DOS/V PCI Bus

4-Axis Motor Control Board with Interpolation

MC8043P User's Manual

2006-11-13 Ver. 1.1

NOVA electronics

Introduction

■ Before You Begin

Before using MC8043P, please read this manual carefully to fully understand for correct use and observe all the instructions given in this manual. We shall be exempted from taking responsibility and held harmless for damage or losses incurred by the user if the user fails to observe the instructions.

■ Checking the Contents

When you unpack your MC8043P package, check for the following accessories. If something is missing or broken, contact the place of purchase.

- MC8043P 1
- I/O Cable 1

The user's manual and software are not with the package for resource-saving. If you need additional manuals or software, contact the place of purchase or contact us. You can also download the latest manual and software from our web site:
http://www.novaelec.co.jp/eng

■ MCX314As Manual

The circuit of MC8043P consists of mainly 4-axes motion control IC "MCX314As", a PCI-bus interface circuit and I/O interface circuits of each axis. Basic functions of this board all depend on MCX314As, so please refer to the user's manual of MCX314As regarding these functions. This manual describes the installation on Windows, how to use the library and the interface circuits of PCI bus, I/O address and I/O signals.

■ Caution/Danger

Use the following environmental conditions.

Operating Temperature	0～45℃(32～113° F)
Humidity	20～90% (no condensation)
Floating dust	Not to be excessive
Corrosive gases	None
Electric supply source	DC+5V (±5%), external source: DC+12～24V

Perform inspection and maintenance periodically for correct use.

Cable connection	The connector of the board and a cable should properly be connected.
Card-edge	No dust and no corrosion.
Connector terminal area	No dust and no corrosion.
On the IC and board	No excessive dust and no foreign substance.

■ Handling Precautions

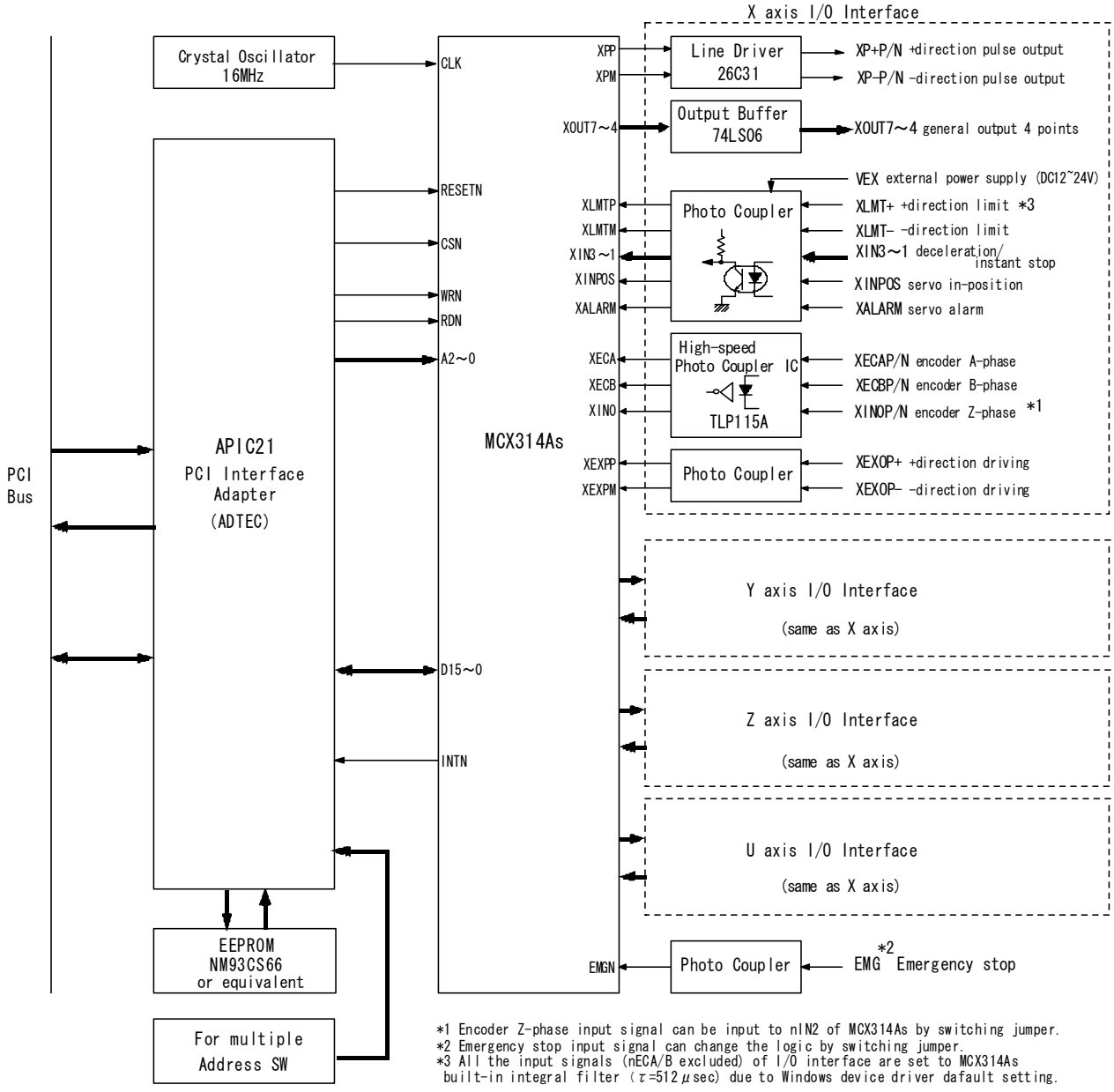
- This product is wrapped in an antistatic envelope. Before handling the product, eliminate static electricity of your body and clothes and then hold both ends of the board between your fingers or hold a mounting bracket.
- Do not touch connector terminals and other terminals of components as much as possible. If the person who is electrically charged touches the part, CMOS-IC can be destroyed by static electricity. Use caution to prevent any ESD in a dry condition especially in wintertime.
- Do not use in any location subject to shock, vibration, magnetism and electricity. Otherwise, the equipment may be damaged or malfunctioned.
- Do not disassemble, repair or modify the equipment.
- Do not connect or disconnect the board or cables while power is applied. Otherwise, breakdown or operation error may result.

Information in this manual is subject to change without notice.
Windows are registered trademark of Microsoft Corporation.
This user's manual supports Japanese User's Manual Version 2006.08.30.

1. Outline

MC8043P is a PCI-bus compliant PC/AT compatible circuit board equipped with 4-axes motion control IC with interpolation function “MCX314As”. It can independently control 4-axes of either stepper motor or pulse type servo drives for position and speed controls. In addition, this IC can perform 2/3 axes linear interpolation, CW/CCW circular interpolation and 2/3 axes bit pattern interpolation.

MC8043P functional block diagram is shown as follows. MC8043P consists of mainly 4-axes motion control IC “MCX314As”, a PCI-bus interface circuit and I/O interface circuits of each axis: X, Y, Z and U. Therefore, basic functions of this board all depend on MCX314As, so please refer to the user’s manual of MCX314As regarding these functions.



MC8043P Circuit Block Diagram

1.1 MCX314As Functional Restriction

MC8043P does not support the following MCX314As input/output signals due to the board area and the number of I/O connector pins.

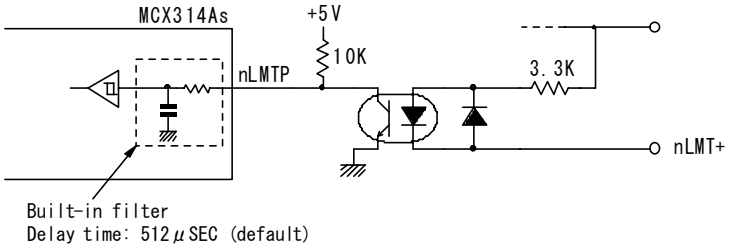
- BUSYN output signal
- EXPLSN input signal
- SCLK output signal
- nDRIVE/DCC output signal
- nOUT3~0 general output signal (4 points of each axis nOUT7~4 are used as output through buffer.)

1.2 Difference from MC8041P

MC8041P is a PCI board equipped with MCX314, and MC8043P is a PCI board equipped with MCX314As instead of MCX314. Concerning I/O interface, signal names and pin assignments are completely the same as MC8041P. However, the following are different from MC8041P for upgrade.

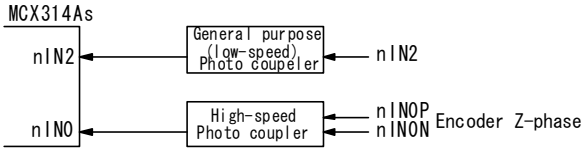
■ Input Signal Filter Circuit Deletion

In MCX314As, all the input signals excluding nECA/B signal are equipped with the integral filters in the IC. MC8043P board is not equipped with CR filter on the board in order to effectively use these built-in integral filters. IC built-in filter sets the delay time of all the input signals excluding nECA/B signal to 512μsec at the initial setting of Windows device driver provided by NOVA electronics. IC built-in filter can freely change the delay time in mode setting of MCX314As.

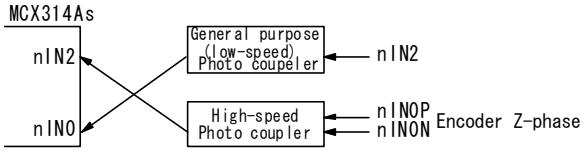


■ Encoder Z-phase Input Signal Switching

MC8041P uses nIN0 as the input of an encoder Z-phase signal. However, if the user uses automatic home search function of MCX314As on MC8043P, nIN2 is assigned to the input of the encoder Z-phase signal. In MC8043P, short-circuiting 1 and 2 of the jumper pin JP3, nIN0 can be used as the encoder Z-phase signal as well as MC8041P (factory default). And if short-circuiting 2 and 3 of the jumper pin JP3, encoder Z-phase input is connected to nIN2 of MCX314As and the encoder Z-phase signal can be input in automatic home search of MCX314As.



JP3:1-2 short-circuited



JP3:2-3 short-circuited

1.3 PCI Bus Interface

■ Occupied I/O Address

In this board, SA15~4 is address decoded and the internal 16-bit read/write register can be selected by SA3~1 of MCX314As. The board requires 16 I/O address locations for PCI bus. I/O addressing is determined by “plug and play” function of Windows.

■ Data Length

Data length is 16-bit. Read/Write access cannot be performed per byte.

■ Interrupt Signal

When using an interrupt to PCI bus, the board uses IRQ determined by “plug and play” function of Windows.

1.4 Each Axis I/O Interface

■ Drive Pulse Output (nP+P/N, nP-P/N)

Drive pulses in the +/- direction for motor driving are output a 50% duty cycle of from 1PPS to 4MPPS.
Drive pulse output signals of each direction are the differential line-drive output of AM26C31 line driver or equivalent.

■ General Output (nOUT7~4)

Each axis has 4 general outputs. Output buffer uses SN74LS06 or equivalent and is the open collector output. These signals can be used as a stack counter clear, servo free and alarm reset for a servomotor.

■ Over Run Limit Input (nLMT+, nLMT-)

Input signal to disable output pulse for + and – direction respectively. Decelerating stop and instant stop for active can be selected in mode setting. These input signals are isolated by photo coupler from internal circuit. DC12~24V power supply is needed.

■ Decelerating Stop/Instant Stop Input (nIN3~1)

In home search, this input signal is to stop drive pulse in deceleration or immediately from outside. Enable/Disable and active logical level can be selected in mode setting. Each axis has three inputs, also can be used as general input. These input signals are isolated by photo coupler from internal circuit.

■ Servo Motor Input (nINPOS, nALARM)

INPOS (in-position) signal and ALARM signal for servo motor drivers can be input, which can also be used as general input signals. These input signals are isolated by photo coupler from internal circuit.

■ Encoder Input (nECAP/N, nECBP/N, nINOP/N)

This signal inputs A/B phase and Z-phase signals from an encoder. nECAP/N, nECBP/N signals are for an encoder A/B phase signal input and count up or down 32-bit real position counter inside MCX314As. nINOP/N signal is for a Z-phase signal input and stops drive pulse in deceleration or immediately. In default setting, nINOP/N signal is connected to nIN0 input of MCX314As. Short-circuiting 2 and 3 of the jumper pin JP3, this Z-phase input is connected to nIN2 of MCX314As and the user can perform automatic home search function of MCX314As. These input signals are isolated by photo coupler from internal circuit and can easily be connected to a differential output line-drive.

■ Driving by External Input(nEXOP+, nEXOP-)

This signal externally controls driving in the + or – direction. In fixed pulse driving mode, the input signal triggers (the falling edge) to output specified drive pulse. In continuous pulse driving mode, drive pulse is output continuously while the input signal is low. This function can reduce the load of the host CPU, so the user can perform jog feed of each axis speedy. These input signals are isolated by photo coupler from internal circuit.

■ Emergency Stop Input (EMG)

This signal is to perform the emergency stop for all axes. Active logical level can be set by selecting a jumper on the board. This input signal is isolated by photo coupler from internal circuit.

2. I/O Address Setting and Register

I/O port address of the board is automatically determined by the plug and play function (PnP function) of the PCI bus. The board requires serial 16 I/O address locations for PCI bus.
Check it not to overlap the I/O address of PC main board or other I/O expansion boards using [System Properties] – [Device Manager].

I/O port address of MCX314As is as shown in the table below. The number in () of I/O address means each register address when PnP function sets to 0280~028Fh. Each register is 16-bit length. Be sure to access by word, it cannot be accessed by byte. For details on each register, see chapter 4 of MCX314As user's manual.

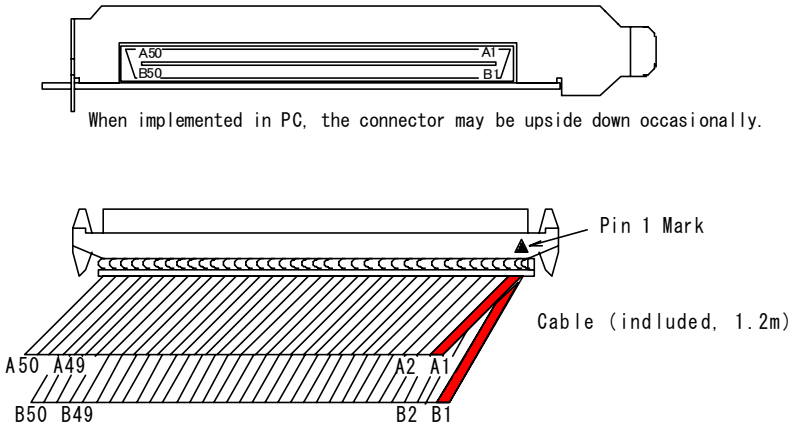
I/O Address	Write Register		Read Register	
SA3 SA2 SA1	Sign	Register Name	Sign	Register Name
0 0 0 (0280h)	WR0	Command register	RR0	Main status register
0 0 1 (0282h)	XWR1 YWR1 ZWR1 UWR1	X axis mode register 1 Y axis mode register 1 Z axis mode register 1 U axis mode register 1	XRR1 YRR1 ZRR1 URR1	X axis status register 1 Y axis status register 1 Z axis status register 1 U axis status register 1
0 1 0 (0284h)	XWR2 YWR2 ZWR2 UWR2	X axis mode register 2 Y axis mode register 2 Z axis mode register 2 U axis mode register 2	XRR2 YRR2 ZRR2 URR2	X axis status register 2 Y axis status register 2 Z axis status register 2 U axis status register 2
	BP1P	BP1P register		
0 1 1 (0286h)	XWR3 YWR3 ZWR3 UWR3	X axis mode register 3 Y axis mode register 3 Z axis mode register 3 U axis mode register 3	XRR3 YRR3 ZRR3 URR3	X axis status register 3 Y axis status register 3 Z axis status register 3 U axis status register 3
	BP1M	BP1M register		
1 0 0 (0288h)	WR4	Output register	RR4	Input register 1
	BP2P	BP2P register		
1 0 1 (028Ah)	WR5	Interpolation mode register	RR5	Input register 2
	BP2M	BP2M register		
1 1 0 (028Ch)	WR6 BP3P	Write data register 1 BP3P register	RR6	Read data register 1
1 1 1 (028Eh)	WR7 BP3M	Write data register 2 BP3M register	RR7	Read data register 2

3. I/O Signals

This chapter describes each I/O signal of the I/O connector. In the description, the signal name of each axis is described as n○○○○. This “n” means X, Y, Z and U.

3.1 I/O Connector

I/O Connector Pin Assignments



The cable (included) is A1, A2, … A49, A50 from the right (red) of the upper cable to the left, and B1, B2, … B49, B50 from the right (red) of the lower cable to the left when Pin 1 mark (▲) of the connector is placed in the upper right.

Connector type: Board side FX2B-100P-1.27DS (Hirose), Cable side FX2B-100S-1.27R (Hirose)

Pin	Signal	I/O	Contents	Chapter
A1	VEX		External Power (DC12~24V)	3.10
A2	EMG	Input	Emergency Stop (All axes)	3.9
A3	XLMT+	Input	X axis Limit in + direction	3.4
A4	XLMT-	Input	X axis Limit in – direction	3.4
A5	XIN1	Input	X axis Decelerating Stop / Instant Stop	3.5
A6	XIN2	Input	X axis Decelerating Stop / Instant Stop	3.5
A7	XIN3	Input	X axis Decelerating Stop / Instant Stop	3.5
A8	YLMT+	Input	Y axis Limit in + direction	3.4
A9	YLMT-	Input	Y axis Limit in – direction	3.4
A10	YIN1	Input	Y axis Decelerating Stop / Instant Stop	3.5
A11	YIN2	Input	Y axis Decelerating Stop / Instant Stop	3.5
A12	YIN3	Input	Y axis Decelerating Stop / Instant Stop	3.5
A13	XINPOS	Input	X axis Servo Inposition	3.6
A14	XALARM	Input	X axis Servo Alarm	3.6
A15	XECAP	Input	X axis Encoder A-phase	3.7
A16	XECAN	Input	X axis Encoder A-phase	3.7
A17	XECBP	Input	X axis Encoder B-phase	3.7
A18	XECBN	Input	X axis Encoder B-phase	3.7
A19	XIN0P	Input	X axis Encoder Z-phase	3.7
A20	XIN0N	Input	X axis Encoder Z-phase	3.7
A21	YINPOS	Input	Y axis Servo Inposition	3.6
A22	YALARM	Input	Y axis Servo Alarm	3.6
A23	YECAP	Input	Y axis Encoder A-phase	3.7
A24	YECAN	Input	Y axis Encoder A-phase	3.7
A25	YECBP	Input	Y axis Encoder B-phase	3.7

Pin	Signal	I/O	Contents	Chapter
A26	YECBN	Input	Y axis Encoder B-phase	3.7
A27	YIN0P	Input	Y axis Encoder Z-phase	3.7
A28	YIN0N	Input	Y axis Encoder Z-phase	3.7
A29	XEXOP+	Input	X axis Driving in + direction	3.8
A30	XEXOP-	Input	X axis Driving in – direction	3.8
A31	YEXOP+	Input	Y axis Driving in + direction	3.8
A32	YEXOP-	Input	Y axis Driving in – direction	3.8
A33	GND		Internal Circuit GND	
A34	XOUT4	Output	X axis General Output	3.3
A35	XOUT5	Output	X axis General Output	3.3
A36	XOUT6	Output	X axis General Output	3.3
A37	XOUT7	Output	X axis General Output	3.3
A38	XP+P	Output	X axis Drive Pulse in + direction	3.2
A39	XP+N	Output	X axis Drive Pulse in + direction	3.2
A40	XP-P	Output	X axis Drive Pulse in – direction	3.2
A41	XP-N	Output	X axis Drive Pulse in – direction	3.2
A42	GND		Internal Circuit GND	
A43	YOUT4	Output	Y axis General Output	3.3
A44	YOUT5	Output	Y axis General Output	3.3
A45	YOUT6	Output	Y axis General Output	3.3
A46	YOUT7	Output	Y axis General Output	3.3
A47	YP+P	Output	Y axis Drive Pulse in + direction	3.2
A48	YP+N	Output	Y axis Drive Pulse in + direction	3.2
A49	YP-P	Output	Y axis Drive Pulse in – direction	3.2
A50	YP-N	Output	Y axis Drive Pulse in – direction	3.2

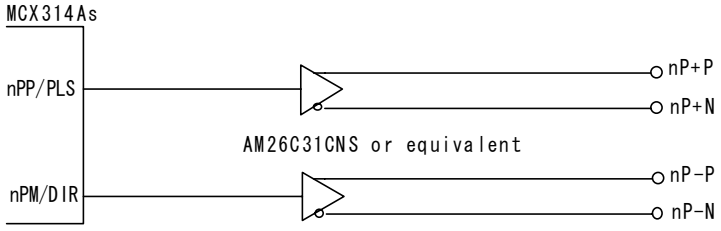
Pin	Signal	I/O	Contents	Chapter
B1	VEX		External Power (DC12~24V)	3.10
B2				
B3	ZLMT+	Input	Z axis Limit in + direction	3.4
B4	ZLMT-	Input	Z axis Limit in – direction	3.4
B5	ZIN1	Input	Z axis Decelerating Stop / Instant Stop	3.5
B6	ZIN2	Input	Z axis Decelerating Stop / Instant Stop	3.5
B7	ZIN3	Input	Z axis Decelerating Stop / Instant Stop	3.5
B8	ULMT+	Input	U axis Limit in + direction	3.4
B9	ULMT-	Input	U axis Limit in – direction	3.4
B10	UIN1	Input	U axis Decelerating Stop / Instant Stop	3.5
B11	UIN2	Input	U axis Decelerating Stop / Instant Stop	3.5
B12	UIN3	Input	U axis Decelerating Stop / Instant Stop	3.5
B13	ZINPOS	Input	Z axis Servo Inposition	3.6
B14	ZALARM	Input	Z axis Servo Alarm	3.6
B15	ZECAP	Input	Z axis Encoder A-phase	3.7
B16	ZECAN	Input	Z axis Encoder A-phase	3.7
B17	ZECBP	Input	Z axis Encoder B-phase	3.7
B18	ZECBN	Input	Z axis Encoder B-phase	3.7
B19	ZIN0P	Input	Z axis Encoder Z-phase	3.7
B20	ZIN0N	Input	Z axis Encoder Z-phase	3.7
B21	UINPOS	Input	U axis Servo Inposition	3.6
B22	UALARM	Input	U axis Servo Alarm	3.6
B23	UECAP	Input	U axis Encoder A-phase	3.7
B24	UECAN	Input	U axis Encoder A-phase	3.7
B25	UECBP	Input	U axis Encoder B-phase	3.7

Pin	Signal	I/O	Contents	Chapter
B26	UECBN	Input	U axis Encoder B-phase	3.7
B27	UIN0P	Input	U axis Encoder Z-phase	3.7
B28	UIN0N	Input	U axis Encoder Z-phase	3.7
B29	ZEXOP+	Input	Z axis Driving in + direction	3.8
B30	ZEXOP-	Input	Z axis Driving in – direction	3.8
B31	UEXOP+	Input	U axis Driving in + direction	3.8
B32	UEXOP-	Input	U axis Driving in – direction	3.8
B33	GND		Internal Circuit GND	
B34	ZOUT4	Output	Z axis General Output	3.3
B35	ZOUT5	Output	Z axis General Output	3.3
B36	ZOUT6	Output	Z axis General Output	3.3
B37	ZOUT7	Output	Z axis General Output	3.3
B38	ZP+P	Output	Z axis Drive Pulse in + direction	3.2
B39	ZP+N	Output	Z axis Drive Pulse in + direction	3.2
B40	ZP-P	Output	Z axis Drive Pulse in – direction	3.2
B41	ZP-N	Output	Z axis Drive Pulse in – direction	3.2
B42	GND		Internal Circuit GND	
B43	UOUT4	Output	U axis General Output	3.3
B44	UOUT5	Output	U axis General Output	3.3
B45	UOUT6	Output	U axis General Output	3.3
B46	UOUT7	Output	U axis General Output	3.3
B47	UP+P	Output	U axis Drive Pulse in + direction	3.2
B48	UP+N	Output	U axis Drive Pulse in + direction	3.2
B49	UP-P	Output	U axis Drive Pulse in – direction	3.2
B50	UP-N	Output	U axis Drive Pulse in – direction	3.2

Note: When connecting the cable into the I/O connector, turn OFF PC first and turn OFF external power (DC+24V), then connect the cable. Otherwise, the destruction of the internal circuit may be caused. Be careful about the connector direction and not to reverse it.

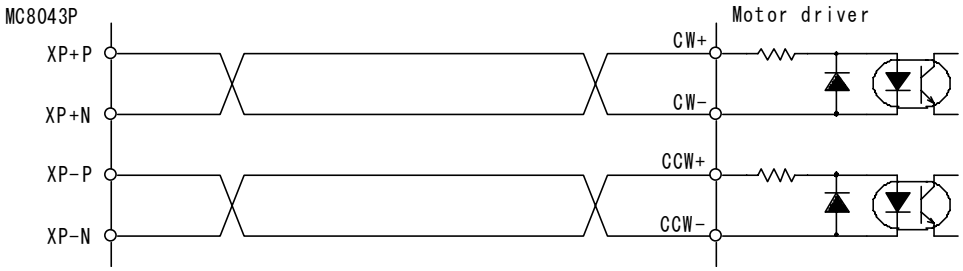
3.2 Drive Pulse Output Signal (nP+P, nP+N, nP-P, nP-N)

Drive pulse output signal outputs the drive pulse of +/– direction of MCX314As through a differential line-drive output (AM26C31 or equivalent). nP+N is the reverse output of nP+P and nP-N is the reverse output of nP-P. At resetting, positive output (nP+P, nP-P) becomes low level and reverse output (nP+N, nP-N) becomes hi level. Drive pulse output is set to independent 2-pulse type after resetting; however, the user can change to 1-pulse 1-direction type in mode setting. See chapter 2.9.2 and 4.5 of MCX314As user's manual.

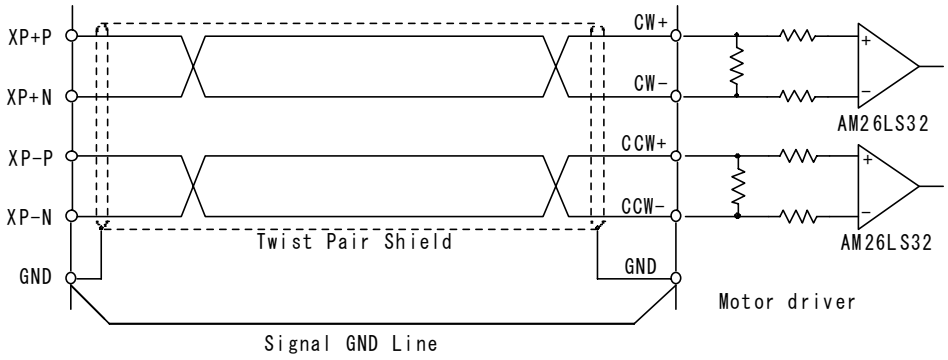


Drive Pulse Output Signal Circuit

The following is the connection example of a motor driver with a photo coupler input and line receiver input.



Connection example of a motor driver with a photo coupler input

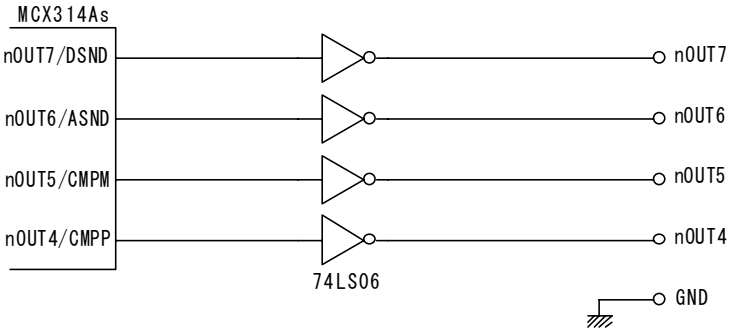


Connection example of a motor driver with a line receiver input

Note:
As shown above, when using a line receiver input circuit, connect MC8043P and a motor driver with Signal GND line. If there is the potential difference between MC8043P and motor driver, a malfunction and the distruction of the driver circuit and/or the motor diriver circuit may be caused.

3.3 General Output Signal (nOUT7, nOUT6, nOUT5, nOUT4)

General output signal outputs nOUT7/DSND, nOUT6/ASND, nOUT5/CMPM and nOUT4/CMPP signals of MCX314As through buffer (74LS06).
At resetting, each output signal will be OFF.



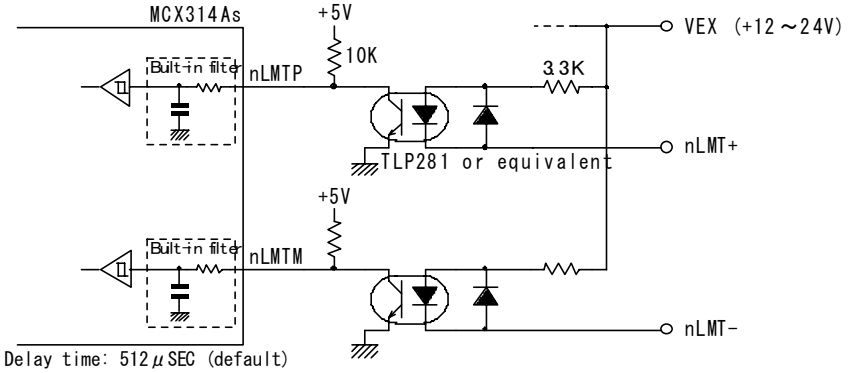
General Output Circuit

General output signals can be used as a stack counter clear, alarm reset and excitation OFF signal of a motor driver.
In addition, these can output the accelerating/decelerating drive status and small and large status of a position counter and compare register. For the setting of general output signals, see chapter 2.9.8 and 4.6 of MCX314As user's manual. And for the accelerating/decelerating drive output, see 2.9.7 and 4.6, and for the small and large status output of a position counter and compare register, see 2.3 and 4.6.

3.4 Over Run Limit Input Signal (nLMT+, nLMT-)

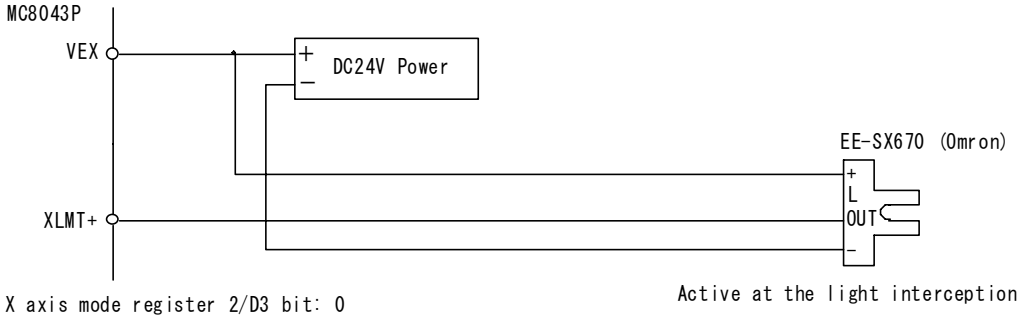
Input signal to restrain each drive pulse in the +/ – direction. This input signal is connected to the limit input of MCX314As through a photo coupler. After resetting, MCX314As becomes low active, so limit function works when current flows out from a signal pin (nLMT+, nLMT-). The logical level and decelerating/instant stop can be changed. For details on mode setting, see chapter 4.5 of MCX314As user's manual.

To enable this signal, external power supply DC12~24V is needed. When the board is powered on, the built-in integral filter of MCX314As becomes the setting of signal delay time 512 μ sec due to the default setting of Windows device driver provided by NOVA electronics. This signal delay time can be changed for circumstances of system noise. For more details, see chapter 2.8 and 6.16 of MCX314As user's manual.



Over Run Limit Input Signal Circuit

The connection example of an over run limit input signal and a photo microsensor is shown below. When D3 bit of X axis mode register 2 (XWR2) is set to 0 (the mode at reset), limit function becomes active at the light interception.



Connection Example of Over Run Limit Input Signal and Photo Microsensor

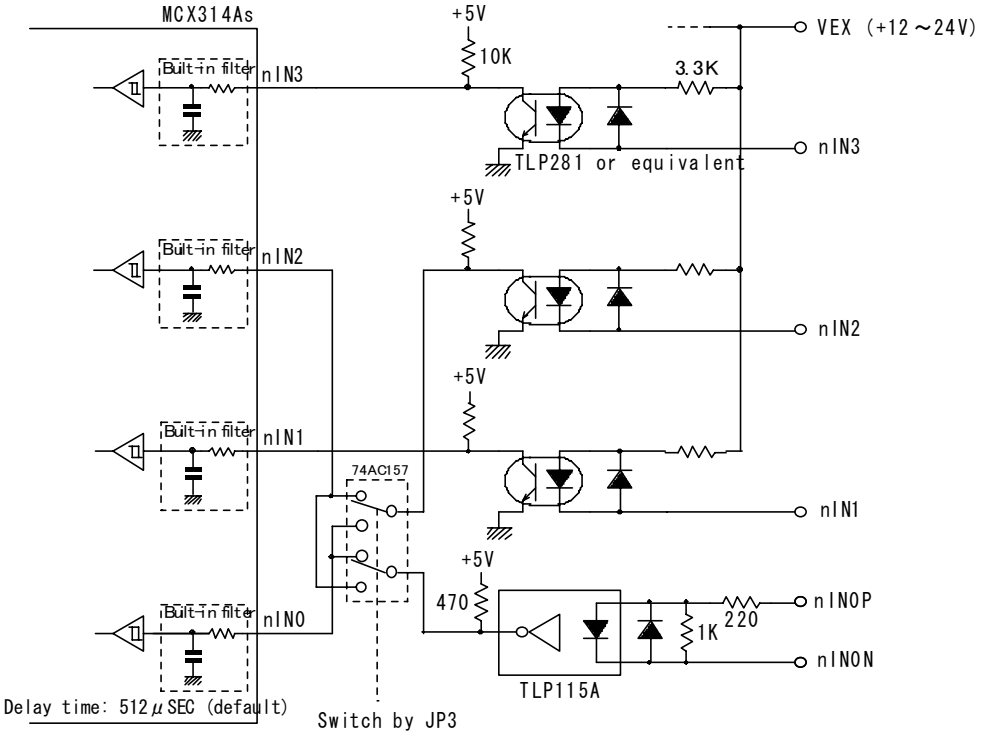
When long wiring is needed, use the shield cable.

3.5 Decelerating Stop/Instant Stop Input Signal (nIN1, nIN2, nIN3)

Three input signals to stop drive pulse output in deceleration or immediately. MCX314As has four signals, IN3~IN0 for each axis. Short-circuiting 1 and 2 of the jumper pin JP3 (default setting), the interface circuit for an encoder Z-phase (high-speed photo coupler TLP115A) is connected to nIN0 of MCX314As. nIN1, nIN2, nIN3 signals are used as home or near home input signals. If short-circuiting 2 and 3 of JP3, the interface circuit for the encoder Z-phase (high-speed photo coupler TLP115A) is connected to nIN2 of MCX314As, and automatic home search function of MCX314As can be used. For details on automatic home search, see chapter 2.5 of MCX314As user's manual.

Each inpu signal can be set enable/disable and logical level in mode setting. When enable is set in mode setting, and when this signal becomes active during driving, drive pulse stops to output. When in acceleration/deceleration driving, it stops in deceleration and when in constant driving, it stops immediately. After resetting, all the signals are disabled. For instance, in IN3 signal of X axis, when D7, D6 bit of XWR1 register is set to 1, 0 and set to low level and enable, and when current flows out from XIN3 signal pin of this board, driving stops. For details on mode setting, see chapter 4.4 of MCX314As user's manual.

