The invisible hand for more convenient world
Autonics sensors & controllers

Autonics
Sensors & Controllers

Programmable motion controller

PMC-2HSP/PMC-2HSN Series

USER MANUAL

PMC-2HSP/PMC-2HSN Series

Thank you very much for selecting Autonics products.

For your safety, please read the following before using.

Preface

Thank you for purchasing an Autonics product.

Please familiarize yourself with the information contained in the **Safety Precautions** section before using this product.

This user manual contains information about the product and its proper use, and should be kept in a place where it will be easy to access.

User Manual Guide

- Please familiarize yourself with the information in this manual before using the product.
- This manual provides detailed information on the product's features. It does not offer any guarantee concerning matters beyond the scope of this manual.
- This manual may not be edited or reproduced in either part or whole without permission.
- A user manual is not provided as part of the product package.
  Visit www.autonics.com to download a copy.
- The manual's content may vary depending on changes to the product's software and other unforeseen developments within Autonics, and is subject to change without prior notice. Upgrade notice is provided through out homepage.
- We contrived to describe this manual more easily and correctly. However, if there are any corrections or questions, please notify us these on our homepage.

User Manual Symbols

Symbol	Description
	Supplementary information for a particular feature.
	Failure to follow instructions can result in serious injury or death.
	Failure to follow instructions can lead to a minor injury or product damage.
	An example of the concerned feature's use.
※1	Annotation mark.

Safety Precautions

- Following these safety precautions will ensure the safe and proper use of the product and help prevent accidents and minimize hazards.
- Safety precautions are categorized as Warnings and Cautions, as defined below:

Warning	**Warning**	Cases that may cause serious injury or fatal accident if instructions are not followed.
Caution	**Caution**	Cases that may cause minor injury or product damage if instructions are not followed.

Warning

- In case of using this unit with machineries (Nuclear power control, Medical equipment, vehicle, train, airplane, combustion apparatus, entertainment or safety device etc), it is require to install fail-safe device, or contact us.
  It may cause a fire, human injury or property loss.
- Please read and fully understand this user manual prior to operating the unit.
  Non-compliance may cause mechanical loss, injury or malfunction due to wrong operation.
- Avoid using the unit where flammable or explosive gas or direct ray of the light exists.
  Non-compliance may cause electric shock, fire, personal injury or damage to property.
- Limit switches and emergency stop switches should be installed where dangerous accident-prone environments.
  It may cause a fire, human injury or property loss.
- Install with the plan for power failure.
  It may cause a fire, human injury or property loss.
- Keep any impurities from entering into ventilation window.
  It may cause fire, failure, damage or degradation.
- Power input shall supply rectified power through the insulated transformer.
  It may give an electric shock and cause a fire or human injury.
- Confirm the power input specification and connect the power after checking the input terminal.
  Non-compliance may lead to fire.
- Do not wire, inspect or repair when the power is applied.
  It may cause an electric shock, damage or malfunction.

- Do not cut off power or disconnect connectors while operating the unit.
  It may cause personal injury, damage to property or wrong operation.
- Do not disassemble or alter the unit.
  It may cause an electric shock or a fire.
- Confirm that power cables and signal cables are firmly fixed.
  It may cause an electric shock, fire and malfunction.
- Power connector and connector screw for RS485 should be tightened under 0.4N·m.
  It may break screw and cause a bad connection.
- Use AWG 28-16 line for the power line.
  Non-compliance may lead to the outbreak of fire.
- If a ribbon cable is used as the I/O line, connect the cable correctly and prevent from poor contact.
  The poor contact may cause wrong operation.
- Connect after checking the connector specification and format.
  The use of wrong connector may cause fire, electric shock or damage to the product.
- Use the product at the range of the range/performance.
  Non-compliance may decrease the life cycle and lead to fire.
- In wiring, possibly separate cables from the power line, the load line not to be affected by noise.
  The noise mat lead to wrong operation and damage to product.
- In cleaning unit, do not use water or an oil-based detergent and use dry towels.
  It may cause an electric shock, fire or damage.
- Please handle it as industrial waste for exhausting.
- This product has obtained electromagnetic compatibility registration for business (Level A). Distributor and user should be sure this and this product is intended for use except home.

※ The specifications and dimensions of this manual are subject to change without any notice.

Table of Contents

1 Product Overview

1.1 Features

PMC-2HSP/2HSN series is a Motion Controller that controls positions and speeds of pulse input stepper motors or servo motors. This standalone type product runs the built-in program with or without a PC by means of Parallel I/F. PMC-2HSP/2HSN series can use functions such as interpolation(for PMC-2HSP series), generic input/output, S curve accel/decel and home search. It also controls up to 16 nodes (total 32 axes) through RS485 communications.

- Saves up to 200 program data
- 2-axis control
- Connects max. 16 nodes (2 axes x 16 nodes = a total of 32 controllable axes)
- Supports USB, RS232C, RS485 communications
- Supports max. 4Mpps speed
- Controls with Parallel I/F is available Parallel
- Major fields of application
  - For transfer and assembly: feeder, loader/unloader, conveyor
  - Industrial machines: packing machine, semiconductor, processor, cutting machine, XY table
  - Peripherals: pallet

1.2 Model Lineup

PMC	-	2HSP	-	USB/485
①		②		③

Item		Description
① Series	PMC	Programmable Motion Controller
② Number of axes /Type	2HSP	2-axis high speed interpolation
	2HSN	2-axis high speed normal
③ Communications method	USB	USB/RS232C communications
	485	RS485/RS232C communications

1.3 Basic Operations

There are 2 methods of operating the Motion Controller.

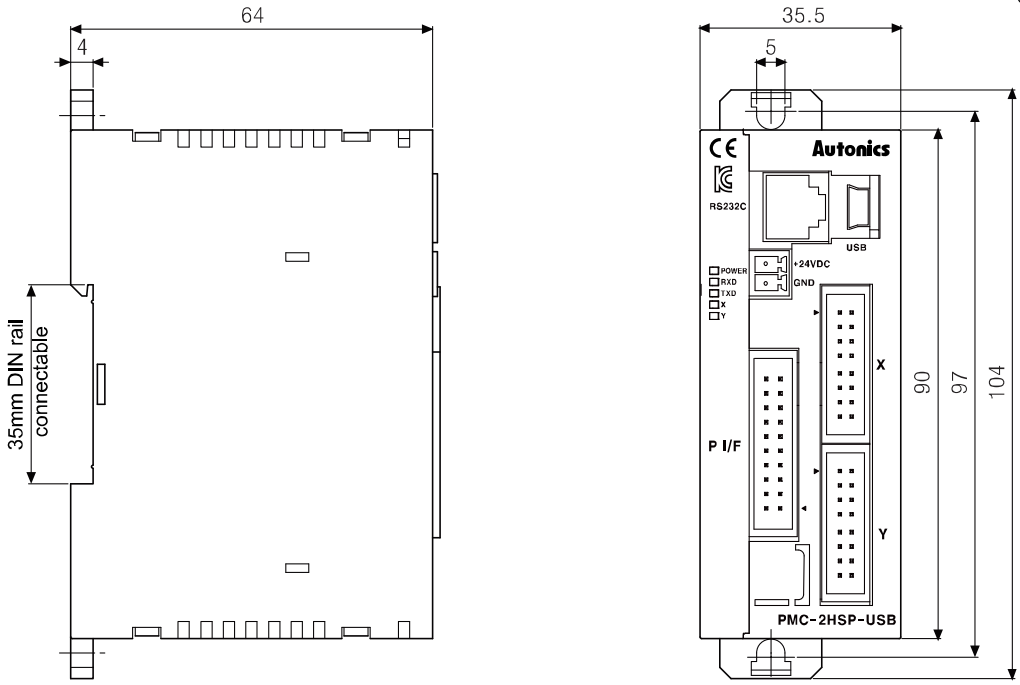
- Using PC (MotionStudio): Operates by connecting PC and motion controller with communications cable and running MotionStudio.
  For further details, refer to '3 MotionStudio'.
- Using Parallel I/F: Operates by connecting sequence controller or switch to Parallel I/F.
  For further details, refer to '4 Basic Control using MotionStudio and Parallel I/F'.

2 Product Specifications

2.1 Dimensions

2.1.1 PMC-2HSP/2HSN series

(Unit:mm)



Note

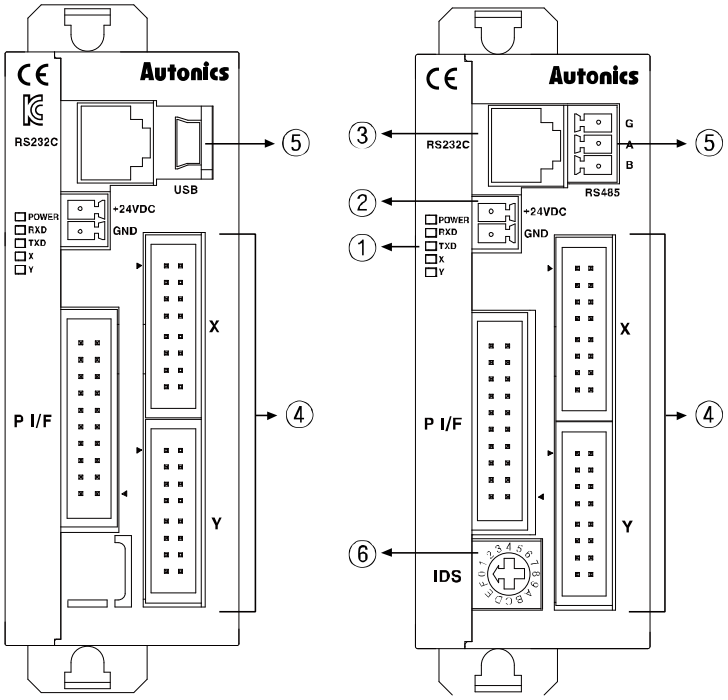
The size of PMC-2HSP series is the same as PMC-2HSN series.

Above image may be a little from real product.

2.2 Parts and Part Functions

● PMC-2HSP-USB
PMC-2HSN-USB

● PMC-2HSP-485
PMC-2HSN-485



① Power and status display
Displays power, transmission/reception of the controller and axis operation status on LED.

② Power connector
Connects motion controller's power supply.

③ RS232C connection connector
Connects RS-232 Serial(RJ12-DSUB9) connection cable.

④ Connection connector for Parallel I/F and X, Y axis control
It is used to control motion controller using external signals, and to connect X, Y axis drivers.

⑤ RS485/USB connection connector
Connects USB and RS485 connection cable.

⑥ ID Select switch
Sets individual ID for each node when communicating with RS485.

2.3 Specifications

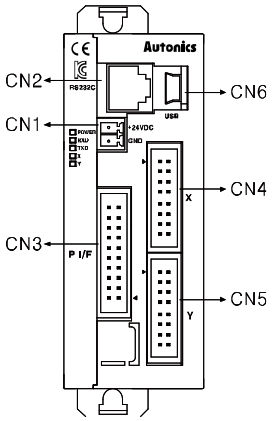
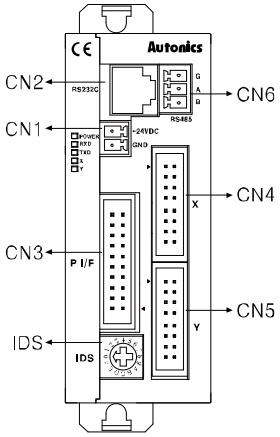
Series	PMC-2HSP series		PMC-2HSN series	
Model	PMC-2HSP-USB	PMC-2HSP-485	PMC-2HSN-USB	PMC-2HSN-485
Number of control axes	2-axis			
Source voltage	24VDC ±10%			
Power consumption	6W Max.			
Position range	-8,388,608 to +8,388,607 (Enables to assign relative/absolute values, supports pulse scaling)			
Motor to control	Pulse string input stepping motor or servo motor			
Run speed	1PPS to 4MPPS (1 to 8,000PPS × 1 to 500 Multipliers)			
Pulse output method	Supports 1 pulse / 2 pulse output type (Line Driver output)			
Run mode	Jog mode			
	Continuous mode			
	Index mode (number of assignable indices: 0 to 63, total 64EA)			
	Program mode	ABS(Move absolute position)		
		INC(Move relative position)		
		HOM(Home search)		
		LID(2-axis liner interpolation)	-	
		CID(2-axis CW circle interpolation)	-	
		FID(2-axis CW circle interpolation)	-	
		RID(2-axis CCW circle interpolation)	-	
		TIM (Timer)		
		JMP (Jump)		
		REP (Start repeating)		
		RPE (Stop repeating)		
		ICJ (Jump input condition)		
		IRD (Waiting external input)		
		OPC (Output port ON/OFF)		
		OPT (Output port ON pulse)		
		NOP (No Operation)		
		END (End the program)		
		Step numbers of program: 200EA, Power on program start function		
Home search	Home search function using 4steps:	High-speed near home search, low speed home search Low-speed Z-phase search, high-speed offset movement		
	Power on home search function			
I/O	Parallel I/F(CN3): Input/output: 13/4 EA			

Series		PMC-2HSP series		PMC-2HSN series	
		X axis (CN4): Input/output: 8/6 EA, (general purpose I/O: 2/2 EA)			
		Y axis (CN5): Input/output: 8/6 EA, (general purpose I/O: 2/2 EA)			
Environment	Ambient temperature	0 to 45°C, Storage temperature: -15 to 70°C			
	Ambient humidity	20 to 90% RH, Storage humidity: 20 to 90% RH			
Accessories		Power connector, I/O connector(P I/F, X axis, Y axis, RS-232C communications cable(1.5m x 1EA), User guide			
		1 of 1 m USB communications cable	1 RS485 connector	1 of 1 m USB communications cable	1 RS485 connector
Approval		CE,	CE	CE,	CE
Unit weight		Approx. 102g	Approx. 101g	Approx. 102g	Approx. 101g

※1. These modes are available only for PCM-2HSP series.

※Environment resistance is rated at no freezing or condensation.

2.4 External I/O Specifications

PMC-2HSP/2HSN-USB	PMC-2HSP/2HSN-485	Connector	Description
		CN1	Power connector
		CN2	RS232C connector
		CN3	Parallel I/F connector
		CN4	X axis input/output connector
		CN5	Y axis input/output connector
		CN6	USB connector / RS485 connector
		IDS	ID select switch

2.4.1 Power connector(CN1)

Connects DC 24 V of electricity. Connect properly with right polarities. The power is not on if polarities are reversed.

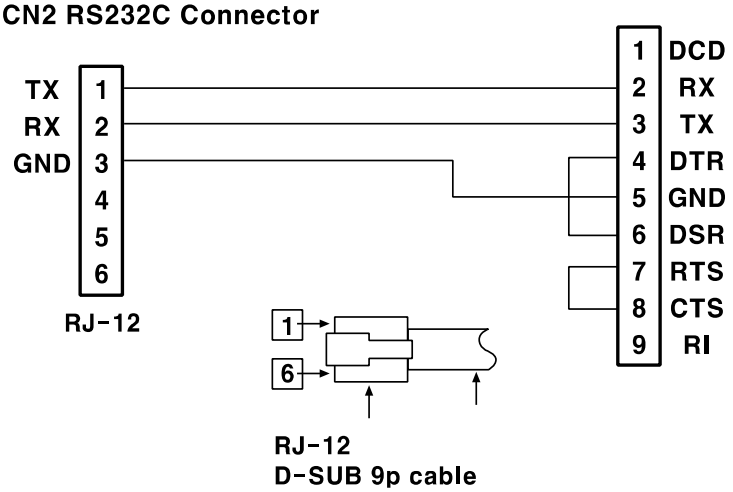
Pin number	Signal
1	24VDC
2	GND (0V)

2.4.2 RS232C Connector(CN2)

This is a serial communications cable (RJ12 - D SUB) provided for editing or manual operations with MotionStudio. It connects the communications ports of CN2 and PC.

Pin number	Signal	I/O	Description
1	TXD	Input	Transmitted data
2	RXD	Output	Received data
3	GND	-	Ground
4	-	-	Do not connect anything
5	-	-	Do not connect anything
6	-	-	Do not connect anything

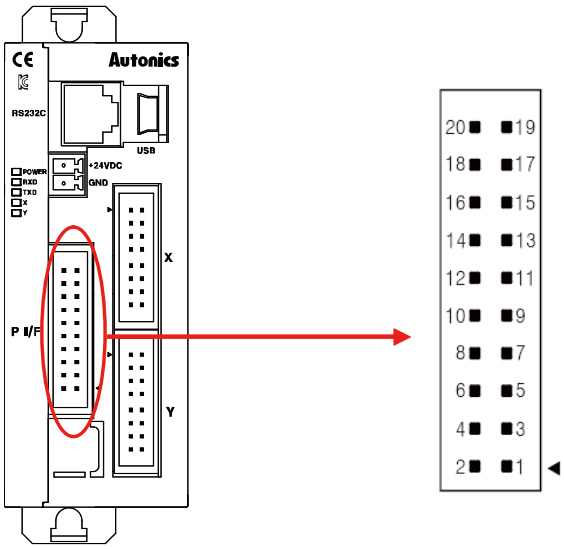
PMC-2HSP, PMC-2HSN
CN2 RS232C Connector



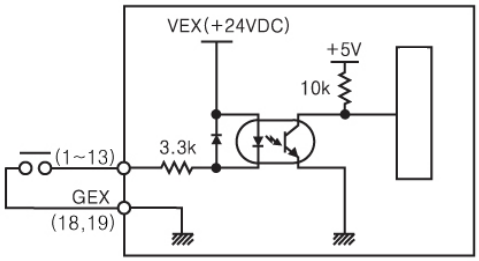
2.4.3 Parallel I/F Connector(CN3)

Multiple run modes can be operated through external Parallel I/F input/output ports. The usage of each input/output port is listed in the table below.

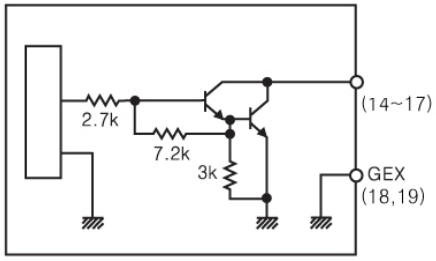
The parallel I/F connector deployment of PMC-2HSP/2HSN-USB is the same as that of PMC-2HSP/2HSN-485 model.



Pin number	Signal	I/O	Description
1	RESET	Input	Reset
2	HOME	Input	Home search
3	STROBE	Input	Start drive
4	X/JOG Y+	Input	Assign X axis/Jog 2 mode Y+
5	Y/JOG Y-	Input	Assign Y axis/Jog 2 mode Y-
6	STEPSL0/RUN+/JOG X+	Input	Assign step 0/Run+/Jog 2 mode X+
7	STEPSL1/RUN-/JOG X-	Input	Assign step 1/Run-/Jog 2 mode X-
8	STEPSL2/SPD0	Input	Assign step 2/assign drive speed 0
9	STEPSL3/SPD1	Input	Assign step 3/assign drive speed 1
10	STEPSL4/JOG	Input	Assign step 4/assign jog
11	STEPSL5/STOP	Input	Assign step 5/stop drive
12	MODE0	Input	Assign run mode 0
13	MODE1	Input	Assign run mode 1
14	X DRIVE/END	Output	X axis driving/drive end pulse
15	Y DRIVE/END	Output	Y axis driving/drive end pulse
16	X ERROR	Output	X axis error
17	Y ERROR	Output	Y axis error
18	GEX	-	Ground (0 V)
19	GEX	-	Ground (0 V)
20	VEX	-	Outputs power for sensor (DC 24V, less than 100mA)



< CN3 control input signal circuit >



< CN3 control output signal circuit >

Caution

Pins with more than one function have different usage for each mode. Confirm the mode you are using.

(1) Pin number 1: RESET (input, reset)

When the signal is ON, present position value becomes 0. If it is in error state, the error state is to be reset. It can also be used as an emergency stop signal because it stops immediately when driving.

Caution

Be careful if you use RESET while in high-speed. It stops immediately and may cause injury or damage to the product.

(2) Pin number 2: HOME (input, start home search)

If HOME signal is ON and the both signals assigned to X and Y axes (Pin 4 and 5) are ON, X and Y axes start home search at the same time. If only one axis is assigned, only the relevant axis starts home search. Keep the signal ON for at least for 10msec.

(3) Pin number 3: STROBE (input, start the drive)

This is a start signal when in index or program mode. Assign step numbers (Pin 6 to11) and X, Y axes (Pin 4, 5) then turn the signal ON to start the drive. Keep the signal ON for at least for 10msec.

(4) Pin number 4: X / JOG Y+ (input, assign X axis/jog 2 mode Y+)
Pin number 5: Y / JOG Y- (input, assign Y axis/jog 2 mode Y-)

These signals are used for the following two purposes.
X, Y: Used as a signal to assign each X, Y axis when in index mode, jog 1 mode, continuous mode, program mode and home search. When used as a signal to assign an axis, the signal must be in ON state before drive start signal is permitted (before turn STROBE/RUN signal ON) to select relevant axis.
JOG Y+, JOG Y-: When using jog 2 mode, the pin is used as a signal to start drive in the + or - direction of Y axis.

