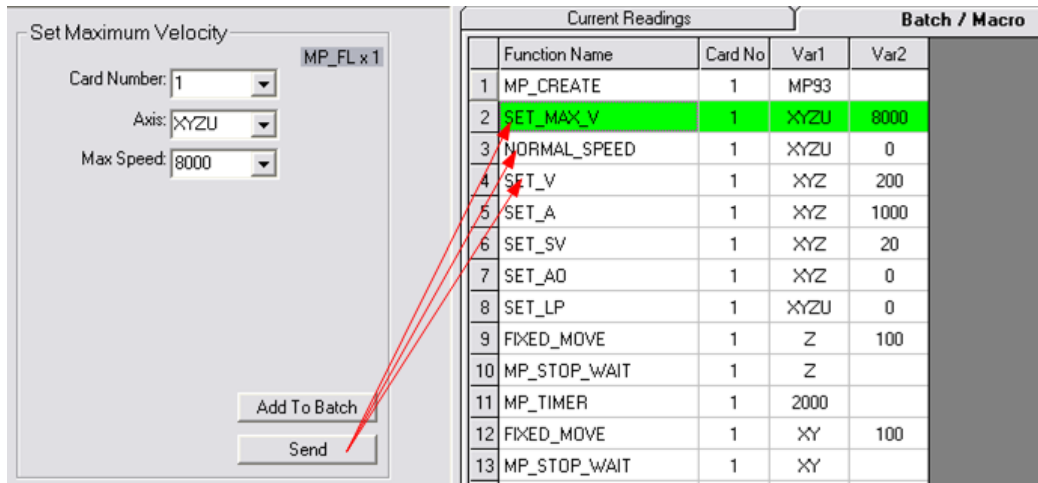
Switch back to the Graph window, to monitor the motion path of the executing macro program. The above example is a square on the XY plane.



**Execute commands one by one**

When editing a Macro program, the function statements are shown on the screen. Users can execute either one of these statements by directly pressing the Send button.

For example, click on the second row (Figure 9) containing the SET\_MAX\_V command in the Macro editor to open the corresponding parameter input window. Press the Send button of the parameter input window to directly send the command to the RS-M8194H.



**Figure 9: Single command execution**

# 11 Macro Program Demo

The demo examples for the RS-M8194H are in the following folder:  
C:\ICPDAS\RS-M8194H\API\_Lib\_Demo\Demo

The demo programs show how to write and download macro programs to the RS-M8194H. After a macro program has been downloaded to the non-volatile memory of the i8094H module any Modbus RTU master (PLC, HMI, etc.) can call this macro program to execute. The demo program is written in Visual Basic 6.0.

In the following the download macro source code part of the Visual Basic 6.0 demo “RSM VB Demo” is being shown:

```
Private Sub cmdDownloadMP_Click() 'Step 2: download macro program

    lbl_Msg.Caption = "Downloading MP..."
    DoEvents
    'Download Macro Program to MP94
    RSM_MP_CREATE handle, 1, MP94 'MP94 - Create is the start of MP downloading
    RSM_MACRO_SET_MAX_V handle, 1, AXIS_XYZU, 8000 'set max velocity to be 8000 pps
    RSM_MACRO_NORMAL_SPEED handle, 1, AXIS_XYZU, 0 'set speed profile,
    '0 =>symmetric T curve
    RSM_MACRO_SET_V handle, 1, AXIS_XYZ, 200 'set velocity to be 200 pps
    RSM_MACRO_SET_A handle, 1, AXIS_XYZ, 1000 'set acc to be 1000 pps/sec
    RSM_MACRO_SET_SV handle, 1, AXIS_XYZ, 20 'set start velocity to be 20 pps
    RSM_MACRO_SET_AO handle, 1, AXIS_XYZ, 0 'set AO to be 0
    RSM_MACRO_SET_LP handle, 1, AXIS_XYZU, 0 'set logical position to be 0
    RSM_MACRO_FIXED_MOVE handle, 1, AXIS_Z, 100 'move Z axis 100 pulses
    RSM_MACRO_STOP_WAIT handle, 1, AXIS_Z 'wait until Z axis stops
    RSM_MACRO_TIMER handle, 1, 2000 'delay 2000 ms
    RSM_MACRO_FIXED_MOVE handle, 1, AXIS_XY, 100 'move X,Y axes 100 pulses
    RSM_MACRO_STOP_WAIT handle, 1, AXIS_XY 'wait until X,Y axes stop
    RSM_MACRO_FIXED_MOVE handle, 1, AXIS_Z, -100 'move Z axis -100 pulses
    RSM_MACRO_STOP_WAIT handle, 1, AXIS_Z 'wait until Z axis stops
    RSM_MACRO_FIXED_MOVE handle, 1, AXIS_Y, 800 'move Y axis 800 pulses
    RSM_MACRO_STOP_WAIT handle, 1, AXIS_Y 'wait until Y axis stops
    RSM_MACRO_FIXED_MOVE handle, 1, AXIS_X, 800 'move X axis 800 pulses
    RSM_MACRO_STOP_WAIT handle, 1, AXIS_X 'wait until X axis stops
    RSM_MACRO_FIXED_MOVE handle, 1, AXIS_Y, -800 'move Y axis -800 pulses
    RSM_MACRO_STOP_WAIT handle, 1, AXIS_Y 'wait until Y axis stops
    RSM_MACRO_FIXED_MOVE handle, 1, AXIS_X, -800 'move X axis -800 pulses
    RSM_MACRO_STOP_WAIT handle, 1, AXIS_X 'wait until X axis stops

    RSM_MACRO_MP_CLOSE handle, 1 'end of MP94

    lbl_Msg.Caption = "Complete download!"

End Sub
```