To enable this signal, external power supply DC12~24V is needed. This signal can read out the signal status by input register 1, 2 (RR4, 5) at any time, so it can be used as general input. When the board is powered on, the built-in integral filter of MCX314As shown below becomes the setting of signal delay time 512 μ sec due to the default setting of Windows device driver provided by NOVA electronics. This signal delay time can be changed for circumstances of system noise. For more details, see chapter 2.8 and 6.16 of MCX314As user's manual.



JP3: nIN0/nIN2 switching

JP3 1-2 short circuit	Normal (Default)	The board I/O connector nIN0P/N signal is connected to nIN0 of MCX314As and the board I/O connector nIN2 signal is connected to nIN2 of MCX314As.
JP3 2-3 short circuit	Cross	The board I/O connector nIN0P/N signal is connected to nIN2 of MCX314As and the board I/O connector nIN2 signal is connected to nIN0 of MCX314As.

Decelerating Stop/Instant Stop Input Signal Circuit

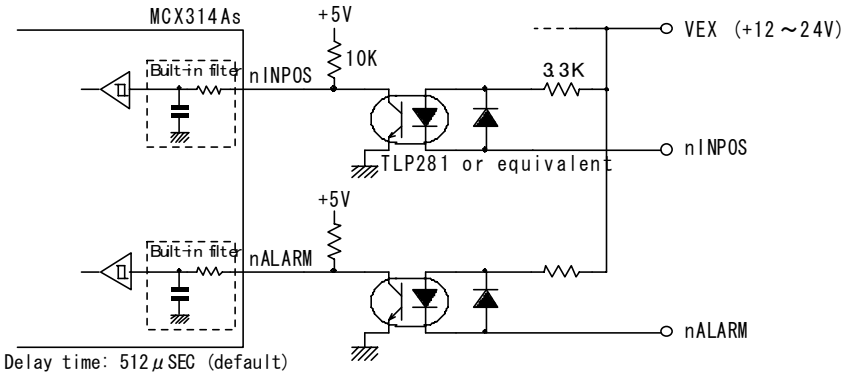
3.6 Input Signal for Servo Motor (nINPOS, nALARM)

nINPOS input signal is applied to the in-position output of a servo motor driver. Enable/disable and logical level can be set in mode setting of MCX314As. When enable is set and after completion of the driving, nDRV bit of main status register (RR0) returns to 0 after this signal becomes active.

nALARM input signal is applied to the alarm output from a servo motor driver. Enable/disable and logical level can be set in mode setting. When enable is set, nALARM input signal is monitored, and when nALARM is active, the ALARM bit of status

register 2 (nRR2) is set to 1. When the signal becomes active during driving, driving will stop immediately.

After resetting, both signals are disabled. For nINPOS input signal, set 1, 0 to the D15, 14 bit of mode register 2 (nWR2) of MCX314As as low active, and the n-DRV bit of RR0 register returns to 0 after waiting to flow level current from nINPOS signal. For nALARM input signal, set 1, 0 to the D13, 12 bit of nWR2 register as low level active, and the signal becomes an alarm state when current flows out from nALARM signal pin. For more details, see chapter 2.9.5 and 4.5 of MCX314As user's manual.



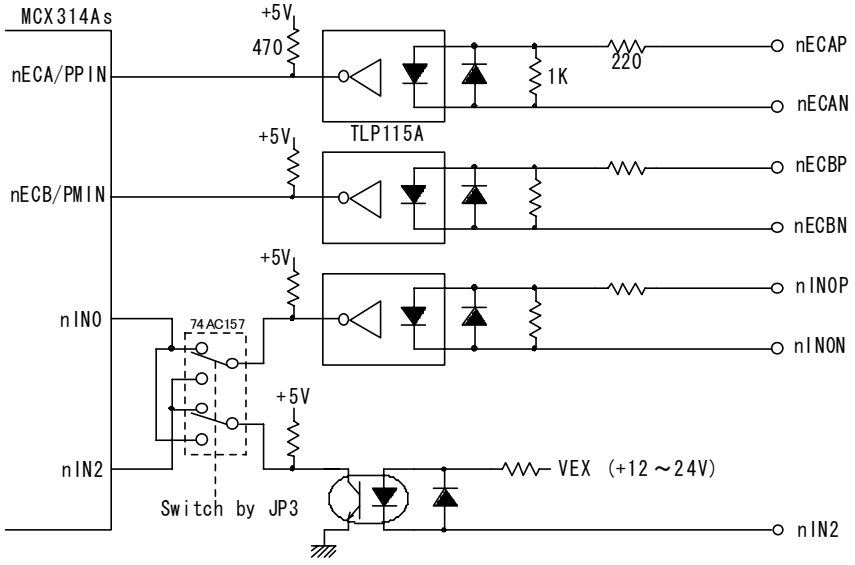
Servo Motor Input Signal Circuit

To enable this signal, external power supply DC12~24V is needed. When the board is powered on, the built-in integral filter of MCX314As shown above becomes the setting of signal delay time 512 μ sec due to the default setting of Windows device driver provided by NOVA electronics. This signal delay time can be changed for circumstances of system noise. For more details, see chapter 2.8 and 6.16 of MCX314As user's manual.

3.7 Encoder Input Signal (nECAP, nECAN, nECBP, nECBN, nINOP, nINON)

nECAP/N, nECBP/N, input signals are the input to count a real position counter of MCX314As by connecting to the 2-phase output signal of an encoder or that of a servo motor driver. For more details, see chapter 2.3.1, 2.9.3 and 4.5 of MCX314As user's manual.

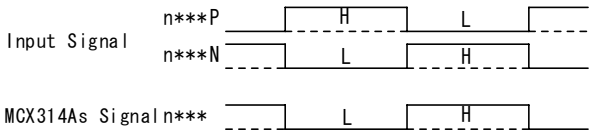
nINOP/N input signal is to stop drive pulse output by connecting to the Z-phase output signal of an encoder or that of a servo motor driver. Enable/disable and logical level can be set in mode setting. When enable is set and after this signal becomes active during driving, drive pulse stops to output. As described in chapter 3.5, if short-circuiting 2 and 3 of JP3, the interface circuit for the encoder Z-phase (high-speed photo coupler TLP115A) is connected to nIN2 of MCX314As, and automatic home search function of MCX314As can be used. For details on automatic home search, see chapter 2.5 of MCX314As user's manual.



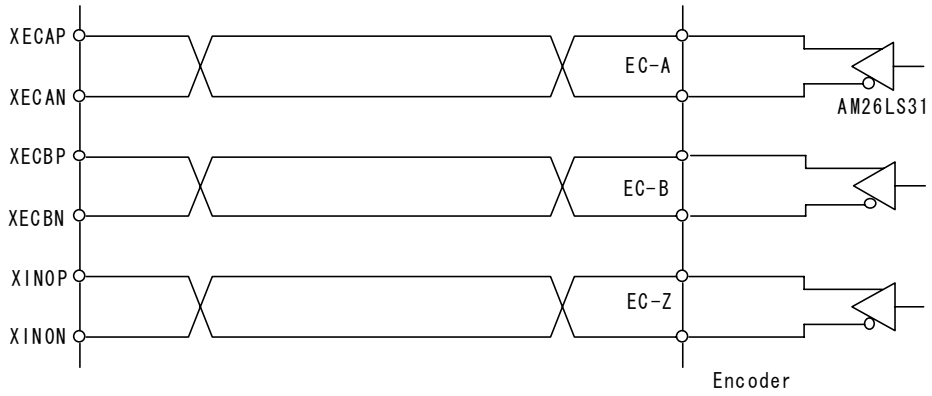
Encoder Input Signal Circuit

As shown above, encoder input signal circuit uses high-speed photo coupler IC TLP115A (Toshiba). Each input signal can be directly connected to a differential line-drive output. As the figure below, when n***P/N signal is H/L, n*** signal of MCX314As becomes Low and when is L/H, it becomes Hi. The delay time from input to the signal pin of MCX314As is under 100nSEC, so

that the signal can count up to 4MHz in the case of 2-phase pulse input.

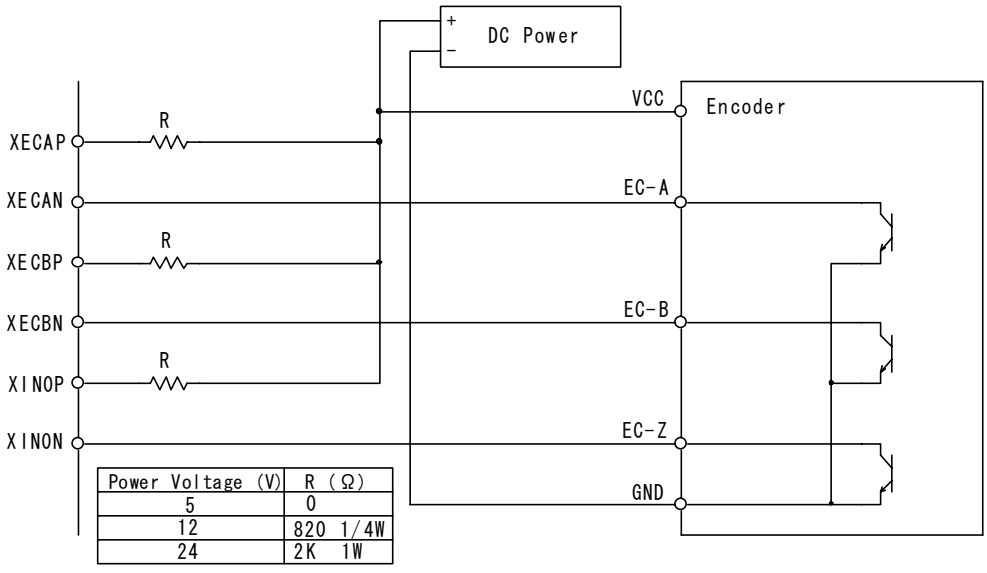


The connection example of an encoder input signal and a differential line-drive output is shown as follows:



Connection Example with Differential Line-Drive Output

The connection example of an encoder input signal and the encoder with open collector output is shown as follows:

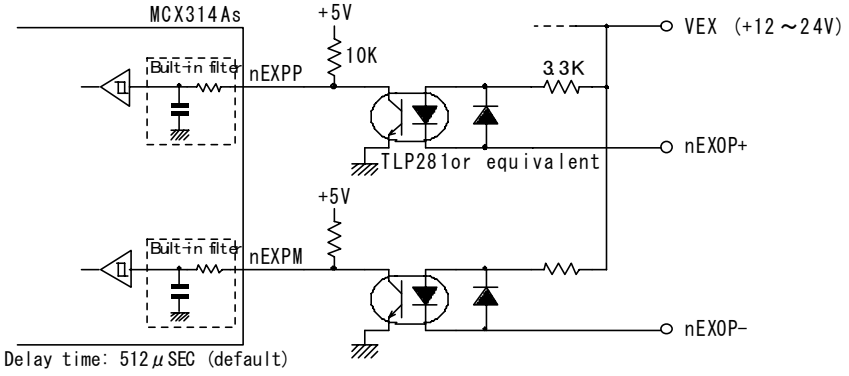


Connection Example with Open Collector Output

3.8 Driving by External Signal (nEXOP+, nEXOP-)

The signal externally controls driving in the + or – direction. In fixed pulse driving mode, the falling edge of these signals trigger to output specified drive pulse. In continuous pulse driving mode, drive pulse is output continuously while the input signals are low. This function can reduce the load of the host CPU, so the user can perform jog feed of each axis speedy. External signal for driving can be set in mode setting of MCX314As. For details, see chapter 2.9.1 and 4.6 of MCX314As user's manual.

To enable this signal, external power supply DC12~24V is needed. When the board is powered on, the built-in integral filter of MCX314As shown below becomes the setting of signal delay time 512 μ sec due to the default setting of Windows device driver provided by NOVA electronics. This signal delay time can be changed for circumstances of system noise. For more details, see chapter 2.8 and 6.16 of MCX314As user's manual.

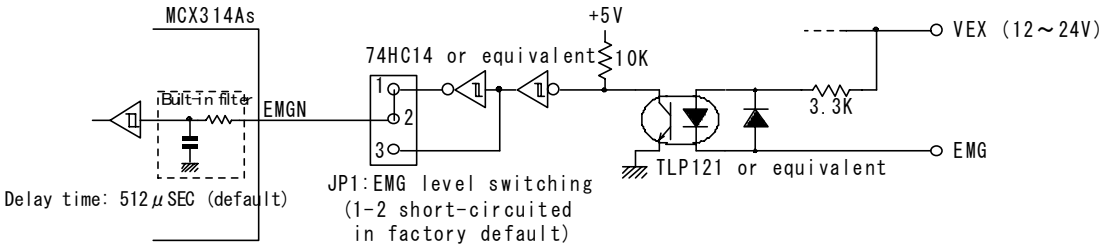


External Driving Signal Circuit

3.9 Emergency Stop Input Signal (EMG)

All the drive pulse output stops when emergency stop signal becomes active. Active level can be switched by the JP1 jumper pin on the board. When emergency stop signal becomes active during driving, driving for all axes stops instantly and 1 is set to the error bit of all axes of main status register. For emergency stop of MCX314As, see chapter 2.9.6 and 4.12 of MCX314As user's manual.

JP1: 1-2 short circuit: When emergency stop signal (EMG) is short-circuited with GND of the external power, it becomes active.
JP1: 2-3 short circuit: When emergency stop signal (EMG) is open, it becomes active.
Factory default is 1-2 short-circuited.



Emergency Stop Input Signal Circuit

To enable this signal, external power supply DC12~24V is needed. When the board is powered on, the built-in integral filter of MCX314As shown above becomes the setting of signal delay time 512 μ sec due to the default setting of Windows device driver provided by NOVA electronics. This signal delay time can be changed for circumstances of system noise. For more details, see chapter 2.8 and 6.16 of MCX314As user's manual.

3.10 External Power (VEX)

The power supplied externally is used for over run limit input signal (nLMT+, nLMT–) of each axis, decelerating stop/instant stop (nIN1, nIN2, nIN3), input signal for servo motor (nINPOS, nALARM), external signal for driving (nEXOP+, nEXOP–) and emergency stop input signal (EMG). DC12~24V is needed. Consumption current is 3.3mA per 1 input signal in DC12V and 7mA per 1 input signal in DC24V.

4. Interrupt

This board has an interrupt signal generated by MCX314As, which connect to the INTA# of four interrupt request signals in the PCI bus. The interrupt can be handled in the application on Windows.

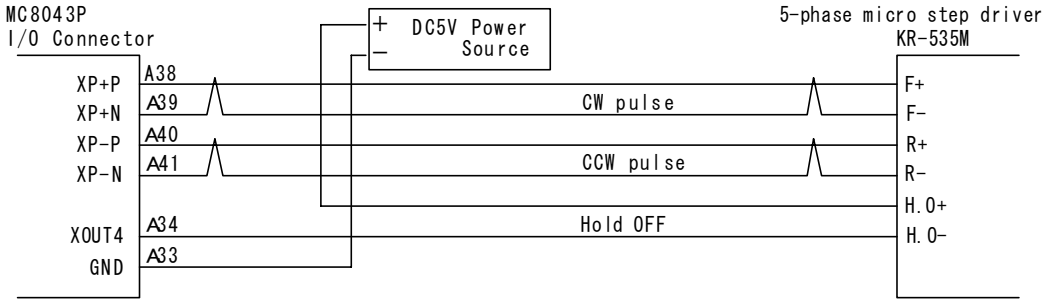
Create an application program with VC. VB program cannot handle the interrupt.

For more details on programming handling the interrupt, see chapter 9 Programming.

5. Connection Example for Motor Driver

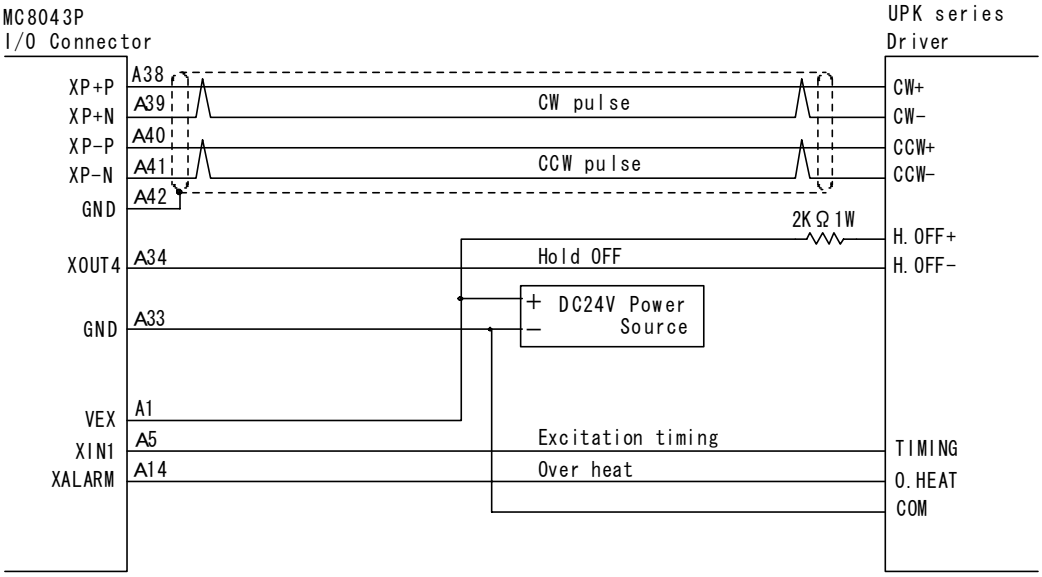
5.1 Connection Example for Stepper Motor

The figure shown below illustrates the connection example of MC8043P X axis and 5-phase micro step driver KR535M.



Note1: Wire hold OFF signal according to need. The hold off signal can be controlled by writing 0, 1 into the D8 bit of WR3 register of MCX314As.

The figure shown below illustrates the connection example of MC8043P X axis and the stepper motor driver of Oriental Motor UPK series.

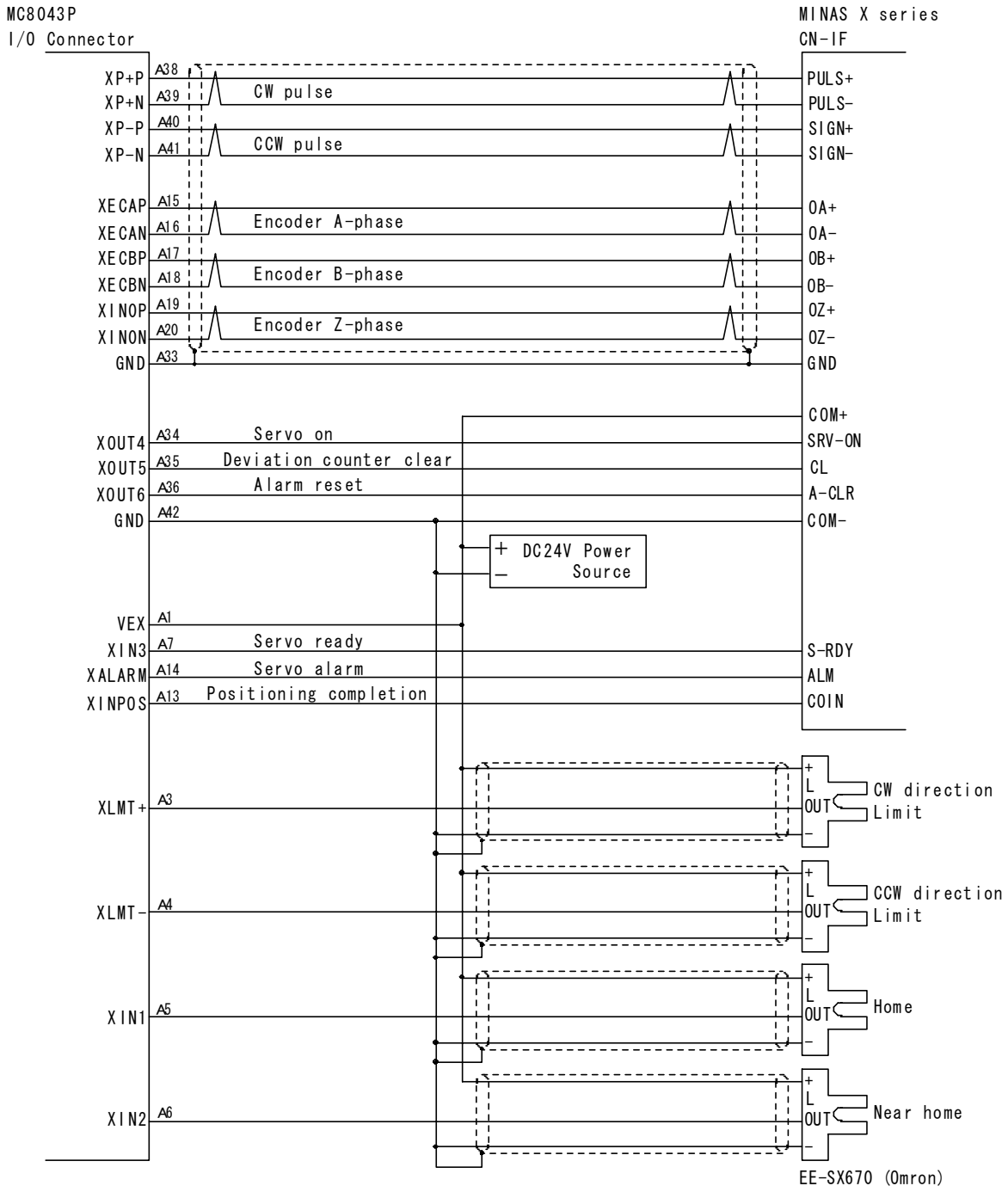


Note1: Wire hold OFF, excitation timing and over heat signals according to need. The hold off signal can be controlled by writing 0, 1 into the D8 bit of WR3 register of MCX314As. The excitation timing signal can perform a home search by the mode setting of the WR1 register D0, 1 bit. The over heat signal can perform an alarm function by the mode setting of the WR2 register D12, 13 bit. In addition, excitation timing and over heat signals can directly read out the signal level through the RR4, 5 registers.

Note2: When the circumstances are affected by strong noise or distance to the driver is long, the twist pair shield cable shown above is recommended.

5.2 Connection Example for AC servo motor driver

The figure shown below illustrates the connection example of MC8043P X axis and the AC servo motor driver of MINAS X series.



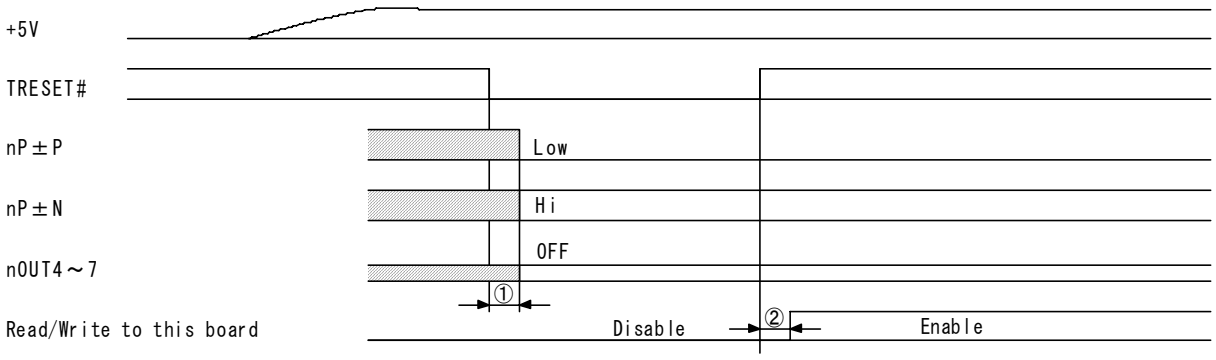
Note1: Set the mode of MINAS driver control to the position control mode and the pulse form to CW/CCW pulse mode. Do not set the command pulse form to Pulse/Sign mode because the lack of t6 time occurs.

Note2: Use encoder A/B phase signals when the user counts a real position counter in MCX314As. If the real position data is not necessary, no need to connect them. For other signals, connect them according to need.

Note3: When the circumstances are affected by strong noise or the distance to the driver is long, the twist pair shield cable shown above is recommended.

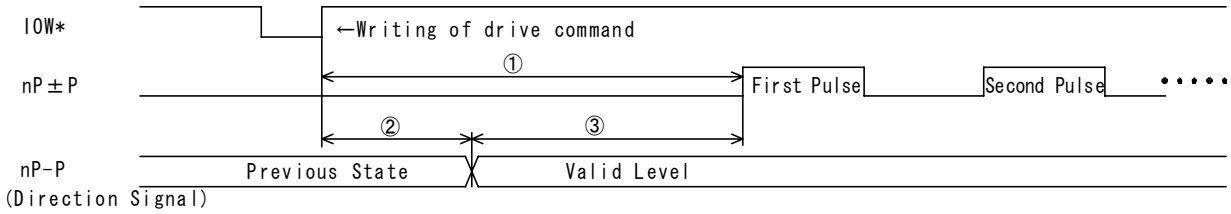
6. Input/Output Signals Timing

6.1 Reset



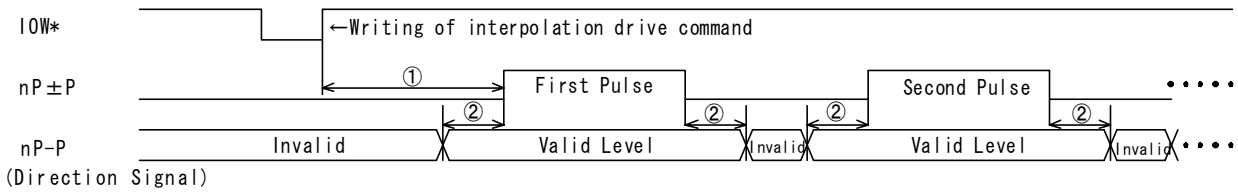
① Drive pulse output signals (nP±P, nP±N) and general output signals (nOUT4~7) are determined within a maximum of 250nSEC after ↓ of the target reset signal (TRESET#) of APIC21 (ADTEC).
② Writing/Reading to this board can be performed after 500nSEC from ↑ of the target reset signal (TRESET#).

6.2 Independent Driving



① First drive pulse is output within a maximum of 650nSEC after writing of drive command.
②③ When drive output pulse is 1-pulse type, a direction signal (nP-P) becomes valid level within a maximum of 275nSEC after writing of drive command. And first drive pulse is output after 375nSEC when the direction signal becomes valid level.

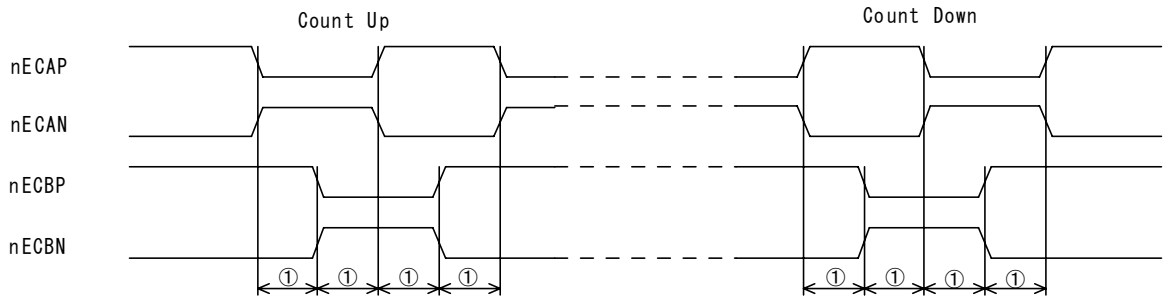
6.3 Interpolation



① During interpolation driving, first drive pulse is output within a maximum of 775nSEC after writing of interpolation drive command.
② When drive output pulse is 1-pulse type, a direction signal (nP-P) becomes valid level while each drive pulse is Hi level and between before and after the 125nSEC only. (When the drive pulse is positive logical level)

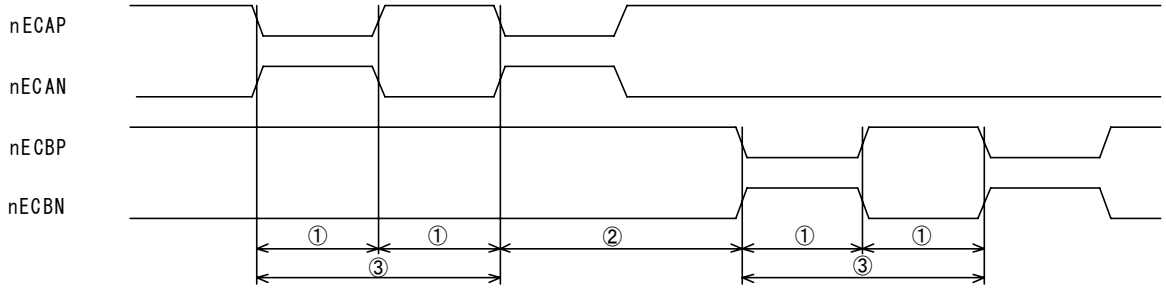
6.4 Input Pulse Timing

■ Encoder 2-phase Pulse Input



① EC-A,EC-B phase difference time : 200nSEC min.

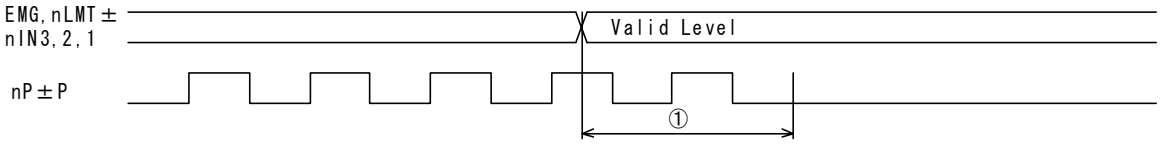
■ Up/Down Pulse Input



① UP/DOWN pulse width : 130nSEC min.
② UP⇔DOWN between the pulses : 260nSEC min.
③ UP/DOWN pulse cycle : 260nSEC min.

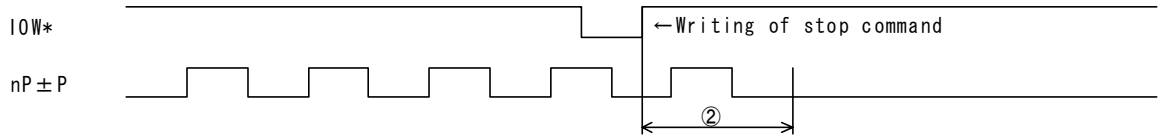
6.5 Instant Stop Timing

■ Instant Stop by External Signal



① When an instant stop signal becomes valid level during driving, the driving stops after photo coupler delay time (100 μ sec max.) + the delay time of IC built-in integral filter (512 μ sec default) + 1 drive pulse.

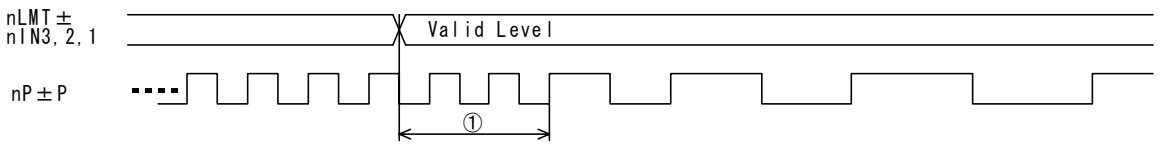
■ Instant Stop by Command



② When stop command is written during driving, the driving stops after a maximum of 1 drive pulse.

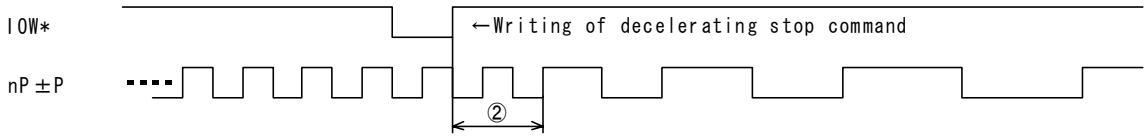
6.6 Decelerating Stop Timing

■ Decelerating Stop by External Signal



① When an external decelerating stop signal becomes valid level during driving, the driving starts deceleration after photo coupler delay time (100 μ sec max.) + the delay time of IC built-in integral filter (512 μ sec default) + 2 drive pulses.

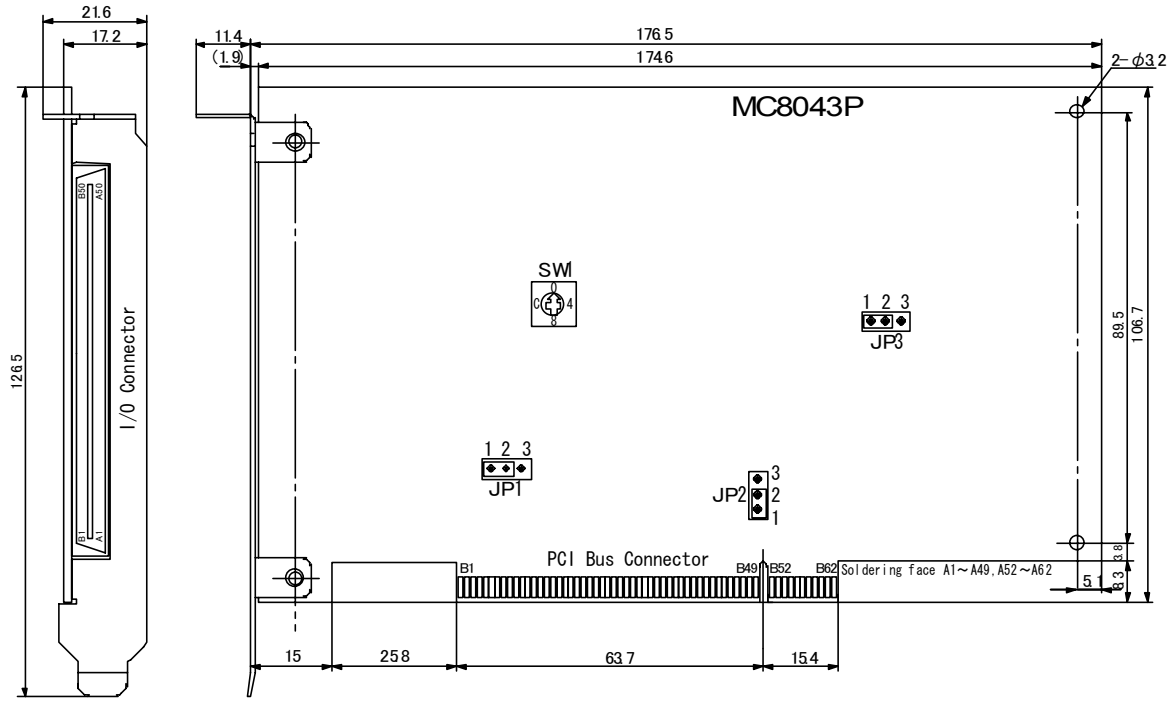
■ Decelerating Stop by Command



② When decelerating stop command is written during driving, the driving starts deceleration after a maximum of 2 drive pulses.

7. Board Dimensions

Unit: mm



JP1: Select active logical level for emergency stop signal (EMG).
1-2 short circuit (default): When the signal is short-circuited with GND, it becomes active.
2-3 short circuit: When the signal is open, it becomes active.

JP2: Keep 1-2 short circuit (default setting).