(5) Pin number 6: STEPSL0 / RUN+ / JOG X+ (input, assign step 0/run+/jog 2 mode X+)
Pin number 7: STEPSL1 / RUN- / JOG X- (input, assign step 1/run-/jog 2 mode X-)

These signals are used for the following three purposes.

- STEPSL0, STEPSL1: To assign starting numbers when using index mode. When the drive start signal is ON, the drive will be kept even if the step number assign signal is OFF. Assign step start number of a program stored in Motion Controller memory, using a combination of signals from STEPSL 0 to 5 as a binary number. STEPSL0 is used as a bottommost bit and STEPSL5 is used as an uppermost bit.
  Like the example on the next page, you can assign 0 to 63 program steps using a combination of 6 STEP signals as a binary number. However, 64 to 199 program steps cannot be assigned.

Ex.

Assigning program steps

Step number	STEPSL0	STEPSL1	STEPSL2	STEPSL3	STEPSL4	STEPSL5
0	OFF	OFF	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF	OFF
3	ON	ON	OFF	OFF	OFF	OFF
~						
20	OFF	OFF	ON	OFF	ON	OFF
21	ON	OFF	ON	OFF	ON	OFF
22	OFF	ON	ON	OFF	ON	OFF
23	ON	ON	ON	OFF	ON	OFF
~						
60	OFF	OFF	ON	ON	ON	ON
61	ON	OFF	ON	ON	ON	ON
62	OFF	ON	ON	ON	ON	ON
63	ON	ON	ON	ON	ON	ON

- RUN+, RUN-: When using continuous mode or jog mode, RUN+ and RUN- are respectively used as + direction and – direction drive start signals.
- JOG X+, JOG X-: When using jog 2 mode, JOG X+ and JOG X- are respectively used as + direction and – direction drive start signals of X axis.

(6) Pin number 8: STEPSL2 / SPD0 (input, assign step 2 / assign drive speed 0)
Pin number 9: STEPSL3 / SPD1 (input, assign step 3/assign drive speed 1)

These signals are used for the following two purposes.

- STEPSL2, STEPSL3: Same as STEPSL0, 1 of pin number 5.
- SPD0, SPD1: Used as a drive speed decision signal with a combination of SPD0 and SPD1 in jog and continuous pulse drives. You can select from 1 to 4 drive speed parameters that are stored in motion controller memory.

Ex.

Assigning drive speed

	SPD1(9)	SPD0(8)
Drive Speed 1	OFF	OFF
Drive Speed 2	OFF	ON
Drive Speed 3	ON	OFF
Drive Speed 4	ON	ON

(7) Pin number 10: STEPSL4 / JOG (input, assign step 4/assign jog)

These signals are used for the following two purposes.

- STEPSL4: Same as STEPSL0, 1 of pin number 5.
- JOG: Operates in jog 1 mode if jog signal is OFF, and in jog 2 mode if it is ON, when run mode is set to jog drive.

(8) Pin number 11: STEPSL5 / STOP (input, assign step 5 / stop drive)

These signals are used for the following two purposes.

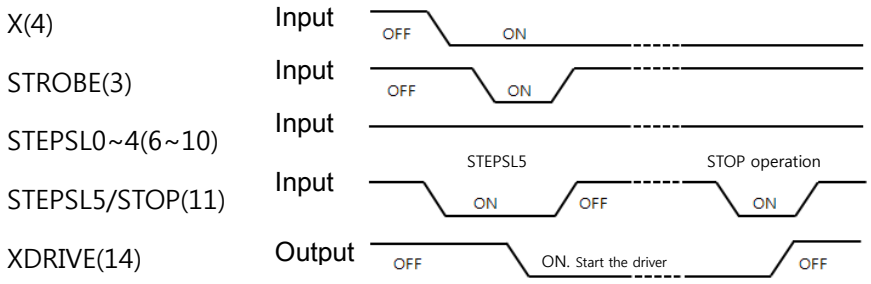
- STEPSL5: Same as STEPSL0, 1 of pin number 5.
- STOP Used as a drive stop signal for the relevant axis according to the X, Y axes assign signal (Pin4, 5) selection. Keep the signal ON for at least for 10msec. Functions differently according to the run mode, as described in the table below.

Note

As STEPSL5 and STOP signals share pin number 11 in index or program mode, pay attention to the point of signal ON. (Operates with STOP signal in continuous mode and home search.)

- When stopped: Operates with STEPSL5 signal (drive is kept even if OFF after drive start signal is ON.)
- While driving: Operates with STOP signal (operates when ON after the STEPSL5 signal is OFF.)

If the drive stopped, restore STOP signal to OFF. If it stays ON, drive cannot be carried out. Refer to the figure below.



(9) Pin number 12: Mode 0 (input, assign run mode 0)
Pin number 13: Mode1 (input, assign run mode 1)

This signal is used to assign run mode. Refer to the table.

Mode 1 (Number13)	Mode 0 (Number 12)	Run mode
OFF	OFF	Index mode
OFF	ON	Jog mode※1
ON	OFF	Continuous mode
ON	ON	Program mode

※1. Runs in jog 1 mode when pin number 10 JOG signal is OFF. Runs in jog 1 mode when JOG signal is ON.

(10) Pin number 14: X DRIVE / END (output, driving X axis/drive end pulse)
Pin number 15 Y DRIVE / END (output, driving Y axis/drive end pulse)

These output signals are used for following two purposes

- X DRIVE, Y DRIVE: Used as a n DRIVE signal if you set the end pulse to disable in MotionStudio's operation mode. It outputs ON when drive pulse is being produced on each axis.
- END: If you set as enable end pulse in operation mode of MotionStudio, output is ON as much as value set for end pulse width in the parameter section after completing drive pulse output. Drive related commands (ABS, INC, HOM, LID, CID, FID, RID) in program mode have a separate field to specify whether to end pulse. In addition, in program mode, the next step proceeds only after end pulse is complete.

Setting n DRIVE / End Pulse

Run mode	End Pulse is disable	End Pulse is enable
Home search	n DRIVE output is ON while running home search/OFF when ended.	Output is OFF while running home search. When Home search ended, output is ON as much as the End Pulse Width.
Jog drive Continuous pulse drive	n DRIVE output is ON while running the drive/OFF when finished.	Output is OFF while running the drive. When Home search ended, output is ON as much as the End Pulse Width.
Index drive Program drive	n DRIVE output is ON while executing drive command/OFF when ended.	Output is OFF while executing drive command. End Pulse is Enabled On when drive instructions end.

Ex.

End Pulse combinations

Run mode	End Pulse setting	Program commands※1 End Pulse setting	n DRIVE	End Pulse
Jog or continuous pulse drive	Disable	-	ON	OFF
	Enable	-	OFF	ON
Index or program drive	Disable	0	ON	OFF
	Disable	1	ON	OFF
	Enable	0	OFF	OFF
	Enable	1	OFF	ON

※1. Program commands: ABS, INC, HOM, LID, CID, FID, RID

Ex.

If end pulse in the parameter section is set to disable and end pulse of INC command is set to 0:
n DRIVE signal output is ON while driving and the signal is OFF when finished. In this case, pulse does not operate in either status.

(11) Pin number 16: X ERROR (output, X axis error)
Pin number 17: Y ERROR (output, Y axis error)

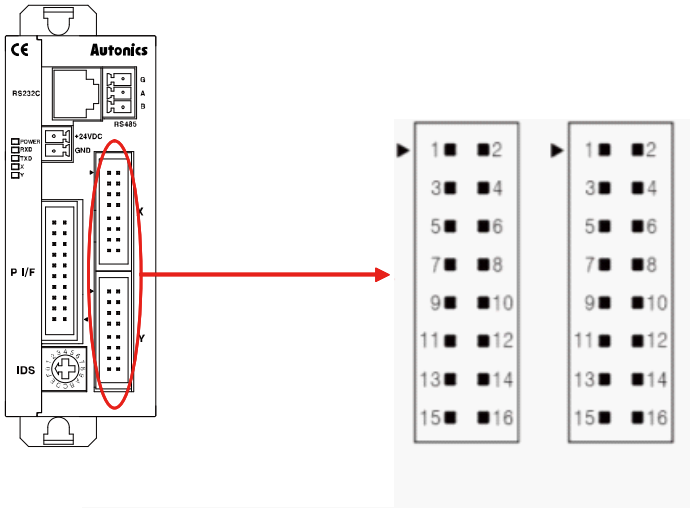
It is ON if any error occurred in each axis control.
For detailed error descriptions, refer to error messages in '3.4.6 Message'.

(12) Pin number 20: VEX (output, outputs power for sensor)

Supplies power to external sensors such as limit sensor and home sensor. Rated specifications are DC 24V and less than 100 ㎃. VEX power is supplied to each of CN3, 4 and 5. Make sure the total current of the 3 connectors is below 300 ㎃.

2.4.4 X, Y Axes I/O Connectors (CN4, 5)

CN4, 5 are composed of input/output ports for drives to run. The usage of each input/output port is listed in the table below. Pin deployments for CN4 and CN5 are the same.



※ CN4, CN5 connector deployments of PMC-2HSP/2HSN-USBare the same as for PMC-2HSP /2HSN-485 model.

Pin number	Signal	I/O	Description
1	n P+P	Output	CW+ drive pulse
2	n P+N	Output	CW- drive pulse
3	n P-P	Output	CCW+ drive pulse
4	n P-N	Output	CCW- drive pulse
5	n OUT0	Output	General purpose output 0
6	n OUT1	Output	General purpose output 1
7	n IN0	Input	General purpose output 0
8	n IN1	Input	General purpose output 1
9	n STOP2	Input	Encoder Z-phase
10	n STOP1	Input	Home
11	n STOP0	Input	Near home
12	n LMT+	Input	+ direction limit
13	n LMT-	Input	-+ direction limit
14	EMG	Input	Emergency stop
15	GEX	-	Ground (0V)
16	VEX	-	Outputs power for sensor (DC 24 V, less than 100 ㎃)

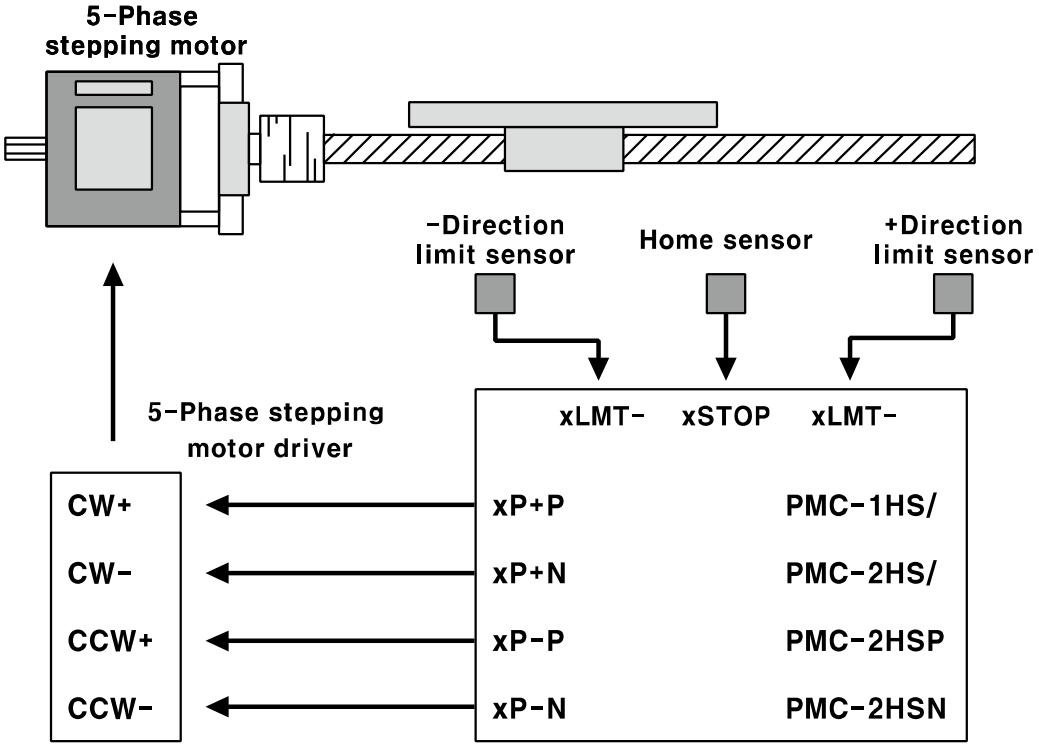
Input/output of CN4 and 5 (except drive pulse) are the same as CN3's input/output circuits.

Drive pulse output of a Motion Controller which enters to motor driver, is line driver output.

(1) Pin number 1 : n P+P (output, CW+ drive pulse)
Pin number 2 : n P+N (output, CW- drive pulse)
Pin number 3 : n P-P (output, CCW+ drive pulse)
Pin number 4 : n P-N (output, CCW- drive pulse)

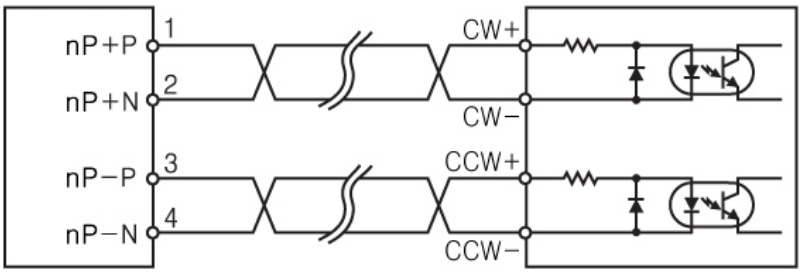
Drive pulse signal of a Motion Controller is output from line driver of differential outputs. n P+N is the invert output of n P+P, n P-N is the invert of n P-P. The following diagram is an example of connection with motor drivers.

Connection with a motor driver



Ex.

Connection with a motor driver



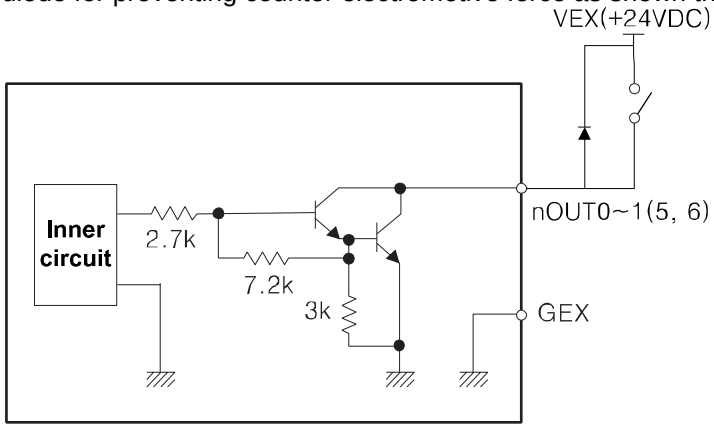
Note

PMC-2HSP/2HSN sereis supports 1/2 pulse output method.

For further details, refer to '3.4.5 Node Information'.

(2) Pin number 5: n OUT0 (general purpose output 0)
Pin number 6: n OUT1 (general purpose output 1)

These are general purpose outputs of which ON/OFF can be controlled with program operations. Program instruction OPC (ON/OFF output port) and OPT (ON pulse of output port) are used to control output.
When controlling the coil load like relay in general purpose output, install the free-wheeling diode for preventing counter electromotive force as shown the picture.



(3) Pin number 7: n IN0 (general purpose output 0)
Pin number 8: n IN1 (general purpose output 1)

You can create a program using general purpose input signals. Set logical levels at input 0, 1 (general purpose input 0, 1) levels in operation mode. If the input signal is connected to GEX it is activated on low signal, and is activated on high signal if it is open. Program instruction ICJ (jump input condition) and IRD (waiting input) are used for control.

(4) Pin number 9: n STOP2 (input, Z-phase encoder)
Pin number 10: n STOP1 (input, home)
Pin number 11: n STOP0 (input, near home)

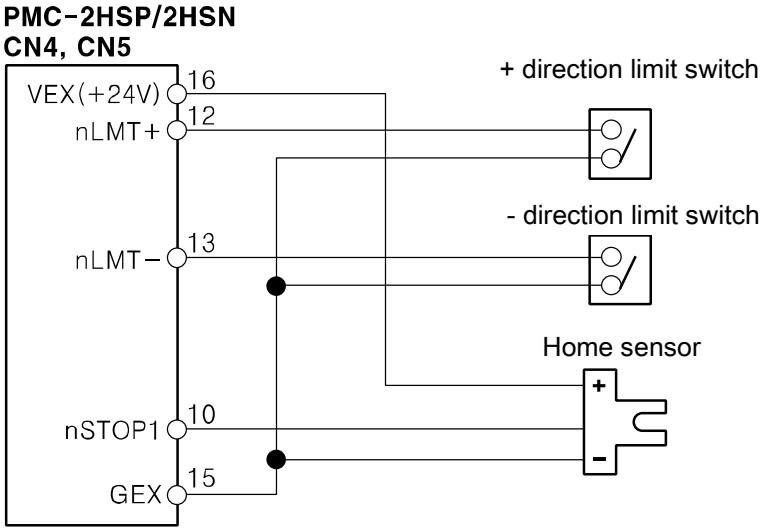
These are input signals for home search.
For further details, refer to '5.3 Home Search'.

(5) Pin number 12: n LMT+ (input, + direction limit)
Pin number 13: n LMT- (input, – direction limit)

Input signal n LMT+ is a + direction limit signal. If n LMT+ becomes active during + direction drive pulse output, the drive reduces speed or stops immediately. Alternatively, input signal n LMT- is a - direction limit signal. If n LMT- becomes active during - direction drive pulse output, the drive reduces speed or stops immediately. Even if n LMT+/n LMT- input signals remain active after stop, drive in the opposite directions of each limit sensor is available. You can set limit stop mode and limit active level in operation mode. The following image shows an example of connection between limit signal and home signal.

Ex.

Limit signal and home signal connection example



(6) Pin number 14: EMG (input, emergency stop)

You can stop all driving axes immediately by turning EMG signal ON. Keep this signal OFF and turn ON only in emergency situations by connecting with GEX. The logical level of EMG signal is fixed to low active.

Caution

Be careful with EMG signal. It may cause injuries or product damage if you use emergency stop during high-speed drive, because it stops immediately when EMG signal is applied.

(7) Pin number 16: VEX (output, outputs power for sensor)

Supplies power to external sensors such as limit sensor and home sensor. Rated specifications are DC 24 V and less than 100 ㎃. VEX power is supplied to each of CN3, 4 and 5. Make sure the total current of the 3 connectors is below 300 ㎃

2.4.5 Communications I/O Configurations of PMC-2HSP/2HSN series (CN6)

For further details, refer to '6 Communication Specification'.

	PMC-2HSP/2HSN-USB		PMC-2HSP/2HSN-485	
Pin number	**Signal**	**Description**	**Signal**	**Description**
1	V+	5V power	B(-)	Differential
2	DM	USB Data Signal -	A(+)	
3	DP	USB Data Signal +	GND	Connect as needed according to the communications environment
4	ID	Do not connect anything	-	-
5	GND	Ground	-	-

2.4.6 Node ID Select Switch (IDS)

Only PMC-2HSP/2HSN-485 model has node ID Select switch, which is used to set unique IDs for each node. When you are controlling multiple axes, you must assign different IDs for each node.

For further details, refer to '6.4 RS485 Communication'.

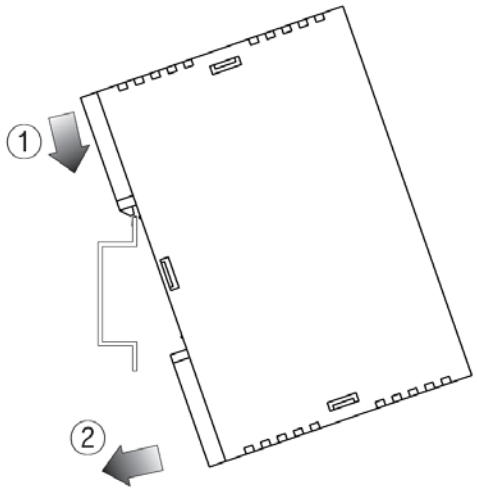
Caution

Entering a duplicate ID may result in malfunction and product damage. Make sure to check the ID before use.

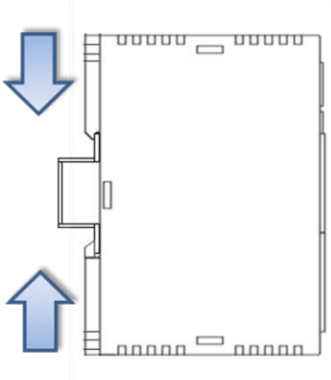
2.5 Product Installation

2.5.1 Mounting DIN Rail

1st Insert the DIN rail into the groove at the top of main system.