JP3: Switch nIN0/nIN2 signal.
1-2 short circuit (default): The board I/O connector nIN0P/N signal is connected to nIN0 of MCX314As and the board I/O connector nIN2 signal is connected to nIN2 of MCX314As.
2-3 short circuit: The board I/O connector nIN0P/N signal is connected to nIN2 of MCX314As and the board I/O connector nIN2 signal is connected to nIN0 of MCX314As.

SW1: Rotary switch to set the board number when multiple boards are used, which can be set from 0 to 9 (default setting: 0).

8. Installation

This chapter describes how to install the board into your PC and install the device driver.

8.1 Preparation of Driver Software

When installing the driver from CD-ROM, prepare MC8043P CD-ROM.
When installing the driver from the downloaded file from our homepage, extract the file.

8.2 How to Install the Board into your PC

(1) Make sure that the PC is powered OFF, and then remove the external cover and slot cover.
(2) Insert the board into an empty expansion slot. Be sure that the board's edge connector fits into the PC's PCI bus connector.
(3) Screw the mounting bracket. Make sure that you fix the screws appropriately; otherwise, short out, breakdown or operation error may result.
(4) Replace the external cover.

Note: **Make sure the PC's power is shut off before installing the board.** Otherwise, the circuit elements may be damaged.

[Notes on using multiple boards]
When using multiple boards on a system (PC), in order to individually recognize each board on the PCI bus, set the board number of second or later board by the rotary switch on the board. For the location of the rotary switch (SW1), see chapter 7 "Board Dimensions".

8.3 How to Install Device Driver

The device driver is common in the operation systems and languages described in chapter 9.1.1.
The device driver can recognize the board up to 10 simultaneously.

Hereinafter, the installation procedure will be described for each OS.

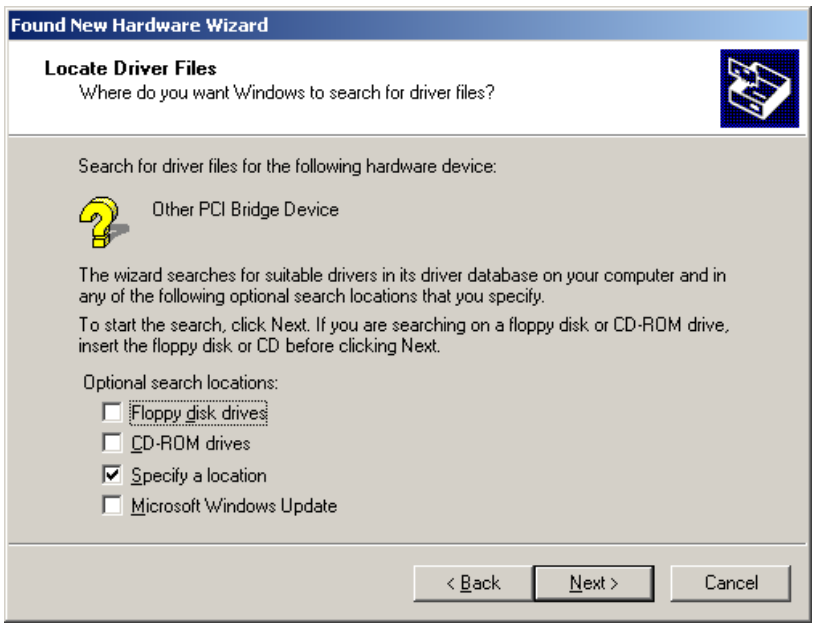
8.3.1 Windows 2000

Before starting the installation procedure, ensure that you are logged on to Windows with a user name having administrator authority. Otherwise, the installation is not successfully completed.

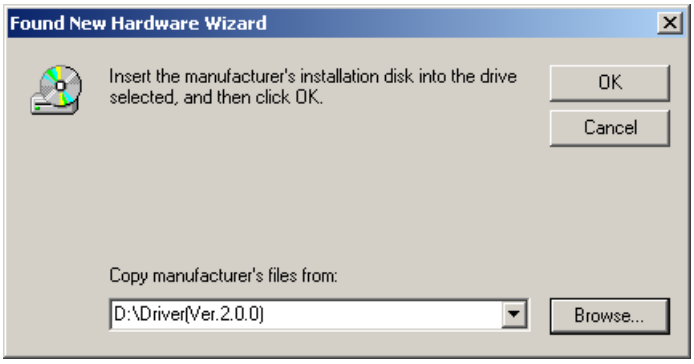
(1) Prepare the device driver by chapter 8.1.
(2) Make sure that the board is seated properly in the PC by chapter 8.2.
(3) Turn on the PC and start Windows 2000.
(4) Log on to Windows with a user name having administrator authority.
(5) Windows will display the notification **Found New Hardware** and **Found New Hardware Wizard** will open.
(6) Click **Next** on Found New Hardware Wizard.

(7) Select **Search for a suitable driver for my device (recommended)**, then click **Next**.

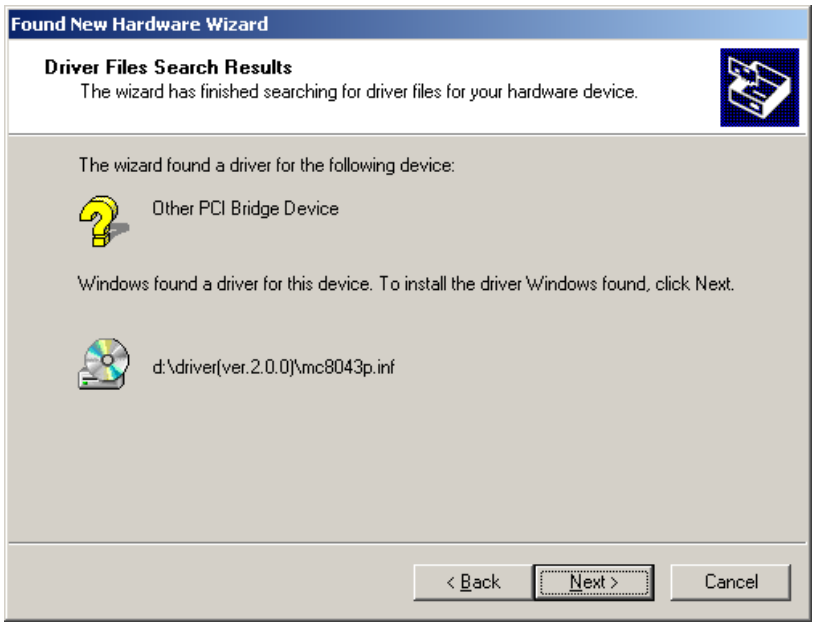
(8) Select **Specify a location**, then click **Next**.



(9) When installing the driver from CD-ROM, insert CD-ROM into CD drive, then wait until CD-ROM will be recognized by OS. Click **Browse** button and select the Driver folder in CD-ROM (When CD-ROM is in D drive, select **D:\Driver**), or select the downloaded driver folder on hard disc, and then click **OK**.

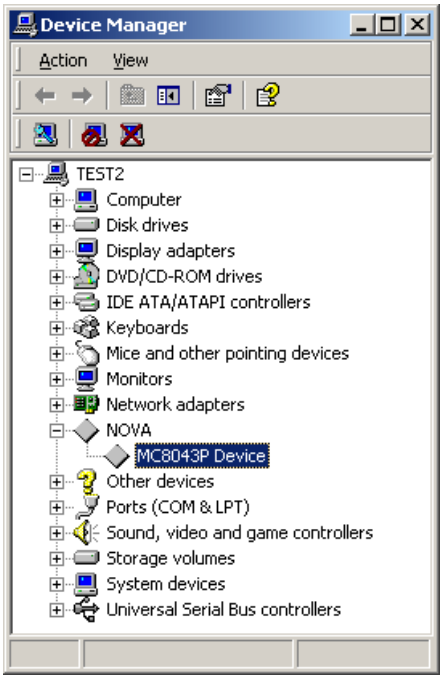


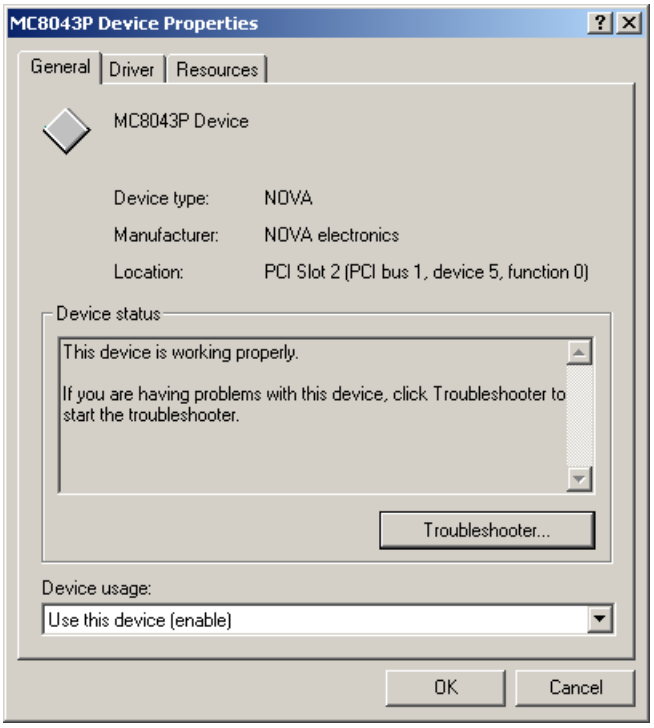
(10) The Driver Files Search Results dialog box opens. Make sure the proper file name, "\driver\mc8043p.inf" is indicated, then click **Next**.



(11) After the installation is successfully completed, the following dialog box opens, then click **Finish**.

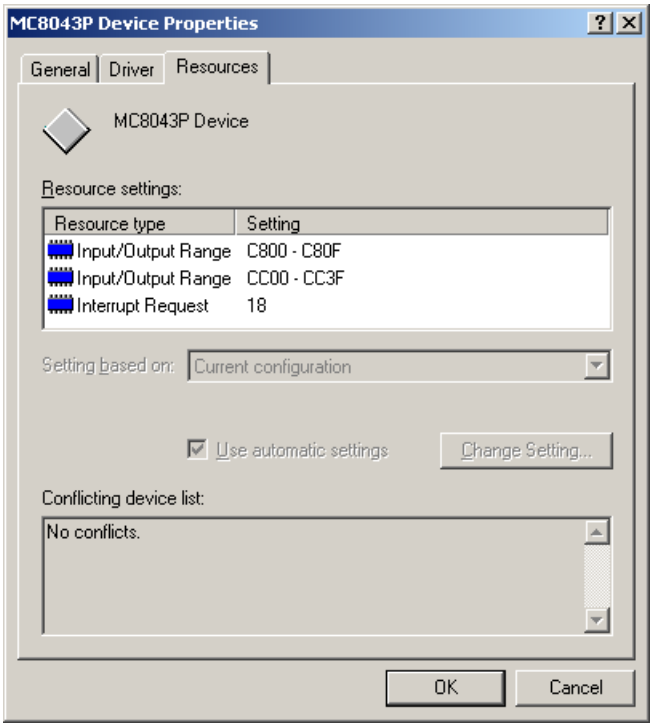
(12) The installation has finished. Check the installation is successfully completed by the following steps:
[Control Panel] → [System] → [Hardware] tab → [Device Manager] (shown on the left below), double click "**MC8043P Device**" under "**NOVA**", and then click the "**General**" tab to display the window shown on the right below. If the driver is correctly installed, you can see "**This device is working properly**" in the Device status field.





If Found New Hardware Wizard opens again, the installation may not successfully be completed. In this case, remove the board according to steps at 8.4 and then reinstall from chapter 8.2.

After the installation is successfully completed, check the resource settings (I/O address and IRQ) and conflicts.
[Control Panel] → [System] → [Hardware] tab → [Device Manager] → [Properties]



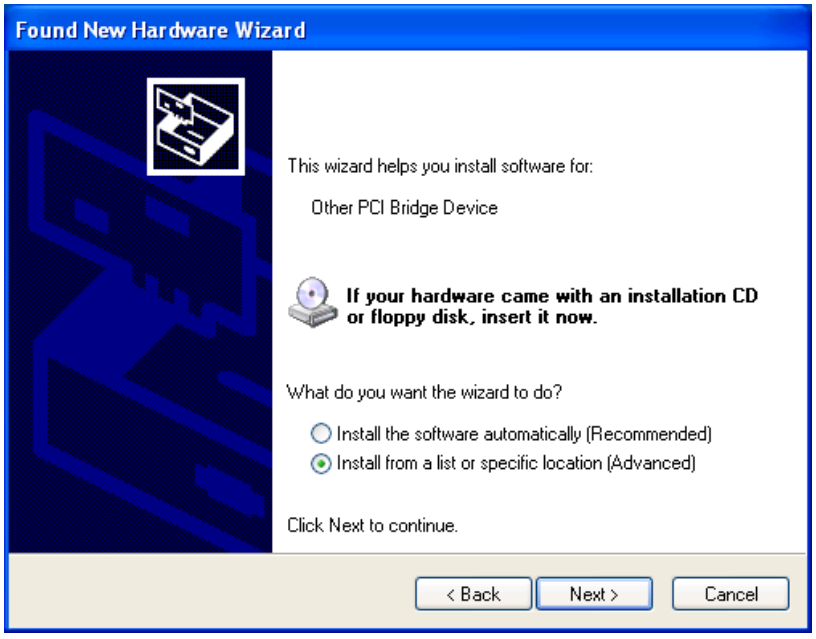
8.3.2 Windows XP

Before starting the installation procedure, ensure that you are logged on to Windows with a user name having administrator authority. Otherwise, the installation is not successfully completed.

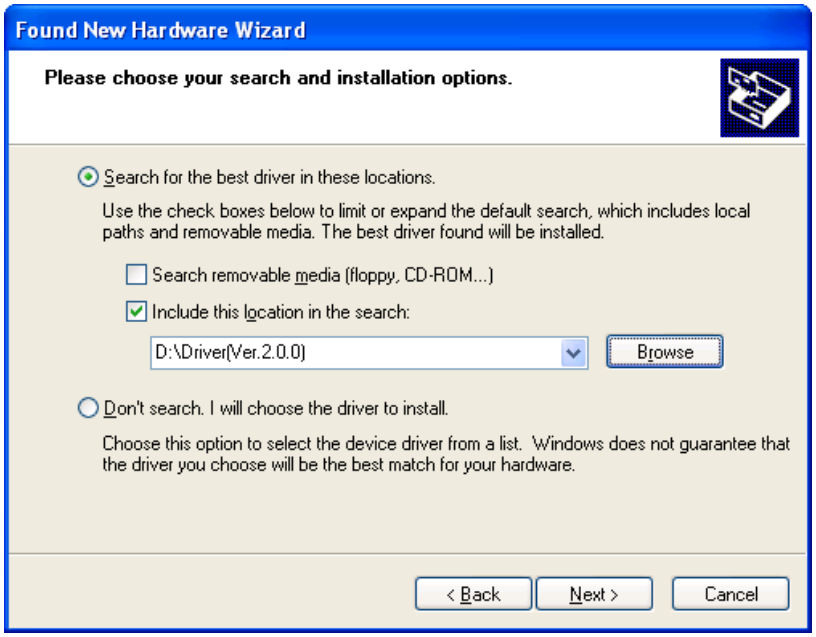
(1) Prepare the device driver by chapter 8.1.
(2) Make sure that the board is seated properly in the PC by chapter 8.2.
(3) Turn on the PC and start Windows XP.
(4) Log on to Windows with a user name having administrator authority.

(5) For Windows XP service pack 2 users, the following wizard appears. Click **No, not this time** and then click **Next** to continue. For Windows XP service pack 1 users, the following wizard does not appear, so skip this step.

(6) Found New Hardware Wizard will open. Select **Install from a list or specific location (Advanced)**, then click **Next**.

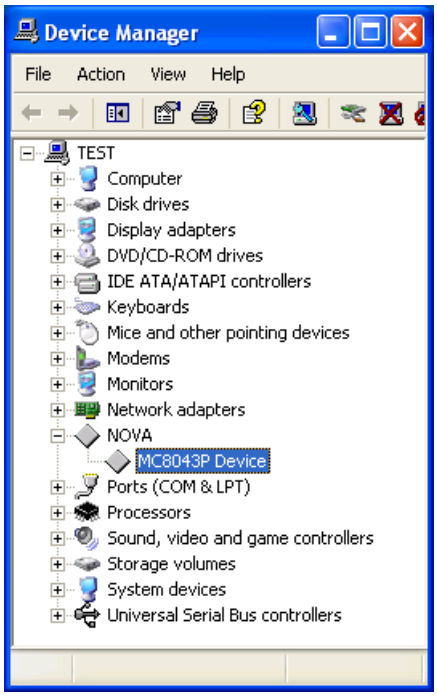


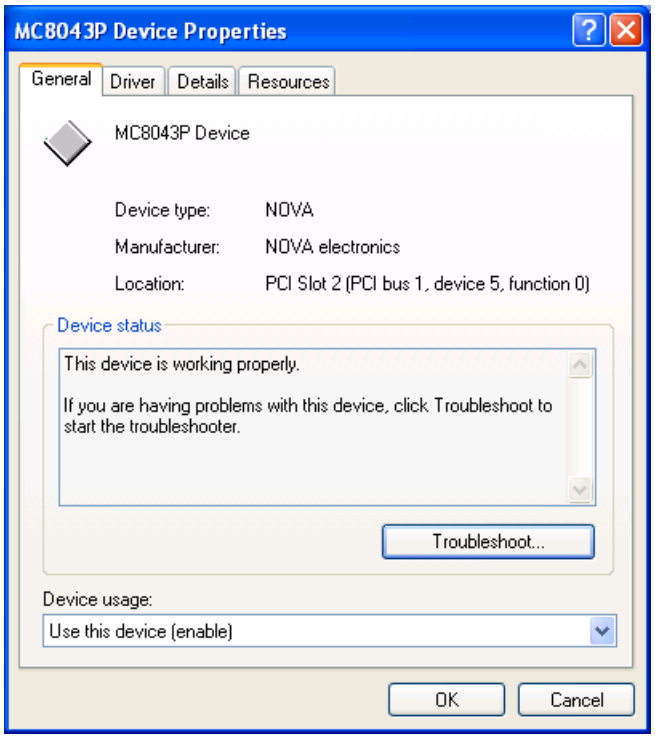
(7) Select **Search for the best driver in these locations** and check **Include this location in the search**.
When installing the driver from CD-ROM, insert CD-ROM into CD drive, CD-ROM will soon-to-be recognized by OS.
Click **Browse** button and select the Driver folder in CD-ROM (When CD-ROM is in D drive, select **D:\Driver**), or select the downloaded driver folder on hard disc, and then click **Next**.



(8) After the installation is successfully completed, the following dialog box opens, then click **Finish**.

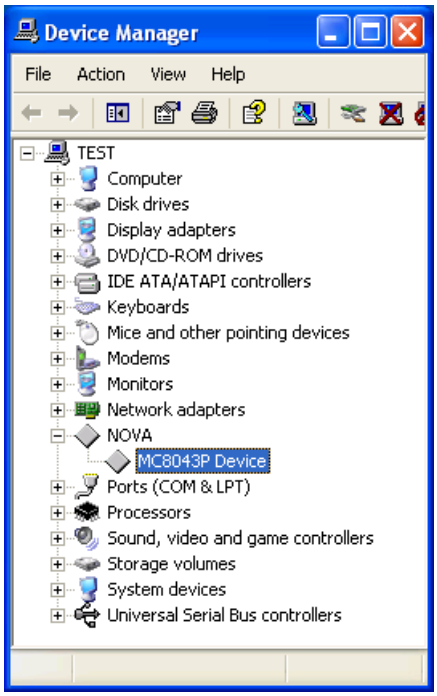
(9) The installation has finished. Check the installation is successfully completed by the following steps:
[Control Panel] → [System] → [Hardware] tab → [Device Manager] (shown on the left below), double click "**MC8043P Device**" under "**NOVA**", and then click the "General" tab to display the window shown on the right below. If the driver is correctly installed, you can see "**This device is working properly**" in the Device status field.

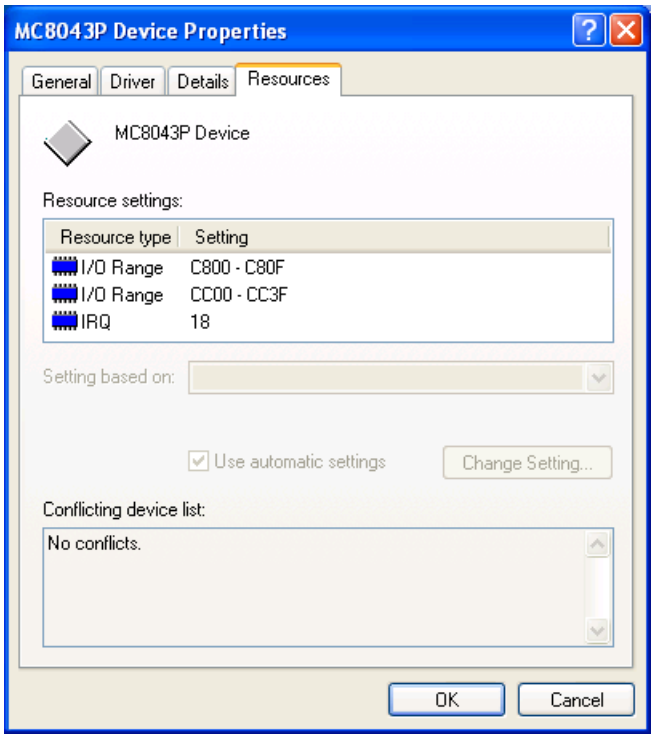




If Found New Hardware Wizard opens again, the installation may not successfully be completed. In this case, remove the board according to steps at 8.4 and then reinstall from chapter 8.2.

After the installation is successfully completed, check the resource settings (I/O address and IRQ) and conflicts.
[Control Panel] → [System] → [Hardware] tab → [Device Manager] → [Properties]

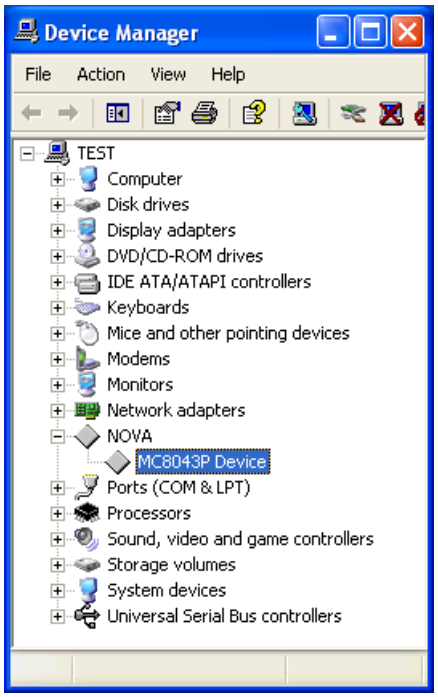




8.4 Board Removal

8.4.1 Windows 2000/XP

(1) Uninstall the device driver using Device Manager.
[Control Panel] → [System] → [Hardware] tab → [Device Manager]
(2) Make sure that the PC is powered OFF and then remove the external cover and slot cover.
(3) Unscrew the mounting bracket.
(4) Remove the board by lifting steadily.
(5) Turn on the PC and start Windows 2000/XP.
(6) Make sure that MC8043P is deleted from [Control Panel] → [System] → [Hardware] tab → [Device Manager].

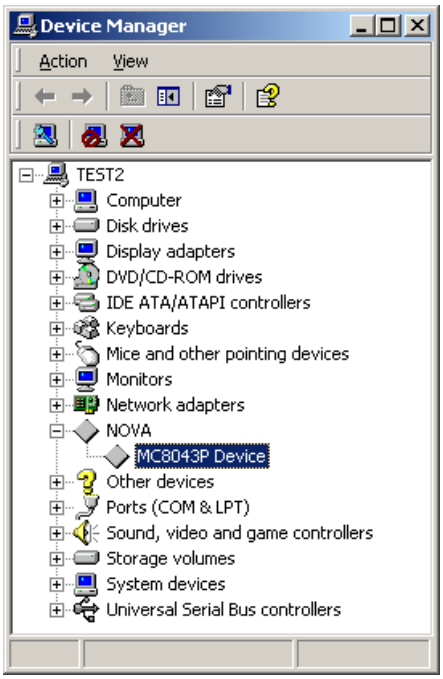


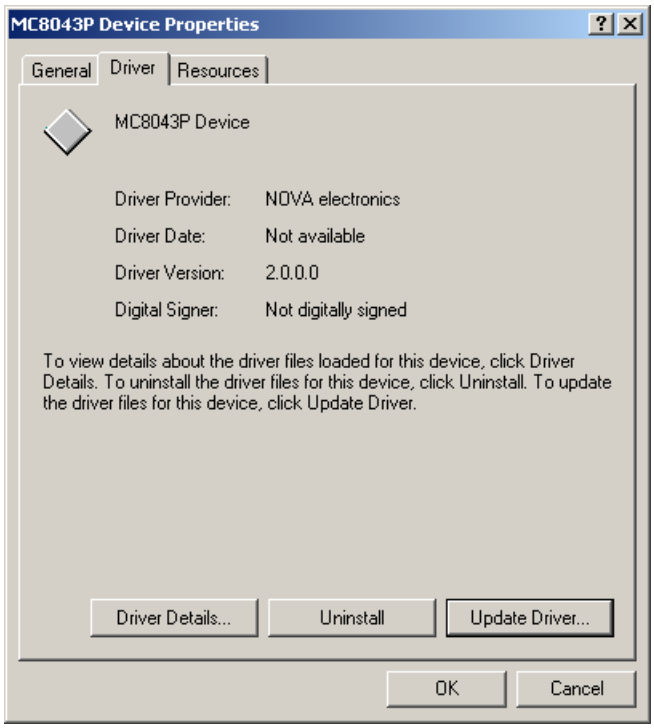
8.5 Updating Device Driver

To update the driver, follow the steps below.
Hereinafter, the installation procedure will be described for each OS.

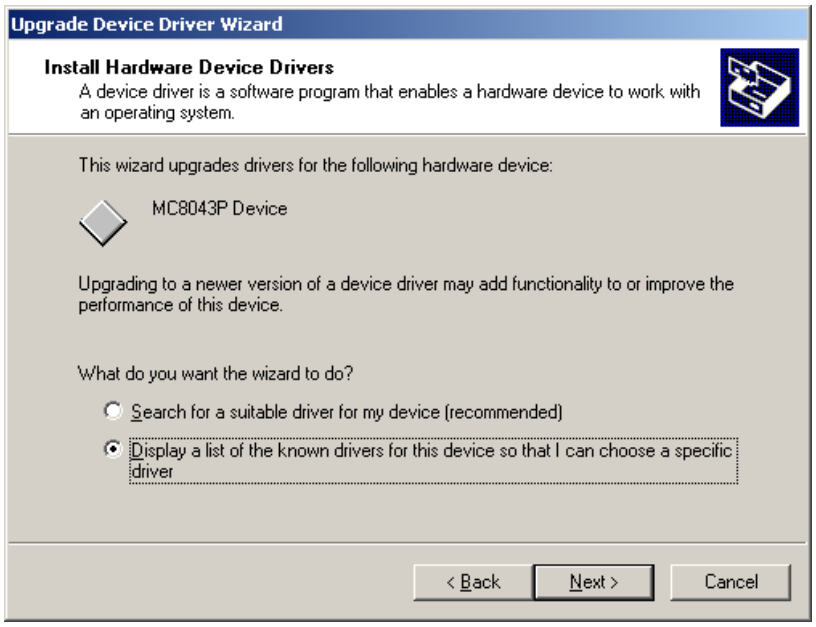
8.5.1 Windows 2000

(1) Open [Control Panel] → [System] → [Hardware] tab → [Device Manager] (shown on the left below), double click "**MC8043P Device**" under "**NOVA**", and then click the "**Driver**" tab to display the window shown on the right below.
(2) Click **Update Driver…** and then click **Next**.

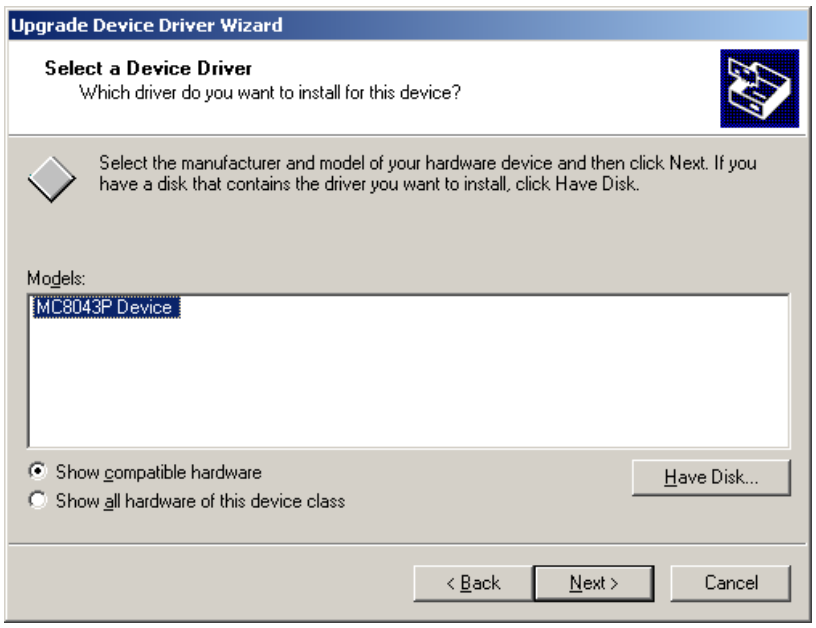




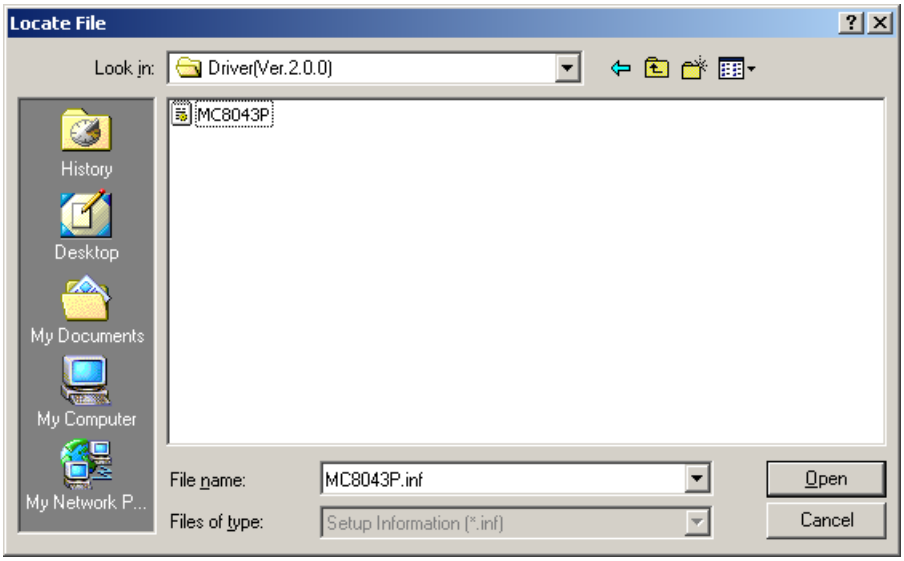
(3) Select **Display a list of the known drivers for this device so that I can choose a specific driver**, then click **Next**.



(4) Click **Have Disk…** button and then click **Browse** button.

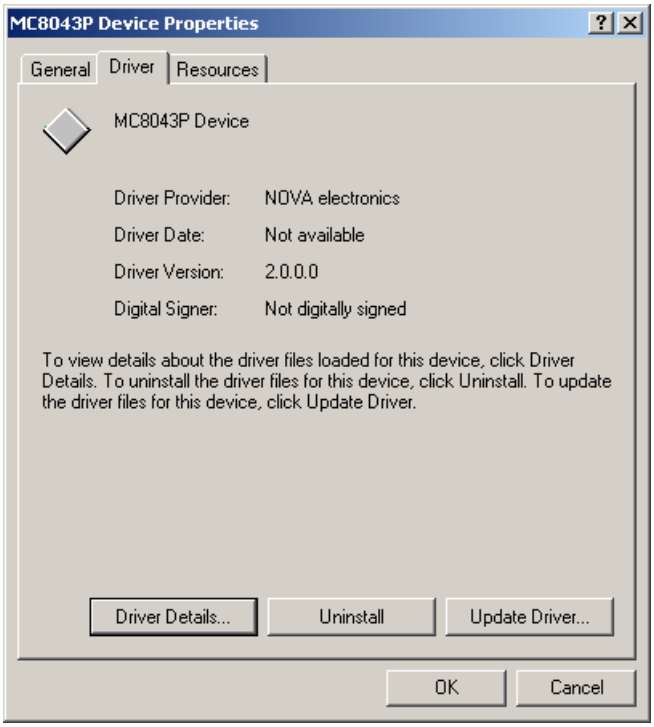


(5) Point the directory to the driver folder (**Driver**), then click **Open** and **OK**. Then click **Next** button twice in the next and after the next window.

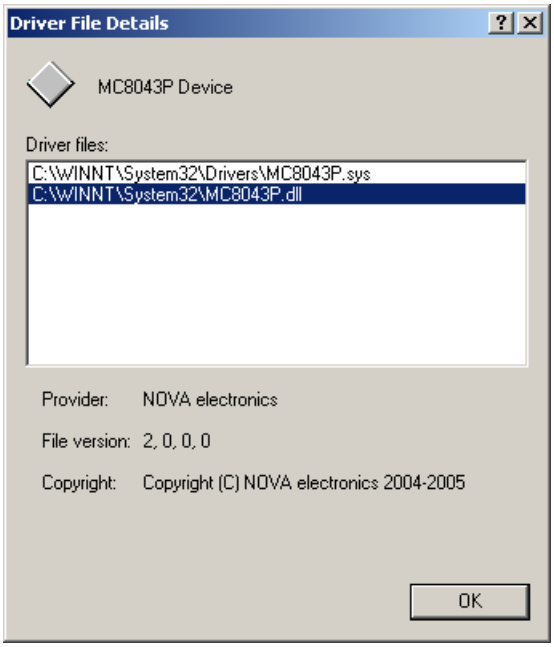


(6) After the updating is successfully completed, the following dialog box opens, then click **Finish**.

(7) Check the updated driver's version in **MC8043P Device Properties**.
Open **\Driver\Version.txt** file and check the version described in the "1. Driver Version", and then check the updated version displayed in the following window. Then click **Driver Details…** button.



(8) Check the updated driver's file version in the following window.
Open **\Driver\Version.txt** file and check the version described in the "2. Driver File Version", and then check the updated version displayed in the following window.

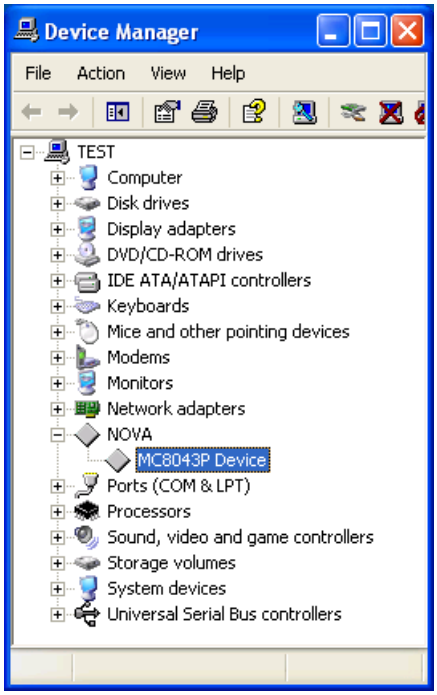


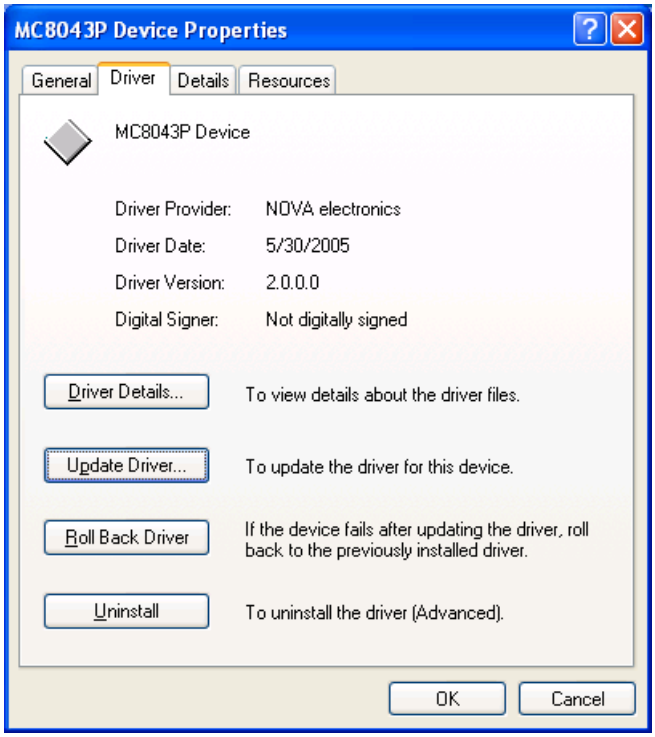
(9) If multiple MC8043P boards are used, update all the drivers of **MC8043P Device** under **NOVA** displayed in Device Manager.

(10) Restart your PC, and the driver update will be finished.

8.5.2 Windows XP

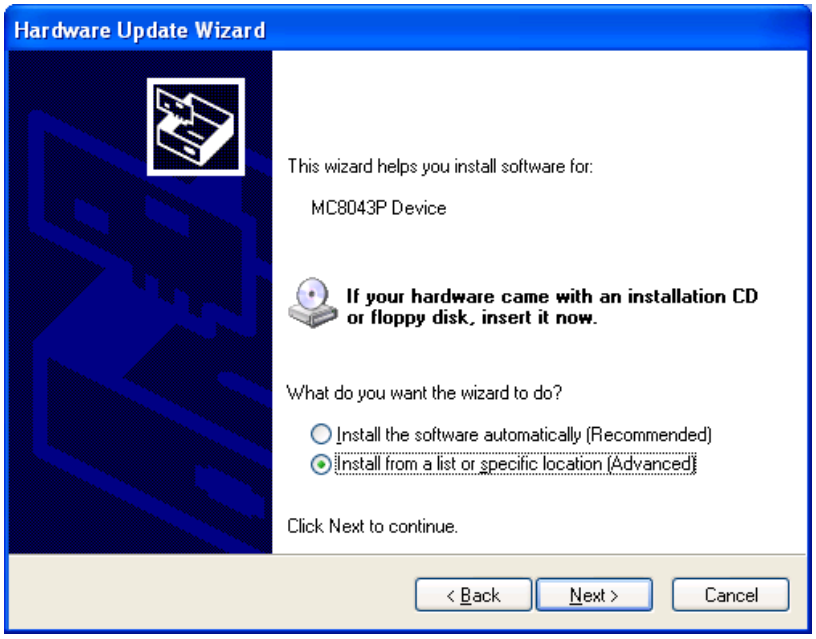
(1) Open [Control Panel] → [System] → [Hardware] tab → [Device Manager] (shown on the left below), double click "**MC8043P Device**" under "**NOVA**", and then click the "**Driver**" tab to display the window shown on the right below.
(2) Click **Update Driver…**.



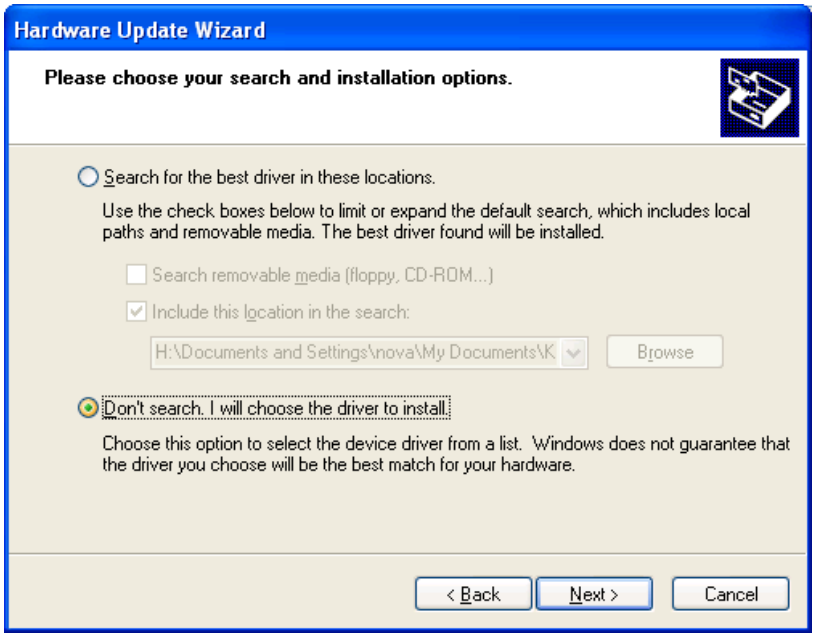


(3) For Windows XP service pack 2 users, the following wizard appears. Click **No, not this time** and then click **Next** to continue. For Windows XP service pack 1 users, the following wizard does not appear, so skip this step.

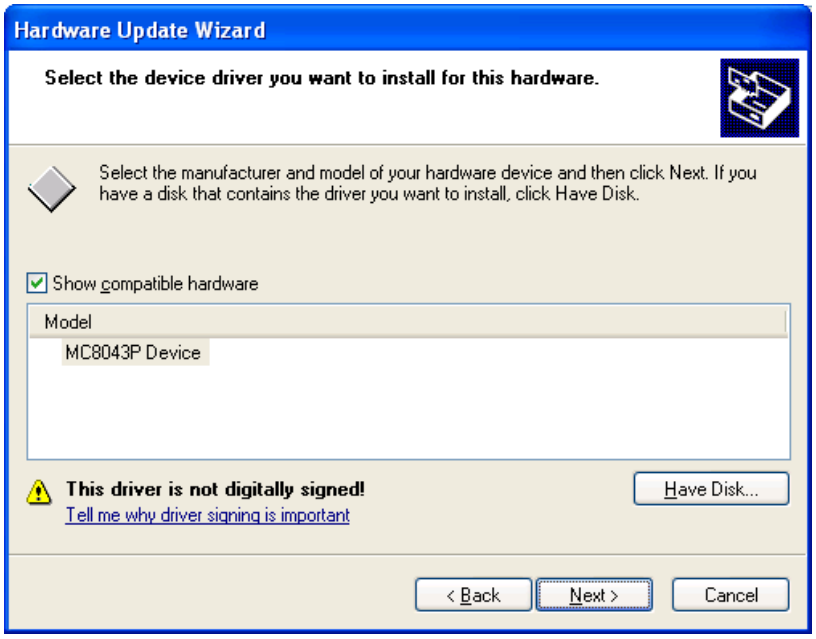
(4) Hardware Update Wizard will open. Select **Install from a list or specific location (Advanced)**, then click **Next**.



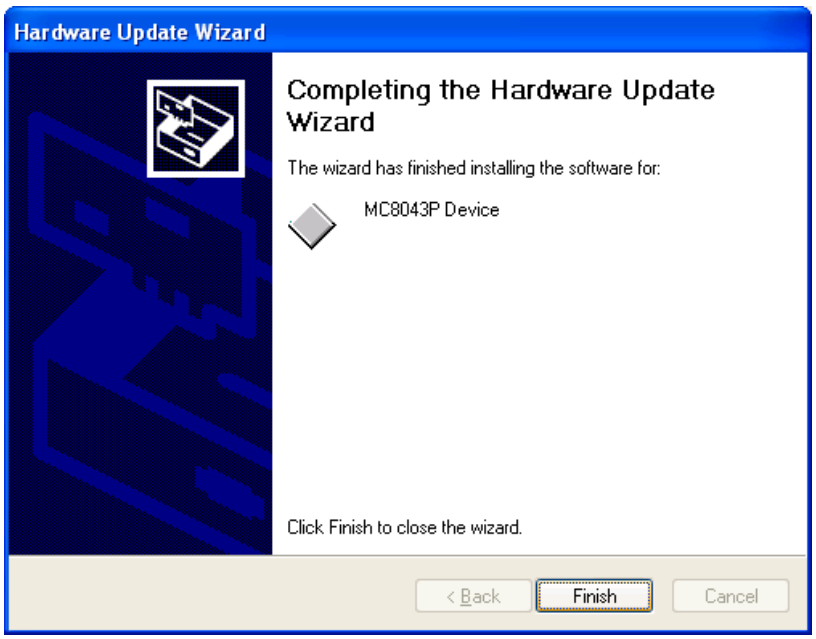
(5) Select **Don't search. I will choose the driver to install**, then click **Next**.



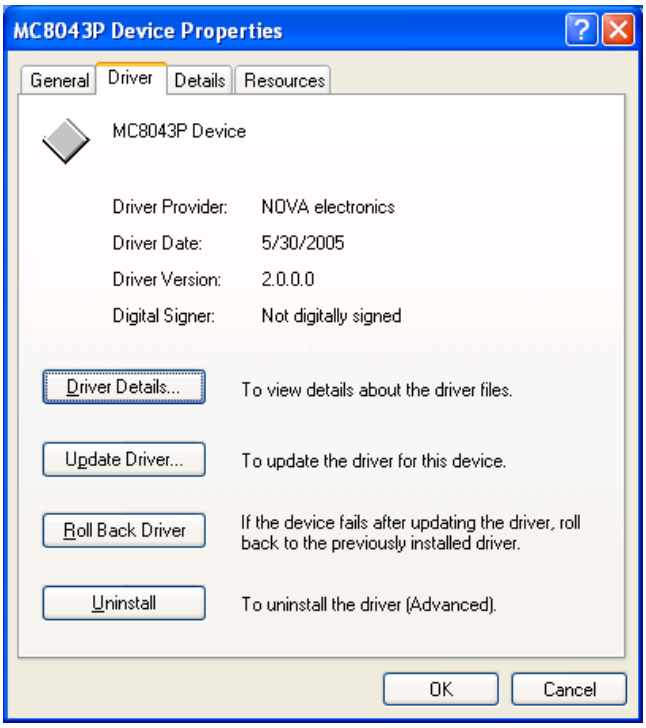
(6) Click **Have Disk…** button and then click **Browse…** button.Select the driver folder (**\Driver**) and then click **Next**.



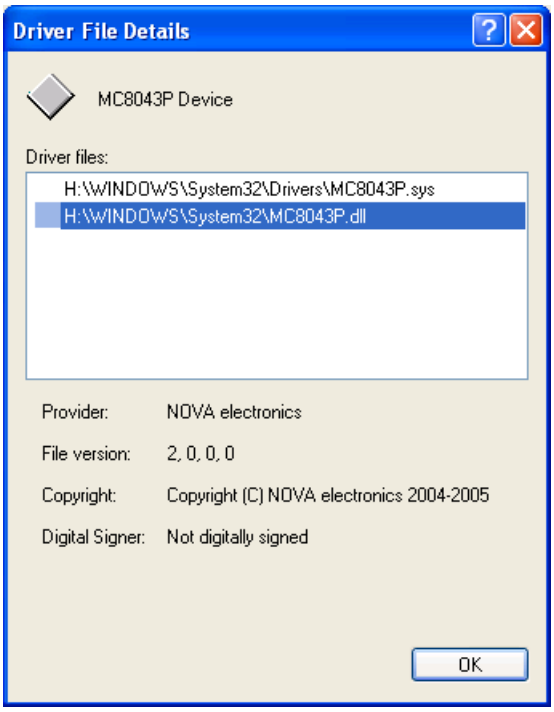
(7) After the updating is successfully completed, the following dialog box opens, then click **Finish**.



(8) Check the updated driver's version in **MC8043P Device Properties**.
Open **\Driver\Version.txt** file and check the version described in the "1. Driver Version", and then check the updated version displayed in the following window. Then click **Driver Details…** button.



(9) Check the updated driver's file version in the following window.
Open **\Driver\Version.txt** file and check the version described in the "2. Driver File Version", and then check the updated version displayed in the following window.



(10) If multiple MC8043P boards are used, update all the drivers of **MC8043P Device** under **NOVA** displayed in Device Manager.

(11) Restart your PC, and the driver update will be finished.

8.6 Notes for When Connected to External Device

It is important to note when MC8043P is operated by connecting to an external device.

- Do not connect the output signal between output signals or to the output signal of the other device. Otherwise, breakdown may occur.
- Do not short-circuit the output signal to an external power. Otherwise, breakdown may occur.
- For your own safety at malfunction, make sure to connect over run limits of the external device.
- Before driving a motor, make sure of wiring. Be sure to check motor rotation and the operation of a limit switch, separating the motor from the device.
- Inputting an electrical surge may cause the malfunction of MC8043P.
- I/O Signal Connection

  When connecting an external power or I/O signal, do not reverse the polarity and do not apply a voltage/current over a rated range. Otherwise, the destruction of circuit elements or reliability degradation may occur. Make sure to correctly wire them.
- I/O Cable

  The included I/O cable is 1.2 meters in length; however, A33~A50 and B33~B50 signals are the same input/output signal line as the PC internal circuit, so that the user must use the minimum length and be careful not to be affected by electromagnetic induction noise from the environment.

9. Programming

This chapter describes software specifications and how to program applications.
Applications can be developed with Microsoft Visual C++ (VC++) or Microsoft Visual Basic (VB).

9.1 Software Specifications

9.1.1 Operating Environment

Operating Systems: Windows 2000, Windows XP
Support Languages: Microsoft Visual C++ 6.0
Microsoft Visual Basic 6.0

Microsoft Visual C++ .NET 2003
Microsoft Visual Basic .NET 2003

9.1.2 Program Configuration File

Configuration File Type	Folder	File Name, Folder	Description
Device Driver	Driver	MC8043P.SYS	Device driver
		MC8043P.DLL	Dynamic link library for VC++, VB
		MC8043P.INF	Install file
Library	Lib\VB6	MC8043P_DLL.BAS	Declare definition file to use MC8043P.DLL VB6.0 only
	Lib\VB.NET2003	MC8043P_DLL.vb	Declare definition file to use MC8043P.DLL VB.NET2003 only
	Lib\VC6	MC8043P.LIB	Library to use MC8043P.DLL VC++ only
		MC8043P_DLL.H	Header definition file to use MC8043P.DLL VC++ only
VB Sample Program (VB6.0)	Sample\VB6	Sample A	Sample program A: Limit input display, Logical position counter display, fixed driving operation example
		Sample C	Sample program C: For multiple boards Limit input display, Logical position counter display, fixed driving operation example
		Sample E	Sample program E: Fixed drive for all axes, RR0,1,2,4,5 reading example
		Sample G	Sample program G: BP interpolation and Continuous interpolation using interpolation function
		NormallyClose \Sample A	Sample program A (NormallyClose) : Limit input display, Logical position counter display, fixed driving operation example. The sample for the logic of the limit sensor is normally closed.
VB Sample Program (VB.NET2003)	Sample\ VB.NET2003	Sample A	Sample program A: Limit input display, Logical position counter display, fixed driving operation example
		Sample C	Sample program C: For multiple boards Limit input display, Logical position counter display, fixed driving operation example
		Sample E	Sample program E: Fixed drive for all axes, RR0,1,2,4,5 reading example
		Sample G	Sample program G: BP interpolation and Continuous interpolation using interpolation function

Configuration File Type	Folder	File Name, Folder	Description
VB Sample Program (VB.NET2003)	Sample\ VB.NET2003	NormallyClose \Sample A	Sample program A (NormallyClose) : Limit input display, Logical position counter display, fixed driving operation example. The sample for the logic of the limit sensor is normally closed.
VC++ Sample Program (VC6.0)	Sample\VC6	Sample A	Sample program A: Limit input display, Logical position counter display, fixed driving operation example
		Sample B	Sample program B: Program example using interrupt
		Sample C	Sample program C: For multiple boards Limit input display, Logical position counter display, fixed driving operation example
		Sample D	Sample program D: For multiple boards Program example using interrupt
		Sample E	Sample program E: Fixed drive for all axes, RR0,1,2,4,5 reading example, interrupt program example
		Sample F	Sample program F: Continuous interpolation program example using interrupt
		Sample G	Sample program G: BP interpolation and Continuous interpolation using interpolation function
		NormallyClose \Sample A	Sample program A (NormallyClose) : Limit input display, Logical position counter display, fixed driving operation example. The sample for the logic of the limit sensor is normally closed.

Note: Description about files being automatically created by VC++ MFC AppWizard is omitted.

9.1.3 API (MC8043P Driver Function)

API provided by MC8043P.SYS and MC8043P.DLL.

9.1.3.1 Function List

The following table is the API function list.

The column of VC, VB, VB.NET indicates the availability of each function in each language. ○ is available and × is not.

(1) Basic Function

Function Name	Description	VC	VB	VB.NET	Page
OpenMC8043P	Start to use MC8043P	○	○	○	42
CloseMC8043P	Stop to use MC8043P	○	○	○	〃
CloseAllMC8043P	Stop to use all the MC8043P	○	○	○	〃
OutpMC8043P	Write data to output port	○	○	○	43
InpMC8043P	Read data from input port	○	○	○	〃
SetEventMC8043P	Set user function to handle an interrupt.	○	×	×	44
ResetEventMC8043P	Release user function to handle an interrupt.	○	×	×	〃
ReadEventMC8043P	Read RR3 value of each axis right after the interrupt generated.	○	×	×	45

(2) Reset, Command

Function Name	Description	VC	VB	VB.NET	Page
Nmc_Reset	Reset MC8043P	○	○	○	46
Nmc_Command	Execute the command of the specified axis.	○	○	○	〃
Nmc_Command_IP	Execute the interpolation command	○	○	○	〃

(3) Write Register

Function Name	Description	VC	VB	VB.NET	Page
Nmc_WriteReg0	WR0 (Command Register) Writing	○	○	○	47
Nmc_WriteReg1	WR1 (Mode Register 1) Writing	○	○	○	〃
Nmc_WriteReg2	WR2 (Mode Register 2) Writing	○	○	○	〃
Nmc_WriteReg3	WR3 (Mode Register 3) Writing	○	○	○	48
Nmc_WriteReg4	WR4 (Output Register) Writing	○	○	○	〃
Nmc_WriteReg5	WR5 (Interpolation Mode Register) Writing	○	○	○	〃
Nmc_WriteReg6	WR6 (Write Data Register 1) Writing	○	○	○	49
Nmc_WriteReg7	WR7 (Write Data Register 2) Writing	○	○	○	〃

(4) Read Register

Function Name	Description	VC	VB	VB.NET	Page
Nmc_ReadReg0	RR0 (Main Status Register) Reading	○	○	○	49
Nmc_ReadReg1	RR1 (Status Register 1) Reading	○	○	○	50
Nmc_ReadReg2	RR2 (Status Register 2) Reading	○	○	○	〃
Nmc_ReadReg4	RR4 (Input Register 1) Reading	○	○	○	〃
Nmc_ReadReg5	RR5 (Input Register 2) Reading	○	○	○	〃
Nmc_ReadReg6	RR6 (Read Data Register 1) Reading	○	○	○	51
Nmc_ReadReg7	RR7 (Read Data Register 2) Reading	○	○	○	〃

(5) Parameter Settings

Function Name	Description	VC	VB	VB.NET	Page
Nmc_Range	Range Setting	○	○	○	51
Nmc_Jerk	Jerk Setting	○	○	○	52
Nmc_Acc	Acceleration Setting	○	○	○	〃
Nmc_Dec	Deceleration Setting	○	○	○	〃
Nmc_StartSpd	Initial Speed Setting	○	○	○	53
Nmc_Speed	Drive Speed Setting	○	○	○	〃
Nmc_Pulse	Output Pulse Number/Interpolation Finish Point Setting (For VC)	○	×	×	〃
Nmc_Pulse_VB	Output Pulse Number/Interpolation Finish Point Setting (For VB)	×	○	○	54
Nmc_DecP	Manual Decelerating Point Setting (For VC)	○	×	×	〃
Nmc_DecP_VB	Manual Decelerating Point Setting (For VB)	×	○	○	〃
Nmc_Center	Circular Center Point Setting	○	○	○	55
Nmc_Lp	Logical Position Counter Setting	○	○	○	〃
Nmc_Ep	Real Position Counter Setting	○	○	○	〃
Nmc_CompP	COMP+ Register Setting	○	○	○	56
Nmc_CompM	COMP– Register Setting	○	○	○	〃
Nmc_AccOfst	Acceleration Counter Offsetting	○	○	○	〃
Nmc_DJerk	Deceleration Increasing Rate Setting	○	○	○	57
Nmc_HomeSpd	Home Search Speed Setting	○	○	○	〃

(6) Extension / Synchronous Action Mode Settings

Function Name	Description	VC	VB	VB.NET	Page
Nmc_ExpMode	Extension Mode Setting	○	○	○	57
Nmc_SyncMode	Synchronous Action Mode Setting	○	○	○	58

(7) Data Reading

Function Name	Description	VC	VB	VB.NET	Page
Nmc_ReadLp	Logical Position Counter Reading	○	○	○	58
Nmc_ReadEp	Real Position Counter Reading	○	○	○	〃
Nmc_ReadSpeed	Current Drive Speed Reading	○	○	○	59
Nmc_ReadAccDec	Current Acceleration/Deceleration Reading	○	○	○	〃
Nmc_ReadSyncBuff	Synchronous Action Buffer Register Reading	○	○	○	〃

(8) Status Reading

Function Name	Description	VC	VB	VB.NET	Page
Nmc_GetDriveStatus	Drive Status Reading	○	○	○	60
Nmc_GetCNextStatus	The Status Reading of Ready Signal for Writing of Continuous Interpolation	○	○	○	〃
Nmc_GetBpSc	BP Interpolation Stack Counter Reading	○	○	○	61

(9) Writing / Reading

Function Name	Description	VC	VB	VB.NET	Page
Nmc_WriteRegSetAxis	Axis Assignment Write Register Writing (WR1~3)	○	○	○	61
Nmc_ReadRegSetAxis	Axis Assignment Read Register Reading (RR1~2)	○	○	○	〃
Nmc_WriteData	Data Writing (Parameter)	○	○	○	62
Nmc_WriteData2	Data Writing (Extension Mode, Synchronous Action Mode)	○	○	○	〃
Nmc_ReadData	Data Reading	○	○	○	〃

(10) Interpolation Execution

Function Name	Description	VC	VB	VB.NET	Page
Nmc_2BPExec	2-axis BP Interpolation Execution	○	○	○	63
Nmc_3BPExec	3-axis BP Interpolation Execution	○	○	○	64
Nmc_2BPExec_BG	2-axis BP Interpolation Execution (run in the background)	○	○	○	65
Nmc_3BPExec_BG	3-axis BP Interpolation Execution (run in the background)	○	○	○	67
Nmc_2CIPExec	2-axis Continuous Interpolation Execution	○	○	○	69
Nmc_3CIPExec	3-axis Continuous Interpolation Execution	○	○	○	71
Nmc_2CIPExec_BG	2-axis Continuous Interpolation Execution (run in the background)	○	○	○	73
Nmc_3CIPExec_BG	3-axis Continuous Interpolation Execution (run in the background)	○	○	○	75
Nmc_IPStop	Stop the Interpolation Execution	○	○	○	77

9.1.3.2 Function Specifications

For VC++ users See **VC** and [VC]
For VC++.NET users See **VC** and [VC]
For VB users See **VB** and [VB]
For VB.NET users See **VB.NET** and [VB]
And others are common to each language.

Function Name	Function and Content
OpenMC8043P	Start MC8043P. **VC** BOOL OpenMC8043P(int No); **VB** Function OpenMC8043P(ByVal No As Long) As Long **VB.NET** Function OpenMC8043P(ByVal No As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) **Return Value** [VC] If the function succeeds, the return value is TRUE. If the function fails, the return value is FALSE. [VB] If the function succeeds, the return value is nonzero. If the function fails, the return value is 0. **Example** [VC] status = OpenMC8043P(0); // Open the board 0. [VB] status = OpenMC8043P(0)
CloseMC8043P	Terminate MC8043P. **VC** BOOL CloseMC8043P(int No); **VB** Function CloseMC8043P(ByVal No As Long) As Long **VB.NET** Function CloseMC8043P(ByVal No As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) **Return Value** [VC] If the function succeeds, the return value is TRUE. If the function fails, the return value is FALSE. [VB] If the function succeeds, the return value is nonzero. If the function fails, the return value is 0. **Example** [VC] status = CloseMC8043P(0); // Close the board 0. [VB] status = CloseMC8043P(0)
CloseAllMC8043P	Terminate all the MC8043P. **VC** BOOL CloseAllMC8043P(void); **VB** Function CloseAllMC8043P() As Long **VB.NET** Function CloseAllMC8043P() As Integer **Input Parameter** None **Return Value** [VC] If the function succeeds, the return value is TRUE. If the function fails, the return value is FALSE. [VB] If the function succeeds, the return value is nonzero. If the function fails, the return value is 0. **Example** [VC] status = CloseAllMC8043P(); // Close all the boards. [VB] status = CloseAllMC8043P()

Function Name	Function and Content
OutpMC8043P	Write 2-byte data into output port. **VC** void OutpMC8043P(int No, long Adr, long Data); **VB** Sub OutpMC8043P(ByVal No As Long, ByVal Adr As Long, ByVal Data As Long) **VB.NET** Sub OutpMC8043P(ByVal No As Integer, ByVal Adr As Integer, ByVal Data As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Adr Address to write. (MCX314_WR0～MCX314_WR7). See Footnote (1) for more details. Ex.) For WR0, specify MCX314_WR0 and for WR1, specify MCX314_WR1 Data Data to be written. **Return Value** None **Example** [VC] OutpMC8043P(No, MCX314_WR0, 0x8000); // Soft reset the board. [VB] Call OutpMC8043P(No, MCX314_WR0, &H8000)
InpMC8043P	Read out 2-byte data from input port. **VC** long InpMC8043P(int No, long Adr); **VB** Function InpMC8043P(ByVal No As Long, ByVal adr As Long) As Long **VB.NET** Function InpMC8043P(ByVal No As Integer, ByVal adr As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Adr Address to read. (MCX314_RR0～MCX314_RR7). See Footnote (1) for more details. Ex.) For RR0, specify MCX314_RR0 and for RR1, specify MCX314_RR1. **Return Value** Data read out from input port. **Example** [VC] data = InpMC8043P(0, MCX314_RR0); // Read out the read register RR0. [VB] data = InpMC8043P(0, MCX314_RR0) **Note** [VC] Regarding reading the RR3 register data, refer to ReadEventMC8043P function.

Function Name	Function and Content
SetEventMC8043P	Set user function to handle an interrupt. By executing this function, the user function is called when an interrupt occurs and then one specified argument is passed. This user function is run as one thread. **VC** BOOL SetEventMC8043P (int No, LPTHREAD_START_ROUTINE UserThread, LPVOID lpParameter); **VB** cannot be used. **VB.NET** cannot be used. **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) UserThread Pointer to the user function to be called when an interrupt occurs. lpParameter Assign one argument to pass to user function thread. Set the available pointer for the thread. When not using the argument, set NULL. **Return Value** If the function succeeds, the return value is TRUE. If the function fails, the return value is FALSE. **Example** [VC] (When the board number is 0) status = SetEventMC8043P(0,(LPTHREAD_START_ROUTINE)MC8043P_EventProc0, NULL); // Set the function address and argument Nmc_WriteReg1(0, AXIS_ALL, 0x8000); // Interrupt occurs at the stop (All axes) (When the board number is 1) status = SetEventMC8043P(1,(LPTHREAD_START_ROUTINE)MC8043P_EventProc1, lpParameter); // Set the function address and argument Nmc_WriteReg1(1, AXIS_ALL, 0x8000); // Interrupt occurs at the stop (All axes) ■ Example of interrupt user function declaration void MC8043P_EventProc0(void); void MC8043P_EventProc1(LPVOID lpParameter);
ResetEventMC8043P	Release user function to handle an interrupt. By executing this function, the user function is not called when an interrupt occurs. **VC** BOOL ResetEventMC8043P(int No); **VB** cannot be used. **VB.NET** cannot be used. **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) **Return Value** If the function succeeds, the return value is TRUE. If the function fails, the return value is FALSE. **Example** [VC] Nmc_WriteReg1(No, AXIS_ALL, 0x0000); // No interrupt (All axes) status = ResetEventMC8043P(No);

Function Name	Function and Content
ReadEventMC8043P	Read the value of RR3 of each axis right after an interrupt generation. (RR3 will be cleared after reading.) **VC** BOOL ReadEventMC8043P(int No, long* Rr3X, long* Rr3Y, long* Rr3Z, long* Rr3U); **VB** cannot be used. **VB.NET** cannot be used. **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Rr3X Pointer to a variable that receives the X axis RR3 value. Rr3Y Pointer to a variable that receives the Y axis RR3 value. Rr3Z Pointer to a variable that receives the Z axis RR3 value. Rr3U Pointer to a variable that receives the U axis RR3 value. **Return Value** If the function succeeds, the return value is TRUE. If the function fails, the return value is FALSE. **Example** [VC] long Rr3X, Rr3Y, Rr3Z, Rr3U; ReadEventMC8043P(No, &Rr3X, &Rr3Y, &Rr3Z, &Rr3U); **Note** The RR3 value of MC8043P is cleared due to the driver operation, just after the interrupt occurs. The user must use this function in order to know the interrupt factor. In addition, when the interrupt occurs, the driver certainly reads and saves RR3 data regardless of the execution of SetEventMC8043P or ResetEventMC8043P functions. RR3 data saved in the driver can be cleared after reading by execution of ReadEventMC8043P function. To clear the RR3 data of the driver, execute ReadEventMC8043P function.

Function Name	Function and Content
Nmc_Reset	Reset MC8043P. **VC** void Nmc_Reset(int No); **VB** Sub Nmc_Reset(ByVal No As Long) **VB.NET** Sub Nmc_Reset(ByVal No As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) **Return Value** None **Example** [VC] Nmc_Reset(0); // Reset the board of number 0. [VB] Call Nmc_Reset(0)
Nmc_Command	Execute the command of a specified axis. (Write the command of a specified axis into WR0.) **VC** void Nmc_Command(int No, int Axis, int cmd); **VB** Sub Nmc_Command(ByVal No As Long, ByVal Axis As Long, ByVal cmd As Long) **VB.NET** Sub Nmc_Command(ByVal No As Integer, ByVal Axis As Integer, ByVal cmd As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to execute the command. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. cmd Command number. Specify one command from “Driving commands, Other commands” of “Command Definition” described in definition file (*1). For + direction fixed drive, specify CMD_F_DRV_P. *1: [VC] MC8043P_DLL.H, [VB] MC8043P_DLL.bas, [VB.NET] MC8043P_DLL.vb **Return Value** None **Example** [VC] Nmc_Command(No, AXIS_X, CMD_F_DRV_P); // Execute the + direction fixed drive of X axis. [VB] Call Nmc_Command(No, AXIS_X, CMD_F_DRV_P)
Nmc_Command_IP	Execute interpolation command. (Write interpolation command into WR0.) **VC** void Nmc_Command_IP(int No, int cmd); **VB** Sub Nmc_Command_IP(ByVal No As Long, ByVal cmd As Long) **VB.NET** Sub Nmc_Command_IP(ByVal No As Integer, ByVal cmd As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) cmd Command number. Specify one command from “Interpolation Commands” of “Command Definition” described in definition file (*1). For 2-axis linear interpolation drive, specify CMD_IP_2ST. *1: [VC] MC8043P_DLL.H, [VB] MC8043P_DLL.bas, [VB.NET] MC8043P_DLL.vb **Return Value** None **Example** [VC] Nmc_WriteReg5(No, 0x0004); // Set the interpolation axis (Main axis: X, Second axis: Y). Nmc_Command_IP(No, CMD_IP_2ST); // Execute 2-axis linear interpolation drive. [VB] Call Nmc_WriteReg5(No, &H0004) ' Set the interpolation axis (Main axis: X, Second axis: Y). Call Nmc_Command_IP(No, CMD_IP_2ST) ' Execute 2-axis linear interpolation drive.