2nd Engage the top and bottom rail locks. Push until it clicks and the rail locks firmly fix the DIN rail.



To dismount from the DIN rail, perform the above steps in reverse order.

Note

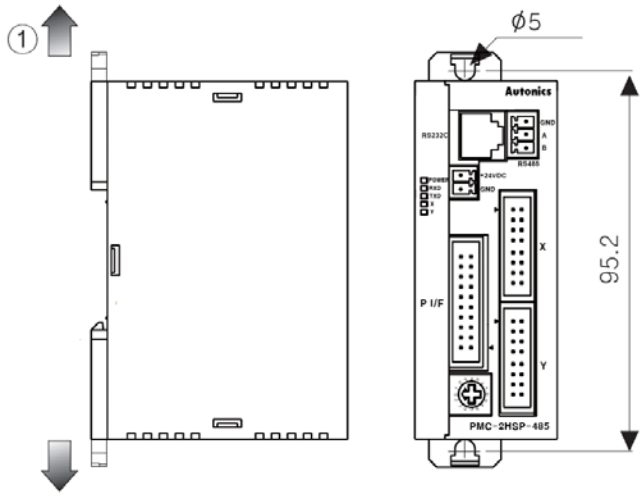
Use a DIN rail with a rail width of 35 mm.

Make sure the DIN rail is seated on a vertical surface.

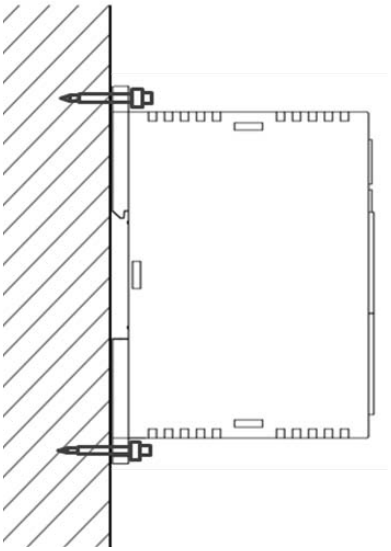
DIN rail and End PLATE are not included with the product and are sold separately.

2.5.2 Inserting Bolts

1st Pull top and bottom rail locks up and down respectively.



2nd Insert bolts and tighten them. (with tightening torque of 0.5N•m to 0.9 N•m.)



3 MotionStudio

MotionStudio is a PC program designed to control Motion Controllers. A PC and a Motion Controller have a master - slave relationship. The PC acts as the master, and the Motion Controller acts as the slave. PC (master) and Motion Controller (slave) are connected via communications.

3.1 MotionStudio Specifications

- Microsoft Windows 98, NT, 2000, XP(32/64bit), Vista(32/64bit), 7(32/64bit) compatible
- Supports 9,600, 19,200, 38,400, 57,600, 115,200 bps communication speed
- Available to use on all OSs supported COM ports (COM1 to COM254)
- Multilingual support (Korean, English)
- Provides a calculator for convenience
  - PMC-2HSP series: Calculates output PPS, center and end coordinates of interpolation, manual deceleration point
  - PMC-2HSN series: Calculates output PPS

3.2 USB Driver Installation

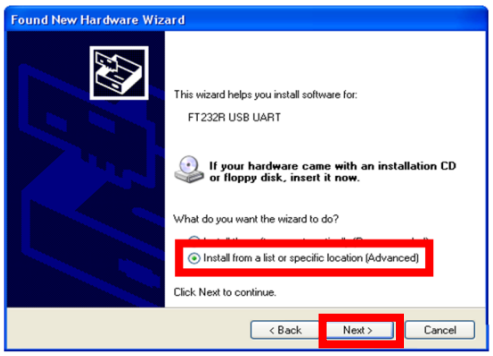
USB driver must be installed prior to using a USB port.

- When searching hardware automatically,

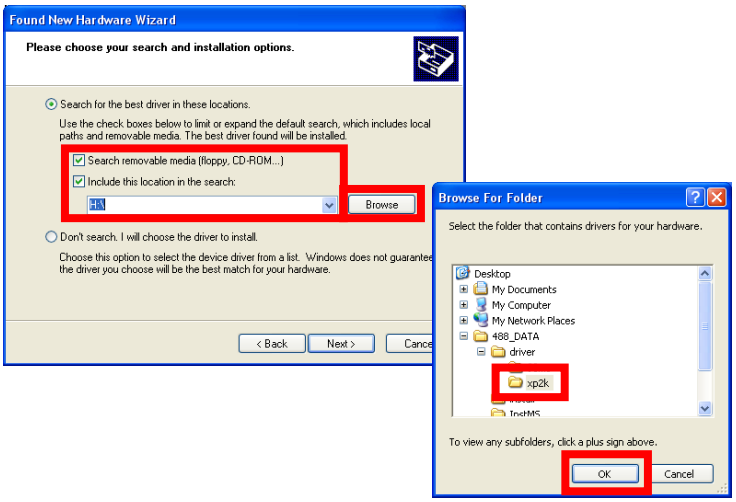
1st Unzip the new version FT232R device driver in the desired folder.

2nd Connect PC and motion controller using USB communication cable and then turn power ON.

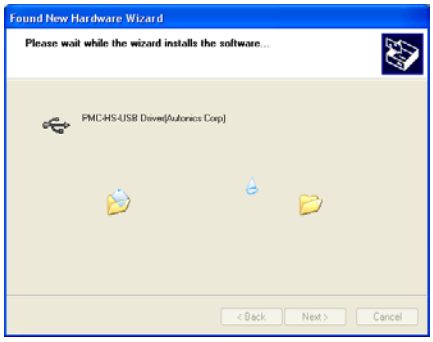
3rd [Found New Hardware Wizard] automatically executes. Select [Install from a list or specific location(Advanced)] and click [Next].

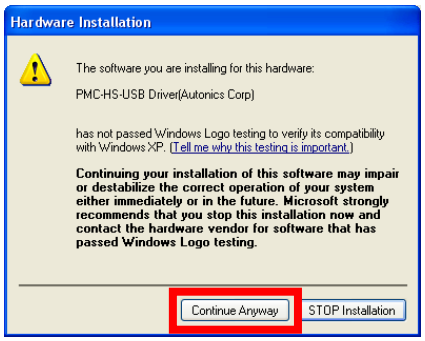


4th Select [Include this location in the search] and click [Browse] then [Browse For Folder] dialog box is open. Specify the foler which the file is in and click [OK]. When back to the [Found New Hardware Wizard], click [Next].

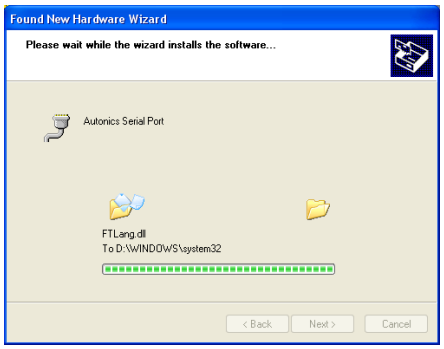


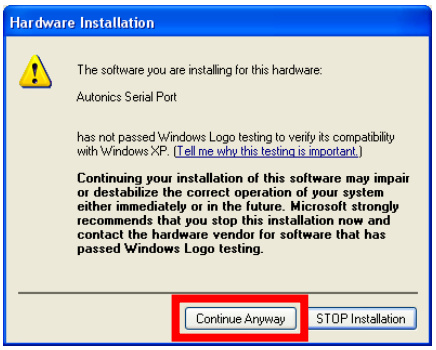
5th [Hardware Installation] dialog box is open, and click [Continue Anyway] to complete the driver installation.





6th After the driver installation is complete, install the applicable port. Installations of serial ports are same as 3rd, 4th steps. [Hardware Installation] dialog box is open, and click [Continue Anyway] to complete the applicable port installation.



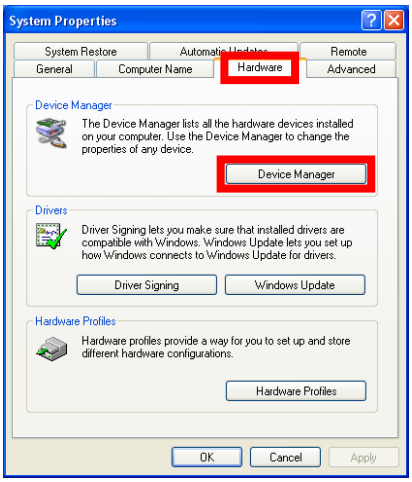


7th Click [Finish] to complete the USB driver installation.

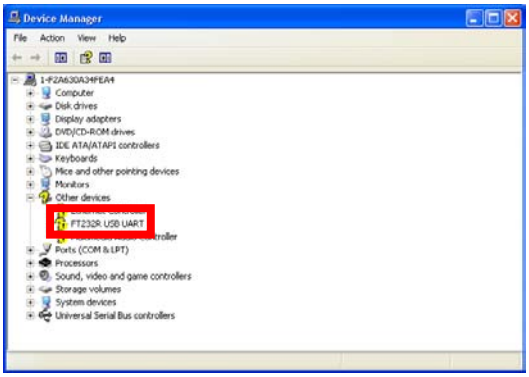
- When it is not searching hardware automatically,

1st Go to [Start]-[Control Panel]-[System]-[Hardware] tab.

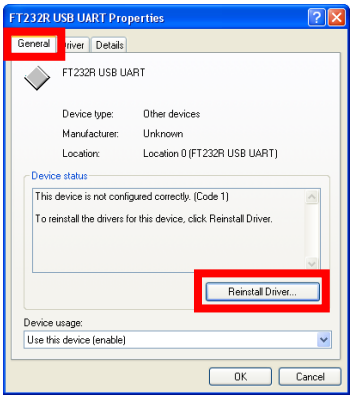
2nd Click [Device Manager] button to open [Device Manager] dialog box on [Hardware] tab.



3rd Double-click [FT232R USB UART] under [Other devices].



4th [FT232R USB UART Properties] is open and click [Reinstall Driver] on [General] tab.

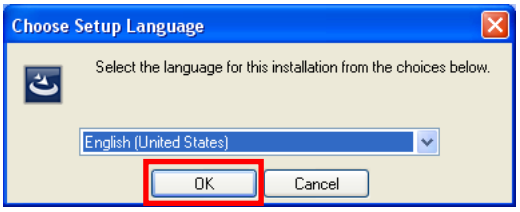


5th The following steps are the same as “When searching hardware automatically,” steps.

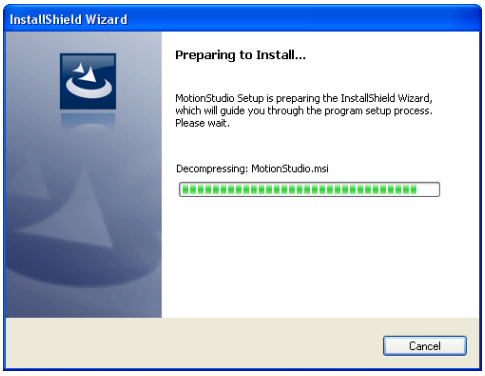
3.3 Installing and Uninstalling the Program

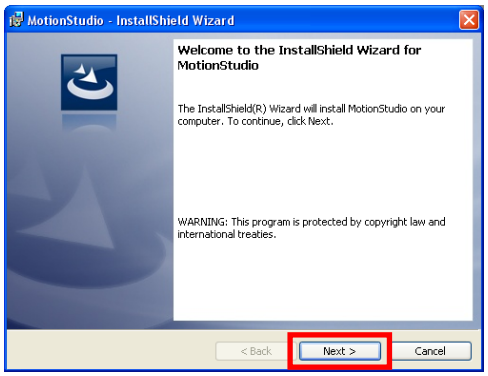
1st Run the setup file (MotionStudio.exe).

2nd Choose a setup language and click [OK]. (The following steps are an example with English selected.)

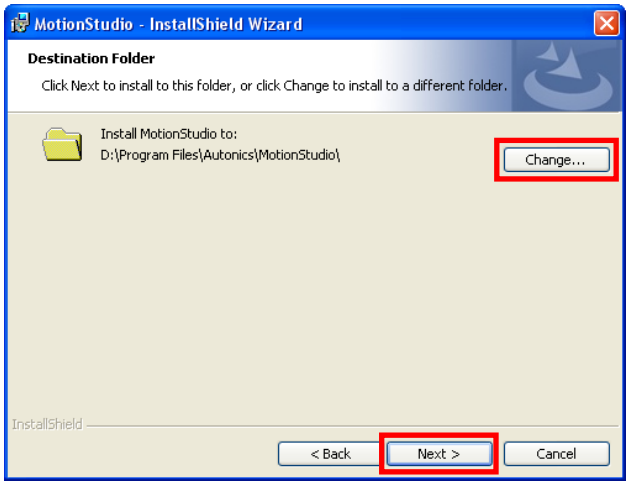


3rd Click [Next] when [InstallShield Wizard] is ready.

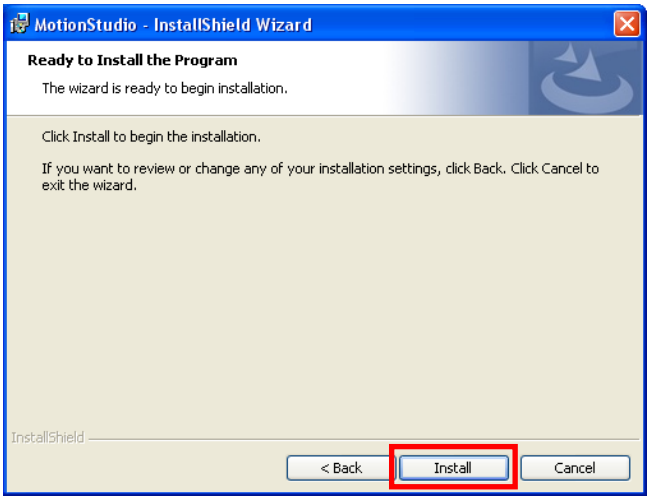




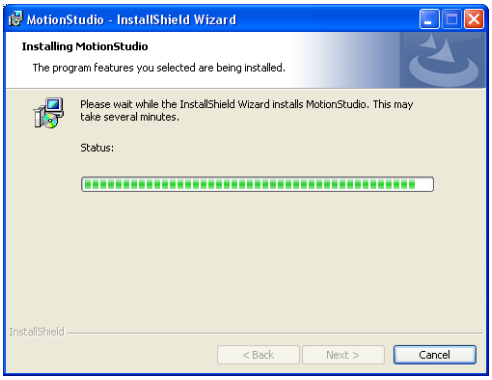
4th Specify installation foler and click [Next]. (If you want to change the installation folder, click [Change] and re-specify the folder.)

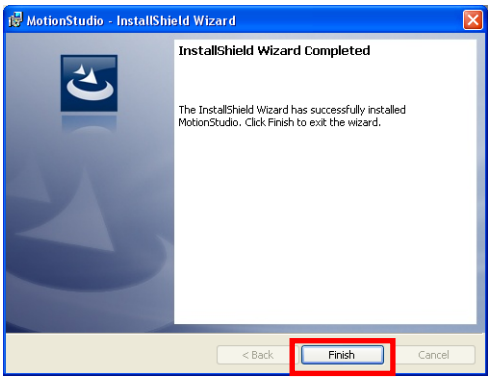


5th Click [Install] when the wizard is ready to begin installation.

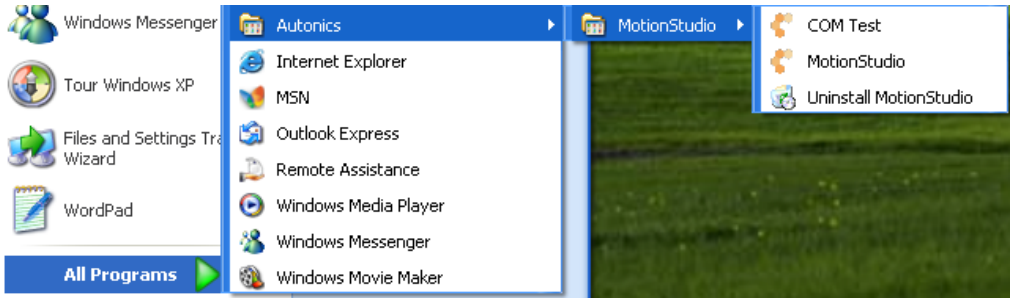


6th Click [Finish] after the wizard proceeds and completes the installation.

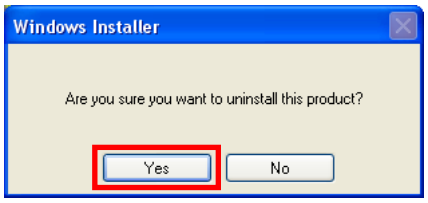




7th Go to [Start]-[All Programs]-[Autonics]-[MotionStudio]-[MotionStudio] to run the program.



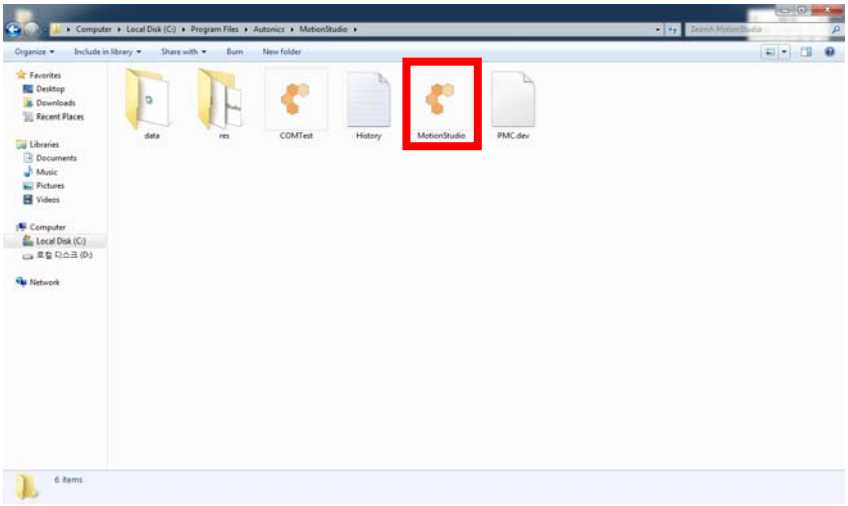
8th If you want to uninstall MotionStudio, go to [Start]-[All Programs]-[Autonics]-[MotionStudio]-[Uninstall MotionStudio]. The following dialog box is open.



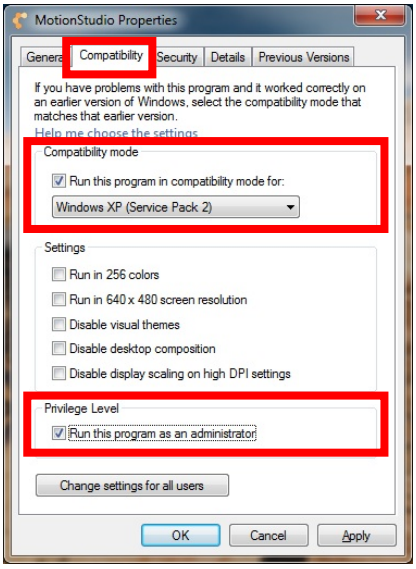
9th Click [Yes] to uninstall the MotionStudio.

To run the program in Windows Vista / 7, follow the steps below. (Do not apply this steps to Windows XP)

1st Open Windows Explorer and go to C:\Program Files\Autonics\MotionStudio. Right-click MotionStudio.exe and open [Properties].

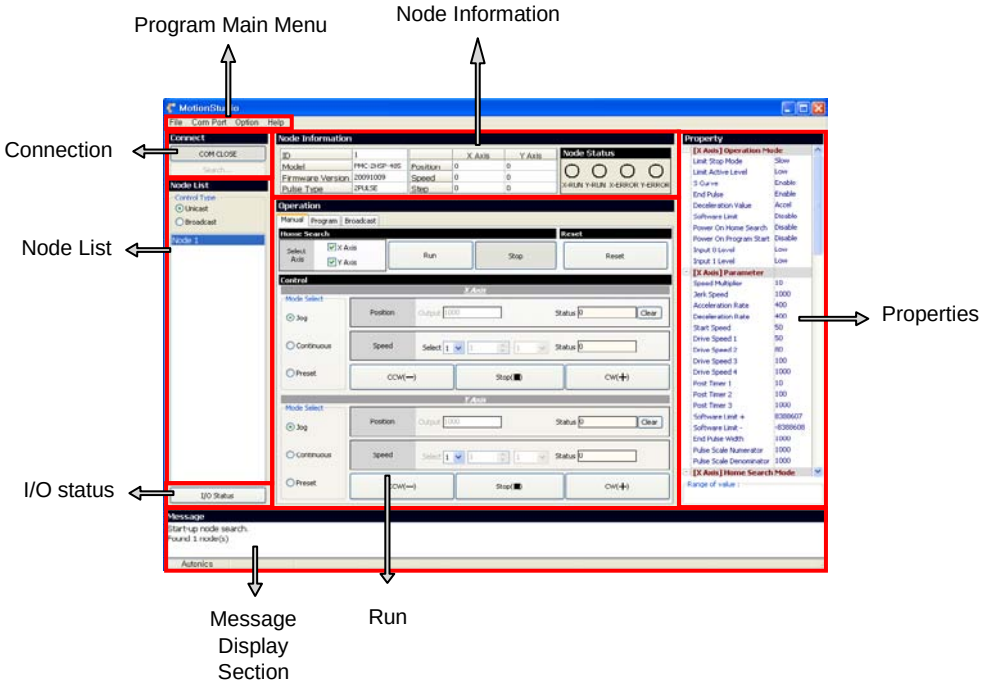


2nd [MotionStudio Properties] dialog box is open and go to [Compatibility] tab. Check [Run this program in compatibility mode for] and select [Windows XP (Service Pack 2)] in [Compatibility mode]. Check [Run this program as an administor] in [Privilege Level] and click [OK].