Function Name	Function and Content
Nmc_WriteReg0	Write data into WR0 (Command register). **VC** void Nmc_WriteReg0(int No, long wdata); **VB** Sub Nmc_WriteReg0(ByVal No As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_WriteReg0(ByVal No As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) wdata Data to be written. **Return Value** None **Example** [VC] Nmc_WriteReg0(No, 0x0120); // Execute the + direction fixed drive of X axis. [VB] Call Nmc_WriteReg0(No, &H120)
Nmc_WriteReg1	Write data into WR1 (Mode register 1). **VC** void Nmc_WriteReg1(int No, int Axis, long wdata); **VB** Sub Nmc_WriteReg1(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_WriteReg1(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to write data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be written. **Return Value** None **Example** [VC] Nmc_WriteReg1(No, AXIS_X, 0x0002); // Enable driving stop input signal IN0 (X axis). [VB] Call Nmc_WriteReg1(No, AXIS_X, &H2)
Nmc_WriteReg2	Write data into WR2 (Mode register 2). **VC** void Nmc_WriteReg2(int No, int Axis, long wdata); **VB** Sub Nmc_WriteReg2(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_WriteReg2(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to write data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be written. **Return Value** None **Example** [VC] Nmc_WriteReg2(No, AXIS_Y, 0x2000); // Enable ALARM (Y axis). [VB] Call Nmc_WriteReg2(No, AXIS_Y, &H2000)

Function Name	Function and Content
Nmc_WriteReg3	Write data into WR3 (Mode register 3). **VC** void Nmc_WriteReg3(int No, int Axis, long wdata); **VB** Sub Nmc_WriteReg3(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_WriteReg3(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to write data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be written. **Return Value** None **Example** [VC] Nmc_WriteReg3(No, AXIS_ALL, 0x0100); // Hi level output for all axes general output OUT4. [VB] Call Nmc_WriteReg3(No, AXIS_ALL, &H0100)
Nmc_WriteReg4	Write data into WR4 (Output register). **VC** void Nmc_WriteReg4(int No, long wdata); **VB** Sub Nmc_WriteReg4(ByVal No As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_WriteReg4(ByVal No As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) wdata Data to be written. **Return Value** None **Example** [VC] Nmc_WriteReg4(No, 0x0001); // Hi level output for X axis general output OUT0. [VB] Call Nmc_WriteReg4(No, &H0001)
Nmc_WriteReg5	Write data into WR5 (Interpolation mode register). **VC** void Nmc_WriteReg5(int No, long wdata); **VB** Sub Nmc_WriteReg5(ByVal No As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_WriteReg5(ByVal No As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) wdata Data to be written. **Return Value** None **Example** [VC] Nmc_WriteReg5(No, 0x0024); // Set the interpolation axis (Master axis: X, Second axis: Y, Third axis: Z). [VB] Call Nmc_WriteReg5(No, &H0024)

Function Name	Function and Content
Nmc_WriteReg6	Write data into WR6 (Write data register 1). **VC** void Nmc_WriteReg6(int No, long wdata); **VB** Sub Nmc_WriteReg6(ByVal No As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_WriteReg6(ByVal No As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) wdata Data to be written. **Return Value** None **Example** [VC] Nmc_WriteReg6(No, 0x1234); // Write data (1234)H into write data register 1. [VB] Call Nmc_WriteReg6(No, &H1234)
Nmc_WriteReg7	Write data into WR7 (Write data register 2). **VC** void Nmc_WriteReg7(int No, long wdata); **VB** Sub Nmc_WriteReg7(ByVal No As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_WriteReg7(ByVal No As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) wdata Data to be written. **Return Value** None **Example** [VC] Nmc_WriteReg7(No, 0x5678); // Write data (5678)H into write data register 2. [VB] Call Nmc_WriteReg7(No, &H5678)
Nmc_ReadReg0	Read out data from RR0 (Main status register). **VC** long Nmc_ReadReg0(int No); **VB** Function Nmc_ReadReg0(ByVal No As Long) As Long **VB.NET** Function Nmc_ReadReg0(ByVal No As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) **Return Value** The data of RR0 (Main status register) **Example** [VC] Data = Nmc_ReadReg0(No); // Read out RR0. [VB] Data = Nmc_ReadReg0(No)

Function Name	Function and Content
Nmc_ReadReg1	Read out data from RR1 (Status register 1). **VC** long Nmc_ReadReg1(int No, int Axis); **VB** Function Nmc_ReadReg1(ByVal No As Long, ByVal Axis As Long) As Long **VB.NET** Function Nmc_ReadReg1(ByVal No As Integer, ByVal Axis As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to read data. Assign AXIS_X for X axis, AXIS_Y for Y axis, AXIS_Z for Z axis, AXIS_U for U axis. **Return Value** The data of RR1 (Status register 1) **Example** [VC] Data = Nmc_ReadReg1(No, AXIS_X); // Read out RR1 X axis. [VB] Data = Nmc_ReadReg1(No, AXIS_X)
Nmc_ReadReg2	Read out data from RR2 (Status register 2). **VC** long Nmc_ReadReg2(int No, int Axis); **VB** Function Nmc_ReadReg2(ByVal No As Long, ByVal Axis As Long) As Long **VB.NET** Function Nmc_ReadReg2(ByVal No As Integer, ByVal Axis As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to read data. Assign AXIS_X for X axis, AXIS_Y for Y axis, AXIS_Z for Z axis, AXIS_U for U axis. **Return Value** The data of RR2 (Status register 2) **Example** [VC] Data = Nmc_ReadReg2(No, AXIS_Y); // Read out RR2 Y axis. [VB] Data = Nmc_ReadReg2(No, AXIS_Y)
Nmc_ReadReg4	Read out data from RR4 (Input register 1). **VC** long Nmc_ReadReg4(int No); **VB** Function Nmc_ReadReg4(ByVal No As Long) As Long **VB.NET** Function Nmc_ReadReg4(ByVal No As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) **Return Value** The data of RR4 (Input register 1) **Example** [VC] Data = Nmc_ReadReg4(No); // Read out RR4. [VB] Data = Nmc_ReadReg4(No)
Nmc_ReadReg5	Read out data from RR5 (Input register 2). **VC** long Nmc_ReadReg5(int No); **VB** Function Nmc_ReadReg5(ByVal No As Long) As Long **VB.NET** Function Nmc_ReadReg5(ByVal No As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) **Return Value** The data of RR5 (Input register 2) **Example** [VC] Data = Nmc_ReadReg5(No); // Read out RR5. [VB] Data = Nmc_ReadReg5(No)

Function Name	Function and Content
Nmc_ReadReg6	Read out data from RR6 (Read data register 1). **VC** long Nmc_ReadReg6(int No); **VB** Function Nmc_ReadReg6(ByVal No As Long) As Long **VB.NET** Function Nmc_ReadReg6(ByVal No As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) **Return Value** The data of RR6 (Read data register 1) **Example** [VC] Data = Nmc_ReadReg6(No); // Read out RR6. [VB] Data = Nmc_ReadReg6(No)
Nmc_ReadReg7	Read out data from RR7 (Read data register 2). **VC** long Nmc_ReadReg7(int No); **VB** Function Nmc_ReadReg7(ByVal No As Long) As Long **VB.NET** Function Nmc_ReadReg7(ByVal No As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) **Return Value** The data of RR7 (Read data register 2) **Example** [VC] Data = Nmc_ReadReg7(No); // Read out RR7. [VB] Data = Nmc_ReadReg7(No)
Nmc_Range	Set the range. **VC** void Nmc_Range(int No, int Axis, long wdata); **VB** Sub Nmc_Range(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_Range(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be set. **Return Value** None **Example** [VC] Nmc_Range(No, AXIS_ALL, 800000); // Set 800000 (Multiple = 10) to range (All axes). [VB] Call Nmc_Range(No, AXIS_ALL, 800000)

Function Name	Function and Content
Nmc_Jerk	Set jerk. **VC** void Nmc_Jerk(int No, int Axis, long wdata); **VB** Sub Nmc_Jerk(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_Jerk(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be set. **Return Value** None **Example** [VC] Nmc_Jerk(No, AXIS_X, 1000); // Set 1000 to jerk (X axis). [VB] Call Nmc_Jerk(No, AXIS_X, 1000)
Nmc_Acc	Set acceleration. **VC** void Nmc_Acc(int No, int Axis, long wdata); **VB** Sub Nmc_Acc(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_Acc(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be set. **Return Value** None **Example** [VC] Nmc_Acc(No, AXIS_Y, 100); // Set 100 to acceleration (Y axis). [VB] Call Nmc_Acc(No, AXIS_Y, 100)
Nmc_Dec	Set deceleration. **VC** void Nmc_Dec(int No, int Axis, long wdata); **VB** Sub Nmc_Dec(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_Dec(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be set. **Return Value** None **Example** [VC] Nmc_Dec(No, AXIS_Z, 100); // Set 100 to deceleration (Z axis). [VB] Call Nmc_Dec(No, AXIS_Z, 100)

Function Name	Function and Content
Nmc_StartSpd	Set initial speed. **VC** void Nmc_StartSpd(int No, int Axis, long wdata); **VB** Sub Nmc_StartSpd(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_StartSpd(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be set. **Return Value** None **Example** [VC] Nmc_StartSpd(No, AXIS_U, 100); // Set 100 to initial speed (U axis). [VB] Call Nmc_StartSpd(No, AXIS_U, 100)
Nmc_Speed	Set drive speed. **VC** void Nmc_Speed(int No, int Axis, long wdata); **VB** Sub Nmc_Speed(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_Speed(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be set. **Return Value** None **Example** [VC] Nmc_Speed(No, AXIS_X | AXIS_Y, 1000); // Set 1000 to drive speed (X/Y axes). [VB] Call Nmc_Speed(No, AXIS_X Or AXIS_Y, 1000)
Nmc_Pulse	Set output pulse number or interpolation finish point. (VC only) The number of output pulses indicates the total number of pulses that are output in fixed pulse driving. For linear and circular interpolation driving, set the finish point of each axis. The finish point should be set by relative numbers. The output pulse number is unsigned 32-bit value. The interpolation finish point is signed 32-bit value. **VC** void Nmc_Pulse(int No, int Axis, long wdata); **VB** cannot be used. **VB.NET** cannot be used. **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be set. **Return Value** None **Example** [VC] Nmc_Pulse(No, AXIS_X, 2000); // Set 2000 to output pulse number (X axis). Nmc_Pulse(No, AXIS_Y, 300); // Set 300 to interpolation finish point (Y axis). Nmc_Pulse(No, AXIS_Z, -400); // Set -400 to interpolation finish point (Z axis).

Function Name	Function and Content
Nmc_Pulse_VB	Set output pulse number or interpolation finish point. (VB only) The number of output pulses indicates the total number of pulses that are output in fixed pulse driving. For linear and circular interpolation driving, set the finish point of each axis. The finish point should be set by relative numbers. **VC** cannot be used. **VB** Sub Nmc_Pulse_VB(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Double) **VB.NET** Sub Nmc_Pulse_VB(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Double) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be set. **Return Value** None **Example** [VB] Call Nmc_Pulse_VB(No, AXIS_X, 2000) ‘ Set 2000 to output pulse number (X axis). Call Nmc_Pulse_VB(No, AXIS_Y, 300) ‘ Set 300 to interpolation finish point (Y axis). Call Nmc_Pulse_VB(No, AXIS_Z, -400) ‘ Set -400 to interpolation finish point (Z axis).
Nmc_DecP	Set manual decelerating point. (VC only) **VC** void Nmc_DecP(int No, int Axis, ULONG wdata); **VB** cannot be used. **VB.NET** cannot be used. **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be set. **Return Value** None **Example** [VC] Nmc_DecP(No, AXIS_U, 30000); // Set 30000 to manual decelerating point (U axis).
Nmc_DecP_VB	Set manual decelerating point. (VB only) **VC** cannot be used. **VB** Sub Nmc_DecP_VB(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Double) **VB.NET** Sub Nmc_DecP_VB(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Double) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be set. **Return Value** None **Example** [VB] Call Nmc_DecP_VB(No, AXIS_X, 40000) ‘ Set 40000 to manual decelerating point (X axis).

Function Name	Function and Content
Nmc_Center	Set circular center point. **VC** void Nmc_Center(int No, int Axis, long wdata); **VB** Sub Nmc_Center(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_Center(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be set. **Return Value** None **Example** [VC] Nmc_Center(No, AXIS_Y, 1500); // Set 1500 to circular center point (Y axis). [VB] Call Nmc_Center(No, AXIS_Y, 1500)
Nmc_Lp	Set logical position counter. **VC** void Nmc_Lp(int No, int Axis, long wdata); **VB** Sub Nmc_Lp(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_Lp(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be set. **Return Value** None **Example** [VC] Nmc_Lp(No, AXIS_ALL, 0); // Set 0 to logical position counter of all axes. [VB] Call Nmc_Lp(No, AXIS_ALL, 0)
Nmc_Ep	Set real position counter. **VC** void Nmc_Ep(int No, int Axis, long wdata); **VB** Sub Nmc_Ep(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_Ep(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be set. **Return Value** None **Example** [VC] Nmc_Ep(No, AXIS_ALL, 0); // Set 0 to real position counter of all axes. [VB] Call Nmc_Ep(No, AXIS_ALL, 0)

Function Name	Function and Content
Nmc_CompP	Set COMP+ register. **VC** void Nmc_CompP(int No, int Axis, long wdata); **VB** Sub Nmc_CompP(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_CompP(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be set. **Return Value** None **Example** [VC] Nmc_CompP(No, AXIS_X, 50000); // Set 50000 to COMP+ register (X axis). [VB] Call Nmc_CompP(No, AXIS_X, 50000)
Nmc_CompM	Set COMP– register. **VC** void Nmc_CompM(int No, int Axis, long wdata); **VB** Sub Nmc_CompM(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_CompM(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be set. **Return Value** None **Example** [VC] Nmc_CompM(No, AXIS_X, -50000); // Set -50000 to COMP– register (X axis). [VB] Call Nmc_CompM(No, AXIS_X, -50000)
Nmc_AccOfst	Set acceleration counter offsetting. **VC** void Nmc_AccOfst(int No, int Axis, long wdata); **VB** Sub Nmc_AccOfst(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_AccOfst(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be set. **Return Value** None **Example** [VC] Nmc_AccOfst(No, AXIS_Y, 20); // Set 20 to acceleration counter offsetting (Y axis). [VB] Call Nmc_AccOfst(No, AXIS_Y, 20)

Function Name	Function and Content
Nmc_DJerk	Set deceleration increasing rate. **VC** void Nmc_DJerk(int No, int Axis, long wdata); **VB** Sub Nmc_DJerk(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_DJerk(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be set. **Return Value** None **Example** [VC] Nmc_DJerk(No, AXIS_Z, 1000); // Set 1000 to deceleration increasing rate (Z axis). [VB] Call Nmc_DJerk(No, AXIS_Z, 1000)
Nmc_HomeSpd	Set home search speed. **VC** void Nmc_HomeSpd(int No, int Axis, long wdata); **VB** Sub Nmc_HomeSpd(ByVal No As Long, ByVal Axis As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_HomeSpd(ByVal No As Integer, ByVal Axis As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. wdata Data to be set. **Return Value** None **Example** [VC] Nmc_HomeSpd(No, AXIS_U, 200); // Set 200 to home search speed (U axis). [VB] Call Nmc_HomeSpd(No, AXIS_U, 200)
Nmc_ExpMode	Set extension mode. **VC** void Nmc_ExpMode(int No, int Axis, long EM6_data, long EM7_data); **VB** Sub Nmc_ExpMode(ByVal No As Long, ByVal Axis As Long, ByVal EM6_data As Long, ByVal EM7_data As Long) **VB.NET** Sub Nmc_ExpMode(ByVal No As Integer, ByVal Axis As Integer, ByVal EM6_data As Integer, ByVal EM7_data As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. EM6_data Data to be set in extension mode register EM6. EM7_data Data to be set in extension mode register EM7. **Return Value** None **Example** Set enable for all filters, delay time 512μs and execution of automatic home search step1, 2 and 4 to X axis extension mode. [VC] Nmc_ExpMode(No, AXIS_X, 0x5F00, 0x0045); [VB] Call Nmc_ExpMode(No, AXIS_X, &H5F00, &H0045)

Function Name	Function and Content
Nmc_SyncMode	Set synchronous action mode. **VC** void Nmc_SyncMode(int No, int Axis, long SM6_data, long SM7_data); **VB** Sub Nmc_SyncMode(ByVal No As Long, ByVal Axis As Long, ByVal SM6_data As Long, ByVal SM7_data As Long) **VB.NET** Sub Nmc_SyncMode(ByVal No As Integer, ByVal Axis As Integer, ByVal SM6_data As Integer, ByVal SM7_data As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to set data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. SM6_data Data to be set in synchronous action mode register SM6. SM7_data Data to be set in synchronous action mode register SM7. **Return Value** None **Example** Set “start fixed driving in the + direction of Y axis at the termination of X axis driving”. (1) Set the activation factor D-END to X axis synchronous action mode for Y axis activation. (2) Set fixed driving in the + direction (FDRV+) as action to Y axis synchronous action mode. [VC] (1) Nmc_SyncMode(No, AXIS_X, 0x2020, 0); (2) Nmc_SyncMode(No, AXIS_Y, 0, 0x0001); [VB] (1) Call Nmc_SyncMode(No, AXIS_X, &H2020, 0) (2) Call Nmc_SyncMode(No, AXIS_Y, 0, &H0001)
Nmc_ReadLp	Read out logical position counter. **VC** long Nmc_ReadLp(int No, int Axis); **VB** Function Nmc_ReadLp(ByVal No As Long, ByVal Axis As Long) As Long **VB.NET** Function Nmc_ReadLp(ByVal No As Integer, ByVal Axis As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to read data. Assign AXIS_X for X axis, AXIS_Y for Y axis, AXIS_Z for Z axis and AXIS_U for U axis. **Return Value** The value of the current logical position counter **Example** [VC] Data = Nmc_ReadLp(No, AXIS_X); // Read out logical position counter of X axis. [VB] Data = Nmc_ReadLp(No, AXIS_X)
Nmc_ReadEp	Read out real position counter. **VC** long Nmc_ReadEp(int No, int Axis); **VB** Function Nmc_ReadEp(ByVal No As Long, ByVal Axis As Long) As Long **VB.NET** Function Nmc_ReadEp(ByVal No As Integer, ByVal Axis As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to read data. Assign AXIS_X for X axis, AXIS_Y for Y axis, AXIS_Z for Z axis and AXIS_U for U axis. **Return Value** The value of the current real position counter **Example** [VC] Data = Nmc_ReadEp(No, AXIS_Y); // Read out real position counter of Y axis. [VB] Data = Nmc_ReadEp(No, AXIS_Y)

Function Name	Function and Content
Nmc_ReadSpeed	Read out the current drive speed. **VC** long Nmc_ReadSpeed(int No, int Axis); **VB** Function Nmc_ReadSpeed(ByVal No As Long, ByVal Axis As Long) As Long **VB.NET** Function Nmc_ReadSpeed(ByVal No As Integer, ByVal Axis As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to read data. Assign AXIS_X for X axis, AXIS_Y for Y axis, AXIS_Z for Z axis and AXIS_U for U axis. **Return Value** The current drive speed. **Example** [VC] Data = Nmc_ReadSpeed(No, AXIS_Z); // Read out the current drive speed of Z axis. [VB] Data = Nmc_ReadSpeed(No, AXIS_Z)
Nmc_ReadAccDec	Read out the current acceleration/deceleration. Read out the value of the current acceleration or deceleration during driving. When the driving stops, the read data is random number. **VC** long Nmc_ReadAccDec(int No, int Axis); **VB** Function Nmc_ReadAccDec(ByVal No As Long, ByVal Axis As Long) As Long **VB.NET** Function Nmc_ReadAccDec(ByVal No As Integer, ByVal Axis As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to read data. Assign AXIS_X for X axis, AXIS_Y for Y axis, AXIS_Z for Z axis and AXIS_U for U axis. **Return Value** The current acceleration/deceleration **Example** [VC] Data = Nmc_ReadAccDec(No, AXIS_U); // Read out the current acceleration/deceleration of U axis. [VB] Data = Nmc_ReadAccDec(No, AXIS_U)
Nmc_ReadSyncBuff	Read out synchronous action buffer register. **VC** long Nmc_ReadSyncBuff(int No, int Axis); **VB** Function Nmc_ReadSyncBuff(ByVal No As Long, ByVal Axis As Long) As Long **VB.NET** Function Nmc_ReadSyncBuff(ByVal No As Integer, ByVal Axis As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to read data. Assign AXIS_X for X axis, AXIS_Y for Y axis, AXIS_Z for Z axis and AXIS_U for U axis. **Return Value** The value of synchronous action buffer register **Example** [VC] Data = Nmc_ReadSyncBuff(No, AXIS_X); // Read out synchronous action buffer register of X axis. [VB] Data = Nmc_ReadSyncBuff(No, AXIS_X)

Function Name	Function and Content
Nmc_GetDriveStatus	Read drive status. The user can use to check whether the driving of the specified axis has finished or not. **VC** int Nmc_GetDriveStatus(int No, int Axis); **VB** Function Nmc_GetDriveStatus(ByVal No As Long, ByVal Axis As Long) As Long **VB.NET** Function Nmc_GetDriveStatus(ByVal No As Integer, ByVal Axis As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to read drive status. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. **Return Value** If all the specified axes have finished driving, the return value is 0. If more than one of the specified axes is/are driving, the return value is nonzero. **Example** [VC] if(Nmc_GetDriveStatus(No, AXIS_X) == 0) // When X axis has finished driving. AfxMessageBox("X axis has finished driving"); else AfxMessageBox("X axis is driving"); [VB] If Nmc_GetDriveStatus(No, AXIS_X) = 0 Then ' When X axis has finished driving. Call MsgBox("X axis has finished driving") Else Call MsgBox("X axis is driving") End If
Nmc_GetCNextStatus	Read the status of ready signal for writing of continuous interpolation. (Read the status of the bit CNEXT of RR0.) The user can use to check whether the signal for the writing of continuous interpolation is ready or not during continuous interpolation execution. **VC** int Nmc_GetCNextStatus(int No); **VB** Function Nmc_GetCNextStatus(ByVal No As Long) As Long **VB.NET** Function Nmc_GetCNextStatus(ByVal No As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) **Return Value** If the signal for the writing of continuous interpolation is ready, the return value is nonzero. If the signal for the writing of continuous interpolation is not ready, the return value is 0. **Example** [VC] if(Nmc_GetCNextStatus(No) != 0) // When the signal for the writing is ready. AfxMessageBox("The signal for the writing of continuous interpolation is ready"); else AfxMessageBox("The signal for the writing of continuous interpolation is not ready"); [VB] If Nmc_GetCNextStatus(No) <> 0 Then ' When the signal for the writing is ready. Call MsgBox("The signal for the writing of continuous interpolation is ready") Else Call MsgBox("The signal for the writing of continuous interpolation is not ready") End If

Function Name	Function and Content
Nmc_GetBpSc	Read the value of BP interpolation stack counter. **VC** int Nmc_GetBpSc(int No); **VB** Function Nmc_GetBpSc(ByVal No As Long) As Long **VB.NET** Function Nmc_GetBpSc(ByVal No As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) **Return Value** The value of the current bit pattern interpolation stack counter. **Example** [VC] Data = Nmc_GetBpSc(No); // Read the value of BP interpolation stack counter. [VB] Data = Nmc_GetBpSc(No)
Nmc_WriteRegSetAxis	Write data into one specified write register of WR1~WR3 for the specified axis. **VC** void Nmc_WriteRegSetAxis(int No, int Axis, int RegNumber, long wdata); **VB** Sub Nmc_WriteRegSetAxis(ByVal No As Long, ByVal Axis As Long, ByVal RegNumber As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_WriteRegSetAxis(ByVal No As Integer, ByVal Axis As Integer, ByVal RegNumber As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to write data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. RegNumber Write register number to write data. Assign MCX314_WR1 for WR1, MCX314_WR2 for WR2 and MCX314_WR3 for WR3. See Footnote (1). wdata Data to be written. **Return Value** None **Example** Write ALARM Enable (2000)H into WR2 of all axes. [VC] Nmc_WriteRegSetAxis(No, AXIS_ALL, MCX314_WR2, 0x2000); [VB] Call Nmc_WriteRegSetAxis(No, AXIS_ALL, MCX314_WR2, &H2000)
Nmc_ReadRegSetAxis	Read out data from the specified read register (either RR1 or RR2) for the specified axis. **VC** long Nmc_ReadRegSetAxis(int No, int Axis, int RegNumber); **VB** Function Nmc_ReadRegSetAxis(ByVal No As Long, ByVal Axis As Long, ByVal RegNumber As Long) As Long **VB.NET** Function Nmc_ReadRegSetAxis(ByVal No As Integer, ByVal Axis As Integer, ByVal RegNumber As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to read data. Assign AXIS_X for X axis, AXIS_Y for Y axis, AXIS_Z for Z axis and AXIS_U for U axis. RegNumber Read register number to read data. Assign MCX314_RR1 for RR1 and MCX314_RR2 for RR2. See Footnote (1). **Return Value** The data of the specified read register for the specified axis. **Example** Read out the data of X axis RR1. [VC] Data = Nmc_ReadRegSetAxis(No, AXIS_X, MCX314_RR1); [VB] Data = Nmc_ReadRegSetAxis(No, AXIS_X, MCX314_RR1)

Function Name	Function and Content
Nmc_WriteData	Write the specified parameter into the specified axis. (Execute commands for data writing) **VC** void Nmc_WriteData(int No, int Axis, int cmd, long wdata); **VB** Sub Nmc_WriteData(ByVal No As Long, ByVal Axis As Long, ByVal cmd As Long, ByVal wdata As Long) **VB.NET** Sub Nmc_WriteData(ByVal No As Integer, ByVal Axis As Integer, ByVal cmd As Integer, ByVal wdata As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to write data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. cmd Commands for data writing ((00)H～(0E)H, (61)H). Ex.: Range setting is (00)H. wdata Data to be written. **Return Value** None **Example** Set 1000 to the drive speed of all axes. Drive speed command code is (05)H. [VC] Nmc_WriteData(No, AXIS_ALL, 0x05, 1000); [VB] Call Nmc_WriteData(No, AXIS_ALL, &H05, 1000)
Nmc_WriteData2	Write the data of extension mode or synchronous action mode into the specified axis. (Execute commands for data writing) **VC** void Nmc_WriteData2(int No, int Axis, int cmd, long WR6_data, long WR7_data); **VB** Sub Nmc_WriteData2(ByVal No As Long, ByVal Axis As Long, ByVal cmd As Long, ByVal WR6_data As Long, ByVal WR7_data As Long) **VB.NET** Sub Nmc_WriteData2(ByVal No As Integer, ByVal Axis As Integer, ByVal cmd As Integer, ByVal WR6_data As Integer, ByVal WR7_data As Integer) **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to write data. Assign AXIS_X, AXIS_Y and so on. Multiple axes can be assigned. See Footnote (2) for more details. cmd Commands for data writing. Specify (60)H for extension mode, and (64)H for synchronous action mode. WR6_data Data to be written into EM6 in extension mode and into SM6 in synchronous action mode. WR7_data Data to be written into EM7 in extension mode and into SM7 in synchronous action mode. **Return Value** None **Example** Write EM6 data (5F00)H and EM7 data (45)H into extension mode of X axis. [VC] Nmc_WriteData2(No, AXIS_X, 0x60, 0x5F00, 0x0045); [VB] Call Nmc_WriteData2(No, AXIS_X, &H60, &H5F00, &H45)
Nmc_ReadData	Read out data by executing commands for reading data. **VC** long Nmc_ReadData(int No, int Axis, int cmd); **VB** Function Nmc_ReadData(ByVal No As Long, ByVal Axis As Long, ByVal cmd As Long) As Long **VB.NET** Function Nmc_ReadData(ByVal No As Integer, ByVal Axis As Integer, ByVal cmd As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) Axis Axis to read data. Assign AXIS_X for X axis, AXIS_Y for Y axis, AXIS_Z for Z axis and AXIS_U for U axis. cmd Commands for reading data ((10)H～(14)H). Ex.: Logical position counter reading is (10)H. **Return Value** Data to be read. **Example** [VC] Data = Nmc_ReadData(No,AXIS_X, 0x10); // Read the logical position counter of X axis. [VB] Data = Nmc_ReadData(No,AXIS_X, &H10)

Function Name	Function and Content
Nmc_2BPExec	Execute 2-axis bit pattern interpolation using the specified interpolation data. This function returns control after the interpolation process has finished. That is the control will not return unless the interpolation process ends, so it is recommended to create a thread in the application and call from the thread. **VC** DWORD Nmc_2BPExec(int No, DATA_2BP* pData2Bp, int DataCnt, int IpAxis, BOOL ContinueFlg = FALSE); **VB** Function Nmc_2BPExec(ByVal No As Long, ByRef pData2Bp As DATA_2BP, ByVal DataCnt As Long, ByVal IpAxis As Long, ByVal ContinueFlg As Long) As Long **VB.NET** Function Nmc_2BPExec(ByVal No As Integer, ByRef pData2Bp As DATA_2BP, ByVal DataCnt As Integer, ByVal IpAxis As Integer, ByVal ContinueFlg As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) pData2Bp Pointer to an array of DATA_2BP structures (user-defined type in VB). Set the 2-axis BP interpolation data to DATA_2BP. See footnote (3) for DATA_2BP. DataCnt The number of 2-axis BP interpolation data. Specify the number of the DATA_2BP structure (user-defined type) array. IpAxis Axis to execute interpolation. Specify the same value as the setting value of WR5 D0~D5 (Axis assignment). See footnote (4). ContinueFlg Set the flag to continue when BP interpolation stopped during driving (because the driving speed is too fast to stack the next data). [VC] TRUE: Continue, FALSE: Not continue Can be omitted. Default is FALSE. [VB] True: Continue, False: Not continue **Return Value** If the function succeeds, the return value is BP_END. If the function fails, the return value is the following Error code. ■ Normal end BP_END BP interpolation has been successfully completed. ■ Error code BP_CNT_ERR The number of the specified data is out of range. BP_ALREADY_EXEC BP interpolation or continuous interpolation is already running. BP_STOP BP interpolation stopped during driving (too fast to stack next data). BP_USER_STOP The user aborted BP interpolation. BP_DRIVE_ERR Error occurred in MC8043P during BP interpolation. (When the error status was set to RR0.) **Example** [VC] ``` // BP interpolation data BP1P, BP1M, BP2P, BP2M DATA_2BP Data2Bp[2] = {{0x0000, 0x2BFF, 0xFFD4, 0x0000}, {0xF6FE, 0x0000, 0x000F, 0x3FC0}}; Nmc_WriteReg5(No, 0x04); // Axis assignment for interpolation. Master axis: X, Second axis: Y Ret = Nmc_2BPExec(No, Data2Bp, 2, 0x04); // Execute 2-axis BP interpolation. The number of data is 2, X, Y axes. if(Ret == BP_END) AfxMessageBox("Successful completion"); // Return value is correct. ``` [VB] ``` Dim Data2Bp(1) As DATA_2BP ' 2-axis BP interpolation data ' 2-axis BP interpolation data setting Data2Bp(0).Bp1p = &H0: Data2Bp(0).Bp1m = &H2BFF Data2Bp(0).Bp2p = &HFFD4: Data2Bp(0).Bp2m = &H0 Data2Bp(1).Bp1p = &HF6FE: Data2Bp(1).Bp1m = &H0 Data2Bp(1).Bp2p = &HF: Data2Bp(1).Bp2m = &H3FC0 Call Nmc_WriteReg5(No, &H4) ' Axis assignment for interpolation. Master axis: X, Second axis: Y Ret = Nmc_2BPExec(No, Data2Bp(0), 2, &H4, False) ' Execute 2-axis BP interpolation. The number of data is 2, X, Y axes. If Ret = BP_END Then ' Return value is correct. Call MsgBox("Successful completion") End If ```

Function Name	Function and Content
Nmc_3BPExec	Execute 3-axis bit pattern interpolation using the specified interpolation data. This function returns control after the interpolation process has finished. That is the control will not return unless the interpolation process ends, so it is recommended to create a thread in the application and call from the thread. **VC** DWORD Nmc_3BPExec(int No, DATA_3BP* pData3Bp, int DataCnt, int IpAxis, BOOL ContinueFlg = FALSE); **VB** Function Nmc_3BPExec(ByVal No As Long, ByRef pData3Bp As DATA_3BP, ByVal DataCnt As Long, ByVal IpAxis As Long, ByVal ContinueFlg As Long) As Long **VB.NET** Function Nmc_3BPExec(ByVal No As Integer, ByRef pData3Bp As DATA_3BP, ByVal DataCnt As Integer, ByVal IpAxis As Integer, ByVal ContinueFlg As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) pData3Bp Pointer to an array of DATA_3BP structures (user-defined type in VB). Set the 3-axis BP interpolation data to DATA_3BP. See footnote (3) for DATA_3BP. DataCnt The number of 3-axis BP interpolation data. Specify the number of the DATA_3BP structure (user-defined type) array. IpAxis Axis to execute interpolation. Specify the same value as the setting value of WR5 D0~D5 (Axis assignment). See footnote (4). ContinueFlg Set the flag to continue when BP interpolation stopped during driving (because the driving speed is too fast to stack the next data). [VC] TRUE: Continue, FALSE: Not continue Can be omitted. Default is FALSE. [VB] True: Continue, False: Not continue **Return Value** If the function succeeds, the return value is BP_END. If the function fails, the return value is the following Error code. ■ Normal end BP_END BP interpolation has been successfully completed. ■ Error code BP_CNT_ERR The number of the specified data is out of range. BP_ALREADY_EXEC BP interpolation or continuous interpolation is already running. BP_STOP BP interpolation stopped during driving (too fast to stack next data). BP_USER_STOP The user aborted BP interpolation. BP_DRIVE_ERR Error occurred in MC8043P during BP interpolation. (When the error status was set to RR0.) **Example** [VC] ``` // BP interpolation data BP1P, BP1M, BP2P, BP2M, BP3P, BP3M DATA_3BP Data3Bp[2] = {{0xFF30, 0, 0, 0x84FF, 0, 0xAC35}, {0xAC35, 0, 0xC000, 0x36E7, 0xC000, 0x3F3F}}; Nmc_WriteReg5(No, 0x24); // Axis assignment for interpolation. Master axis: X, Second axis: Y, Third axis: Z Ret = Nmc_3BPExec(No, Data3Bp, 2, 0x24); // Execute 3-axis BP interpolation. The number of data is 2, X, Y, Z axes. if(Ret == BP_END) AfxMessageBox("Successful completion"); // Return value is correct. ``` [VB] ``` Dim Data3Bp(1) As DATA_3BP ' 3-axis BP interpolation data ' 3-axis BP interpolation data setting Data3Bp(0).Bp1p = &HFF30: Data3Bp(0).Bp1m = &H0 Data3Bp(0).Bp2p = &H0: Data3Bp(0).Bp2m = &H84FF Data3Bp(0).Bp3p = &H0: Data3Bp(0).Bp3m = &HAC35 Data3Bp(1).Bp1p = &HAC35: Data3Bp(1).Bp1m = &H0 Data3Bp(1).Bp2p = &HC000: Data3Bp(1).Bp2m = &H36E7 Data3Bp(1).Bp3p = &HC000: Data3Bp(1).Bp3m = &H3F3F Call Nmc_WriteReg5(No, &H24) ' Axis assignment for interpolation. Master axis: X, Second axis: Y, Third axis: Z Ret = Nmc_3BPExec(No, Data3Bp(0), 2, &H24, False) ' Execute 3-axis BP interpolation. The number of data is 2, X, Y, Z axes. If Ret = BP_END Then ' Return value is correct. Call MsgBox("Successful completion") End If ```

Function Name	Function and Content
Nmc_2BPExec_BG	Execute 2-axis bit pattern interpolation in the background using the specified interpolation data. This function returns control right after the interpolation process started and executes the interpolation in the background. WM_BP_END message is sent to the specified window at the end of the interpolation and finishing status is passed. **VC** DWORD Nmc_2BPExec_BG(HWND User_hWnd, int No, DATA_2BP* pData2Bp, int DataCnt, int IpAxis, BOOL ContinueFlg = FALSE); **VB** Function Nmc_2BPExec_BG(ByVal User_hWnd As Long, ByVal No As Long, ByRef pData2Bp As DATA_2BP, ByVal DataCnt As Long, ByVal IpAxis As Long, ByVal ContinueFlg As Long) As Long **VB.NET** Function Nmc_2BPExec_BG(ByVal User_hWnd As Integer, ByVal No As Integer, ByRef pData2Bp As DATA_2BP, ByVal DataCnt As Integer, ByVal IpAxis As Integer, ByVal ContinueFlg As Integer) As Integer **Input Parameter** User_hWnd Window handle of the user application No Board number (setting value of rotary switch (0~9) on the board) pData2Bp Pointer to an array of DATA_2BP structures (user-defined type in VB). Set the 2-axis BP interpolation data to DATA_2BP. See footnote (3) for DATA_2BP. DataCnt The number of 2-axis BP interpolation data. Specify the number of the DATA_2BP structure (user-defined type) array. IpAxis Axis to execute interpolation. Specify the same value as the setting value of WR5 D0~D5 (Axis assignment). See footnote (4). ContinueFlg Set the flag to continue when BP interpolation stopped during driving (because the driving speed is too fast to stack the next data). [VC] TRUE: Continue, FALSE: Not continue Can be omitted. Default is FALSE. [VB] True: Continue, False: Not continue **Return Value** If the interpolation process has been successfully started in the background, the return value is BP_START. If an error occurred before starting the interpolation process, the return value is the following Error code (errors before starting the interpolation). ■ Normal start BP_START BP interpolation has been successfully started in the background. ■ Error code (errors before starting the interpolation) BP_CNT_ERR The number of the specified data is out of range. BP_ALREADY_EXEC BP interpolation or continuous interpolation is already running. BP_THREAD_ERR Thread cannot be started. BP_MALLOC_ERR Memory cannot be allocated. After the interpolation process has been successfully started in the background, WM_BP_END message is sent to the specified window at the end of the interpolation. The board number is passed to the first argument received in WM_BP_END message received function and finishing status is passed to the second argument. If the interpolation has been successfully completed, the finishing status is BP_END. If an error occurred during the interpolation process, the following Error code (errors after starting the interpolation) returns. ■ Normal end BP_END BP interpolation has been successfully completed. ■ Error code (errors after starting the interpolation) BP_STOP BP interpolation stopped during driving (too fast to stack next data). BP_USER_STOP The user aborted BP interpolation. BP_DRIVE_ERR Error occurred in MC8043P during BP interpolation. (When the error status was set to RR0.)