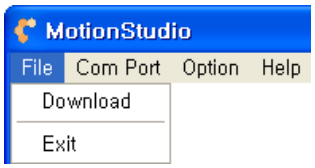
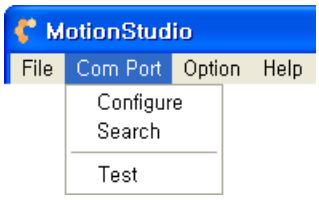
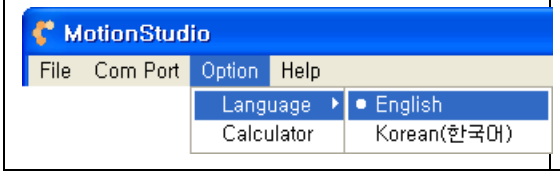
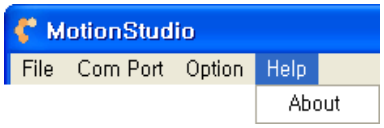
3rd Run MotionStudio program.

3.4 MotionStudio Screen Layout and Description



3.4.1 Program Main Menu

Program main menu has following hierarchy.

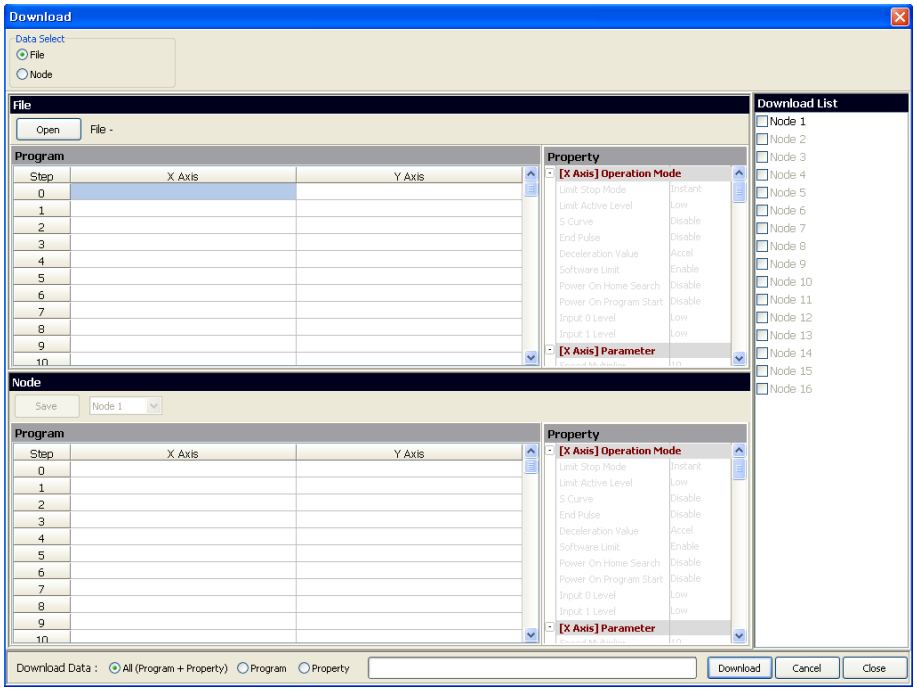
File	Com Port
	
Option	**Help**
	

3.4.1.1 File

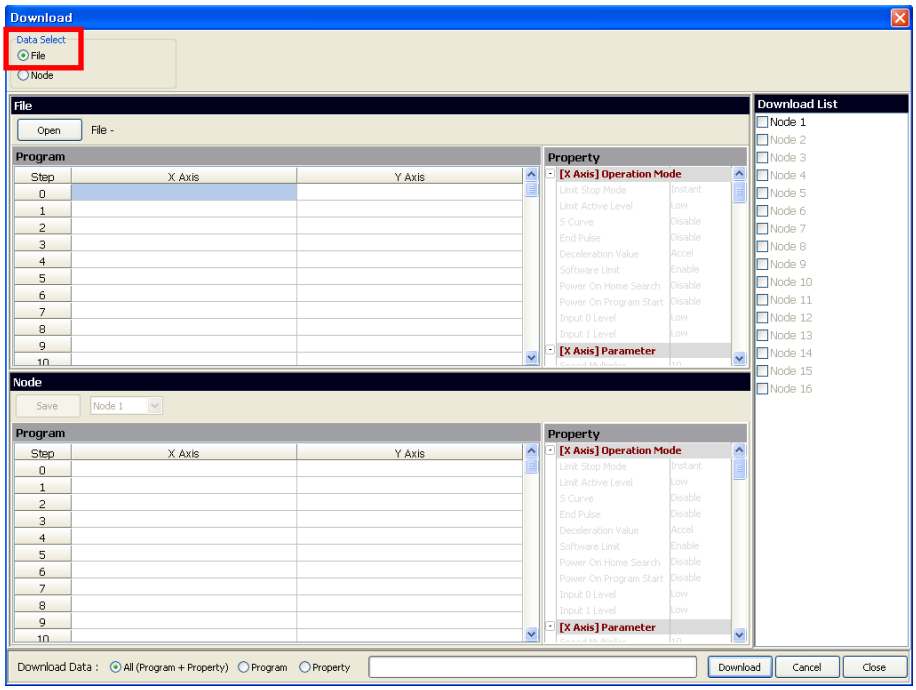
(1) Download (PC → Motion controller)

In Download, you can upload, download and initialize programs and properties.

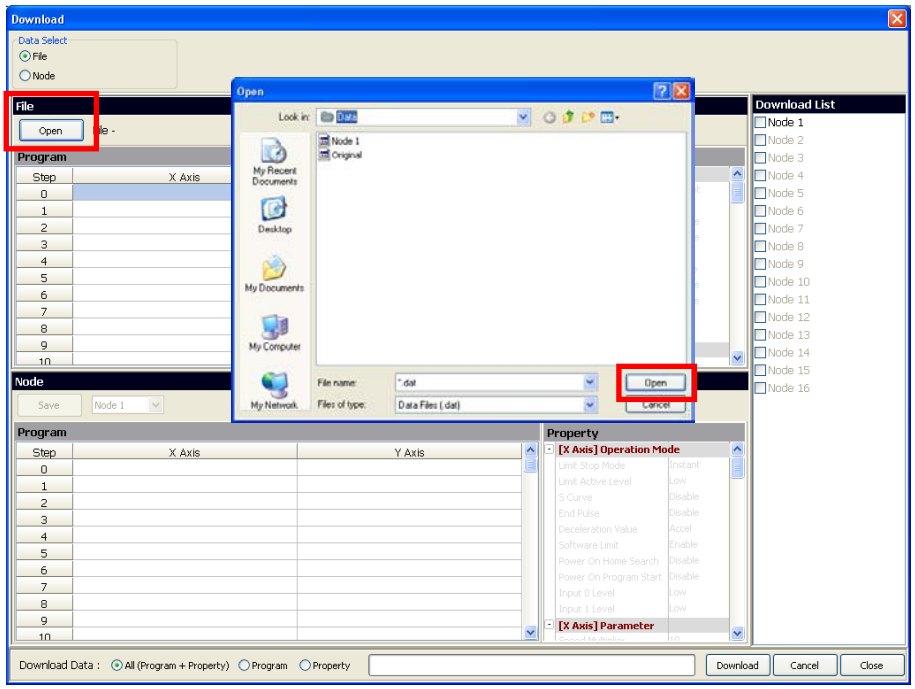
1st When the motion controller and PC are connected in the connection section, [Download] of [File] menu is activated. Click [Download] and the following [Download] dialog box is open.



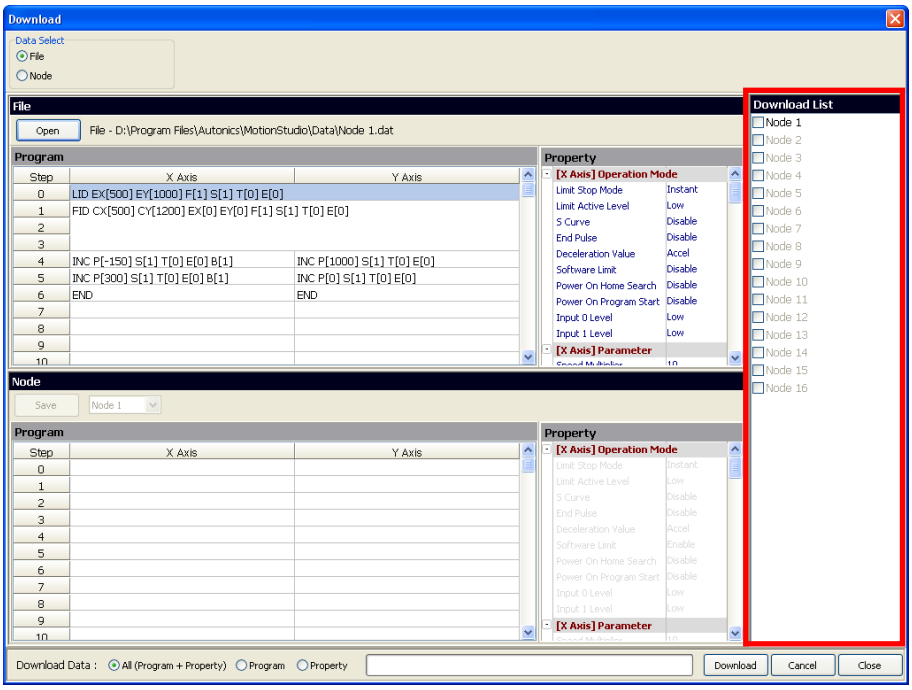
2nd Select [File] in [Data Select]. (It is selected as a default.)



3rd Click [Open] in [File] section and find the file to download (file extension: *.dat) and click [Open] in [Open] dialog box. The program and property data is displayed in [Program] and [Property] in [File] section. You cannot modify the data in [Download] dialog box.



4th Select the node to download from [Download List]. Only communicating nodes are activated in the list.

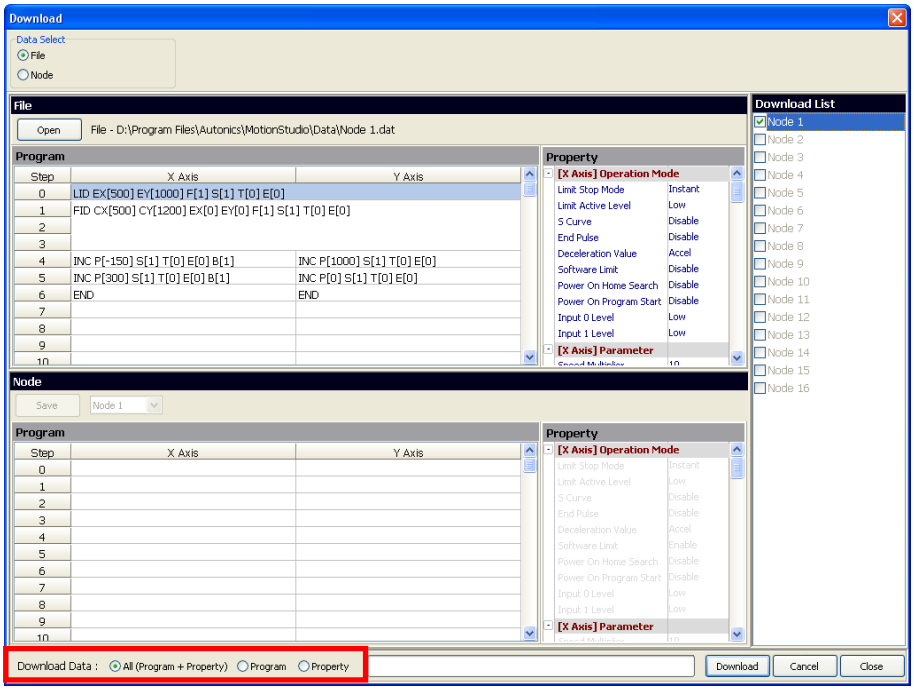


5th You can select the download item from [Download Data] at the bottom left.

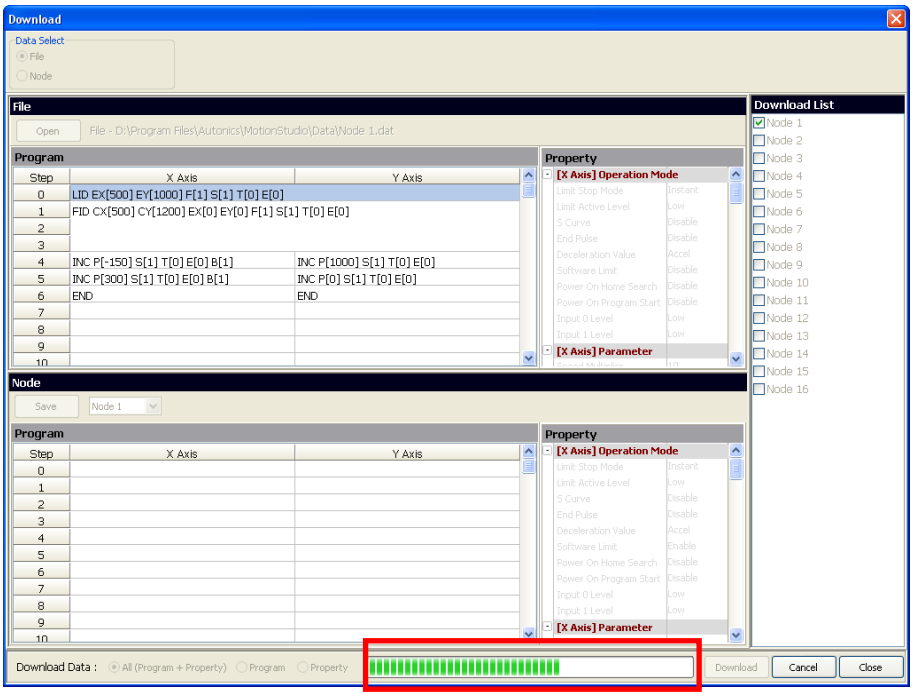
All (Program + Property): Downloads both program and property.

Program: Downloads only the program.

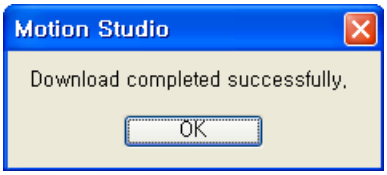
Property: Downloads only the property.



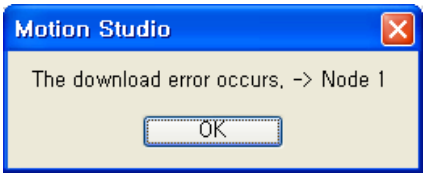
6th Click [Download] at the bottom right to start download. The download progress displays in the status bar on the left side of [Download].



7th If download completes successfully, a confirm dialog box is open as shown below.



8th If the download does not complete successfully, a confirm dialog is open with the error node number and download it again.

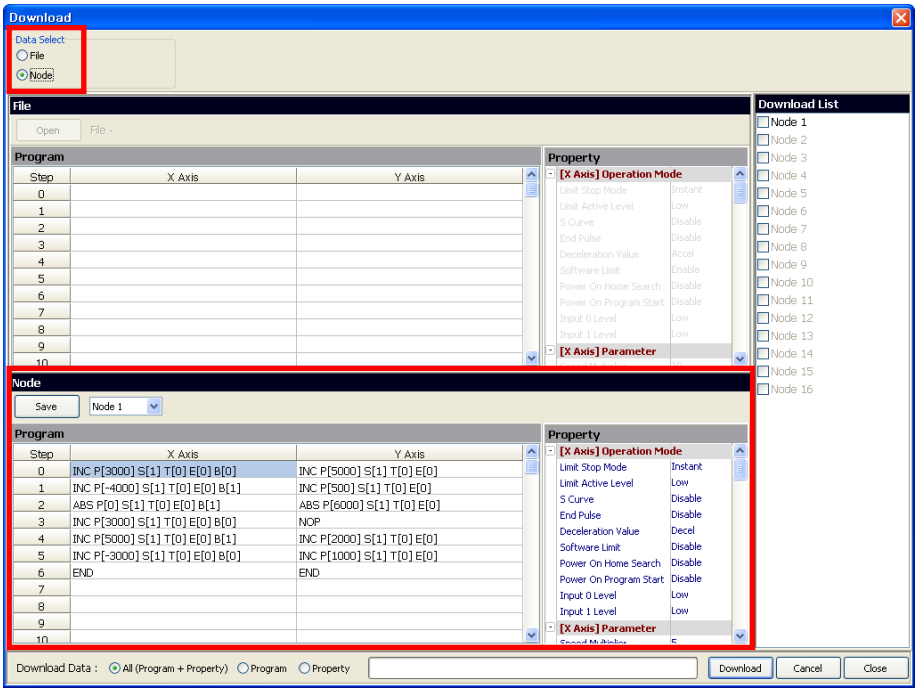


(2) Initialization

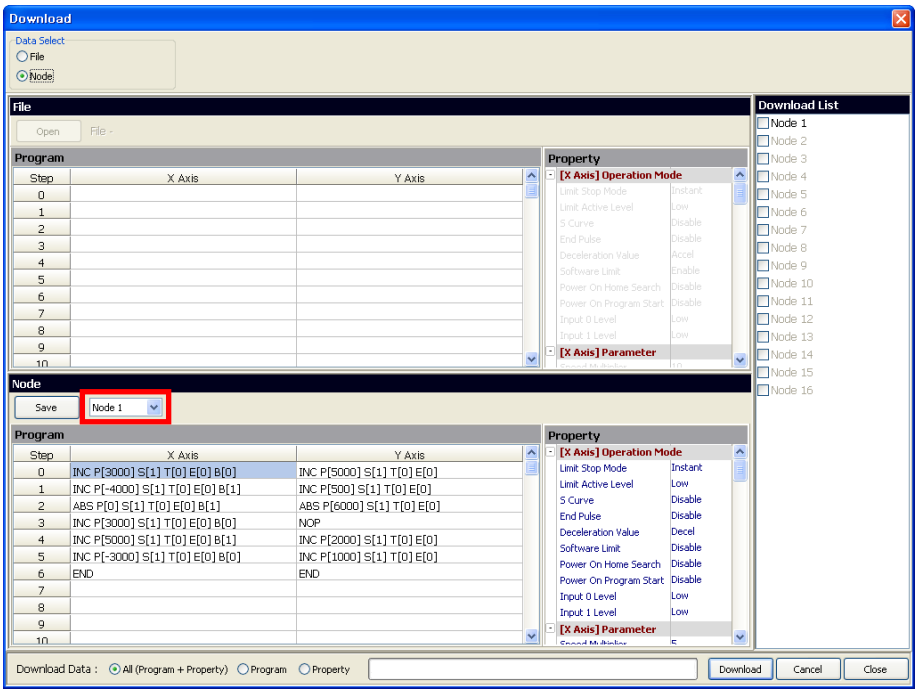
Open [Original.dat] in 3rd step of “(1) Download (PC → Motion controller)”, and download as following steps to initialize the program and property with default values.
(File path: C:\Program Files\AUTONICS\MotionStudio\data)

(3) Upload (Motion controller → PC)

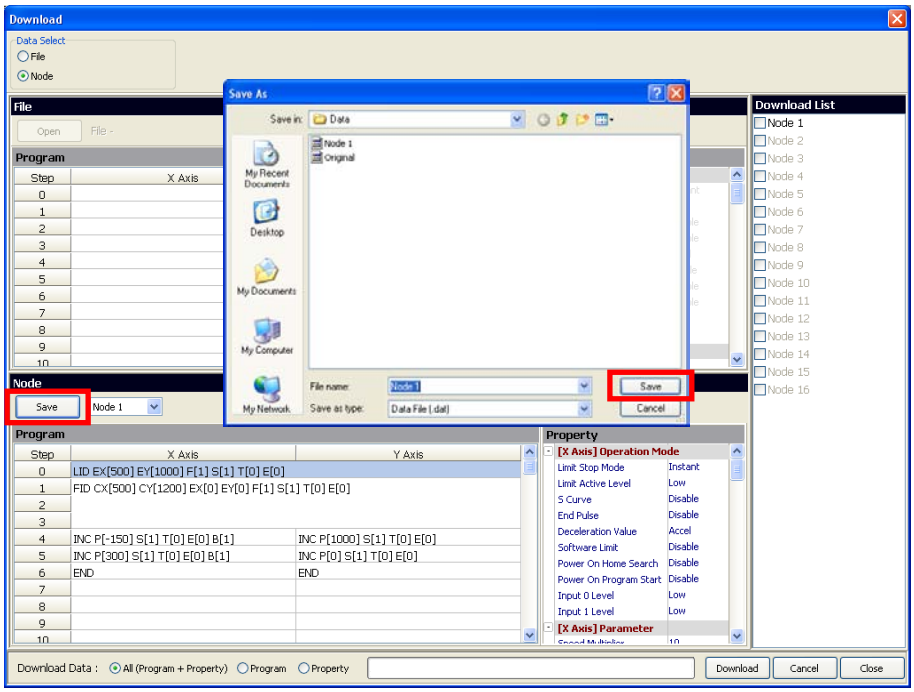
1st Select [Node] in [Data Select]. The program and property data of the toplist connected node (ascending order of node number) is displayed in [Program] and [Property] in [Node] section.