Function Name	Function and Content

Example

[VC]

```
{
    // BP interpolation data      BP1P,     BP1M,    BP2P,     BP2M
    DATA_2BP Data2Bp[2] = {{0x0000, 0x2BFF, 0xFFD4, 0x0000},
                           {0xF6FE, 0x0000, 0x000F, 0x3FC0}};
    Nmc_WriteReg5(No, 0x04);
        // Axis assignment for interpolation. Master axis: X, Second axis: Y
    Ret = Nmc_2BPExec_BG(hWnd, No, Data2Bp, 2, 0x04);
        // Execute 2-axis BP interpolation. The number of data is 2, X, Y axes.
    if(Ret == BP_START)     AfxMessageBox("Interpolation has started");
        // Return value is correct. (Interpolation has started)
}
BEGIN_MESSAGE_MAP(CMC_SAMPLEDlg, CDialog)
        // WM_BP_END message received function settting
    ON_MESSAGE( WM_BP_END, OnMsg_BP )
END_MESSAGE_MAP()

// WM_BP_END message received function
afx_msg LRESULT CMC_SAMPLEDlg::OnMsg_BP(WPARAM BoardNo, LPARAM Status)
{
    if(Status == BP_END)   // Return value is correct. (Interpolation has finished)
        AfxMessageBox("Interpolation has been successfully completed");

    return 0;
}
```

[VB]

```
    Dim Data2Bp(1) As DATA_2BP          ' 2-axis BP interpolation data

    ' 2-axis BP interpolation data setting
    Data2Bp(0).Bp1p = &H0:      Data2Bp(0).Bp1m = &H2BFF
    Data2Bp(0).Bp2p = &HFFD4: Data2Bp(0).Bp2m = &H0
    Data2Bp(1).Bp1p = &HF6FE: Data2Bp(1).Bp1m = &H0
    Data2Bp(1).Bp2p = &HF:      Data2Bp(1).Bp2m = &H3FC0

    Call Nmc_WriteReg5(No, &H4)
        ' Axis assignment for interpolation. Master axis: X, Second axis: Y.
    Ret = Nmc_2BPExec_BG(hWnd, No, Data2Bp(0), 2, &H4, False)
        ' Execute 2-axis BP interpolation. The number of data is 2, X, Y axes.
    If Ret = BP_START Then
        ' Return value is correct. (Interpolation has started)
       Call MsgBox("Interpolation has started")
    End If
End Sub
```

In VB, the following message received function is applied.

```
' WM_BP_END message received function
Function WindowProc(ByVal hw As Long, ByVal uMsg As Long,
                    ByVal wParam As Long, ByVal lParam As Long) As Long
    If uMsg = WM_BP_END Then     ' BP interpolation finishing message
        If lParam = BP_END Then   ' Return value is correct. (Interpolation has finished)
            Call MsgBox("Interpolation has been successfully completed")
        End If
    End If
    WindowProc = CallWindowProc(glpPrevWndProc, hw, uMsg, wParam, lParam)
End Function
```

In VB.NET, the following message received function is applied.

```
' WM_BP_END message received function
Protected Overrides Sub WndProc(ByRef m As Message)

    If m.Msg = WM_BP_END Then    ' BP interpolation finishing message
        If lParam = BP_END Then   ' Return value is correct. (Interpolation has finished)
            Call MsgBox("Interpolation has been successfully completed")
        End If
    End If
    MyBase.WndProc(m)
End Sub
```

Function Name	Function and Content
Nmc_3BPExec_BG	Execute 3-axis bit pattern interpolation in the background using the specified interpolation data. This function returns control right after the interpolation process started and executes the interpolation in the background. WM_BP_END message is sent to the specified window at the end of the interpolation and finishing status is passed. **VC** DWORD Nmc_3BPExec_BG(HWND User_hWnd, int No, DATA_3BP* pData3Bp, int DataCnt, int IpAxis, BOOL ContinueFlg = FALSE); **VB** Function Nmc_3BPExec_BG(ByVal User_hWnd As Long, ByVal No As Long, ByRef pData3Bp As DATA_3BP, ByVal DataCnt As Long, ByVal IpAxis As Long, ByVal ContinueFlg As Long) As Long **VB.NET** Function Nmc_3BPExec_BG(ByVal User_hWnd As Integer, ByVal No As Integer, ByRef pData3Bp As DATA_3BP, ByVal DataCnt As Integer, ByVal IpAxis As Integer, ByVal ContinueFlg As Integer) As Integer **Input Parameter** User_hWnd Window handle of the user application No Board number (setting value of rotary switch (0~9) on the board) pData3Bp Pointer to an array of DATA_3BP structures (user-defined type in VB). Set the 3-axis BP interpolation data to DATA_3BP. See footnote (3) for DATA_3BP. DataCnt The number of 3-axis BP interpolation data. Specify the number of the DATA_3BP structure (user-defined type) array. IpAxis Axis to execute interpolation. Specify the same value as the setting value of WR5 D0~D5 (Axis assignment). See footnote (4). ContinueFlg Set the flag to continue when BP interpolation stopped during driving (because the driving speed is too fast to stack the next data). [VC] TRUE: Continue, FALSE: Not continue Can be omitted. Default is FALSE. [VB] True: Continue, False: Not continue **Return Value** If the interpolation process has been successfully started in the background, the return value is BP_START. If an error occurred before starting the interpolation process, the return value is the following Error code (errors before starting the interpolation). ■ Normal start BP_START BP interpolation has been successfully started in the background. ■ Error code (errors before starting the interpolation) BP_CNT_ERR The number of the specified data is out of range. BP_ALREADY_EXEC BP interpolation or continuous interpolation is already running. BP_THREAD_ERR Thread cannot be started. BP_MALLOC_ERR Memory cannot be allocated. After the interpolation process has been successfully started in the background, WM_BP_END message is sent to the specified window at the end of the interpolation. The board number is passed to the first argument received in WM_BP_END message received function and finishing status is passed to the second argument. If the interpolation has been successfully completed, the finishing status is BP_END. If an error occurred during the interpolation process, the following Error code (errors after starting the interpolation) returns. ■ Normal end BP_END BP interpolation has been successfully completed. ■ Error code (errors after starting the interpolation) BP_STOP BP interpolation stopped during driving (too fast to stack next data). BP_USER_STOP The user aborted BP interpolation. BP_DRIVE_ERR Error occurred in MC8043P during BP interpolation. (When the error status was set to RR0.)

Function Name	Function and Content

Example

[VC]

```
{
    // BP interpolation data     BP1P,     BP1M,    BP2P,     BP2M,     BP3P,     BP3M
    DATA_3BP Data3Bp[2] = {{0xFF30,     0,            0,    0x84FF,          0,    0xAC35},
                           {0xAC35,     0,     0xC000,    0x36E7, 0xC000,    0x3F3F}};
    Nmc_WriteReg5(No, 0x24);
        // Axis assignment for interpolation. Master axis: X, Second axis: Y. Third axis: Z
    Ret = Nmc_3BPExec_BG(hWnd, No, Data3Bp, 2, 0x24);
        // Execute 3-axis BP interpolation. The number of data is 2, X, Y, Z axes.
    if(Ret == BP_START)     AfxMessageBox("Interpolation has started");
        // Return value is correct. (Interpolation has started)
}
BEGIN_MESSAGE_MAP(CMC_SAMPLEDlg, CDialog)
        // WM_BP_END message received function settting
    ON_MESSAGE( WM_BP_END, OnMsg_BP )
END_MESSAGE_MAP()

// WM_BP_END message received function
afx_msg LRESULT CMC_SAMPLEDlg::OnMsg_BP(WPARAM BoardNo, LPARAM Status)
{
    if(Status == BP_END)   // Return value is correct. (Interpolation has finished)
        AfxMessageBox("Interpolation has been successfully completed");

    return 0;
}
```

[VB]

```
    Dim Data3Bp(1) As DATA_3BP          ' 3-axis BP interpolation data

    ' 3-axis BP interpolation data setting
    Data3Bp(0).Bp1p = &HFF30: Data3Bp(0).Bp1m = &H0
    Data3Bp(0).Bp2p = &H0:    Data3Bp(0).Bp2m = &H84FF
    Data3Bp(0).Bp3p = &H0:    Data3Bp(0).Bp3m = &HAC35
    Data3Bp(1).Bp1p = &HAC35: Data3Bp(1).Bp1m = &H0
    Data3Bp(1).Bp2p = &HC000: Data3Bp(1).Bp2m = &H36E7
    Data3Bp(1).Bp3p = &HC000: Data3Bp(1).Bp3m = &H3F3F

    Call Nmc_WriteReg5(No, &H24)
        ' Axis assignment for interpolation. Master axis: X, Second axis: Y, Third axis: Z
    Ret = Nmc_3BPExec_BG(hWnd,No,Data3Bp(0),2,&H24,False)
        ' Execute 3-axis BP interpolation. The number of data is 2, X, Y, Z axes.
    If Ret = BP_START Then
        ' Return value is correct. (Interpolation has started)
      Call MsgBox("Interpolation has started")
    End If
End Sub
```

In VB, the following message received function is applied.

```
' WM_BP_END message received function
Function WindowProc(ByVal hw As Long, ByVal uMsg As Long,
                    ByVal wParam As Long, ByVal lParam As Long) As Long
    If uMsg = WM_BP_END Then     ' BP interpolation finishing message
        If lParam = BP_END Then   ' Return value is correct. (Interpolation has finished)
            Call MsgBox("Interpolation has been successfully completed")
        End If
    End If
    WindowProc = CallWindowProc(glpPrevWndProc, hw, uMsg, wParam, lParam)
End Function
```

In VB.NET, the following message received function is applied.

```
' WM_BP_END message received function
Protected Overrides Sub WndProc(ByRef m As Message)
    If m.Msg = WM_BP_END Then    ' BP interpolation finishing message
        If lParam = BP_END Then   ' Return value is correct. (Interpolation has finished)
            Call MsgBox("Interpolation has been successfully completed ")
        End If
    End If
    MyBase.WndProc(m)
End Sub
```

Function Name	Function and Content
Nmc_2CIPExec	Execute 2-axis continuous interpolation using the specified interpolation data. This function returns control after the interpolation process has finished. That is the control will not return unless the interpolation process ends, so it is recommended to create a thread in the application and call from the thread. **VC** DWORD Nmc_2CIPExec(int No, DATA_2CIP* pData2Cip, int DataCnt, int IpAxis, BOOL SpdChgFlg = FALSE, BOOL ContinueFlg = FALSE); **VB** Function Nmc_2CIPExec(ByVal No As Long, ByRef pData2Cip As DATA_2CIP, ByVal DataCnt As Long, ByVal IpAxis As Long, ByVal SpdChgFlg As Long, ByVal ContinueFlg As Long) As Long **VB.NET** Function Nmc_2CIPExec(ByVal No As Integer, ByRef pData2Cip As DATA_2CIP, ByVal DataCnt As Integer, ByVal IpAxis As Integer, ByVal SpdChgFlg As Integer,ByVal ContinueFlg As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) pData2Cip Pointer to an array of DATA_2CIP structures (user-defined type in VB). Set the 2-axis continuous interpolation data to DATA_2CIP. See footnote (3) for DATA_2CIP. DataCnt The number of 2-axis continuous interpolation data. Specify the number of the DATA_2CIP structure (user-defined type) array. IpAxis Axis to execute interpolation. Specify the same value as the setting value of WR5 D0~D5 (Axis assignment). See footnote (4). SpdChgFlg Set the flag to change the speed during the interpolation process. If you change the speed, See footnote (5). [VC] TRUE: Change, FALSE: Not change Can be omitted. Default is FALSE. [VB] True: Change, False: Not change **When selecting Change:** Refers to the setting value of DATA_2CIP Speed. Set 1～8000 to Speed・・・Changes to the setting speed. Set 0 to Speed・・・・・・ Not change the speed. **When selecting Not change:** Not refers to the setting value of DATA_2CIP Speed. ContinueFlg Set the flag to continue when continuous interpolation stopped during driving (because the driving speed is too fast to stack the next data). [VC] TRUE: Continue, FALSE: Not continue Can be omitted. Default is FALSE. [VB] True: Continue, False: Not continue **Return Value** If the function succeeds, the return value is CIP_END. If the function fails, the return value is the following Error code. ■ Normal end CIP_END Continuous interpolation has been successfully completed. ■ Error code CIP_CNT_ERR The number of the specified data is out of range. CIP_ALREADY_EXEC BP interpolation or continuous interpolation is already running. CIP_CMD_ERR The wrong command was specified. CIP_STOP Continuous interpolation stopped during driving (too fast to set next data). CIP_USER_STOP The user aborted continuous interpolation. CIP_DRIVE_ERR Error occurred in MC8043P during continuous interpolation. (When the error status was set to RR0.)

Function Name	Function and Content

Example

[VC]
```
// 2-axis continuous interpolation data
// Data = Command,Speed,Finishing point 1,Finishing point 2,Center point 1,Center point 2
DATA_2CIP Data2Cip[2]=
   {{CMD_IP_2ST, 0,   4500,         0,         0,         0},   // 2-axis linear interpolation
   {CMD_IP_CCW, 0,   1500,   1500,         0,     1500}}; // CCW circular interpolation

Nmc_WriteReg5(No, 0x04);
      // Axis assignment for interpolation. Master axis: X, Second axis: Y.
Ret = Nmc_2CIPExec(No, Data2Cip, 2, 0x04);
      // Execute 2-axis continuous interpolation. The number of data is 2, X, Y axes.
if(Ret == CIP_END)     AfxMessageBox("Successful completion");
      // Return value is correct.
```

[VB]
```
Dim Data2Cip(1) As DATA_2CIP              ' 2-axis continuous interpolation data

' 2-axis continuous interpolation data setting
Data2Cip(0).Command = CMD_IP_2ST        ' 2-axis linear interpolation
Data2Cip(0).EndP1 = 4500
Data2Cip(0).EndP2 = 0

Data2Cip(1).Command = CMD_IP_CCW        ' CCW circular interpolation
Data2Cip(1).EndP1 = 1500
Data2Cip(1).EndP2 = 1500
Data2Cip(1).Center1 = 0
Data2Cip(1).Center2 = 1500

Call Nmc_WriteReg5(No, &H4)
      ' Axis assignment for interpolation. Master axis: X, Second axis: Y.
Ret = Nmc_2CIPExec(No, Data2Cip(0), 2, &H4, False, False)
      ' 2-axis continuous interpolation. The number of data is 2, X, Y axes.
If Ret = CIP_END Then              ' Return value is correct.
   Call MsgBox("Successful completion")
End If
```

Function Name	Function and Content
Nmc_3CIPExec	Execute 3-axis continuous interpolation using the specified interpolation data. This function returns control after the interpolation process has finished. That is the control will not return unless the interpolation process ends, so it is recommended to create a thread in the application and call from the thread. **VC** DWORD Nmc_3CIPExec(int No, DATA_3CIP* pData3Cip, int DataCnt, int IpAxis, BOOL SpdChgFlg = FALSE, BOOL ContinueFlg = FALSE); **VB** Function Nmc_3CIPExec(ByVal No As Long, ByRef pData3Cip As DATA_3CIP, ByVal DataCnt As Long, ByVal IpAxis As Long, ByVal SpdChgFlg As Long, ByVal ContinueFlg As Long) As Long **VB.NET** Function Nmc_3CIPExec(ByVal No As Integer, ByRef pData3Cip As DATA_3CIP, ByVal DataCnt As Integer, ByVal IpAxis As Integer, ByVal SpdChgFlg As Integer,ByVal ContinueFlg As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) pData3Cip Pointer to an array of DATA_3CIP structures (user-defined type in VB). Set the 3-axis continuous interpolation data to DATA_3CIP. See footnote (3) for DATA_3CIP. DataCnt The number of 3-axis continuous interpolation data. Specify the number of the DATA_3CIP structure (user-defined type) array. IpAxis Axis to execute interpolation. Specify the same value as the setting value of WR5 D0~D5 (Axis assignment). See footnote (4). SpdChgFlg Set the flag to change the speed during the interpolation process. If you change the speed, See footnote (5). [VC] TRUE: Change, FALSE: Not change Can be omitted. Default is FALSE. [VB] True: Change, False: Not change **When selecting Change:** Refers to the setting value of DATA_3CIP Speed. Set 1～8000 to Speed・・・Changes to the setting speed. Set 0 to Speed・・・・・・ Not change the speed. **When selecting Not change:** Not refers to the setting value of DATA_3CIP Speed. ContinueFlg Set the flag to continue when continuous interpolation stopped during driving (because the driving speed is too fast to stack the next data). [VC] TRUE: Continue, FALSE: Not continue Can be omitted. Default is FALSE. [VB] True: Continue, False: Not continue **Return Value** If the function succeeds, the return value is CIP_END. If the function fails, the return value is the following Error code. ■ Normal end CIP_END Continuous interpolation has been successfully completed. ■ Error code CIP_CNT_ERR The number of the specified data is out of range. CIP_ALREADY_EXEC BP interpolation or continuous interpolation is already running. CIP_CMD_ERR The wrong command was specified. CIP_STOP Continuous interpolation stopped during driving (too fast to set next data). CIP_USER_STOP The user aborted continuous interpolation. CIP_DRIVE_ERR Error occurred in MC8043P during continuous interpolation. (When the error status was set to RR0.)

Function Name	Function and Content

Example

```
[VC]  DATA_3CIP Data3Cip[2];              //  3-axis continuous interpolation data

      // 3-axis continuous interpolation data setting
      Data3Cip[0].EndP1 = 1000;
      Data3Cip[0].EndP2 = 2000;
      Data3Cip[0].EndP3 = 3000;
      Data3Cip[0].Speed = 0;

      Data3Cip[1].EndP1 = 2000;
      Data3Cip[1].EndP2 = -1000;
      Data3Cip[1].EndP3 = 3000;
      Data3Cip[1].Speed = 0;

      Nmc_WriteReg5(No, 0x24);
          // Axis assignment for interpolation. Master axis: X, Second axis: Y, Third axis: Z.
      Ret = Nmc_3CIPExec(No, Data3Cip, 2, 0x24);
          // Execute 3-axis continuous interpolation. The number of data is 2, X, Y, Z axes.
      if(Ret == CIP_END)    AfxMessageBox("Successful completion");
          // Return value is correct.

[VB]  Dim Data3Cip(1) As DATA_3CIP      ' 3-axis continuous interpolation data

      ' 3-axis continuous interpolation data setting
      Data3Cip(0).EndP1 = 1000
      Data3Cip(0).EndP2 = 2000
      Data3Cip(0).EndP3 = 3000
      Data3Cip(0).Speed = 0

      Data3Cip(1).EndP1 = 2000
      Data3Cip(1).EndP2 = -1000
      Data3Cip(1).EndP3 = 3000
      Data3Cip(1).Speed = 0

      Call Nmc_WriteReg5(No, &H24)
          ' Axis assignment for interpolation. Master axis: X, Second axis: Y, Third axis: Z.
      Ret = Nmc_3CIPExec(No, Data3Cip(0), 2, &H24, False, False)
          ' 3-axis continuous interpolation. The number of data is 2, X, Y, Z axes.
      If Ret = CIP_END Then
          ' Return value is correct.
        Call MsgBox("Successful completion")
      End If
```

Function Name	Function and Content
Nmc_2CIPExec_BG	Execute 2-axis continuous interpolation in the background using the specified interpolation data. This function returns control right after the interpolation process started and executes the interpolation in the background. WM_CIP_END message is sent to the specified window at the end of the interpolation and finishing status is passed. **VC** DWORD Nmc_2CIPExec_BG(HWND User_hWnd, int No, DATA_2CIP* pData2Cip, int DataCnt, int IpAxis, BOOL SpdChgFlg = FALSE, BOOL ContinueFlg = FALSE); **VB** Function Nmc_2CIPExec_BG(ByVal User_hWnd As Long, ByVal No As Long, ByRef pData2Cip As DATA_2CIP, ByVal DataCnt As Long, ByVal IpAxis As Long, ByVal SpdChgFlg As Long, ByVal ContinueFlg As Long) As Long **VB.NET** Function Nmc_2CIPExec_BG(ByVal User_hWnd As Integer, ByVal No As Integer, ByRef pData2Cip As DATA_2CIP, ByVal DataCnt As Integer, ByVal IpAxis As Integer, ByVal SpdChgFlg As Integer,ByVal ContinueFlg As Integer) As Integer **Input Parameter** User_hWnd Window handle of the user application No Board number (setting value of rotary switch (0~9) on the board) pData2Cip Pointer to an array of DATA_2CIP structures (user-defined type in VB). Set the 2-axis continuous interpolation data to DATA_2CIP. See footnote (3) for DATA_2CIP. DataCnt The number of 2-axis continuous interpolation data. Specify the number of the DATA_2CIP structure (user-defined type) array. IpAxis Axis to execute interpolation. Specify the same value as the setting value of WR5 D0~D5 (Axis assignment). See footnote (4). SpdChgFlg Set the flag to change the speed during the interpolation process. If you change the speed, See footnote (5). [VC] TRUE: Change, FALSE: Not change Can be omitted. Default is FALSE. [VB] True: Change, False: Not change **When selecting Change:** Refers to the setting value of DATA_2CIP Speed. Set 1～8000 to Speed・・・Changes to the setting speed. Set 0 to Speed・・・・・・ Not change the speed. **When selecting Not change:** Not refers to the setting value of DATA_2CIP Speed. ContinueFlg Set the flag to continue when continuous interpolation stopped during driving (because the driving speed is too fast to stack the next data). [VC] TRUE: Continue, FALSE: Not continue Can be omitted. Default is FALSE. [VB] True: Continue, False: Not continue **Return Value** If the interpolation process has been successfully started in the background, the return value is CIP_START. If an error occurred before starting the interpolation process, the return value is the following Error code (errors before starting the interpolation). ■ Normal start CIP_START Continuous interpolation has been successfully started in the background. ■ Error code (errors before starting the interpolation) CIP_CNT_ERR The number of the specified data is out of range. CIP_ALREADY_EXEC BP interpolation or continuous interpolation is already running. CIP_THREAD_ERR Thread cannot be started. CIP_MALLOC_ERR Memory cannot be allocated. CIP_CMD_ERR The wrong command was specified. After the interpolation process has been successfully started in the background, WM_CIP_END message is sent to the specified window at the end of the interpolation. The board number is passed to the first argument received in WM_CIP_END message received function and finishing status is passed to the second argument. If the interpolation has been successfully completed, the finishing status is CIP_END. If an error occurred during the interpolation process, the following Error code (errors after starting the interpolation) returns. ■ Normal end CIP_END Continuous interpolation has been successfully completed. ■ Error code (errors after starting the interpolation) CIP_STOP Continuous interpolation stopped during driving (too fast to set next data). CIP_USER_STOP The user aborted continuous interpolation. CIP_DRIVE_ERR Error occurred in MC8043P during continuous interpolation. (When the error status was set to RR0.)

Function Name	Function and Content

Example

[VC] {

```
// 2-axis continuous interpolation data
// Data = Command,Speed,Finishing point 1,Finishing point 2,Center point 1,Center point 2
DATA_2CIP Data2Cip[2]=
    {{CMD_IP_2ST, 0,   4500,      0,        0,        0},   // 2-axis linear interpolation
    {CMD_IP_CCW, 0,   1500,   1500,        0,     1500}}; // CCW circular interpolation
Nmc_WriteReg5(No, 0x04);
    // Axis assignment for interpolation. Master axis: X, Second axis: Y.
Ret = Nmc_2CIPExec_BG(hWnd, No, Data2Cip, 2, 0x04);
    // Execute 2-axis continuous interpolation. The number of data is 2, X, Y axes.
if(Ret == CIP_START)    AfxMessageBox("Interpolation has started");
    // Return value is correct. (Interpolation has started)
}
BEGIN_MESSAGE_MAP(CMC_SAMPLEDlg, CDialog)
    // WM_CIP_END message received function settting
ON_MESSAGE( WM_CIP_END, OnMsg_CIP )
END_MESSAGE_MAP()
// WM_CIP_END message received function
afx_msg LRESULT CMC_SAMPLEDlg::OnMsg_CIP(WPARAM BoardNo, LPARAM Status)
{
    if(Status == CIP_END)   AfxMessageBox("Interpolation has been successfully completed");
        // Return value is correct. (Interpolation has finished)
    return 0;
}
```

[VB]

```
Dim Data2Cip(1) As DATA_2CIP            ' 2-axis continuous interpolation data
' 2-axis continuous interpolation data setting
Data2Cip(0).Command = CMD_IP_2ST        ' 2-axis linear interpolation
Data2Cip(0).EndP1 = 4500
Data2Cip(0).EndP2 = 0

Data2Cip(1).Command = CMD_IP_CCW        ' CCW circular interpolation
Data2Cip(1).EndP1 = 1500
Data2Cip(1).EndP2 = 1500
Data2Cip(1).Center1 = 0
Data2Cip(1).Center2 = 1500

Call Nmc_WriteReg5(No, &H4)
    ' Axis assignment for interpolation. Master axis: X, Second axis: Y.
    ' 2-axis continuous interpolation. The number of data is 2, X, Y axes.
Ret = Nmc_2CIPExec_BG(hWnd, No, Data2Cip(0), 2, &H4, False, False)
If Ret = CIP_START Then   ' Return value is correct. (Interpolation has started)
    Call MsgBox("Interpolation has started")
End If
End Sub
```

In VB, the following message received function is applied.

```
' WM_CIP_END message received function
Function WindowProc(ByVal hw As Long, ByVal uMsg As Long,
                    ByVal wParam As Long, ByVal lParam As Long) As Long
If uMsg = WM_CIP_END Then     ' Continuous interpolation finishing message
    If lParam = CIP_END Then   ' Return value is correct. (Interpolation has finished)
        Call MsgBox("Interpolation has been successfully completed")
    End If
End If
WindowProc = CallWindowProc(glpPrevWndProc, hw, uMsg, wParam, lParam)
End Function
```

In VB.NET, the following message received function is applied.

```
' WM_CIP_END message received function
Protected Overrides Sub WndProc(ByRef m As Message)
If m.Msg = WM_CIP_END Then   ' Continuous interpolation finishing message
    If lParam = CIP_END Then   ' Return value is correct. (Interpolation has finished)
        Call MsgBox("Interpolation has been successfully completed")
    End If
End If
MyBase.WndProc(m)
End Sub
```

Function Name	Function and Content
Nmc_3CIPExec_BG	Execute 3-axis continuous interpolation in the background using the specified interpolation data. This function returns control right after the interpolation process started and executes the interpolation in the background. WM_CIP_END message is sent to the specified window at the end of the interpolation and finishing status is passed. **VC** DWORD Nmc_3CIPExec_BG(HWND User_hWnd, int No, DATA_3CIP* pData3Cip, int DataCnt, int IpAxis, BOOL SpdChgFlg = FALSE, BOOL ContinueFlg = FALSE); **VB** Function Nmc_3CIPExec_BG(ByVal User_hWnd As Long, ByVal No As Long, ByRef pData3Cip As DATA_3CIP, ByVal DataCnt As Long, ByVal IpAxis As Long, ByVal SpdChgFlg As Long, ByVal ContinueFlg As Long) As Long **VB.NET** Function Nmc_3CIPExec_BG(ByVal User_hWnd As Integer, ByVal No As Integer, ByRef pData3Cip As DATA_3CIP, ByVal DataCnt As Integer, ByVal IpAxis As Integer, ByVal SpdChgFlg As Integer,ByVal ContinueFlg As Integer) As Integer **Input Parameter** User_hWnd Window handle of the user application No Board number (setting value of rotary switch (0~9) on the board) pData3Cip Pointer to an array of DATA_3CIP structures (user-defined type in VB). Set the 3-axis continuous interpolation data to DATA_3CIP. See footnote (3) for DATA_3CIP. DataCnt The number of 3-axis continuous interpolation data. Specify the number of the DATA_3CIP structure (user-defined type) array. IpAxis Axis to execute interpolation. Specify the same value as the setting value of WR5 D0~D5 (Axis assignment). See footnote (4). SpdChgFlg Set the flag to change the speed during the interpolation process. If you change the speed, See footnote (5). [VC] TRUE: Change, FALSE: Not change Can be omitted. Default is FALSE. [VB] True: Change, False: Not change **When selecting Change:** Refers to the setting value of DATA_3CIP Speed. Set 1～8000 to Speed・・・Changes to the setting speed. Set 0 to Speed・・・・・・ Not change the speed. **When selecting Not change:** Not refers to the setting value of DATA_3CIP Speed. ContinueFlg Set the flag to continue when continuous interpolation stopped during driving (because the driving speed is too fast to stack the next data). [VC] TRUE: Continue, FALSE: Not continue Can be omitted. Default is FALSE. [VB] True: Continue, False: Not continue **Return Value** If the interpolation process has been successfully started in the background, the return value is CIP_START. If an error occurred before starting the interpolation process, the return value is the following Error code (errors before starting the interpolation). ■ Normal start CIP_START Continuous interpolation has been successfully started in the background. ■ Error code (errors before starting the interpolation) CIP_CNT_ERR The number of the specified data is out of range. CIP_ALREADY_EXEC BP interpolation or continuous interpolation is already running. CIP_THREAD_ERR Thread cannot be started. CIP_MALLOC_ERR Memory cannot be allocated. CIP_CMD_ERR The wrong command was specified. After the interpolation process has been successfully started in the background, WM_CIP_END message is sent to the specified window at the end of the interpolation. The board number is passed to the first argument received in WM_CIP_END message received function and finishing status is passed to the second argument. If the interpolation has been successfully completed, the finishing status is CIP_END. If an error occurred during the interpolation process, the following Error code (errors after starting the interpolation) returns. ■ Normal end CIP_END Continuous interpolation has been successfully completed. ■ Error code (errors after starting the interpolation) CIP_STOP Continuous interpolation stopped during driving (too fast to set next data). CIP_USER_STOP The user aborted continuous interpolation. CIP_DRIVE_ERR Error occurred in MC8043P during continuous interpolation. (When the error status was set to RR0.)

Function Name	Function and Content

Example

[VC] {

```
        DATA_3CIP Data3Cip[2];              // 3-axis continuous interpolation data
        // 3-axis continuous interpolation data setting
        Data3Cip[0].EndP1 = 1000;
        Data3Cip[0].EndP2 = 2000;
        Data3Cip[0].EndP3 = 3000;

        Data3Cip[1].EndP1 = 2000;
        Data3Cip[1].EndP2 = -1000;
        Data3Cip[1].EndP3 = 3000;
        Nmc_WriteReg5(No, 0x24);
            // Axis assignment for interpolation. Master axis: X, Second axis: Y, Third axis: Z.
        Ret = Nmc_3CIPExec_BG(hWnd, No, Data3Cip, 2, 0x24);
            // Execute 3-axis continuous interpolation. The number of data is 2, X, Y, Z axes.
        if(Ret == CIP_START)    AfxMessageBox("Interpolation has started");
            // Return value is correct. (Interpolation has started)
    }
    BEGIN_MESSAGE_MAP(CMC_SAMPLEDlg, CDialog)
            // WM_CIP_END message received function settting
        ON_MESSAGE( WM_CIP_END, OnMsg_CIP )
    END_MESSAGE_MAP()
    // WM_CIP_END message received function
    afx_msg LRESULT CMC_SAMPLEDlg::OnMsg_CIP(WPARAM BoardNo, LPARAM Status)
    {
        if(Status == CIP_END)   AfxMessageBox("Interpolation has been successfully completed");
            // Return value is correct. (Interpolation has finished)
        return 0;
    }
```

[VB]

```
        Dim Data3Cip(1) As DATA_3CIP      ' 3-axis continuous interpolation data
        ' 3-axis continuous interpolation data setting
        Data3Cip(0).EndP1 = 1000
        Data3Cip(0).EndP2 = 2000
        Data3Cip(0).EndP3 = 3000

        Data3Cip(1).EndP1 = 2000
        Data3Cip(1).EndP2 = -1000
        Data3Cip(1).EndP3 = 3000
        Call Nmc_WriteReg5(No, &H24)
            ' Axis assignment for interpolation. Master axis: X, Second axis: Y, Third axis: Z
            ' 3-axis continuous interpolation. The number of data is 2, X, Y, Z axes.
        Ret = Nmc_3CIPExec_BG(hWnd, No, Data3Cip(0), 2, &H24, False, False)
        If Ret = CIP_START Then   ' Return value is correct. (Interpolation has started)
            Call MsgBox("Interpolation has started")
        End If
    End Sub
```

In VB, the following message received function is applied.

```
    'WM_CIP_END message received function
    Function WindowProc(ByVal hw As Long, ByVal uMsg As Long,
                        ByVal wParam As Long, ByVal lParam As Long) As Long
        If uMsg = WM_CIP_END Then     ' Continuous interpolation finishing message
            If lParam = CIP_END Then   ' Return value is correct. (Interpolation has finished)
                Call MsgBox("Interpolation has been successfully completed")
            End If
        End If
        WindowProc = CallWindowProc(glpPrevWndProc, hw, uMsg, wParam, lParam)
    End Function
```

In VB.NET, the following message received function is applied.

```
    ' WM_CIP_END message received function
    Protected Overrides Sub WndProc(ByRef m As Message)
        If m.Msg = WM_CIP_END Then   ' Continuous interpolation finishing message
            If lParam = CIP_END Then   ' Return value is correct. (Interpolation has finished)
                Call MsgBox("Interpolation has been successfully completed ")
            End If
        End If
        MyBase.WndProc(m)
    End Sub
```

Function Name	Function and Content
Nmc_IPStop	Stop the interpolation process during driving. The interpolation driving stops immediately and terminates the executed interpolation process in Nmc_xxx interpolation function. When stopping the interpolation process using Nmc_IPStop, the return value of each interpolation function is the following error code. ◆ BP interpolation: BP_USER_STOP ◆ Continuous interpolation: CIP_USER_STOP **VC** BOOL Nmc_IPStop(int No); **VB** Function Nmc_IPStop(ByVal No As Long) As Long **VB.NET** Function Nmc_IPStop(ByVal No As Integer) As Integer **Input Parameter** No Board number (setting value of rotary switch (0~9) on the board) **Return Value** [VC] If the function succeeds, the return value is TRUE. If the function fails, the return value is FALSE. [VB] If the function succeeds, the return value is nonzero. If the function fails, the return value is 0. **Example** [VC] Nmc_IPStop(No); // Stop the interpolation process during driving. [VB] Call Nmc_IPStop(No)

■ Footnote

(1) Each definition is defined in the following files.