2nd Select the number of node to download in [Node] section. Only communicating nodes are activated.



3rd Click [Save] in [Node] section and specify installation folder and file name. The file extenstion is *.dat.



4th Upload is complete.

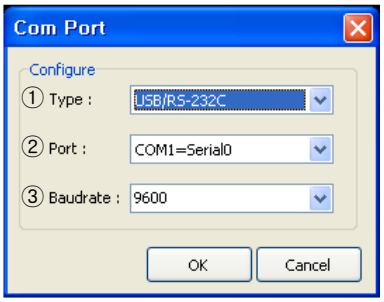
(4) Close

Click [Close] at the bottom right to close present download.

3.4.1.2 Com Port

(1) Configure

In Configure, you can set the communications environment. Click [Configure] of [Com Port] menu, and [Com Port] dialog box is open. You can set the type, port, and baud rate (bps) of the relevant motion controller.



① Type: Select the type of the connected motion controller (USB/RS232C or RS485). When selecting RS485, it connects all 16 nodes. When selecting USB/RS232C, it connects only 1 node. Connecting only 1 node omits unnecessary operations in 1:1 connection and reduces connection time.
In RS485 communications, 1:N communications are not available with USB/RS232C selected. Make sure to confirm before connect.

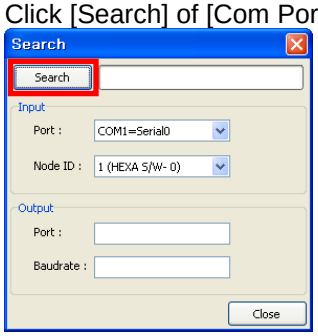
② Port: Select the communication port of the connected motion controller.
If the communications port setting is different to motion controller, communication is not available. You can find communication port information at [Start]-[Control Panel]-[System]-[System Property]-[Hardware]-[Device Manager]-[Port].

③ Baudrate: Select a communication speed among 9,600, 19,200, 38,400, 57,600, or 115,200 (bps). If the communication speed setting is different to motion controller, communication is not available.
You can finde communication speed of the connected motion controller at [Search] of [Com Port] menu. For further details, refer to '3.4.1.2 Com Port (2) Search.

When the setting is complete, click [COM OPEN] and [Search] of [Connect] section. If there is no connection error, the relevant motion controller is connected. When connected with motion montroller, you can change the communication speed using [Com Port].

(2) Search

In Search, the communication speed of the motion controller is displayed.
Click [Search] of [Com Port] menu, and [Search] dialog box is open.



Select [Port] and [Node ID] of [Input] for the connected motion controller. Click [Search] at the top. The Motion Controller's current communication speed is shown in [Baudrate] of [Output].

(3) Test

In Test, it performs COM test program and displays communications status between PC and the motion controller. If you are doubtful about the communications connection, or it is the first time for you to run MotionStudio, it is recommended to check the communications status in this test program prior to operate MotionStudio. You can also perform COM test at [Start]-[All Programs]-[Autonics]-[MotionStudio]-[COM Test].
For further details, refer to '3.5 COM Test'.

3.4.1.3 Option

(1) Language

Select a language, English or Korean to use in MotionStudio at [Language] of [Option] menu.

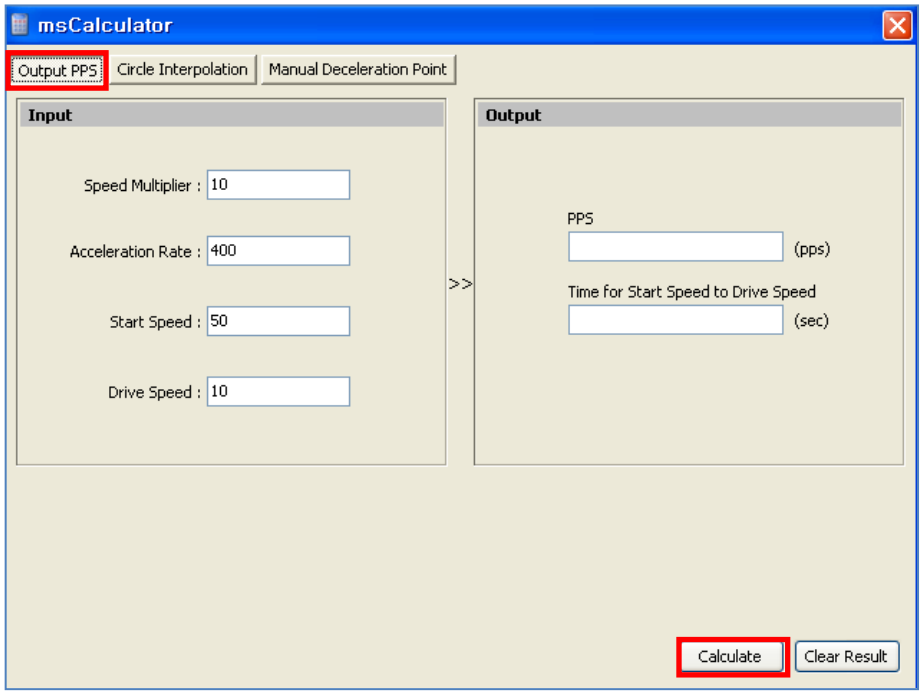
(2) Calculator

Click [Calculator] to open [msCalculator] calculator dialog box.

- PMC-2HSP series: Calculates output PPS, center and end coordinates of interpolation, manual deceleration point.
- PMC-2HSN series: Calculates output PPS.

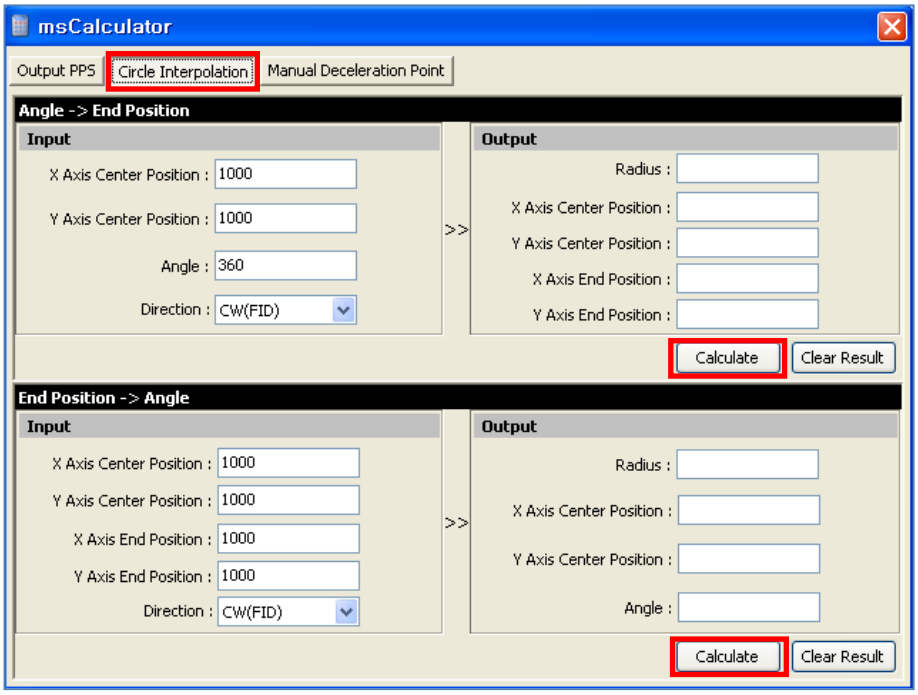
The calculator, [msCalculator], contains Output PPS, Circle Interpolation, Manual Deceleration Point tabs.

1) Output PPS (For PMC-2HSP/2HSN series)



Select [Output PPS] tab and enter speed multiplier, acceleration rate, initial speed, and drive speed in [Input] field on the left side, and click [Calculate]. The PPS of output and time for start speed to drive speed is shown in [Output] field.

2) Circle Interpolation (Only for PMC-2HSP series)



Select [Circle Interpolation] tab and enter each center and end positions of X, Y axes. You can calculate the center and end coordinates by entering center and end positions, and the angle. Alternatively, you can calculate radius and angle by using the center and end positions of X, Y axes already entered. Click [Calculate], and the result is displayed [Output] field.

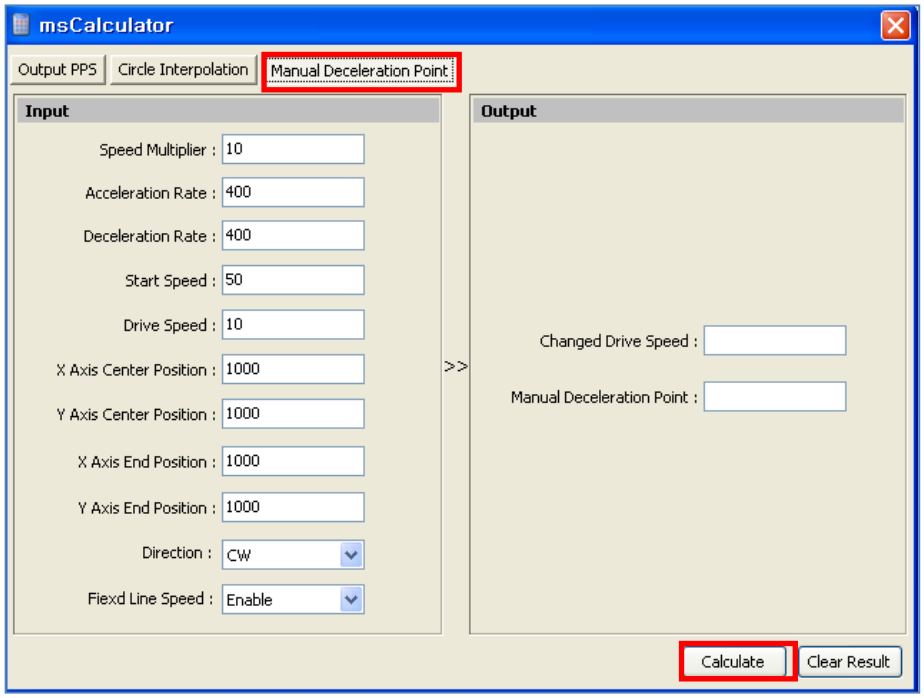
For further details about center position and end position, refer to '5.2 Interpolation Functions- only for PMC-2HSP series'.

Note

The interpolation calculator uses real numbers for calculations and so there is a rounding error.

The input accepts integers, and the result display is in integers.

3) Manual Deceleration Point (Only for PMC-2HSP series)



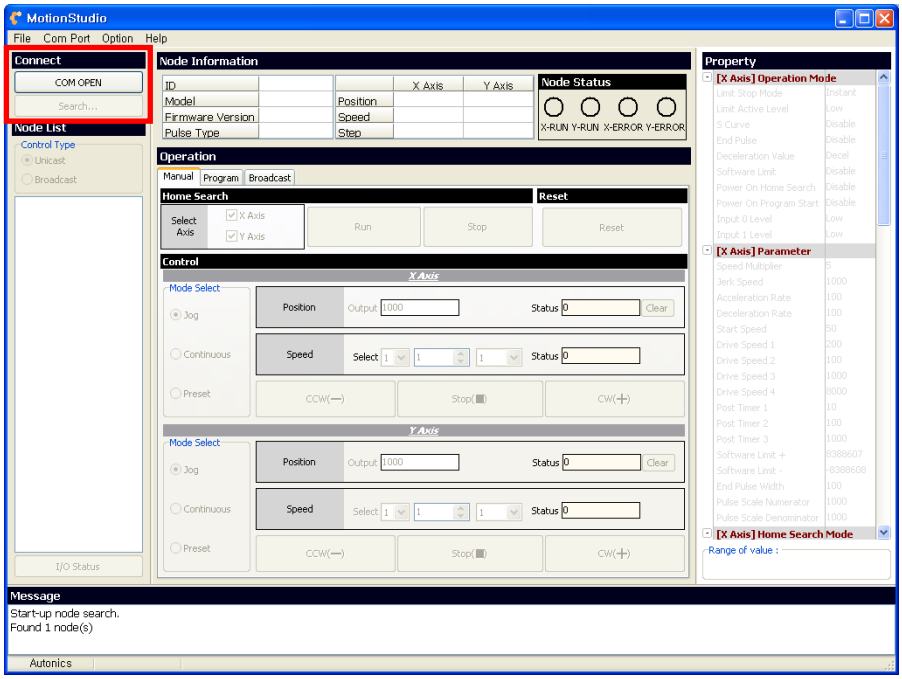
Select [Manual Deceleration Point] tab to set manual deceleration point in circular interpolation. When CID, FID and RID commands are entered in the main window, the manual deceleration point is automatically recorded. However, if the acceleration time from start speed to interpolation drive speed is longer than the total move pulse, the speed becomes irregular and a warning dialog box is open. In this case, manual deceleration point computing determines the changed drive speed. It is able to calculate the manual deceleration point when entering CID, FID and RID commands. Click [Calculate] to check the changed drive speed and the manual deceleration point.

(3) About

You can see MotionStudio version information on [About] of [Help] menu.

3.4.2 Connection

Click [COM OPEN] to activate [Search] of [Connect] section. Click [Search] to search the connected node. After connect PC and node, it displays program and property data of user selected nodes.



Note

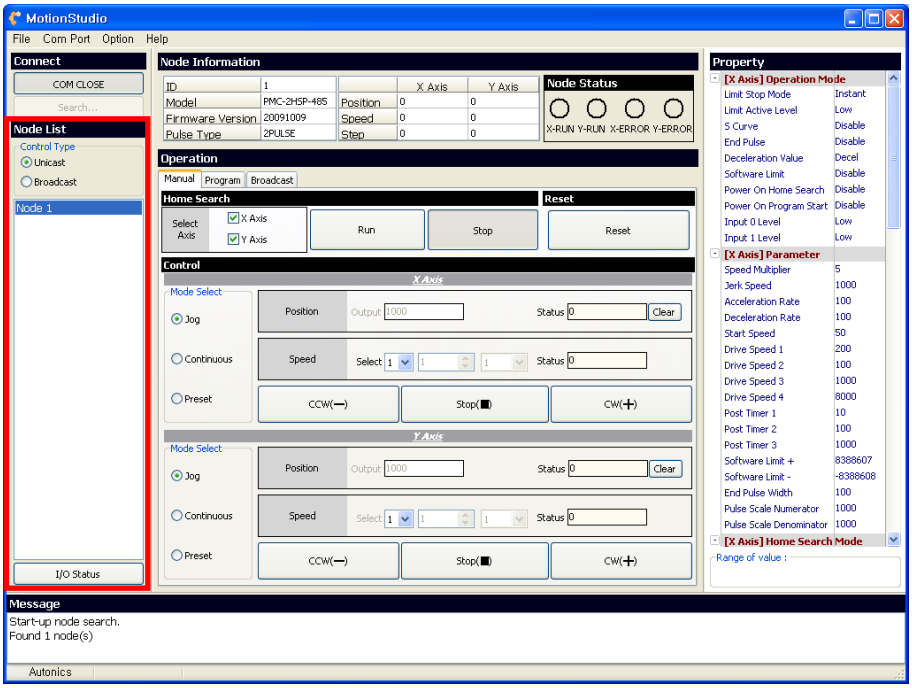
Before click [COM OPEN], set the proper communication port and communication speed in [Configure] of [Com Port].
After connect motion contoller, click [COM CLOSE] to end the connection.

3.4.3 Node List

You can select the control type (Unicast or Broadcast) in [Node List] section. You can check node IDs of all motion controllers connected to PC in the below list box. When selecting the node, program and property data of the selected node are displayed. You can control home search, Jog and Program mode, etc.

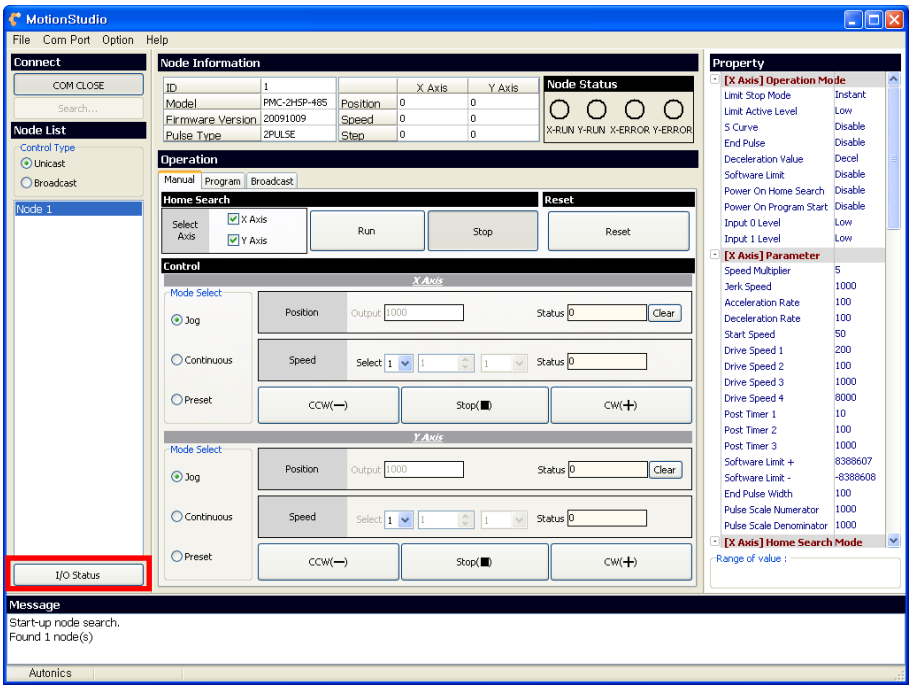
- Unicast: This type is used to control individual node. When you select a node, program and property data of the node is displayed. (When selecting [Unicast], [Manual] and [Program] tabs in [Operation] section are activated and [Broadcast] tab in [Operation] section is not activated.)
- Broadcast: This type is used to control all connected nodes at the same time. (When selecting [Broadcast], [Broadcast] tab in [Operation] section is activated and [Manual] and [Program] tabs in [Operation] section are not activated.)

  For further details, refer to '3.4.7.3 Broadcast'.

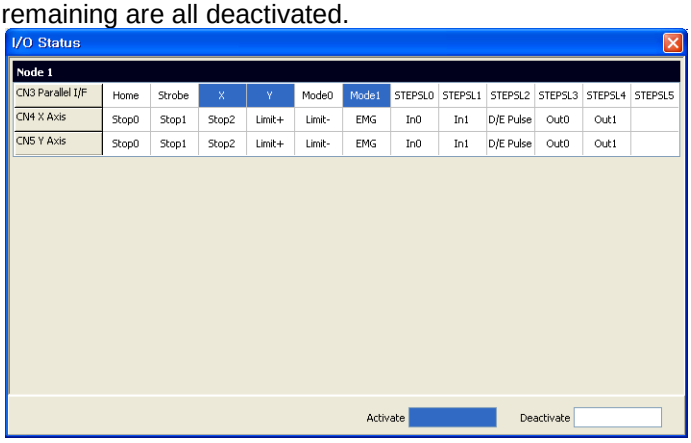


3.4.4 I/O Status

You can see activated/deactivated I/O status of all nodes connected to PC.



Click [I/O Status] to open [I/O Status] dialog box.
In the below screenshot, you can see X, Y and Node 1 of CN3 Parallel I/F are activated and the remaining are all deactivated.

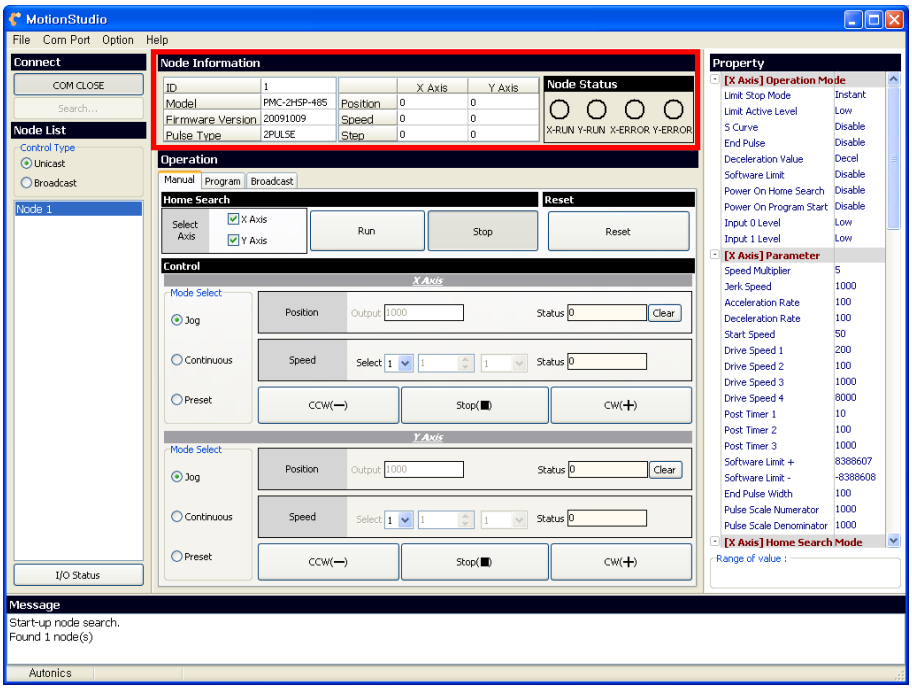


Note

[I/O Status] dialog box is able to test general purpose output. Double-click the general purpose output box (Out 0, Out 1) to ON/OFF.

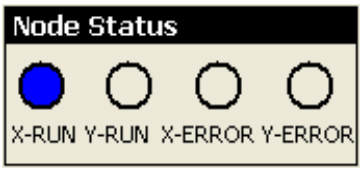
3.4.5 Node Information

[Node Information] section provides the Node ID and model name, firmware version, and operating information of X and Y axes. You can also change the input pulse type of the motor driver (1PULSE/2PULSE), and find the drive and error status of each axis in [Node Status] display.

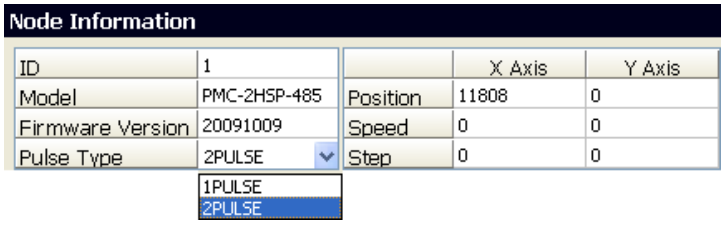


Note

[Node Status] display: You can check X axis is running.



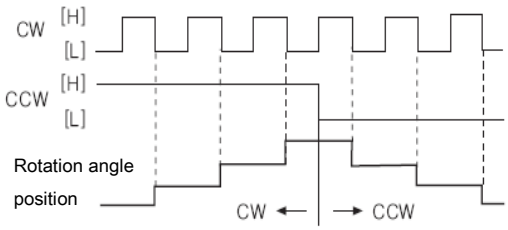
Setting [Pulse Type] (1PULSE/2PULSE)



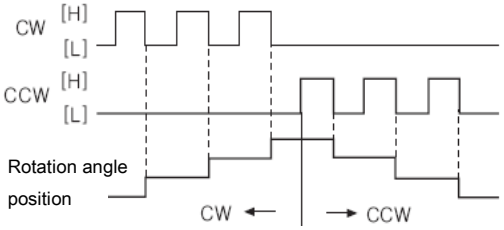
Select [1PULSE] or [2PULSE] in [Pulse Type] field of [Node Information] section.

[1PULSE] input type uses CW as a rotating operation signal, and CCW as a rotating direction signal.

[2PULSE] input type uses CW as a forward rotating signal, and CCW as a reverse rotating signal.



[1PULSE] type



[2PULSE] type

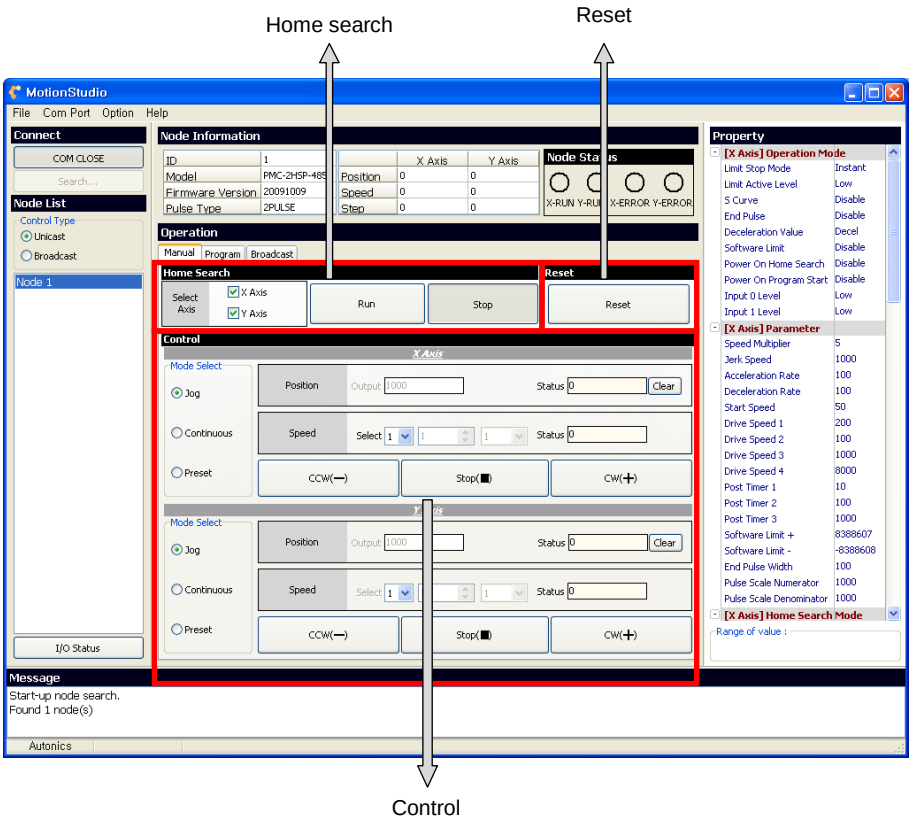
Classification	Description
	Please wait, while initiating program data of this node.
	Initialation of program data will be finshed.
	If you click this button, selected row will be inserted.
	Inserting data is completed.
	If you click this button, data of selected row will be removed.
	Deleting data is completed.
	Please wait, inputting program data of this node will be executing.
	PMC has been reset.

3.4.7 Operation

[Operation] section contain [Manual], [Program], and [Broadcast] tabs.

3.4.7.1 Manual

In the [Manual] tab, there are [Home Search], [Reset], and [Control] sections.



(1) Home Search

[Home Search] is able to select the axis for operating home search and to run or to stop home search. Before running home search, Home Search Mode must be set in [Property] section. For further details, refer to '3.6.3 Home Search Mode'.

(2) Reset

Click [Reset] for present position value to become 0. If it is in an error state, the error state is reset. It can also be an emergency stop signal because it stops immediately when driving.

Caution

Be careful if you use RESET while driving in high-speed. It stops immediately and may cause personal injury or product damage.

(3) Control

1) Mode Select: X axis and Y axis operating methods are the same in every mode.

① Jog
[Jog] mode drives only while clicking [CW (+)] or [CCW (-)]. CW(+) drives clockwise, CCW(-) drives counter-clockwise.

② Continuous
[Continuous] mode starts the drive when click [CW(+)] or [CCW(-)] once to relevant direction, and stops when click [Stop(■)].

③ Preset
[Preset] mode activates [Position] setting box. Enter output pulse value in [Output] and click [CW(+)] or [CCW(-)]. It drives in the relevant direction for a specified pulse value. Pulse value must be a positive number and is processed as a relative position movement.

2) Position: Indicates the value of present position. Click [Clear] to initialize the present position value to 0 (home).

3) Speed: Sets operation speed for Jog / Continuous / Preset mode. You can set a speed of 5 speeds.

- When selecting one of Speed 1 to Speed 4, the set [Drive Speed] value in [Property] is applied.
- When selecting Speed 5, Speed5 Value (Speed setting value) / Speed5 Rate (1/10/100) fields are activated as shown below.

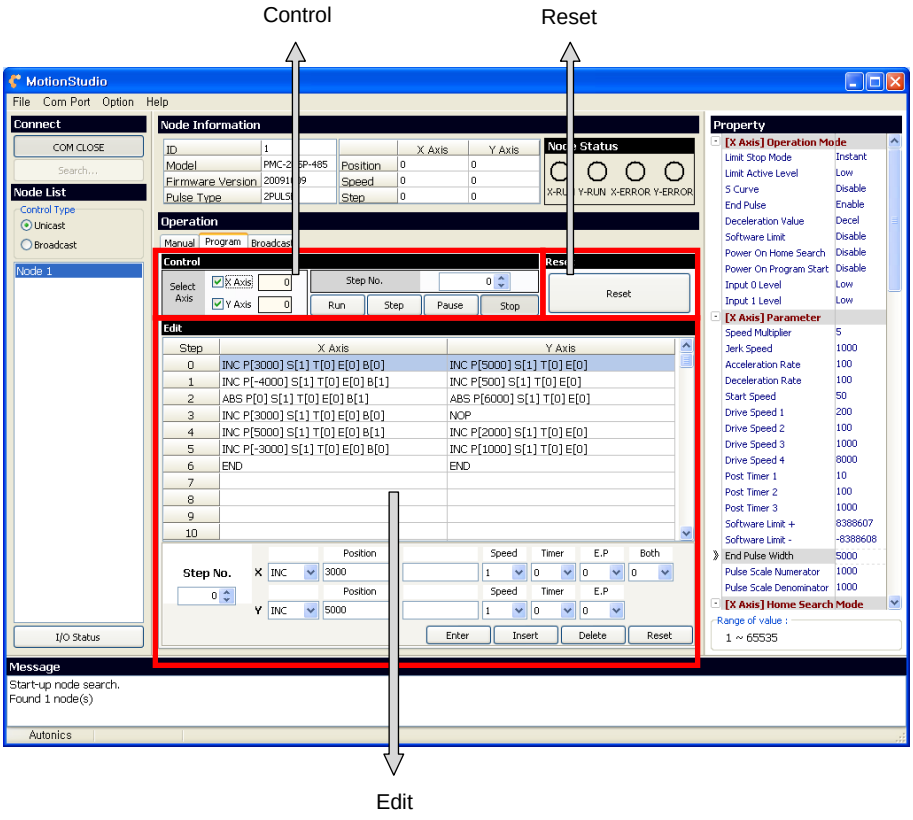
Ex.

Suppose Speed 5 Value is set to 100 and Speed 5 Rate is set to 10:

Because the Speed 5 Rate is 10, if you want to increase the speed it goes up by 10, such as 110, 120, 130…

3.4.7.2 Program

In the [Program] tab, there are [Control], [Reset], and [Edit] sections.



(1) Control

- Select Axis: Select an axis to drive.
- Step number: Enter a step number.

① Run: It starts to drive from the specified step number.
② Step: It drives only the specified step (one step).
③ Pause: It pause the drive after the current step is complete. Click [Run] to drive with the remaining steps after pause.
④ Stop: It stops drive after the current step is complete.

(2) Reset

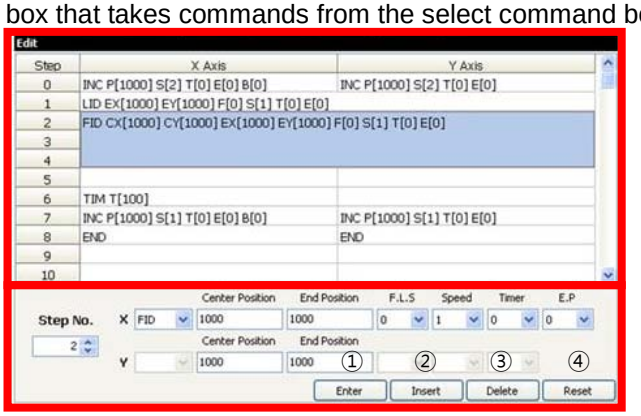
Click [Reset] for present position value to become 0. If it is in an error state, the error state is reset. It can also be an emergency stop signal because it stops immediately when driving.

Caution

Be careful if you use RESET while driving in high-speed. It stops immediately and may cause personal injury or product damage.

(3) Edit

[Edit] section consists of select command box which you can enter a command, and edit box that takes commands from the select command box and writes program data.



Edit box

Select Command box

- Edit box: Enter step numbers and each of X, Y axes programs.
  Use Shift key (consecutive select) and Ctrl key (individual select) to select several steps, and Ctrl+X (cut), Ctrl+C (copy), Ctrl+V (paste), Insert (insert), Delete (delete) keys are available. You can also cut, copy, paste, insert and delete operations by right-click.

- Select command box: Select a step number to enter commands and detailed data for each axis. Click [Enter], and the contents are entered in the edit box.

  ① Enter: Make sure to click [Enter] after you enter commands for each step to input the commands. Whenever click [Enter], the relevant command inputs into the motion controller at that time.
  Even though there is already entered command, it is able to re-enter without deletion. Be sure to re-enter the command which is different command steps, it is required to additionally delete or to paste blank steps.
  Depending on the commend, the activated filed of select command box is different. For further details, refer to '3.7 Program Commands'.

Ex.

To re-enter INC command on the CID command step, it is required to delet the next INC command step.

② Insert: In the edit box, select the insertion position of a step or range of steps, and click [Insert]. For example, if you want to insert 5 empty steps, select 5 steps and click [Insert].

③ Delete: In the edit box, select the desired step to delete and click [Delete]. Use Shift key (consecutive select) and Ctrl key (individual select) to delete several steps.

Delete command deletes all selected steps as well as the commands entered.

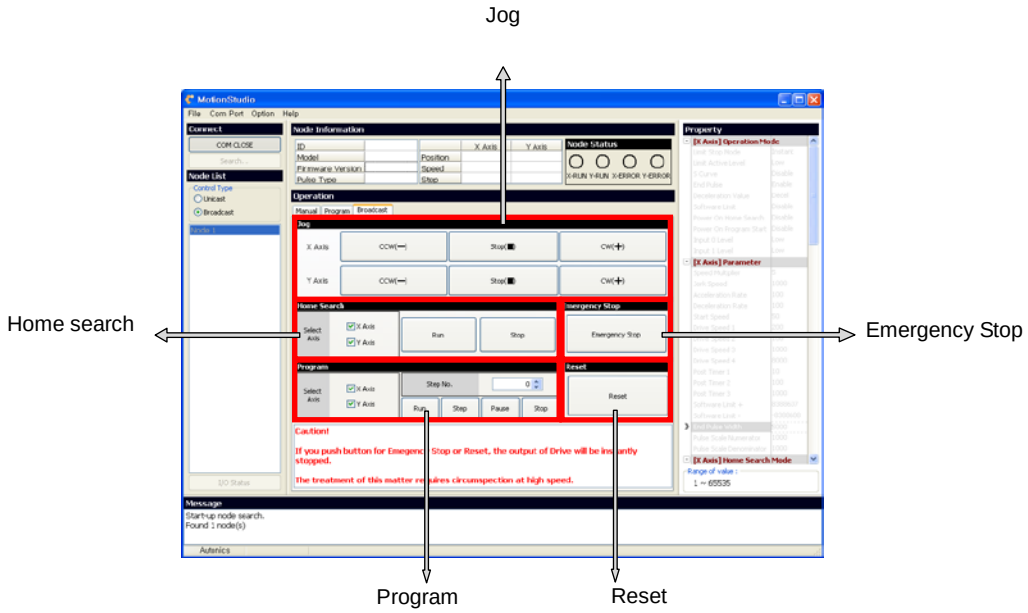
④ Reset: Click [Reset] to initialize all program data which is entered into the edit box.

3.4.7.3 Broadcast

In the [Broadcast] tap, there are [Jog], [Home Search], and [Program] sections. This tab is used to control concurrently several motion controllers. It is not able to read node information when [Broadcast] is selected.

Caution

Home search control or program control should run/stop within individual control. If running/ stopping home search control or program control alternately, it may cause malfuction.



(1) Jog

Jog controls X, Y axes of all connected controllers independently at the same time, and drives while clicking [CW(+)] or [CCW(-)]. CW(+) drives clockwise, CCW(-) drives counter-clockwise. The drive speed is based on the previous run speed of each node.

(2) Home Search

Home search is able to select X, Y axes of all connected controllers independently and to run or to stop home search. Before running home search, Home Search Mode must be set in [Property] section by each node.
For further details, refer to '3.6.3 Home Search Mode'.

(3) Program

Program is able to select X, Y axes of all connected controllers independently and is executed from the command entered for the step number.
Reading is available only, but writing is not. To modify (write) the program, select [Unicast] in [Node List] section and select the node that the program is stored and modify the program. After modifying (writing) the program, re-select [Broadcast] in [Node List] section and control the entire motor driver. .

- Select Axis: Select an axis to drive.
- Step number: Enter a step number.
- Run: It starts to drive from the specified step number.

- Step: It drives only the specified step (one step).
- Pause: It pause the drive after the current step is complete. Click [Run] to drive with the remaining steps after pause.
- Stop: It stops drive after the current step is complete.

 **Ex.**

When clicking [Run] with only X axis and 10 step number, the entire motor drivers run only X axis from 10 step.

(4) Emergency Stop

Emergency stop urgently stops X, Y axes of the entire motor driver. It is available to urgently stop in emergency. After operating emergency stop, all movement commands are not available. Click [Reset] or OFF/ON power to re-operate normally again.

 **Caution**

Be careful when emergency stop is ON. It may cause injuries or product damage during high speed driving because it stops immediately.

(5) Reset

Click [Reset] for the present position value to become 0. If it is in an error state, the error is reset. It can also be used as an emergency stop signal because it stops immediately when driving.

 **Caution**

Be careful to click [Reset]. It may cause injuries or product damage during high speed driving.

3.4.8 Property

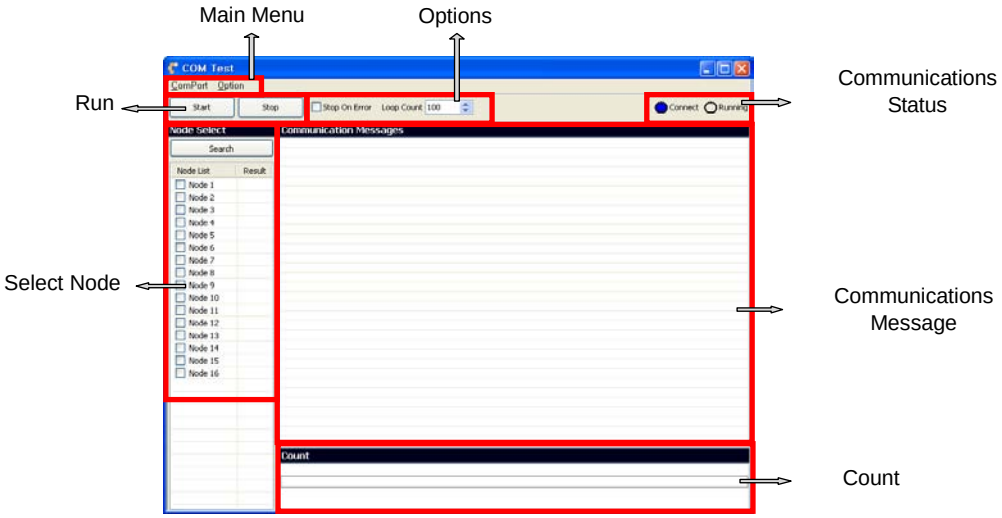
Property is able to set operation mode, parameter, and home search mode by each axis.

For further details, refer to ‘3.6 Property’.

3.5 COM Test

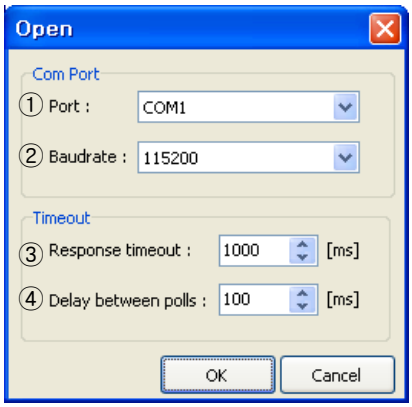
COM Test is available to inspect communication status between PC and motion controller.

Select [ComPort]-[Test] in main menu, or go to [Start]-[All Programs]-[Autonics]-[MotionStudio]-[COM Test] to operate COM Test.



(1) Main menu

1) ComPort: Click [Open] of [ComPort] to open [Open] dialog box.



① Port: Select the port the Motion Controller is connected to.

② Baudrate: Select Communications Speed (bps).

③ Response timeout: Enter the response time taken from the command has been sent.