VC ・・・・・・ MC8043P_DLL.H
VB ・・・・・・ MC8043P_DLL.bas
VB.NET ・・ MC8043P_DLL.vb

VC definition is as follows:

①Address definition

```
#define MCX314_WR0          0x0000    // WR0 address
#define MCX314_WR1          0x0001    // WR1 address
#define MCX314_WR2          0x0002    // WR2 address
#define MCX314_WR3          0x0003    // WR3 address
#define MCX314_WR4          0x0004    // WR4 address
#define MCX314_WR5          0x0005    // WR5 address
#define MCX314_WR6          0x0006    // WR6 address
#define MCX314_WR7          0x0007    // WR7 address

#define MCX314_RR0          0x0000    // RR0 address
#define MCX314_RR1          0x0001    // RR1 address
#define MCX314_RR2          0x0002    // RR2 address
#define MCX314_RR3          0x0003    // RR3 address
#define MCX314_RR4          0x0004    // RR4 address
#define MCX314_RR5          0x0005    // RR5 address
#define MCX314_RR6          0x0006    // RR6 address
#define MCX314_RR7          0x0007    // RR7 address
```

②Axis assignment

```
#define AXIS_ALL            0xF       // All axes
#define AXIS_X              0x1       // X axis
#define AXIS_Y              0x2       // Y axis
#define AXIS_Z              0x4       // Z axis
#define AXIS_U              0x8       // U axis
#define AXIS_NONE           0         // No axis assignment
```

③Command definition

```
// Driving commands
#define CMD_F_DRV_P         0x20      // + direction fixed pulse driving
#define CMD_F_DRV_M         0x21      // – direction fixed pulse driving
#define CMD_C_DRV_P         0x22      // + direction continuous pulse driving
#define CMD_C_DRV_M         0x23      // – direction continuous pulse driving
#define CMD_START_HOLD      0x24      // Drive status holding
#define CMD_START_FREE      0x25      // Drive status holding release/Finishing status clear
#define CMD_STP_STS_CLR     0x25      // Drive status holding release/Finishing status clear
#define CMD_STOP_DEC        0x26      // Decelerating stop
#define CMD_STOP_SUDDEN     0x27      // Sudden stop

// Interpolation commands
#define CMD_IP_2ST          0x30      // 2-axis linear interpolation
#define CMD_IP_3ST          0x31      // 3-axis linear interpolation
#define CMD_IP_CW           0x32      // CW circular interpolation
#define CMD_IP_CCW          0x33      // CCW circular interpolation
#define CMD_IP_2BP          0x34      // 2-axis bit pattern interpolation
#define CMD_IP_3BP          0x35      // 3-axis bit pattern interpolation
#define CMD_BP_ENABLED      0x36      // BP register data writing enabling
#define CMD_BP_DISABLED     0x37      // BP register data writing disabling
#define CMD_BP_STACK        0x38      // BP data stack
#define CMD_BP_CLR          0x39      // BP data clear
#define CMD_IP_1STEP        0x3A      // Single step interpolation
```

```
#define CMD_IP_DEC_VALID      0x3B    // Decelerating enabling
#define CMD_IP_DEC_INVALID    0x3C    // Decelerating disabling
#define CMD_IP_INTRPT_CLR     0x3D    // Interpolation interrupt clear

// Other commands
#define CMD_HOME_EXEC         0x62    // Automatic home search execution
#define CMD_DEVCTR_CLR        0x63    // Stack counter clear output
#define CMD_SYNC_ACTIVE       0x65    // Synchronous action activation
#define CMD_NOP               0x0F    // NOP (for axis switching)
```

④Interpolation finishing message, finishing status

```
// Interpolation finishing message
#define WM_BP_END             (WM_USER + 1)   // BP interpolation finishing message
#define WM_CIP_END            (WM_USER + 2)   // Continuous interpolation finishing message

//***** BP Interpolation     Finishing Status *****
// ■ Normal
#define BP_START              0x101   // BP interpolation has started in the background.
#define BP_END                0x102   // BP interpolation has been successfully completed.

// ■ Errors before starting the interpolation
#define BP_CNT_ERR            0x111   // The number of the specified data is out of range.
#define BP_ALREADY_EXEC       0x112   // BP interpolation or continuous interpolation is already running.
#define BP_THREAD_ERR         0x113   // Thread cannot be started.
#define BP_MALLOC_ERR         0x114   // Memory cannot be allocated.

// ■ Errors during the interpolation driving
#define BP_STOP               0x121   // BP interpolation stopped during driving. (too fast to stack next data)
#define BP_USER_STOP          0x122   // The user aborted BP interpolation.
#define BP_DRIVE_ERR          0x123   // Error occurred in MC8043P during BP interpolation.
                                          (When the error status was set to RR0.)

//***** Continuous Interpolation     Finishing Status *****
// ■ Normal
#define CIP_START             0x201   // Continuous interpolation has started in the background.
#define CIP_END               0x202   // Continuous interpolation has been successfully completed.

// ■ Errors before starting the interpolation
#define CIP_CNT_ERR           0x211   // The number of the specified data is out of range.
#define CIP_ALREADY_EXEC      0x212   // BP interpolation or continuous interpolation is already running.
#define CIP_THREAD_ERR        0x213   // Thread cannot be started.
#define CIP_MALLOC_ERR        0x214   // Memory cannot be allocated.
#define CIP_CMD_ERR           0x215   // Command error (The wrong command was specified by the user.)

// ■ Errors during the interpolation driving
#define CIP_STOP              0x221   // Continuous interpolation stopped during driving.
                                          (too fast to set next data)
#define CIP_USER_STOP         0x222   // The user aborted Continuous interpolation.
#define CIP_DRIVE_ERR         0x223   // Error occurred in MC8043P during Continuous interpolation.
                                          (When the error status was set to RR0.)
```

(2) The method of axis assignment is as follows:

X axis	AXIS_X
Y axis	AXIS_Y
Z axis	AXIS_Z
U axis	AXIS_U
All axes	AXIS_ALL

①To assign 1 axis

Specify one of the following axes: AXIS_X, AXIS_Y, AXIS_Z, AXIS_U.

Example) Set 1000 to the drive speed of X axis.

[VC] Nmc_Speed(No, AXIS_X, 1000);

[VB] Call Nmc_Speed(No, AXIS_X, 1000)

②To assign 2 axes

Use Bit OR operator.

For instance, if the user tries to assign X and Y axes simultaneously,

[VC]・・・Specify AXIS_X | AXIS_Y.

[VB]・・・Specify AXIS_X Or AXIS_Y.

Example) Set 1000 to the drive speed of X and Y axes.

[VC] Nmc_Speed(No, AXIS_X | AXIS_Y, 1000);

[VB] Call Nmc_Speed(No, AXIS_X Or AXIS_Y, 1000)

③To assign 3 axes

Use Bit OR operator.

For instance, if the user tries to assign X, Y and Z axes simultaneously,

[VC]・・・Specify AXIS_X | AXIS_Y | AXIS_Z.

[VB]・・・Specify AXIS_X Or AXIS_Y Or AXIS_Z.

Example) Set 1000 to the drive speed of X, Y and Z axes.

[VC] Nmc_Speed(No, AXIS_X | AXIS_Y | AXIS_Z, 1000);

[VB] Call Nmc_Speed(No, AXIS_X Or AXIS_Y Or AXIS_Z, 1000)

④To assign all axes

Specify AXIS_ALL.

Example) Set 1000 to the drive speed of all axes.

[VC] Nmc_Speed(No, AXIS_ALL, 1000);

[VB] Call Nmc_Speed(No, AXIS_ALL, 1000)

(3) The structure (user-defined type in VB) used in the interpolation function is defined as follows:

①VC

```
// 2-axis BP interpolation
typedef struct _DATA_2BP
{
    USHORT Bp1p;            // BP1P data
    USHORT Bp1m;            // BP1M data
    USHORT Bp2p;            // BP2P data
    USHORT Bp2m;            // BP2M data
} DATA_2BP;

// 3-axis BP interpolation
typedef struct _DATA_3BP
{
    USHORT Bp1p;            // BP1P data
    USHORT Bp1m;            // BP1M data
    USHORT Bp2p;            // BP2P data
    USHORT Bp2m;            // BP2M data
    USHORT Bp3p;            // BP3P data
    USHORT Bp3m;            // BP3M data
} DATA_3BP;

// 2-axis continuous interpolation
typedef struct _DATA_2CIP
{
    USHORT  Command;        // Command number (Set one of CMD_IP_2ST, CMD_IP_CW, CMD_IP_CCW.)
    USHORT  Speed;          // Speed (When changing the speed, set 1~8000. When not changing, set 0.)
    long    EndP1;          // Finishing point (The first axis)
    long    EndP2;          // Finishing point (The second axis)
    long    Center1;        // Circular center point (The first axis)
    long    Center2;        // Circular center point (The second axis)
} DATA_2CIP;                // Note: The first or second axis must be specified by WR5.

// 3-axis continuous interpolation
typedef struct _DATA_3CIP
{
    long    EndP1;          // Finishing point (The first axis)
    long    EndP2;          // Finishing point (The second axis)
    long    EndP3;          // Finishing point (The third axis)
    USHORT  Speed;          // Speed (When changing the speed, set 1~8000. When not changing, set 0.)
} DATA_3CIP;                // Note: The first, second or third axis must be specified by WR5.
```

②VB

```
' 2-axis BP interpolation
Type DATA_2BP
    Bp1p As Integer          ' BP1P data
    Bp1m As Integer          ' BP1M data
    Bp2p As Integer          ' BP2P data
    Bp2m As Integer          ' BP2M data
End Type

' 3-axis BP interpolation
Type DATA_3BP
    Bp1p As Integer          ' BP1P data
    Bp1m As Integer          ' BP1M data
    Bp2p As Integer          ' BP2P data
    Bp2m As Integer          ' BP2M data
    Bp3p As Integer          ' BP3P data
    Bp3m As Integer          ' BP3M data
End Type

' 2-axis continuous interpolation
Type DATA_2CIP
    Command As Integer       ' Command number (Set one of CMD_IP_2ST, CMD_IP_CW, CMD_IP_CCW.)
    Speed As Integer         ' Speed (When changing the speed, set 1~8000. When not changing, set 0.)
    EndP1 As Long            ' Finishing point (The first axis)
    EndP2 As Long            ' Finishing point (The second axis)
    Center1 As Long          ' Circular center point (The first axis)
    Center2 As Long          ' Circular center point (The second axis)
End Type                     ' Note: The first or second axis must be specified by WR5.

' 3-axis continuous interpolation
Type DATA_3CIP
    EndP1 As Long            ' Finishing point (The first axis)
    EndP2 As Long            ' Finishing point (The second axis)
    EndP3 As Long            ' Finishing point (The third axis)
    Speed As Integer         ' Speed (When changing the speed, set 1~8000. When not changing, set 0.)
End Type                     ' Note: The first, second or third axis must be specified by WR5.
```

③VB.NET

```
' 2-axis BP interpolation
Structure DATA_2BP
    Dim Bp1p As Short       ' BP1P data
    Dim Bp1m As Short       ' BP1M data
    Dim Bp2p As Short       ' BP2P data
    Dim Bp2m As Short       ' BP2M data
End Structure

' 3-axis BP interpolation
Structure DATA_3BP
    Dim Bp1p As Short       ' BP1P data
    Dim Bp1m As Short       ' BP1M data
    Dim Bp2p As Short       ' BP2P data
    Dim Bp2m As Short       ' BP2M data
    Dim Bp3p As Short       ' BP3P data
    Dim Bp3m As Short       ' BP3M data
End Structure

' 2-axis continuous interpolation
Structure DATA_2CIP
    Dim Cmd As Short        ' Command number (Set one of CMD_IP_2ST, CMD_IP_CW, CMD_IP_CCW.)
    Dim Speed As Short      ' Speed (When changing the speed, set 1~8000. When not changing, set 0.)
    Dim EndP1 As Integer    ' Finishing point (The first axis)
    Dim EndP2 As Integer    ' Finishing point (The second axis)
    Dim Center1 As Integer  ' Circular center point (The first axis)
    Dim Center2 As Integer  ' Circular center point (The second axis)
End Structure               ' Note: The first or second axis must be specified by WR5.

' 3-axis continuous interpolation
Structure DATA_3CIP
    Dim EndP1 As Integer    ' Finishing point (The first axis)
    Dim EndP2 As Integer    ' Finishing point (The second axis)
    Dim EndP3 As Integer    ' Finishing point (The third axis)
    Dim Speed As Short      ' Speed (When changing the speed, set 1~8000. When not changing, set 0.)
End Structure               ' Note: The first, second or third axis must be specified by WR5.
```

(4) The interpolation axis (IpAxis) specified by the interpolation function is as follows:
Set the axis data to the lower 6-bit of 16-bit data.

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
0	0	0	0	0	0	0	0	0	0	AX31	AX30	AX21	AX20	AX11	AX10

Third axis Second axis First axis

◆ Description of each bit

D1, 0 AX11, 10 Specify the first axis (master axis) for interpolation driving. Axis codes are as follows:

Axis	Code (Binary)
X	00
Y	01
Z	10
U	11

Example of the first axis: X, Second axis: Y, Third axis: Z

D5	D4	D3	D2	D1	D0
1	0	0	1	0	0

D3, 2 AX21, 20 Specify the second axis using the code in the table above for interpolation driving.

D5, 4 AX31, 30 Specify the third axis using the code in the table above for 3-axis interpolation driving. This is not used in 2-axis interpolation driving, so it doesn't matter to set any code.

(5) About the speed change when continuous interpolation function is executed.
Continuous interpolation function can change the speed during interpolation driving. The user can set the speed to each segment. To change the speed during interpolation driving, set TRUE(True) to the function parameter SpdChgFlg.

◆ How to change the speed for each segment

Set the speed of each segment to the Speed of DATA_2CIP or the Speed of DATA_3CIP.

- When set the different speed from the previous segment, set 1~8000.
- When set the same speed as the previous segment, set 0.

◆ About the timing of changing the speed

When the Speed of DATA_2CIP or the Speed of DATA_3CIP is set to 1~8000, the process of interpolation function is described as follows:

For the first segment, set the speed before executing the segment.
For the second or later segment, set the speed right after that segment has started (when the next segment is ready to be written).
For instance, when the second segment starts and the third segment is ready to be written, set the speed of the second segment. Therefore, after the second segment has started, the speed of the first segment is applied until the speed of the second segment is set.

9.1.3.3 Usage

■ API Function Declaration

API function declaration is defined in the following files.

VC ・・・・・・MC8043P_DLL.H
VB ・・・・・・MC8043P_DLL.bas
VB.NET ・・MC8043P_DLL.vb

■ Usage

(1) Start process・・・Execute OpenMC8043P once before using each function.
(2) End process・・・Execute CloseMC8043P or CloseAllMC8043P at the end of program.

■ Notes for Use of Function

(1) About VC, VB (all languages)
①When each function is used before executing OpenMC8043P function, operation is not guaranteed.
②When the board number, which is not connected, is assigned, the operation of each function is not guaranteed.

(2) VC only
①When using the interrupt handling function, the time from the interrupt generation to user-defined function is not guaranteed by the nature of Windows.
②When the user tries to perform the interrupt, do not execute the close handling (CloseMC8043P or CloseAllMC8043P) while the interrupt user-defined function (the function designated by SetEventMC8043P) is running. Before executing the close handling, make sure that the interrupt user-defined function is finished.

■ When handling the interrupt by VC

(1) The user can set user function handling an interrupt by using SetEventMC8043P function. And can specify one argument. When multiple boards are used, the example is as follows.

(When the board number is 0)

```
Nmc_WriteReg1(0, AXIS_ALL, 0x8000);      //    Generate an interrupt at the stop (All axes).
SetEventMC8043P(0,(LPTHREAD_START_ROUTINE)MC8043P_EventProc0, NULL);
・・・                                    //    Assign the address of function and the argument.
```

(When the board number is 1)

```
Nmc_WriteReg1(1, AXIS_ALL, 0x8000);      //    Generate an interrupt at the stop (All axes).
SetEventMC8043P(1,(LPTHREAD_START_ROUTINE)MC8043P_EventProc1, lpParameter);
・・・                                    //    Assign the address of function and the argument.
```

(2) Read the interrupt factor of each board in user function handling an interrupt. To read the interrupt factor of RR3, use ReadEventMC8043P.

(User function handling the interrupt of the board number 0)

```
void MC8043P_EventProc0(void)
{
        long Rr3X, Rr3Y, Rr3Z, Rr3U;
        ReadEventMC8043P(0, &Rr3X, &Rr3Y, &Rr3Z, &Rr3U);
        ・・・・
}
```

(User function handling the interrupt of the board number 1)

```
void MC8043P_EventProc1(LPVOID lpParameter)
{
        long Rr3X, Rr3Y, Rr3Z, Rr3U;
        ReadEventMC8043P(1, &Rr3X, &Rr3Y, &Rr3Z, &Rr3U);
        ・・・・
}
```

(3) Use ResetEventMC8043P to release the interrupt handling function. By executing this function, the user function is not called when an interrupt occurs.

■ Continuous Interpolation

When executing the continuous interpolation of MC8043P, please read the chapter "2.4.5 Continuous Interpolation" of MCX314As user's manual carefully and execute the process described in the chapter in the application. Continuous Interpolation Functions [*1] execute some of the process by DLL. So they will be used to execute the process of the continuous interpolation. But there are some notes when using Continuous Interpolation Functions. Please note them.

[*1] Nmc_2CIPExec, Nmc_3CIPExec, Nmc_2CIPExec_BG, Nmc_3CIPExec_BG

Notes for when using Continuous Interpolation Function:

Continuous interpolation function writes the next segment data such as the finish point, the center point, etc. and writes the interpolation command, and checks the error. If the error occurs, the function returns. If not, it will check whether the data of the next segment is writable or not (check the bit D9 of RR0). When it becomes writable, it will write the data of the next segment and the command of the interpolation. This function repeats the process until the continuous interpolation is completed.

Because the loops that check the error and check whether the next segment data is writable are always executed in DLL, the use of this function isn't suitable if you want to execute other process by the application during this function is executing. In this case the continuous interpolation function shouldn't be used and the user must make the source code of the continuous interpolation in the applications by referring to MCX314As user's manual. Please see the chapter "2.4.6 The Acceleration / Deceleration Control in Interpolation" about the acceleration/deceleration drive of continuous interpolation.

When using continuous interpolation function, the initial speed should be set for 8,000. (Don't change the initial speed during this function is executing.) In this case the fixed speed driving mode is applied in each segment.

■ The BP (Bit Pattern) Interpolation

When executing the BP interpolation of MC8043P, please read the chapter "2.4.3 The Bit Pattern Interpolation" of MCX314As user's manual carefully and execute the process described in the chapter in the application. The BP interpolation functions [*2] execute some of the process by DLL. So they will be used to execute the process of the BP interpolation. But there are some notes when using the BP interpolation functions. Please note them.

[*2] Nmc_2BPExec, Nmc_3BPExec, Nmc_2BPExec_BG, Nmc_3BPExec_BG

Notes for when using the BP Interpolation Function

The BP interpolation function writes the next BP data and the interpolation command and checks the error. If the error occurs, the function returns. If not, it will check whether the stack counter becomes 2 or less (check the bit D14,13 of RR0). When it becomes 2 or less, it will write the next BP data. This function repeats the process until the BP interpolation is completed. Because the loops that check the error and check the stack counter are always executed in DLL, the use of this function isn't suitable if you want to execute other process by the application during this function is executing. In this case the BP interpolation function shouldn't be used and the user must make the source code of the BP interpolation in the applications by referring to MCX314As user's manual. Please see chapter "2.4.6 The Acceleration / Deceleration Control in Interpolation" about the acceleration/deceleration drive of BP interpolation.

■ Notes for Use of Interpolation Function

(1) Concerning the following interpolation function, the user can execute only one interpolation function at once.
While executing the interpolation function, the other interpolation function cannot be executed. If executed, an error will return.

Nmc_2BPExec	Nmc_2BPExec_BG	Nmc_2CIPExec	Nmc_2CIPExec_BG
Nmc_3BPExec	Nmc_3BPExec_BG	Nmc_3CIPExec	Nmc_3CIPExec_BG

(2) While executing the above interpolation function, do not perform the following operation.

①Execution of the interpolation command (30h~3Dh)
②Change of WR5 interpolation mode register

(3) The following interpolation function is executed in the background, so that the memory for interpolation data is allocated at the start of interpolation function and then the interpolation data specified by the user is copied. Then, when the interpolation process in the background is finished, the memory will be released and the message will be sent to the user window.
Therefore, while executing the following interpolation function in the background, do not exit the application.
Then, while executing the following interpolation function in the background, do not execute the close handling (CloseMC8043P or CloseAllMC8043P).
If you want to stop the execution of interpolation function, execute the interpolation stop function (Nmc_IPStop) and make sure to receive the stop message.

Nmc_2BPExec_BG	Nmc_2CIPExec_BG
Nmc_3BPExec_BG	Nmc_3CIPExec_BG

(4) While the interpolation function is executed and when the speed is too fast, the interpolation driving may stop before setting the next data. The following is the measured conditions relatively stably not to stop the interpolation.
When the application is switched during execution of interpolation function or when some event occurs or does not occur, the stop speed is different. In addition, the stop speed is different in continuous interpolation depending on the one moving distance.

Measurement Result:
On the following conditions, when the drive speed kept the speed below, the interpolation did not stop.
When the drive speed is over the speed below, the interpolation sometimes stopped.

[Measurement Environment]
OS: WindowsXP (Japanese) SP1
CPU: Celeron(R) CPU 2.53 GHz

◆ Executed function: Nmc_2BPExec
①When the application is switched during execution of interpolation function
The number of interpolation data : 100
Stable drive speed : 70 PPS

②When the window is never touched during execution of interpolation function
The number of interpolation data : 1,000
Stable drive speed : 600 PPS

◆ Executed function: Nmc_2CIPExec
①When the application is switched during execution of interpolation function
One moving distance : 1,000 pulse
The number of interpolation data : 100
Stable drive speed : 5,000 PPS

②When the window is never touched during execution of interpolation function
One moving distance : 1,000 pulse
The number of interpolation data : 500
Stable drive speed : 30,000 PPS

■ Notes for when developing multithread applications

This chapter describes the notes for developing applications which work in multithread.

In Nmc_xxx function, there are functions executing axis switching, data writing into WR6, WR7 and data reading to RR6, RR7. Each Nmc_xxx function is as follows:

◆ Functions executing axis switching

Nmc_Reset	Nmc_Command	Nmc_Command_IP			
Nmc_WriteReg0	Nmc_WriteReg1	Nmc_WriteReg2	Nmc_WriteReg3		
Nmc_ReadReg1	Nmc_ReadReg2				
Nmc_Range	Nmc_Jerk	Nmc_Acc	Nmc_Dec	Nmc_StartSpd	Nmc_Speed
Nmc_Pulse	Nmc_Pulse_VB	Nmc_DecP	Nmc_DecP_VB	Nmc_Center	Nmc_Lp
Nmc_Ep	Nmc_CompP	Nmc_CompM	Nmc_AccOfst	Nmc_DJerk	Nmc_HomeSpd
Nmc_ExpMode	Nmc_SyncMode				
Nmc_ReadLp	Nmc_ReadEp	Nmc_ReadSpeed	Nmc_ReadAccDec	Nmc_ReadSyncBuff	
Nmc_2BPExec	Nmc_3BPExec	Nmc_2BPExec_BG	Nmc_3BPExec_BG		
Nmc_2CIPExec	Nmc_3CIPExec	Nmc_2CIPExec_BG	Nmc_3CIPExec_BG		
Nmc_WriteRegSetAxis	Nmc_ReadRegSetAxis		Nmc_WriteData	Nmc_WriteData2	Nmc_ReadData

◆ Functions executing data writing into WR6, WR7

Nmc_Range	Nmc_Jerk	Nmc_Acc	Nmc_Dec	Nmc_StartSpd	Nmc_Speed
Nmc_Pulse	Nmc_Pulse_VB	Nmc_DecP	Nmc_DecP_VB	Nmc_Center	Nmc_Lp
Nmc_Ep	Nmc_CompP	Nmc_CompM	Nmc_AccOfst	Nmc_DJerk	Nmc_HomeSpd
Nmc_ExpMode	Nmc_SyncMode	Nmc_WriteData	Nmc_WriteData2		
Nmc_2CIPExec	Nmc_3CIPExec	Nmc_2CIPExec_BG	Nmc_3CIPExec_BG		
Nmc_WriteReg6	Nmc_WriteReg7				

◆ Functions executing data reading to RR6, RR7

Nmc_ReadLp	Nmc_ReadEp	Nmc_ReadSpeed	Nmc_ReadAccDec	Nmc_ReadSyncBuff	Nmc_ReadData

To perform WR1~WR3 writing, RR1~RR2 reading, data writing command and data reading command, basically use the following Nmc_xxx function.

◆ WR1~WR3 writing

Nmc_WriteReg1 Nmc_WriteReg2 Nmc_WriteReg3 Nmc_WriteRegSetAxis

◆ RR1~RR2 reading

Nmc_ReadReg1 Nmc_ReadReg2 Nmc_ReadRegSetAxis

◆ Data writing command

Nmc_Range	Nmc_Jerk	Nmc_Acc	Nmc_Dec	Nmc_StartSpd	Nmc_Speed
Nmc_Pulse	Nmc_Pulse_VB	Nmc_DecP	Nmc_DecP_VB	Nmc_Center	Nmc_Lp
Nmc_Ep	Nmc_CompP	Nmc_CompM	Nmc_AccOfst	Nmc_DJerk	Nmc_HomeSpd
Nmc_ExpMode	Nmc_SyncMode	Nmc_WriteData	Nmc_WriteData2		

◆ Data reading command

Nmc_ReadLp Nmc_ReadEp Nmc_ReadSpeed Nmc_ReadAccDec Nmc_ReadSyncBuff Nmc_ReadData

When performing these operations without Nmc_xxx function, the user must take care in multithread environment.

(1) For example, when writing into WR1, Nmc_WriteReg1 is used; however, there is other way as follows:

```
①OutpMC8043P(No, MCX314_WR0,  0x010F);        // Switch to X axis.
②OutpMC8043P(No, MCX314_WR1,  Data);          // Write to WR1.
```

In this case, if Nmc_xxx function to switch the axis is executed between ① and ②, the data will be written into the WR1 of a different axis.

(2) For example, when setting the speed, Nmc_Speed is used; however, there is other way as follows:

```
①OutpMC8043P( No, MCX314_WR6, Data );          // Write to WR6.
②OutpMC8043P( No, MCX314_WR0, 0x0105 );        // Set WR6 data to the speed of X axis.
```

Also, the following functions can perform the same operation.

```
③Nmc_WriteReg6(No, Data);                      // Write to WR6.
④Nmc_Command(No, AXIS_X, 0x05);                // Set WR6 data to the speed of X axis.
```

In this case, if Nmc_xxx function to write data into WR6, WR7 is executed between ① and ② or ③ and ④, the other data will be set to the speed.

(3) For example, when reading logical position counter, Nmc_ReadLp is used; however, there is other way as follows:

```
①OutpMC8043P( No, MCX314_WR0, 0x0110 );        // Read logical position counter of X axis to RR6, RR7.
②d6 = InpMC8043P( No, MCX314_RR6 );            // Read from RR6.
③d7 = InpMC8043P( No, MCX314_RR7 );            // Read from RR7.
```

In this case, if Nmc_xxx function to read data to RR6, RR7 is executed between ① and ② or ② and ③, the different data will be read.

Thus, in multithread environment, when calling API function more than twice to execute the objective operation, the user needs not to perform such an operation or needs to take exclusive control.

When the operation is finished by calling Nmc_xxx, OutpMC8043P function once, it properly works in multithread environment. Each function of Nmc_xxx, OutpMC8043P takes exclusive control each other.

9.1.4 API (Supporting Function used by MC8041P Driver)

API provided by MC8043P.SYS and MC8043P.DLL.

For the user already developing the application of MC8041P, this driver supports the following MC8041P function.
The user can access MC8043P using the following function.

For the user who newly develops the application of MC8043P, use 9.1.3 API (MC8043P Driver Function).

9.1.4.1 VC++ (When one MC8043P board is used)

When programming in VC++ and using one MC8043P board, the following function can be used.
Before using the following function, set 0 to the value of rotary switch on the board.

Function Name	Function and Content
OpenCard	Start MC8043P. Perform to MC8043P whose board number (setting value of rotary switch on the board) is 0. Input Parameter : void WINAPI Interrupt handling function address (When the interrupt is not used, it is NULL.) Return Value : HANDLE If the function succeeds, the driver handle returns. If the function fails, the return value is NULL. <Example> status = OpenCard(isr); // When using the interrupt and isr is specified to the interrupt function. status = OpenCard(NULL); // When not using the interrupt.
CloseCard	Terminate MC8043P. Perform to MC8043P whose board number (setting value of rotary switch on the board) is 0. Input Parameter : None Return Value : BOOL If the function succeeds, the return value is TRUE. If the function fails, the return value is FALSE. <Example> CloseCard();
OutW	Write 1 word (16 bit) into output port. Perform to MC8043P whose board number (setting value of rotary switch on the board) is 0. Input Parameter : WORD Write register number (WR0～WR7) int Data to be written. Return Value : None <Example> OutW(WR0, 0x8000); // Soft reset the board. Note: The write register numbers (WR0～WR7) are defined in the MC8043P_DLL.h file.
InW	Read out 1 word (16 bit) from input port. Perform to MC8043P whose board number (setting value of rotary switch on the board) is 0. Input Parameter : WORD Read register number (RR0～RR7) Return Value : WORD 1 word read out from input port. <Example> data = InW(RR0); // Read out the read register RR0. Note: The read register numbers (RR0～RR7) are defined in the MC8043P_DLL.h file. Concerning RR3 register data reading, see the description of ReadRR3 function.
ReadRR3	Read the value of RR3 (will be cleared after reading) right after an interrupt event is generated in MC8043P. Perform to MC8043P whose board number (setting value of rotary switch on the board) is 0. Input Parameter : WORD* Pointer to a variable that receives the X axis RR3 value. WORD* Pointer to a variable that receives the Y axis RR3 value. WORD* Pointer to a variable that receives the Z axis RR3 value. WORD* Pointer to a variable that receives the U axis RR3 value. Return Value : None <Example> WORD Rr3X, Rr3Y, Rr3Z, Rr3U; ReadRR3(&Rr3X, &Rr3Y, &Rr3Z, &Rr3U); Note: The RR3 value of MC8043P is cleared due to the driver operation, just after the interrupt occurs. Use this function to check RR3 right after an interrupt generation.

9.1.4.2 VC++ (When multiple MC8043P boards are used)

When programming in VC++ and using multiple MC8043P boards, the following function can be used.

Function Name	Function and Content
OpenCard_N	Start MC8043P. Input Parameter : int Board number(setting value of rotary switch (0~9) on the board) + 1 void WINAPI Pointer to the user function to be called when an interrupt occurs. This pointer must be NULL if the interrupt is not used. Return Value : HANDLE If the function succeeds, the driver handle returns. If the function fails, the return value is NULL. <Example> // Board number is 0. status = OpenCard_N(1, isr); // When using the interrupt and isr is specified to the interrupt function. status = OpenCard_N(1, NULL); // Board number is 0, when not using the interrupt.
CloseCard_N	Terminate MC8043P. Input Parameter : int Board number(setting value of rotary switch (0~9) on the board) + 1 Return Value : BOOL If the function succeeds, the return value is TRUE. If the function fails, the return value is FALSE. <Example> CloseCard_N(1); // Board number is 0
OutW_N	Write 1 word (16 bit) into output port. Input Parameter : int Board number(setting value of rotary switch (0~9) on the board) + 1 WORD Write register number (WR0～WR7) int Data to be written. Return Value : None <Example> OutW_N(1, WR0, 0x8000); // Soft reset the board. Note: The write register numbers (WR0～WR7) are defined in the MC8043P_DLL.h file.
InW_N	Read out 1 word (16 bit) from input port. Input Parameter : int Board number(setting value of rotary switch (0~9) on the board) + 1 WORD Read register number (RR0～RR7) Return Value : WORD 1 word read out from input port. <Example> data = InW_N(1, RR0); // Read out the read register RR0. Note: The read register numbers (RR0～RR7) are defined in the MC8043P_DLL.h file. Concerning RR3 register data reading, see the description of ReadRR3_N function.
CloseCard_all	Terminate all the MC8043P. Input Parameter : None Return Value : BOOL If the function succeeds, the return value is TRUE. If the function fails, the return value is FALSE. <Example> CloseCard_all();
ReadRR3_N	Read the value of RR3 (will be cleared after reading) right after an interrupt event is generated in MC8043P. Input Parameter : int Board number(setting value of rotary switch (0~9) on the board) + 1 WORD* Pointer to a variable that receives the X axis RR3 value. WORD* Pointer to a variable that receives the Y axis RR3 value. WORD* Pointer to a variable that receives the Z axis RR3 value. WORD* Pointer to a variable that receives the U axis RR3 value. Return Value : None <Example> ReadRR3_N(1, &Rr3X, &Rr3Y, &Rr3Z, &Rr3U); // Read RR3 of the board number 0. Note: The RR3 value of MC8043P is cleared due to the driver operation, just after the interrupt occurs. Use this function to check RR3 right after an interrupt generation.

9.1.4.3 VB6.0 (When one MC8043P board is used)

When programming in VB6.0 and using one MC8043P board, the following function can be used.
Before using the following function, set 0 to the value of rotary switch on the board.

Function Name	Function and Content
OpenCard	Start MC8043P. Perform to MC8043P whose board number (setting value of rotary switch on the board) is 0. Input Parameter : 0& Fixed Return Value : As Long If the function succeeds, the driver handle returns. If the function fails, the return value is NULL. <Example> status = OpenCard(0&) ' 0& is fixed. Open the board 0.
CloseCard	Terminate MC8043P. Perform to MC8043P whose board number (setting value of rotary switch on the board) is 0. Input Parameter : None Return Value : As Long If the function succeeds, the return value is nonzero. If the function fails, the return value is 0. <Example> status = CloseCard() ' Close the board 0.
OutW	Write 1 word (16 bit) into output port. Perform to MC8043P whose board number (setting value of rotary switch on the board) is 0. Input Parameter : ByVal As Integer Write register number (WR0～WR7) ByVal As Long Data to be written. Return Value : None <Example> Call OutW(WR0, &H8000) ' Soft reset the board. Note: The write register numbers (WR0～WR7) are defined in the MC8043P_DLL.bas file.
InW	Read out 1 word (16 bit) from input port. Perform to MC8043P whose board number (setting value of rotary switch on the board) is 0. Input Parameter : ByVal As Integer Read register number (RR0～RR7) Return Value : As Long 1 word read out from input port. <Example> data = InW(RR0) ' Read out the read register RR0. Note: The read register numbers (RR0～RR7) are defined in the MC8043P_DLL.bas file.

9.1.4.4 VB6.0 (When multiple MC8043P boards are used)

When programming in VB6.0 and using multiple MC8043P boards, the following function can be used.

Function Name	Function and Content
OpenCard_N	Start MC8043P. Input Parameter : ByVal As Long Board number(setting value of rotary switch (0~9) on the board) + 1 0& Fixed Return Value : As Long If the function succeeds, the driver handle returns. If the function fails, the return value is NULL. <Example> status = OpenCard_N(1, 0&) When opening the board 0, set 1 to the first argument. The second argument must be fixed to 0&.
CloseCard_N	Terminate MC8043P. Input Parameter : ByVal As Long Board number(setting value of rotary switch (0~9) on the board) + 1 Return Value : As Long If the function succeeds, the return value is nonzero. If the function fails, the return value is 0. <Example> status = CloseCard_N(1) ' Close the board 0.
OutW_N	Write 1 word (16 bit) into output port. Input Parameter : ByVal As Long Board number(setting value of rotary switch (0~9) on the board) + 1 ByVal As Integer Write register number (WR0～WR7) ByVal As Long Data to be written. Return Value : None <Example> Call OutW_N(1, WR0, &H8000) ' Soft reset the board. Note: The write register numbers (WR0～WR7) are defined in the MC8043P_DLL.bas file.
InW_N	Read out 1 word (16 bit) from input port. Input Parameter : ByVal As Long Board number(setting value of rotary switch (0~9) on the board) + 1 ByVal As Integer Read register number (RR0～RR7) Return Value : As Long 1 word read out from input port. <Example> data = InW_N(1, RR0) ' Read out the read register RR0. Note: The read register numbers (RR0～RR7) are defined in the MC8043P_DLL.bas file.
CloseCard_all	Terminate all the MC8043P. Input Parameter : None Return Value : As Long If the function succeeds, the return value is nonzero. If the function fails, the return value is 0. <Example> status = CloseCard_all( )

9.1.4.5 VB.NET 2003 (When one MC8043P board is used)

When programming in VB.NET 2003 and using one MC8043P board, the following function can be used.
Before using the following function, set 0 to the value of rotary switch on the board.