④ Delay between polls: Enter the delay time between commands.

Note

The test can be unreliable if response timeout and delay between polls are set too short. Set the response timeout to at least 500 ms, and the waiting time to at least 100 ms regardless the baud rate.

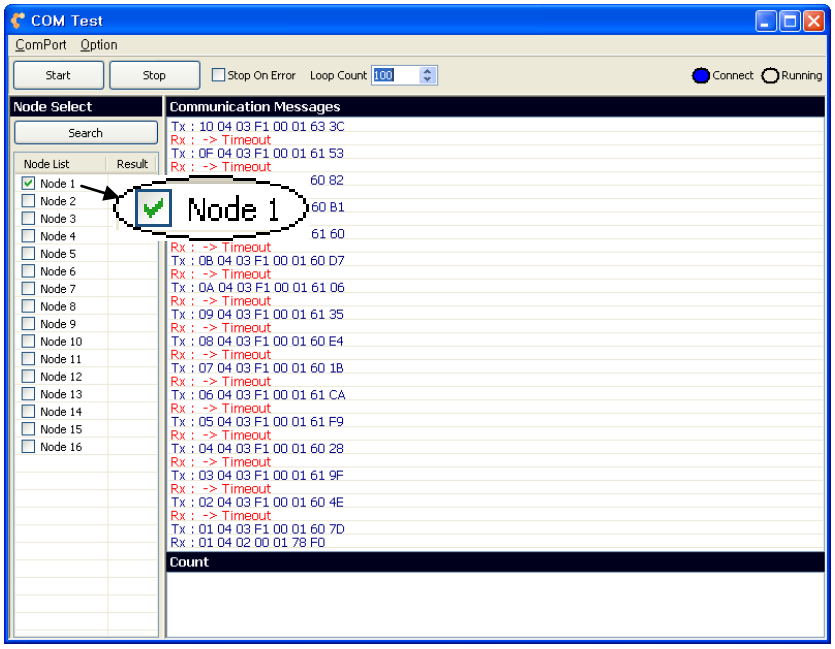
2) Option: You can change the language (English, Korean).

(2) Start

Start: Starts the test.
Stop: Stops the test.

(3) Node Select

Select the node to perform COM Test.
If you do not know the node ID connected to PC, click [Search]. It searches 16 nodes in order and shows connected nodes as below.



In the above case, only Node 1 is connected to PC.

(4) Options

Options contain [Stop On Error] and [Loop Count].

- Stop On Error: stops the test if an error occurs while in progress.
- Loop Count: Specifies number of cycles of the test. (When entering 100, it performs 100 Cycle test.)

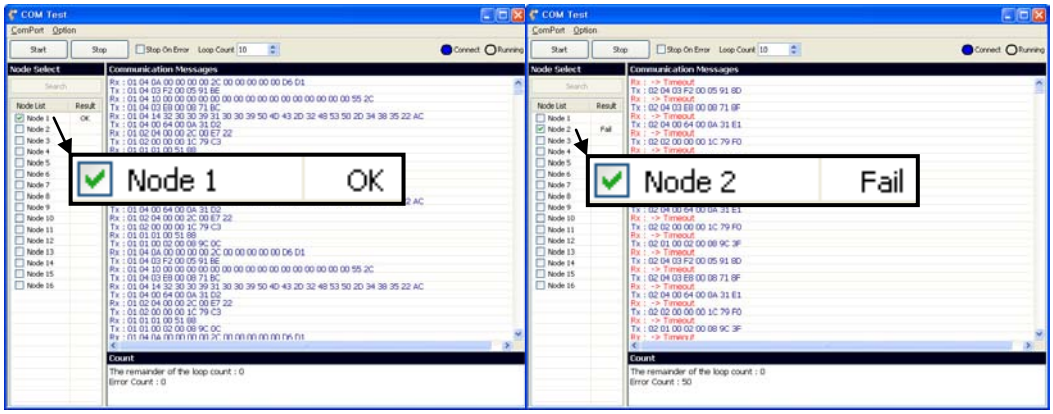
(5) Communication Status

Communication status indicates operating status of communication.

- Connect: The blue lamp is ON when communications ports are connected.
- Running: The blue lamp is ON when the test is in progress.

(6) Communication Messages

<Succeed communications> <Failed communication>



When the test has started, Rx and Tx communications messages are displayed for successful connections and unsuccessful connections. When the test finishes, [Result] box in [Select Node] section displays the test result (OK/Fail). If the communications failure happens repeatedly, inspect communications environment again.

(7) Count

Count indicates the number of remaining loop counts while the test is processing, and the number of total errors after test is finished.

Caution

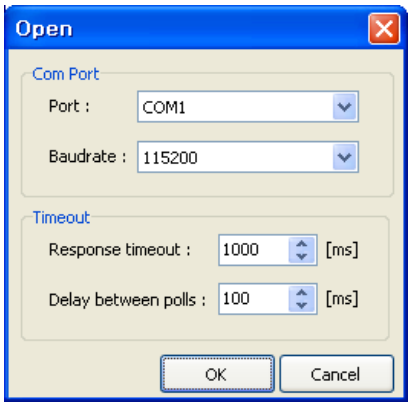
MotionStudio and COM Test are independent programs and cannot access the same port at the same time. You must terminate connection to COM Test before connecting to MotionStudio. Click the [COM CLOSE] of [Connect] section to disconnect COM Test and motion controller.

Ex.

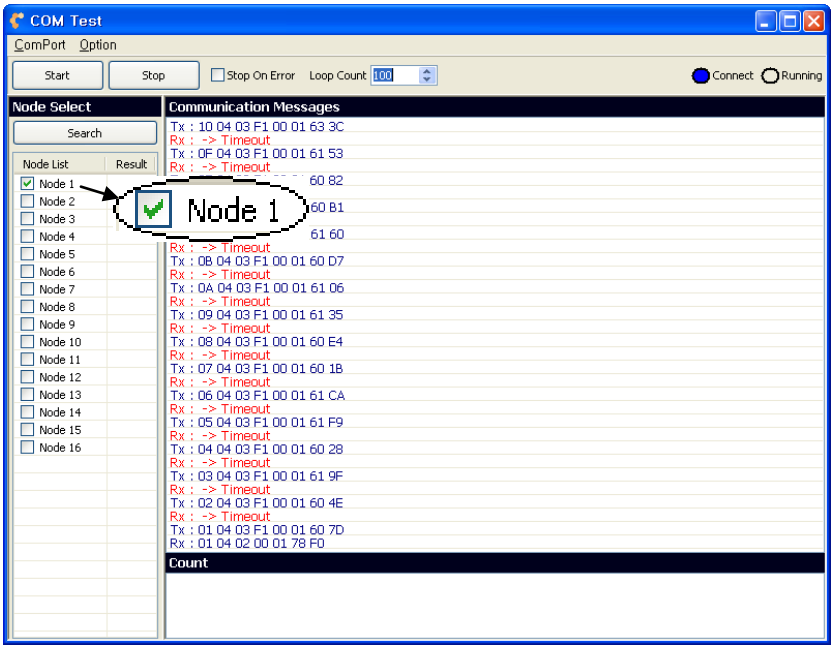
This is a simple example of COM Test.

1st Click [Open] of [ComPort] main menu to open [Open] dialog box.

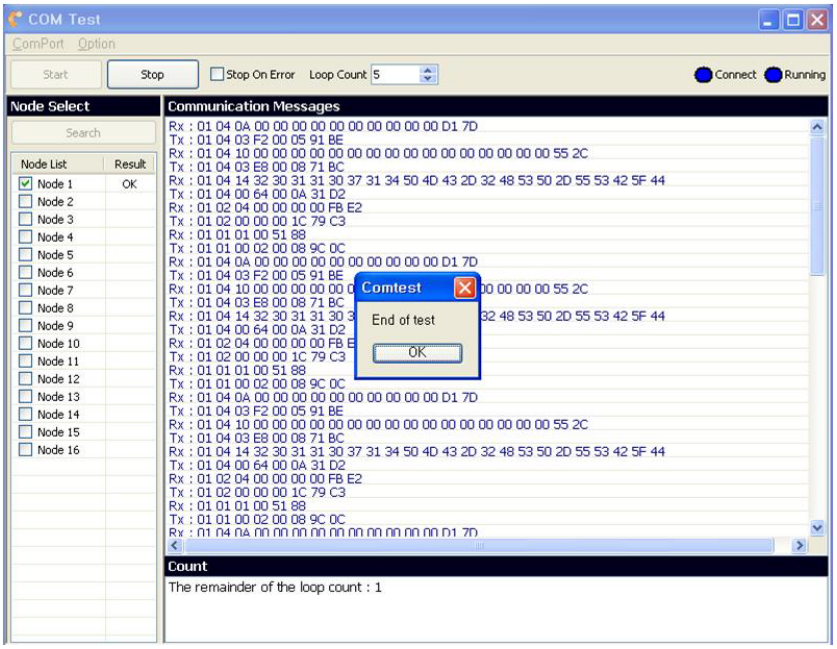
2nd Select connected communications port [Port] and baud rate [Baudrate] accurately, and set response timeout [Response timeout] to 1,0000 ㎳, and delay between polls [Delay between polls] to 100 ㎳. Click [OK] to close [Open] dialog box. ([Start] is activated.)



3rd (If you do not know the connected node ID) Click [Search] of [Node Select] section. It searches 16 nodes in order and shows that Node 1 is connected to PC.



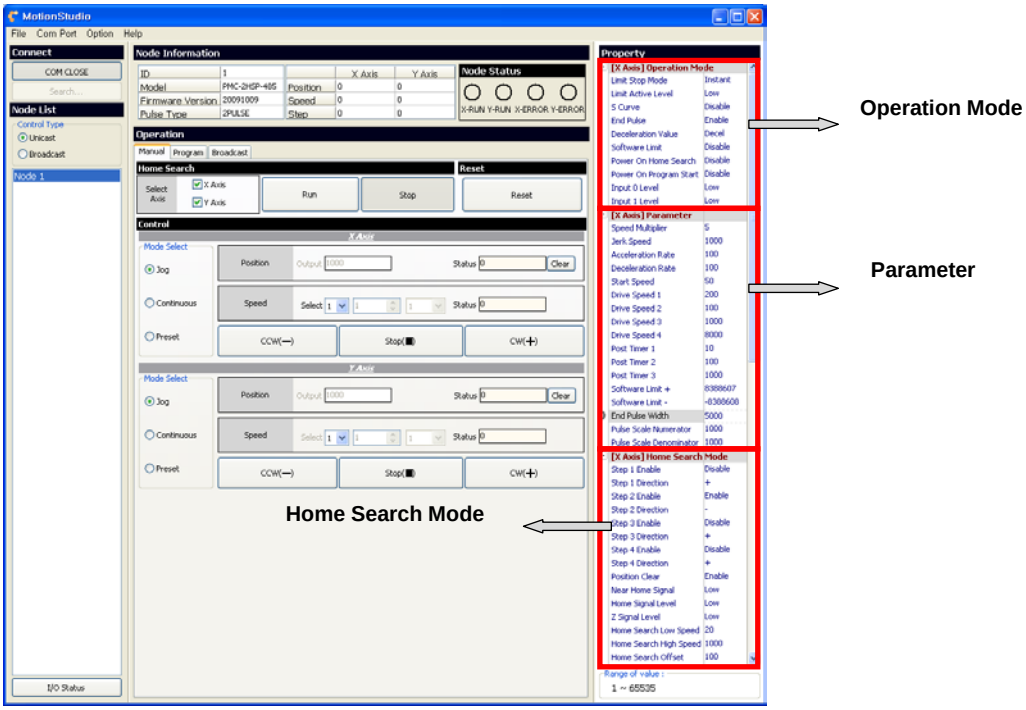
4th Set [Loop Count] to 5 and click [Start] to start the test. After 5 Cycle, a confirm dialog box is open and notifies you that the test is complete. Click [OK] to close the box. [Result] box in [Node Select] section displays the test result as OK.



5th Before connecting PC and MotionStudio, finish COM Test by clicking [Close] of [ComPort] main menu or clicking close window button at the top right corner.

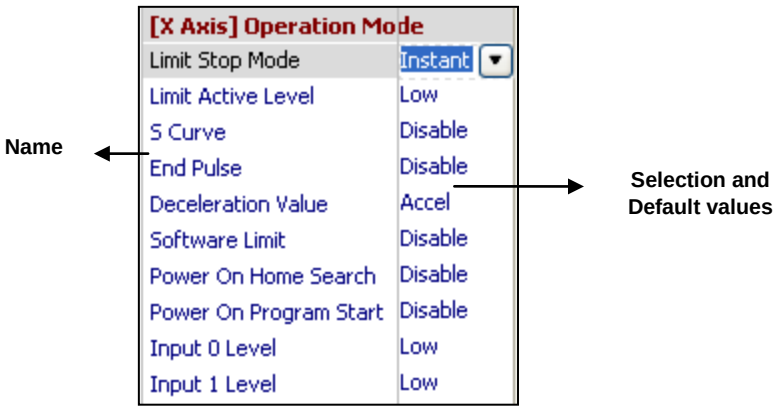
3.6 Property

To operate the motion controller properly, it is first needed to set properties for the diresed system to use.



[Operation Mode], [Parameter] and [Home Search Mode] are in the [Property]section on the right side of the screen. Y axis properties are under the X axis properties.

3.6.1 Operation Mode



Name	Description	Selection	Default value
Limit Stop Mode	Mode to stop limit	Instant / Slow	Instant
Limit Active Level	Logical level of limit signal	Low / High	Low
S Curve	S Curve accel /decel	Enable / Disable	Disable
End Pulse	Drive ending pulse	Enable / Disable	Disable
Deceleration Value	Select deceleration speed	Accel / Decel	Accel
Software Limit	Software limit	Enable / Disable	Disable
Power On Home Search	Home search upon power on Auto start	Enable / Disable	Disable
Power On Program Start	Power on program Auto start	Enable / Disable	Disable
Input 0 Level	General purpose input 0 level	Low / High	Low
Input 1 Level	General purpose input 1 level	Low / High	Low

3.6.1.1 Limit Stop Mode

Limit stop mode is a setting which is used to stop the drive when + (positive) and - (negative) directions limit input signals (n LMT+/-) in each axis are activated.

Name	Description	Selection	Default value
Limit Stop Mode	Instant: Immediate stop Slow: Decelerating stop	Instant / Slow	Instant

Limit input signals (n LMT+/-) are Pin12, 13 of CN4, 5 connectors. Slow stops the drive with acceleration rate or deceleration rate according to the deceleration value setting of operation mode. However, software limit signal is irrelevant.

Note

Limit stop mode is a setting which is used to stop the drive when + (positive) and - (negative) directions limit input signals (n LMT+/-) in each axis are activated.

If the drive speed at the time the activated limit signal is lower than the initial speed, it stops immediately regardless of the mode.

Caution

- When setting [Instant] on [Limit Stop Mode]:

  It stops immediately and will be located in the limit sensor's active zone. (There may be some vibration due to inertia.)

  When the limit signal is activated, it is no longer able to move in the direction of progress. However, it can move in the opposite direction of the limit sensor.

  Danger: If you use instant on limit stop mode while high speed driving, it may cause injuries or product damage.

- When setting [Slow] on [Limit Stop Mode]:

  It stops with decelerated speed. In this case, acceleration or deceleration rates in the parameter section may get out of the limit sensor's active zone and make the limit signals inactive. The system can move in the progressive direction, which may cause serious problems. Special care should be taken.

- Risk factor 1: If the limit sensor is close to physical limits, the drive may collide with devices while in decelerating stop.
- Risk factor 2: If you enter a command to move in the progressive direction which is out of the limit sensor's active zone, the system can move in the progressive direction. Thus, it may cause wrong operation and serious problems.

3.6.1.2 Limit Active Level

It specifies limit active level.

Name	Selection	Default value
Limit Active Level	Low / High	Low

- Low: Activates input signal when the limit input signal is connected to GEX.
- High: Activates input signal when the limit input signal is Open.

3.6.1.3 S Curve

It sets whether to use S curve acceleration/deceleration drive or not.

Name	Selection	Default value
S Curve	Enable/Disable	Disable

To use S Curve, jerk speed must be set.

For further details, refer to '5.1.2.4 S Curve'.

Caution

Precautions for S curve acceleration/deceleration drive

- In a fixed pulse S curve acceleration/deceleration drive, you cannot change speed while driving.
- For PMC-2HSP series, S curve acceleration/deceleration drive cannot be cannot be performed in a circular or circle interpolation.
- For a fixed pulse S curve drive, if you set the initial speed too low, the drive pulse may end before the speed drops to initial speed when decelerating; or even after it reaches the initial speed. It may not stop there and outputs the remaining drive pulse.

3.6.1.4 End Pulse

It sets the output method for DRIVE/END. DRIVE/END output signals of X, Y axes are Pin 14, 15 of Parallel I/F connector.

Name	Selection	Default value
End Pulse	Enable/Disable	Disable

- Enable: Outputs pulse for the duration of end pulse width set in the parameter section when drive ends.
- Disable: Outputs pulse while driving and then OFF when ended.

For further details, refer to '2.4.3 Parallel I/F Connector(CN3)'.

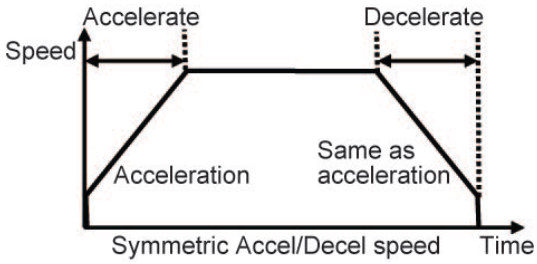
3.6.1.5 Deceleration Value

It sets symmetry/asymmetry of ladder acceleration/deceleration drive.

Name	Selection	Default value
Deceleration Value	Accel / Decel	Accel

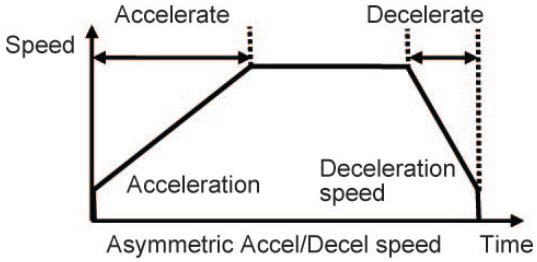
- When setting [Accel] on [Deceleration Value]:

  When decelerating, a symmetric acceleration/deceleration drive is performed, in which the deceleration rate set in the parameter section is the same as acceleration rate. Acceleration is set in of acceleration rate.



- When setting [Decel] on [Deceleration Vaule]:

  When decelerating, asymmetric acceleration/deceleration drive is performed, in which the deceleration value set in the parameter section by the user is applied. Deceleration rate is set in the [Parameter] section.



For further details, refer to '5.1.2.2 Symmetric Trapezoidal Acceleration/Deceleration Drive', and '5.1.2.3 Asymmetric Trapezoidal Acceleration/Deceleration drive'.

Caution

Pay attention to the followings when you are setting asymmetric acceleration/deceleration drive.

If acceleration > deceleration: There is a condition regarding acceleration and deceleration ratio.

$$D > A \times \frac{V}{4 \times 10^6}$$

D : Deceleration (pps/sec)
A : Acceleration (pps/sec)
V : Drive speed (pps)

For example, if the drive speed V is 100 KPPS, deceleration rate D must be greater than 1/40 of the acceleration rate A. It should not be smaller than 1/40.

If acceleration and deceleration ratio (A/D) increases, it may run short of pulses and start to decelerate.

3.6.1.6 Software Limit

It sets whether to use software limit or not. This is a limit function in addition to hardware style limit signal input such as by external sensor. It can be set by using internal position data.

Name	Selection	Default value
Software Limit	Enable/Disable	Disable

For further details, refer to '5.4.1 Limit Operation'.

Note

Hardware limit works independently regardless of the software limit settings and only hardware limit is operated during home search.

3.6.1.7 Power On Home Search

Power on home search automatically performs home search when power is supplied to the system or the system is reset.

Name	Selection	Default value
Power On Home Search	Enable/Disable	Disable

Warning

- When you set power on home search to [Enable], home search related settings must be done separately. If you do not fully understand before starting this operation, it may cause fatal injury.
- Do not change [Power On Home Search] setting while in operation. Change in the main window after the operation is stopped.
  If it is enabled along with [Power On Program Start], the program automatically starts after home search is complete. However, this method is not stable, so set only one of two to [Enable]. If you need to use these two functions together, enable [Power On Program Start] and then set HOM (home search) command at the first step of the program.

3.6.1.8 Power On Program Start

Power On Program Start automatically operates registered programs when power is supplied to the system or the system is reset.