Function Name	Function and Content
OpenCard	Start MC8043P. Perform to MC8043P whose board number (setting value of rotary switch on the board) is 0. Input Parameter : 0 Fixed Return Value : As Integer If the function succeeds, the driver handle returns. If the function fails, the return value is NULL. <Example> status = OpenCard(0) ' 0 is fixed. Open the board 0.
CloseCard	Terminate MC8043P. Perform to MC8043P whose board number (setting value of rotary switch on the board) is 0. Input Parameter : None Return Value : As Integer If the function succeeds, the return value is nonzero. If the function fails, the return value is 0. <Example> status = CloseCard() ' Close the board 0.
OutW	Write 1 word (16 bit) into output port. Perform to MC8043P whose board number (setting value of rotary switch on the board) is 0. Input Parameter : ByVal As Short Write register number (WR0～WR7) ByVal As Integer Data to be written. Return Value : None <Example> Call OutW(WR0, &H8000) ' Soft reset the board. Note: The write register numbers (WR0～WR7) are defined in the MC8043P_DLL.vb file.
InW	Read out 1 word (16 bit) from input port. Perform to MC8043P whose board number (setting value of rotary switch on the board) is 0. Input Parameter : ByVal As Short Read register number (RR0～RR7) Return Value : As Integer 1 word read out from input port. <Example> data = InW(RR0) ' Read out the read register RR0. Note: The read register numbers (RR0～RR7) are defined in the MC8043P_DLL.vb file.

9.1.4.6 VB.NET 2003 (When multiple MC8043P boards are used)

When programming in VB.NET 2003 and using multiple MC8043P boards, the following function can be used.

Function Name	Function and Content
OpenCard_N	Start MC8043P. Input Parameter : ByVal As Integer Board number(setting value of rotary switch (0~9) on the board) + 1 0 Fixed Return Value : As Integer If the function succeeds, the driver handle returns. If the function fails, the return value is NULL. <Example> status = OpenCard_N(1, 0) ' When opening the board 0, set 1 to the first argument. The second argument must be fixed to 0.
CloseCard_N	Terminate MC8043P. Input Parameter : ByVal As Integer Board number(setting value of rotary switch (0~9) on the board) + 1 Return Value : As Integer If the function succeeds, the return value is nonzero. If the function fails, the return value is 0. <Example> status = CloseCard_N(1) ' Close the board 0.
OutW_N	Write 1 word (16 bit) into output port. Input Parameter : ByVal As Integer Board number(setting value of rotary switch (0~9) on the board) + 1 ByVal As Short Write register number (WR0～WR7) ByVal As Integer Data to be written. Return Value : None <Example> Call OutW_N(1, WR0, &H8000) ' Soft reset the board. Note: The write register numbers (WR0～WR7) are defined in the MC8043P_DLL.vb file.
InW_N	Read out 1 word (16 bit) from input port. Input Parameter : ByVal As Integer Board number(setting value of rotary switch (0~9) on the board) + 1 ByVal As Short Read register number (RR0～RR7) Return Value : As Integer 1 word read out from input port. <Example> data = InW_N(1, RR0) ' Read out the read register RR0. Note: The read register numbers (RR0～RR7) are defined in the MC8043P_DLL.vb file.
CloseCard_all	Terminate all the MC8043P. Input Parameter : None Return Value : As Integer If the function succeeds, the return value is nonzero. If the function fails, the return value is 0. <Example> status = CloseCard_all( )

9.1.4.7 Notes

- Execute OpenCard() or OpenCard_N() before using each function in both VC++ and VB; otherwise, operation is not guaranteed.
- Execute CloseCard(), CloseCard_N() or CloseCard_all() at the termination of the program.
- When the board number, which is not connected, is assigned, the operation of each function is not guaranteed.
- Although VC++ supports the interrupt, when using the interrupt handling function, the time from the interrupt generation to user-defined function is not guaranteed by the nature of Windows.
- In VC++, when the user tries to perform the interrupt, do not execute the close handling (CloseCard(), CloseCard_N() or CloseCard_all()) while the interrupt user-defined function (the function designated by OpenCard() or OpenCard_N()) is running. Before executing the close handling, make sure that the interrupt user-defined function is finished.

9.2 Contents of the Accessory Software

The folder tree and file list of the accessory software are as follows:

Note: When files are copied from CD-ROM to HDD, the files and folders may become read only. In this case, remove the read only attribute before using.

```
\
+---Driver
|      +---MC8043P.sys                  Device driver
|      +---MC8043P.inf                  Install program for device driver
|      +---MC8043P.dll                  Dynamic link library for driver
|      +---Version.txt                  Version file of driver
|
+---LIB
|      +---VB6
|      |    +---MC8043P_DLL.bas         MC8043P.DLL Declaration, definition file for VB6.0
|      +---VB.NET2003
|      |    +---MC8043P_DLL.vb          MC8043P.DLL Declaration, definition file for VB.NET 2003
|      +---VC6
|           +---MC8043P.lib             MC8043P.DLL Library file for VC6.0
|           +---MC8043P_DLL.h           MC8043P.DLL Header file (function declaration, definition) for VC6.0
|
|
+---Sample
     +---VB6
     |    +---NormallyClose
     |    |    +---Sample A
     |    |         +---FormA.frm       Sample program A (Normally Close)
     |    |         +---MC8043P_DLL.bas MC8043P.DLL Declaration, definition file for VB6.0
     |    |         +---Module1.bas     MC8043P Control function sample
     |    |         +---VBSample.vbp    Project file for VB sample program (VB6.0)
     |    |         +---exe
     |    |              +---VBSampleA.exe  Executable file
     |    |
     |    +---Sample A
     |    |    +---FormA.frm            Sample program A
     |    |    +---MC8043P_DLL.bas      MC8043P.DLL Declaration, definition file for VB6.0
     |    |    +---Module1.bas          MC8043P Control function sample
     |    |    +---VBSample.vbp         Project file for VB sample program (VB6.0)
     |    |    +---exe
     |    |         +---VBSampleA.exe   Executable file
     |    |
     |    +---Sample C
     |    |    +---FormC.frm            Sample program C
     |    |    +---MC8043P_DLL.bas      MC8043P.DLL Declaration, definition file for VB6.0
     |    |    +---VBSample.vbp         Project file for VB sample program (VB6.0)
     |    |    +---exe
     |    |         +---VBSampleC.exe   Executable file
     |    |
     |    +---Sample E
     |    |    +---Form1.frm            Sample program E
     |    |    +---MC8043P_DLL.bas      MC8043P.DLL Declaration, definition file for VB6.0
     |    |    +--- Module1.bas         MC8043P Control function sample
     |    |    +---MC_Sample.vbp        Project file for VB sample program (VB6.0)
     |    |    +---exe
     |    |         +---VBSampleE.exe   Executable file
     |    |
```

```
|   +---Sample G
|       +---Form1.frm              Sample program G
|       +---MC8043P_DLL.bas        MC8043P.DLL Declaration, definition file for VB6.0
|       +--- Module1.bas           MC8043P Control function sample
|       +---MC_Sample.vbp          Project file for VB sample program (VB6.0)
|       +---exe
|           +---VBSampleG.exe      Executable file
|
|
+---VB.NET2003
|   +---NormallyClose
|   |   +---Sample A
|   |       +---FormA.vb           Sample program A (Normally Close)
|   |       +---MC8043P_DLL.vb     MC8043P.DLL Declaration, definition file for VB.NET 2003
|   |       +---Module1.vb         MC8043P Control function sample
|   |       +---VBSample.sln       Solution file for VB sample program (VB.NET 2003)
|   |       +---exe
|   |           +---VBSampleA.exe  Executable file
|   |
|   +---Sample A
|   |   +---FormA.vb               Sample program A
|   |   +---MC8043P_DLL.vb         MC8043P.DLL Declaration, definition file for VB.NET 2003
|   |   +---Module1.vb             MC8043P Control function sample
|   |   +---VBSample.sln           Solution file for VB sample program (VB.NET 2003)
|   |   +---exe
|   |       +---VBSampleA.exe      Executable file
|   |
|   +---Sample C
|   |   +---FormC.vb               Sample program C
|   |   +---MC8043P_DLL.vb         MC8043P.DLL Declaration, definition file for VB.NET 2003
|   |   +---VBSample.sln           Solution file for VB sample program (VB.NET 2003)
|   |   +---exe
|   |       +---VBSampleC.exe      Executable file
|   |
|   +---Sample E
|   |   +---Form1.vb               Sample program E
|   |   +---MC8043P_DLL.vb         MC8043P.DLL Declaration, definition file for VB.NET 2003
|   |   +---Module1.vb             MC8043P Control function sample
|   |   +---MC_Sample.sln          Solution file for VB sample program (VB.NET 2003)
|   |   +---exe
|   |       +---VBSampleE.exe      Executable file
|   |
|   +---Sample G
|       +---Form1.vb               Sample program G
|       +---MC8043P_DLL.vb         MC8043P.DLL Declaration, definition file for VB.NET 2003
|       +---Module1.vb             MC8043P Control function sample
|       +---MC_Sample.sln          Solution file for VB sample program (VB.NET 2003)
|       +---exe
|           +---VBSampleG.exe      Executable file
|
|
|
|
|
```

```
|
+---VC6
    +--- NormallyClose
    |    +---Sample A
    |         +---SmapleA.cpp          Sample program A (Normally Close)
    |         +---MC8043P.LIB          MC8043P.DLL Library file
    |         +---MC8043P_DLL.H        MC8043P.DLL Header file (function declaration, definition)
    |         +---VCSample.dsw         Project workspace for VC sample program (VC6.0 only)
    |         +---exe
    |              +---VCSampleA.exe   Sample A executable file
    |
    +---Sample A
    |    +---SmapleA.cpp               Sample program A
    |    +---MC8043P.LIB               MC8043P.DLL Library file
    |    +---MC8043P_DLL.H             MC8043P.DLL Header file (function declaration, definition)
    |    +---VCSample.dsw              Project workspace for VC sample program (VC6.0 only)
    |    +---exe
    |         +---VCSampleA.exe        Sample A executable file
    |
    +---Sample B
    |    +---SmapleB.cpp               Sample program B
    |    +---MC8043P.LIB               MC8043P.DLL Library file
    |    +---MC8043P_DLL.H             MC8043P.DLL Header file (function declaration, definition)
    |    +---VCSample.dsw              Project workspace for VC sample program (VC6.0 only)
    |    +---exe
    |         +---VCSampleB.exe        Sample B executable file
    |
    +---Sample C
    |    +---SmapleC.cpp               Sample program C
    |    +---MC8043P.LIB               MC8043P.DLL Library file
    |    +---MC8043P_DLL.H             MC8043P.DLL Header file (function declaration, definition)
    |    +---VCSample.dsw              Project workspace for VC sample program (VC6.0 only)
    |    +---exe
    |         +---VCSampleC.exe        Sample C executable file
    |
    +---Sample D
    |    +---SmapleD.cpp               Sample program D
    |    +---MC8043P.LIB               MC8043P.DLL Library file
    |    +---MC8043P_DLL.H             MC8043P.DLL Header file (function declaration, definition)
    |    +---VCSample.dsw              Project workspace for VC sample program (VC6.0 only)
    |    +---exe
    |         +---VCSampleD.exe        Sample D executable file
    |
    +---Sample E                       Sample program E
    |    +---MC_SAMPLE.cpp             Application class member function
    |    +---MC_SAMPLEDlg.cpp          Dialog class member function
    |    +---MC_SAMPLE.H               Application class declaration
    |    +---MC_SAMPLEDlg.H            Dialog class declaration
    |    +---MC8043P.cpp               MC8043P Control function sample
    |    +---MC8043P.H                 MC8043P Control function declaration
    |    +---MC8043P.LIB               MC8043P.DLL Library file
    |    +---MC8043P_DLL.H             MC8043P.DLL Header file (function declaration, definition)
    |    +---MC_SAMPLE.dsw             Project workspace for VC sample program (VC6.0 only)
    |    +---exe
    |         +---VCSampleE.exe        Executable file
    |
```

+---Sample F	Sample program F
| +---MC_Sample2.cpp	Application class member function
| +---MC_Sample2Dlg.cpp	Dialog class member function
| +---MC_Sample2.H	Application class declaration
| +---MC_Sample2Dlg.H	Dialog class declaration
| +---MC8043P.cpp	MC8043P Control function sample
| +---MC8043P.H	MC8043P Control function declaration
| +---MC8043P.LIB	MC8043P.DLL Library file
| +---MC8043P_DLL.H	MC8043P.DLL Header file (function declaration, definition)
| +---MC_Sample2.dsw	Project workspace for VC sample program (VC6.0 only)
| +---Sample.bmp	Trajectory figure of continuous interpolation executed by this application
| +---exe	
| +---VCSampleF.exe	Executable file
|	
+---Sample G	Sample program G
+---MC_SAMPLE.cpp	Application class member function
+---MC_SAMPLEDlg.cpp	Dialog class member function
+---MC_SAMPLE.H	Application class declaration
+---MC_SAMPLEDlg.H	Dialog class declaration
+---MC8043P.LIB	MC8043P.DLL Library file
+---MC8043P_DLL.H	MC8043P.DLL Header file (function declaration, definition)
+---MC_SAMPLE.dsw	Project workspace for VC sample program (VC6.0 only)
+---exe	
+---VCSampleG.exe	Executable file

9.3 Development Procedure

9.3.1 When developing applications with VC++ (VC++6.0, VC++.NET 2003)

MC8043P.lib and MC8043P_DLL.h files are used in MC8043P application. These two files are for VC++6.0 or later.

■ When newly developing MC8043P applications

(1) Copy two files, MC8043P.lib and MC8043P_DLL.h in \Lib\VC6 folder to the application's folder to development.
(2) Add MC8043P_DLL.h to your project in VC++. Also, include MC8043P_DLL.h to the source file using API function.
(3) For VC++6.0 users, go to [Project] – [Settings] – [Link], and then designate "MC8043P.lib" to [Object/library modules]. (See Fig. 9.3-1 VC++6.0 Project Settings)

For VC++.NET 2003 users, go to [Project] – [Properties] – [Linker] – [Input], and then designate "MC8043P.lib" to [Additional Dependencies]. (See Fig. 9.3-2 VC++.NET 2003 Project Properties)

(4) Program by using functions of "9.1.3 API (MC8043P Driver Function)".

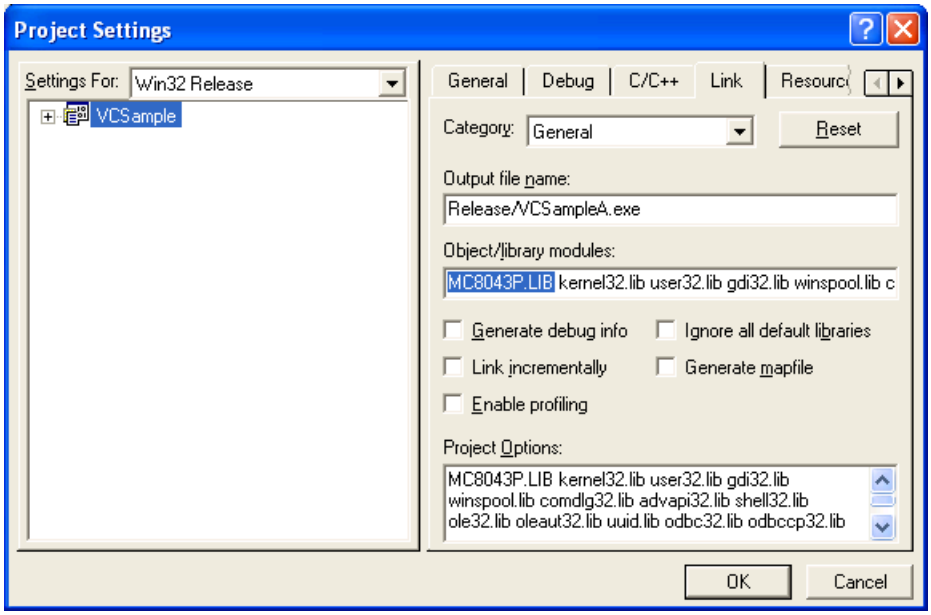


Fig. 9.3-1 VC++6.0 Project Settings

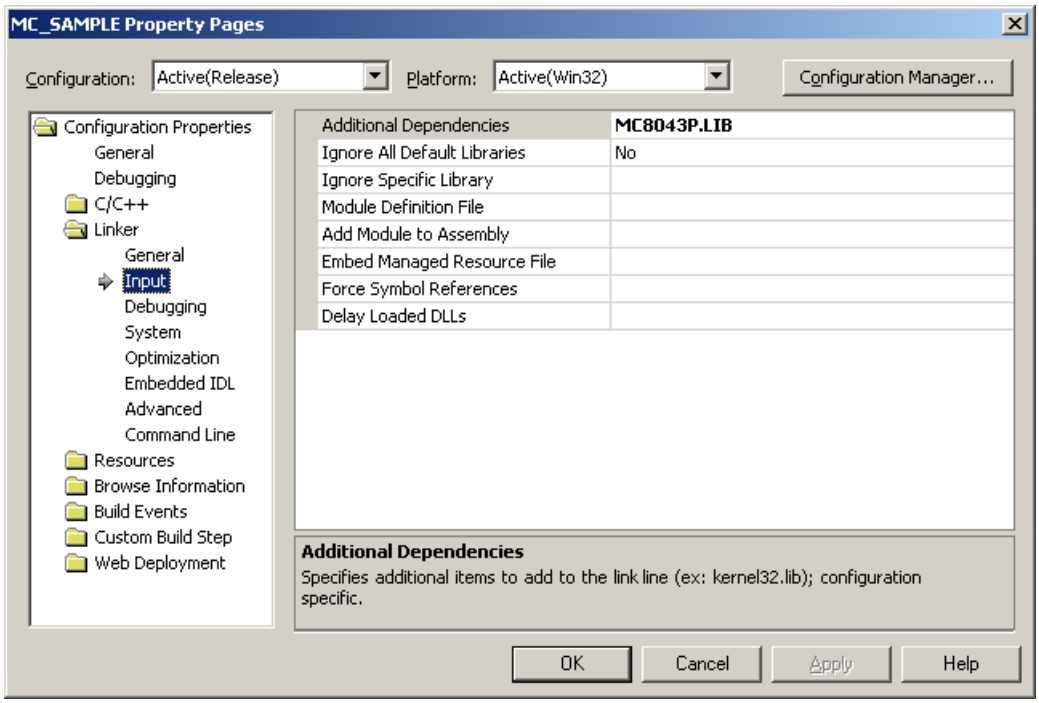


Fig. 9.3-2 VC++.NET 2003 Project Properties

■ When modifying the existing MC8041P application to MC8043P application

Note: The MC8043P's driver supports Windows 2000 or Windows XP. And it does not support Windows 95, Windows 98 or Windows NT.

The user can modify the existing MC8041P application to MC8043P application by replacing MC8041P.lib and MC8041P.h (provided files for MC8041P) by MC8043P.lib and MC8043P_DLL.h, and rebuilding them.
Steps to modify are as follows:

(1) Copy two files, MC8043P.lib and MC8043P_DLL.h in \Lib\VC6 folder to the application's folder to development.
(2) Add MC8043P_DLL.h to your project in VC++ and delete the existing MC8041P.h from your project. Then change "#include MC8041P.h" to "#include MC8043P_DLL.h" in the source file. However, if you have added extra modification to MC8041P.h, the extra modification must be remained.
(3) For VC++6.0 users, go to [Project] – [Settings] – [Link], and then delete "MC8041P.lib" from [Object/library modules], then designate "MC8043P.lib". (See Fig. 9.3-1 VC++6.0 Project Settings)

For VC++.NET 2003 users, go to [Project] – [Properties] – [Linker] – [Input], and then delete "MC8041P.lib" from [Additional Dependencies], then designate "MC8043P.lib". (See Fig. 9.3-2 VC++.NET 2003 Project Properties)

(4) MC8041P.lib and MC8041P.h for MC8041P are not used, so move them to the other folder according to need.
(5) The user can use functions of "9.1.4.1/9.1.4.2 VC++" in "9.1.4 API (Supporting Function used by MC8041P Driver)".
For the board number, refer to the chapter of above API.

However, the user may need to change the interrupt handling of the source file. In this driver, the user can read out RR3 register by using ReadRR3 function or ReadRR3_N function after an interrupt occurs. And the user cannot directly read out RR3 register by InW or InW_N function. (See Note in ReadRR3 function for a reason.)
Therefore, if the user is using InW or InW_N function to read out RR3 register after an interrupt occurs, the user must change these functions to ReadRR3 or ReadRR3_N function.

(6) Rebuild the application.
When the application is successfully rebuilt, the user can run the application on the machine properly installed MC8043P driver.

9.3.2 When developing applications with VB6.0

■ When newly developing MC8043P applications

(1) Add MC8043P_DLL.BAS in \Lib\VB6 folder to your project to development as a Module.
(2) Program by using functions of "9.1.3 API (MC8043P Driver Function)".

If the user cannot link to MC8043P.dll during debugging, copy MC8043P.dll to the current folder.
Note: The user cannot use interrupt of MC8043P in VB applications.

■ When modifying the existing MC8041P application to MC8043P application

Note: The MC8043P's driver supports Windows 2000 or Windows XP. And it does not support Windows 95, 98 or Windows NT.

(1) Add MC8043P_DLL.BAS in \Lib\VB6 folder to your project to development as a Module.
(2) Delete the Declare statement for MC8041P.DLL function declared in the existing MC8041P application source.
◆ Examples of the Declare statement for MC8041P.DLL to be deleted

```
Declare Function OpenCard Lib "mc8041p.dll" (ByVal isr As Long) As Long
Declare Function CloseCard Lib "mc8041p.dll" () As Long
```

(3) The user can use functions of "9.1.4.3/9.1.4.4 VB6.0" in "9.1.4 API (Supporting Function used by MC8041P Driver)".
For the board number, refer to the chapter of above API.
However, VB does not support the interrupt, so if the interrupt handling is already included, the user must change it.

(4) Create exe file.
When the file is successfully compiled, the user can run the application on the machine properly installed MC8043P driver.

If the user cannot link to MC8043P.dll during debugging, copy MC8043P.dll to the current folder.
Note: The user cannot use interrupt of MC8043P in VB applications.

9.3.3 When developing applications with VB.NET 2003

■ When newly developing MC8043P applications

(1) Add MC8043P_DLL.vb in \Lib\VB.NET2003 folder to your project to development.
(2) Program by using functions of "9.1.3 API (MC8043P Driver Function)".

If the user cannot link to MC8043P.dll during debugging, copy MC8043P.dll to the current folder.
Note: The user cannot use interrupt of MC8043P in VB applications.

■ When modifying the existing MC8041P application to MC8043P application

Note: The MC8043P's driver supports Windows 2000 or Windows XP. And it does not support Windows 95, 98 or Windows NT.

(1) Add MC8043P_DLL.vb in \Lib\VB.NET2003 folder to your project to development.
(2) Delete the Declare statement for MC8041P.DLL function declared in the existing MC8041P application source.
◆ Examples of the Declare statement for MC8041P.DLL to be deleted

```
Declare Function OpenCard Lib "mc8041p.dll" (ByVal isr As Integer) As Integer
Declare Function CloseCard Lib "mc8041p.dll" () As Integer
```

(3) The user can use functions of "9.1.4.5/9.1.4.6 VB.NET 2003" in "9.1.4 API (Supporting Function used by MC8041P Driver)".
To be on the safe side, check the data type of the argument and the return value for API function. For the board number, refer to the chapter of above API.
However, VB does not support the interrupt, so if the interrupt handling is already included, the user must change it.

(4) Create exe file.
When the file is successfully compiled, the user can run the application on the machine properly installed MC8043P driver.

If the user cannot link to MC8043P.dll during debugging, copy MC8043P.dll to the current folder.
Note: The user cannot use interrupt of MC8043P in VB applications.

9.4 Notes on Programming

(1) Initial setting of input signal filter
Each input signal of MC8043P, for example, a limit signal, uses the built-in integral filter of MCX314As. The device driver provided by NOVA electronics sets the filter as shown below for each input signal by writing extension mode setting command (60h) to MCX314As by default when PC is powered on.

Filter delay time: 512 μ sec

Each Input Signal Filter Enable/Disable:

Signal Name	Enable / Disable
EMG, nLMT+, nLMT-, nIN0, nIN1	Enable
nIN2	Enable
nINPOS, nALARM	Enable
nEXOP+, nEXOP-	Enable
nIN3	Enable

To switch Enable/Disable of these input signal filters on the application, see chapter 6.16 of MCX314As user's manual. It can be changed by extension mode setting command (60h). The following example shows that all axes (X, Y, Z and U axes) of the board number 0 are set to the same setting as the table above. Nmc_ExpMode executes extension mode setting command (60h).

Example 1)
```
Nmc_ExpMode(0, AXIS_ALL, 0x5F00, 0x0000);
```

Example 2)
```
OutpMC8043P(0, MCX314_WR6, 0x5F00);
OutpMC8043P(0, MCX314_WR7, 0x0000);
OutpMC8043P(0, MCX314_WR0, 0x0F60);
```

Notes:
①Extension mode setting command (60h) also sets the automatic home search (WR7) setting with input signal filter (WR6) setting. If the user tries to set either, be sure to set the proper value to both WR6 and WR7.

②When the user executes soft reset (set 1 to WR0/D15) in the application, the device driver sets the above setting, the same setting as the above table , to the filter of each input signal.

(2) PC standby mode and hibernation mode
In this driver, the operation after standby or hibernation mode is not guaranteed.
When the user tries to access MC8043P after standby or hibernation mode, be sure to restart PC before access.

(3) Interrupt support
The user can use the interrupt in the application only developed in VC++.
And the user can not use the interrupt in the application developed in VB.

Supported interrupts are as follows:

- All interrupts reported by RR3 register
- The interrupt that occurs when the bit CNEXT of RR0 becomes 1 during continuous interpolation execution. (If this bit is 1, the user can set next segment data and interpolation drive command.)
- The interrupt that occurs when the value of stack counter changes from 2 to 1 in bit pattern interpolation.

(4) Interrupt clearing

①The interrupt reported by RR3 register

The interrupt is cleared after the driver read RR3, just after the interrupt occurs in MC8043P.
Then, user-defined function of the application for interrupt is called. (Only when user-defined function has been set.)

②The interrupt that occurs when the bit CNEXT of RR0 becomes 1 in continuous interpolation driving.

The interpolation interrupt is cleared in the driver, just after the interrupt occurs in MC8043P.
Then, user-defined function of the application for interrupt is called. (Only when user-defined function has been set.)

③The interrupt that occurs when the value of stack counter changes from 2 to 1 in bit pattern interpolation.

The interpolation interrupt is cleared in the driver, just after the interrupt occurs in MC8043P.
Then, user-defined function of the application for interrupt is called. (Only when user-defined function has been set.)

(5) Board number specified by the application

The following is an example of open function.

NO	Function	Board number specified by the function	Board actually activated
1	OpenMC8043P	0~9 (The value of rotary switch)	Specified board
2	OpenCard_N	1~10 (The value of rotary switch + 1)	Specified board
3	OpenCard	None specified	Board whose setting value of rotary switch is 0

When board number 1 is specified by OpenCard_N function, the board whose setting value of rotary switch is 0 opens.
When board number 10 is specified by OpenCard_N function, the board whose setting value of rotary switch is 9 opens.

(6) Simultaneous access from two applications to one board.

Do not access (like Open) simultaneously from two or more applications to one board.

(7) When modifying the existing MC8041P application to MC8043P application

See chapter 9.3 Development Procedure.

(8) When using both RR3 interrupt and the Interpolation Interrupt

When both the interrupt reported by register RR3 and the interpolation interrupt [*1] are enabled, do as follows. When checking the factor of the interrupt in the interrupt user function [*2,] read the factor of RR3 interrupt first and after that check whether the interpolation interrupt occurs or not.

Example) The Interrupt User Function Process when the interrupt occurs

1. Read the factor of RR3 interrupt by using ReadEventMC8043P[*3]. And check if there is the interrupt on RR3 or not.
2. Check if there is the interpolation interrupt or not. (Check the bit CNEXT of RR0 or the bit BPSC1, 0 of RR0)

[*1] The interrupt that occurs when the bit CNEXT(D9) of RR0 becomes 1.(when the next segment data and the interpolation command become writable during the continuous interpolation driving).
Or the interrupt that occurs when the value of the stack counter has changed into 1 from 2 during the BP interpolation.

[*2] The user function specified by SetEventMC8043P function.
(If you use the MC8041P function, it is the user function specified by OpenCard or OpenCard_N function.)

[*3] If you use the MC8041P function, it is ReadRR3 or ReadRR3_N function.

10. Specifications

- Control Axis 4 axes

PCI Bus Interface

- Data Bit Width 16 bit
- Occupied I/O Address 16 byte Address is determined by PnP.
- Interrupt IRQ Connected by PnP.

Interpolation Functions

■ 2-axis / 3-axis Linear Interpolation

- Interpolation Range Each axis -2,147,483,646～+2,147,483,646
- Interpolation Speed 1PPS ~ 4MPPS
- Interpolation Accuracy ±0.5LSB (Within the range of whole interpolation)

■ Circular Interpolation

- Interpolation Range Each axis -2,147,483,646～+2,147,483,646
- Interpolation Speed 1PPS ~ 4MPPS
- Interpolation Accuracy ±1 LSB (Within the range of whole interpolation)

■ 2-axis / 3-axis Bit Pattern Interpolation

- Interpolation Speed 1PPS ~ 4MPPS (Dependent on CPU data writing time)

■ Related functions of Interpolation

- Can select any axis
- Constant vector speed
- Continuous interpolation
- Single step interpolation (Command)

Common Specifications of Each Axis

■ Drive Pulses Output

- Pulse Output Circuit Differential line-drive (AM26C31) output
- Pulse Output Speed 1PPS ~ 4MPPS
- Pulse Output Speed Accuracy ± 0.1% (according to the setting speed)
- Speed Multiplier 1 ~ 500
- S-curve Jerk
  954~ 62.5×10^6PPS/SEC^2 (Multiple = 1)
  477 x 10^3 ~ 31.25 x 10^9PPS/ SEC^2 (Multiple =500)
- Accelerating / Decelerating Speed
  125 ~ 1 x 10^6 PPS/SEC (Multiple = 1)
  62.5×10^3 ~ 500 x 10^6 PPS/ SEC (Multiple = 500)
- Initial Speed
  1 ~ 8,000PPS (Multiple = 1)
  500PPS ~ 4×10^6 PPS (Multiple = 500)
- Drive Speed
  1 ~ 8,000PPS (Multiple = 1)
  500PPS ~ 4×10^6 PPS (Multiple = 500)
- Output-pulse Number 0 ~ 4,294,967,295/ unlimited
- Speed Curve Constant speed, symmetrical/non-symmetrical linear acceleration, symmetrical/non-symmetrical parabola S-curve acceleration/deceleration drive
- Index Drive Deceleration Mode Auto (non-symmetrical linear acceleration is also allowed) / manual
- Prevention of triangle driving profile for fixed pulse trapezoidal/S-curve acceleration
- Output-pulse numbers and drive speeds changeable during the driving
- Independent 2-pulse system or 1-pulse 1-direction system selectable
- Logical levels of drive pulse selectable

■ Encoder A/B/Z Quadrature Input

- Input Circuit High-speed photo coupler input. Connectable with differential line-driver.
- 2-phase pulse style or Up/Down pulse style selectable
- Pulse of 1, 2 and 4 divisions selectable (2-phase pulse style)

■ Position Counter

- Logic Position Counter (for output pulse) range −2,147,483,648 ~ +2,147,483,647
- Real Position Counter (for feedback pulse) range −2,147,483,648 ~ +2,147,483,647

Data read and write possible

■ Comparison Register

- COMP + Register Position comparison range −2,147,483,648 ~ +2,147,483,647
- COMP − Register Position comparison range −2,147,483,648 ~ +2,147,483,647
- Status and signal outputs for the comparisons of position counters
- Software limit functioned

■ **Automatic home search**

● Automatic execution of Step 1 (high-speed near home search) → Step 2 (low-speed home search) → Step 3 (low-speed encoder Z-phase search) → Step 4 (high-speed offset drive). Enable/Disable of each step and search direction selectable

■ **Synchronous action**

● Activation factor Transition to “position counter ≥ COMP+”, Transition to “position counter < COMP+”, Trasition to “position counter < COMP−”, Transition to “position counter ≥ COMP−”, start of driving, termination of driving, IN3 signal↑, IN3 signal↓, LP read command, activation command.

● Action Start of +/− fixed pulse drive, start of +/− continuous pulse drive, drive decelerating stop, drive instant stop, saving position counter values, setting position counter values, setting an output pulse number, setting a drive speed and interrupt

Any action of other axes can be activated from the factor of the own axis.

■ **Interrupt** (Interpolations Excluded)

● The factors of occurring interrupt:

..drive-pulse outputting
..start / finish of a constant-speed drive during the acceleration / deceleration driving
..end of the driving
..Transition to “the volume of position counter ≥ the volume of COMP−”
..Transition to ”the volume of position counter < the volume of COMP−”
..Transition to ”the volume of position counter ≥ the volume of COMP+”
..Transition to ”the volume of position counter < the volume of COMP+”
..terminating of automatic home search, synchronous action

Enable / disable for these factors selectable

■ **External Signal for Driving**

● EXPP and EXPM signals for +/- direction fixed pulse / continuous drive
● Input Circuit Photo coupler + IC built-in integral filter

■ **External Deceleration / Instant Stop Signal**

● IN0 ~ 3 4 points for each axis (IN0:encoder Z-phase input)
● Input Circuit Photo coupler + IC built-in integral filter (IN0: high-speed photo coupler input)

Enable / disable and logical levels selectable and can be used as general input.

■ **Servo Motor Input Signal**

● ALARM (Alarm), INPOS (In Position Check)
● Input Circuit Photo coupler + IC built-in integral filter

Enable / disable and logical levels selectable

■ **General Output Signal**

● OUT4 ~ 7 4 points for each axis (General output/drive status output can be switched)
● Output Circuit 74LS06 output (open collector output)

■ **Driving Status Signal Output**

● ASND (speed accelerating), DSND (speed decelerating), CMPP (position ≥ COMP+), CMPM (position < COMP−)

Drive status and status registers readable

■ **Limit Signals Input**

● 2 points, for each + and − side
● Input Circuit Photo coupler + IC built-in integral filter

Logical levels and decelerating / sudden stop selectable

■ **Emergency Stop Signal Input**

● EMGN 1 point for all axes

Stop the drive pulse immediately for all axes and logical levels selectable by jumper on the board.

● Input Circuit Photo coupler + IC built-in integral filter

Electrical Characters

● Temperature Range for Driving	0 ~ + 45°C (No condensation)
● Power Voltage for Driving	+5V ± 5 % (Consumption current 700mA max.)
● External Supply Voltage	+12 ~ 24V
● Board Dimensions	174.6 × 106.7mm (Connectors and brackets excluded)
● I/O Connector Type	FX2B-100PA-1.27DS (Hirose)
● Accessories	FX2B-100SA-1.27R (Hirose) with 1.2m cable