Name	Selection	Default value
Power On Program Start	Enable/Disable	Disable

Caution

- When you use [Power On Program Start], use TIM (timer) command for the first step and set the command to be executed after a specified time. Using timer command is more stable than auto-starting the program immediately after power is turned ON.
- Do not change [Power On Program Start] setting while in operation. Change in the main window after the operation is stopped.
- Do not edit or change [Operation Mode] or [Parameter] section while the program is running by [Power On Program Start]. Change in the main window after stopping the program.
- If it is [Enabled] on [Power On home search], the program automatically starts after home search is complete. However, this method is not stable, so set only one of two to [Enable]. If you need to use these two functions together, enable [Power On Program Start] and then set HOM (home search) command at the first step of the program.

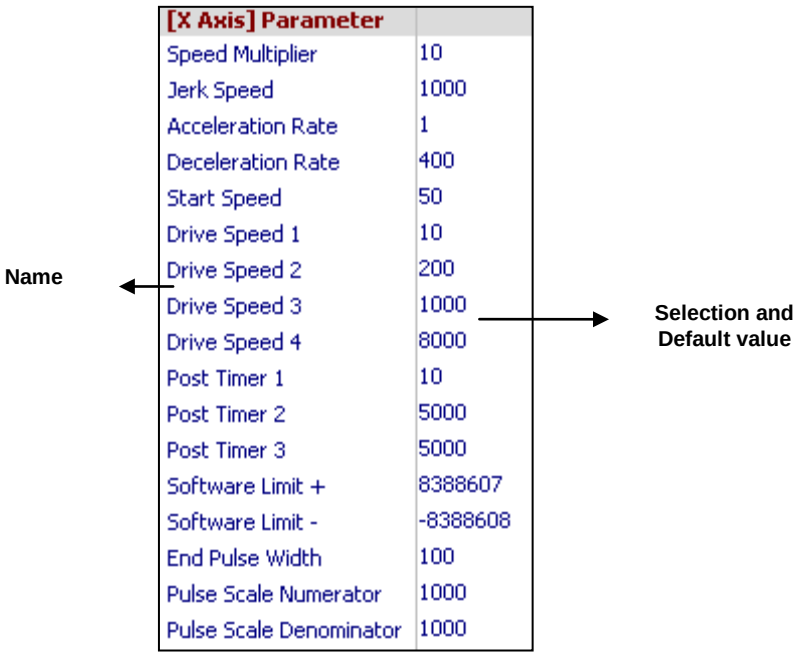
3.6.1.9 Input 0, 1(General purpose input 0, 1) Level

Name	Selection	Default value
Input0 Level	Low/High	Low
Input1 Level		

It sets active level of general purpose inputs 0, 1.

- Low: Activates input signal when the limit input signal is connected to GEX.
- High: Activates input signal when the limit input signal is Open.

3.6.2 Parameter



Name	Description	Selection	Default value
Speed Multiplier	Speed multiplier	1 to 500	10
Jerk Speed	Jerk speed	1 to 65,535	1,000
Acceleration Rate	Acceleration rate	1 to 8,000	400
Deceleration Rate	Rate of deceleration	1 to 8,000	400
Start Speed	Initial speed	1 to 8,000	50
Drive Speed 1	Drive speed 1	1 to 8,000	10
Drive Speed 2	Drive speed 2	1 to 8,000	100
Drive Speed 3	Drive speed 3	1 to 8,000	1,000
Drive Speed 4	Drive speed 4	1 to 8,000	8,000
Post Timer 1	Post timer 1	1 to 65,535 (unit: msec)	10
Post Timer 2	Post timer 2	1 to 65,535 (unit: msec)	100
Post Timer 3	Post timer 3	1 to 65,535 (unit: msec)	1,000
Software Limit+	Software limit +	-8,388,608 to +8,388,607	+8,388,607
Software Limit-	Software limit-	-8,388,608 to +8,388,607	-8,388,608
End Pulse Width(msec)	Drive ending pulse width	1 to 65,535 (unit: msec)	100
Pulse Scale Numeration	Numerator of pulse scale	1 to 65,535	1,000
Pulse Scale Denomination	Denominator of pulse scale	1 to 65,535	1,000

3.6.2.1 Speed Multiplier

Speed multiplier decides speed parameter multipliers for drive speed, initial speed and high/low home search speed.

Name	Selection	Default value
Speed Multiplier	1 to 500	10

The setting range of speed parameters for drive speed, acceleration/deceleration speed, initial speed and high/low home search speed is 1 to 8,000. If using above this range, make sure to properly set a speed multiplier. The range of speed multiplier is max. 500. If setting bigger speed multiplier, it is able to drive in high speed but it decreases the speed resolution. So set the multiplier to the minimum value needed to accept the scope of drive speed.

 Ex.

To use the drive speed up to 40 KPPS, the multiplier 5 can be used because the speed setting range is 1 to 8,000. (8,000 X 5 = 40KPPS)

 Caution

Do not change speed multiplier while driving.

Speed may become discontinuous.

3.6.2.2 Jerk Speed

Jerk speed is a parameter used to decide acceleration and deceleration rates in a given time in an S curve drive.

Name	Selection	Default value
Jerk Speed	1 to 65,535	1,000

With jerk speed value as K, the actual jerk speed can be calculated with the following formula.

$$\textbf{Jerk Speed}\left(\frac{\textbf{PPS}}{\textbf{SEC}^2}\right) = \frac{62.5 \times 10^6}{\textbf{K}} \times \textbf{Speed multiplier}$$

 Ex.

When K is 625 and speed multiplier is 10, the jerk speed is as following.

$$\textbf{Jerk Speed}(\textbf{PPS}/\textbf{SEC}^2) = \frac{62.5 \times 10^6}{625} \times 10 = 1\textbf{MPPS}/\textbf{SEC}^2$$

 Note

Jerk speed: Acceleration /Deceleration rates of Acceleration /Deceleration speed per unit of time.

For further details, refer to ‘5.1.2.4 S Curve’.

3.6.2.3 Acceleration Rate

Acceleration rate is a parameter representing acceleration value in acceleration/deceleration drive.

Name	Selection	Default value
Acceleration Rate	1 to 8,000	400

With acceleration rate as A, the actual acceleration speed can be calculated with the following formula.

$$\mathbf{A} = \frac{\text{Acceleration Speed}}{\mathbf{125}\times \text{Speed Multiplier}} \qquad \text{Acceleration Speed } (\mathbf{PPS/SEC}) = \frac{\text{Drive Speed} - \text{Initial Speed}}{\text{Time}}$$

To run acceleration /Deceleration drive, initial speed, drive speed, acceleration rate and deceleration rate must be set in [Parameters]. (When running symmetric acceleration/ deceleration drive, it uses acceleration rate when decelerating, so it does not need to separately set deceleration rate.)

Ex.

Parameter setting for acceleration to reach 20,000 pps in 0.3 sec starting from the initial speed of 500 pps:

Acceleration(PPS/SEC) = (20,000 - 500) / 0.3 = 65,000 PPS/SEC

A = 65,000 / (125 x Speed Multiplier) = 520 / Speed Multiplier

- When speed multiplier is 10, acceleration rate set value A = 65,000/1250 = 52
- Initial speed set value SV = Initial speed / Speed multiplier = 500 / 10 = 50PPS
- Drive speed set value V = Drive speed / Speed multiplier = 20,000/10 = 2,000PPS

For further details, refer to '5.1.2.2 Symmetric Trapezoidal Acceleration/Deceleration Drive'.

3.6.2.4 Deceleration Rate

The parameter representing deceleration value in accel/decel drive.

Name	Selection	Default value
Deceleration Rate	1 to 8,000	400

With deceleration rate as D, the actual deceleration speed can be calculated with the following formula.

$$\mathbf{D} = \frac{\text{Deceleration Rate}}{\mathbf{125}\times \text{Speed Multiplier}} \qquad \text{Deceleration Speed } (\mathbf{PPS/SEC}) = \frac{\text{Drive Speed} - \text{Initial Speed}}{\text{Time}}$$

When running asymmetric acceleration/deceleration drive, you must set deceleration rate after deceleration value has been set to [Decel] in mode setting.

For further details, refer to '5.1.2.3 Asymmetric Trapezoidal Acceleration/Deceleration drive'.

3.6.2.5 Start Speed

Start and end speed in acceleration/deceleration drive.

Name	Selection	Default value
Start Speed	1 to 8,000	50

With initial speed value set as SV, the actual initial speed is calculated with the following formula.

Initial Speed (PPS) = SV × Speed Multiplier

- If drive speed > initial speed: Run acceleration/deceleration drive.
  Acceleration/deceleration speed parameters must be set.
- If drive speed ≤ initial speed: Do not run acceleration/deceleration drive and run constant speed drive from the beginning.

Caution

If initial speed is set too high, the motor is likely to step out and not work. Therefore, set initial speed within the stepping motor's starting pulse rate.

3.6.2.6 Drive Speed 1 to 4

A total of 4 kinds of drive speed can be set for each axis of Motion Controller. Select one from drive speed 1 to 4 when in drive.

Name	Selection	Default value
Drive Speed 1 / 2 / 3 / 4	1 to 8,000	10 / 100 / 1,000 / 8,000

With a drive speed set value as V, the actual drive speed is calculated with the following formula.

Drive Speed (PPS) = V × Speed Multiplier

- If drive speed > initial speed: Run acceleration/deceleration drive.
  Acceleration/deceleration speed parameters must be set.
- If drive speed ≤ initial speed: Do not run acceleration/deceleration drive and run constant speed drive from the beginning.

3.6.2.7 Post Timer 1 to 3

These are waiting times from the end of drive commands ABS, INC, LID, CID, FID and RID execution to the start of the next step command.

Name	Selection	Default value
Post Timer 1 / 2 / 3	1 to 65,535 (msec)	10 / 100 / 1,000

There are three kinds of post timers. Use one of three preset post timers when you create commands. (Select Timer 0 when program: do not use waiting time)

Note

The actual post timer value runs longer than set value (msec).

3.6.2.8 Software Limit+/-

It sets +/- direction software limit values. Software limit is a function that allows you to limit with software without additional hardware limit sensor input.

Name	Selection	Default value
Software Limit +	- 8,388,608 to + 8,388,607	+ 8,388,607
Software Limit -		- 8,388,608

Pulse scale numerator/denominator is applied to the set value. (For furter details, refer to '3.6.2.10 Pulse Scale numerator/denominator'.) The ranges in above table are values when pulse scale numerator/denominator=1,000/1,000=1. To operate software limit, set [Enable] on [Software Limit] of [Operation Mode] section. When the software limit value becomes the same as the output pulse value, it stops slowly.

For further details, refer to '5.4.1 Limit Operation'.

3.6.2.9 End Pulse Width

It sets the width of end pulse outputted from n DRIVE/END signal of Parallel I/F connector at the time the drive ends.

Name	Selection	Default value
End Pulse Width	1 to 65,535(msec)	100

To use end pulse width function, [End Pulse] must be set to [Enable] in operation mode. n DRIVE/END outputs stay in OFF status while each axis is driving, and outputs pulse for the duration of end pulse width when the drive ends.

 Ex.

If end pulse width is set to 1,000, it outputs pulse for 1,000 msec(1sec.) after the drive finishes.

 Note

End pulse width runs longer than actual set value (msec).

3.6.2.10 Pulse Scale numerator/denominator

These are used to set the scale of pulse actually output for the entered position data.

Name	Selection	Default value
Pulse Scale numerator	1 to 65,535	1,000
Pulse Scale denominator		

It is able to convert position data entered via this function to other units such as mm or inches. Use the formula below to set..

Pulse value = Input value X (Pulse Scale numerator/Pulse Scale denominator)

Display value = Pulse value X (Pulse Scale numerator/Pulse Scale denominator)

Ex.

To convert input unit to 1 ㎜ when pulse position movement of drive 1 is 0.01 ㎜:

Set pulse scale numerator/pulse scale denominator to 100/1. Enter 1(㎜) in MotionStudio. It outputs 100 pulses and displays the value as 1.00.
In this case, allowed input value range is converted to existing range (-8,388,608 to +8,388,607) x 1/100 (-83,886.08 to +83,886.07).
Desired Position Input value/1 Pulse Position Movement value = 1/0.01 = 100/1

- Pulse Scale numerator = 100
- Pulse Scale denominator = 1

Allowed input value range: (-8,388,608 to +8,388,607) X 1/100 = -83,886.08 to +83,886.07

Note

The display value is the quotient of pulse scale denominator divided by pulse scale numerator with decimal places, and displays up to 4 decimal places.

- Numerator = 1, Denominator = 1 → Quotient = 1, No decimal point
- Numerator= 100, Denominator = 1 → Quotient = 0.01, Displays 2 decimal points
- Numerator= 1, Denominator = 10 → Quotient = 10, Displays 10 times value
- Numerator= 1, Denominator = 100 → Quotient = 100, Displays 100 times value

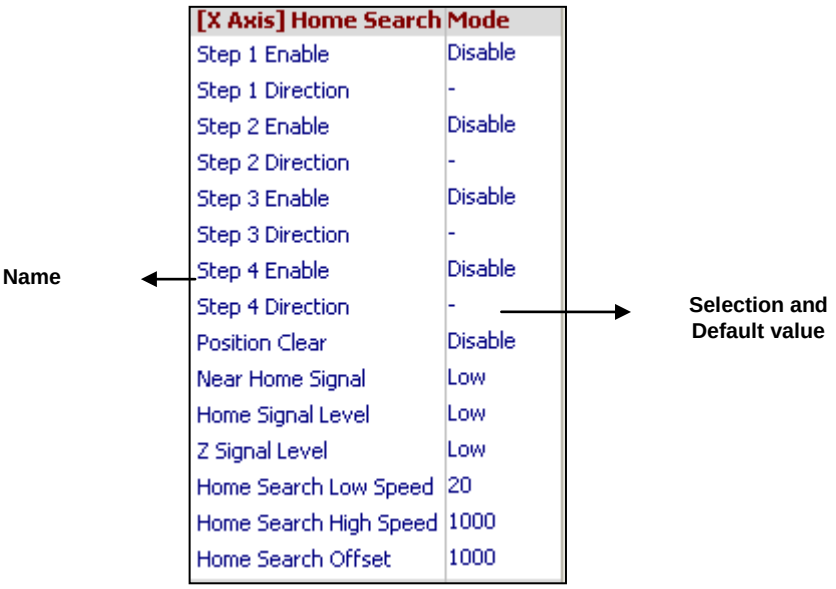
Caution

Pulse scale numerator, pulse scale denominator values affect all position data. Set these values (motor rotation step angle or ball screw pitch) according to the environment. To change set values, stop the system first.

Pulse scale numerator/denominator values are set to 1,000/1,000 = 1 by default, so input value is the same as pulse value. The table below shows position data that is applied when scale value changes.

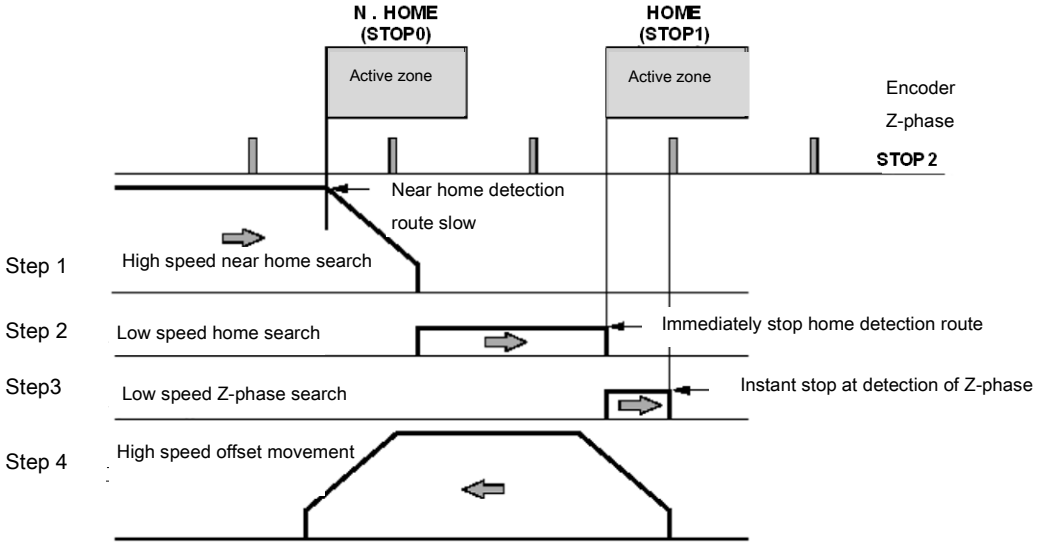
Window	Position data applied when scale value is changed
Main window	Position
Parameter window	Home Search Offset, Software Limit + / -
Program edit window	Position data for ABS/INC/LID/CID/FID/RID commands

3.6.3 Home Search Mode



Name	Description	Selection	Default value
Step 1 Enable	Enable/disable step 1	Enable/Disable	Disable
Step 1 Direction	Step 1 search direction	+ /-	-
Step 2 Enable	Enable/disable step 2	Enable/Disable	Disable
Step 2 Direction	Step 2 search direction	+ / -	-
Step 3 Enable	Enable/disable step 3	Enable/Disable	Disable
Step 3 Direction	Step 3 search direction	+ / -	-
Step 4 Enable	Enable/disable step 4	Enable/Disable	Disable
Step 4 Direction	Step 4 search direction	+ / -	-
Position Clear	Position Clear	Enable/Disable	Disable
Near Home Signal Level (n STOP0)	Near home signal (STOP 0) Logical level	Low/High	Low
Home Signal Level (n STOP1)	Home signal (STOP1) logical level	Low/High	Low
Z Signal Level (n STOP2)	Encoder Z-phase signal (STOP2) Logical level	Low/High	Low
Home Search Low Speed	Home search low speed	1 to 8,000	20
Home Search High Speed	Home search high speed	18,000	1,000
Home Search Offset	Home search offset	0 to 8,388,607	1,000

There are 4 steps in home search, as in the image below.



For further details, refer to '3.7.3 HOM (Home search) '.

3.6.3.1 Step 1 to 4 Enable

Name	Selection	Default value
Step 1 to 4 Enable	Enable/Disable	Disable

It sets whether to use each step or not in home search.

- Disable: The specified step does not run, and proceeds to the next step.
- Enable: It performs search operation of each step in specified direction and then moves to the next step.

3.6.3.2 Step 1 to 4 Direction

Name	Selection	Default value
Step 1 to 4 Direction	+ / -	-

It sets the direction of detection for each step. Check detection position and set properly.

- + : Drive pulse is out in + direction (CW).
- - : Drive pulse is output in - direction (CCW).

3.6.3.3 Position Clear

Name	Selection	Default value
Position Clear	Disable/Enable	Enable

If this is set to [Enable], it initializes position counter when home search ends.

3.6.3.4 Near Home Signal Level(n STOP0 logical level)

Name	Selection	Default value
Near Home Signal Level (n STOP0)	Low/High	Low

It sets active logical level of Near Home signal (n STOP0) used for home search step 1 home search high speed. Near home signal (n STOP0) of each axis is Pin 11 of CN4, 5.

- Low: It starts detection for Step 1. When the signal is connected with GEX, it judges the situation as active and slows to stop.
- High: It starts detection for Step 1. When the signal is open, it judges the situation as active and slows to stop.

3.6.3.5 Home Signal Level(n STOP1 logical level)

Name	Selection	Default value
Home Signal Level (n STOP1)	Low/High	Low

It sets active logical level of home signal (n STOP1) that is used for home search step 2 home search low speed. Home signal (n STOP1) of each axis is Pin 10 of CN4, 5.

- Low: It starts detection for Step 2. When the signal is connected with GEX it judges the situation as active and stops immediately.
- High: It starts detection for Step 2. When the signal is open, it judges the situation as active and stops immediately.

3.6.3.6 Z Signal Level(STOP2 logical level)

Name	Selection	Default value
Z Signal Level (n STOP2)	Low/High	Low

It sets active logical level of Encoder Z-phase signal (n STOP2) used for home search step 3 Z-phase search low speed. Z-phase signal (n STOP2) of each axis is Pin 9 of CN4, 5.

- Low: It starts detection for Step 3. When the signal is connected with GEX it judges the situation as active and stops immediately.
- High: It starts detection for Step 3. When the signal is open, it judges the situation as active and stops immediately.

3.6.3.7 Home Search Low Speed

Name	Selection	Default value
Home Search Low Speed	1 to 8,000	20

It sets home search low speed. With home search low speed value set as LV, the actual home search low speed is calculated with the following formula.

Low Speed(PPS) = LV × Speed Multiplier

Caution

Set home search low speed lower than initial speed, because it has to stop immediately.

3.6.3.8 Home Search High Speed

Name	Selection	Default value
Home Search High Speed	1 to 8,000	1,000

It sets home search high speed. Set home search high speed higher than initial speed to perform Accel/Decel drive. With home search high speed value set as HV, the actual home search high speed is calculated with the following formula.

High Speed(PPS) = HV × Speed Multiplier

3.6.3.9 Home Search Offset

It sets the amount of home search Step 4 high speed offset movement.

Name	Selection	Default value
Home Search Offset	0 to 8,388,607	100

It is able to set this value in mm or inches using pulse scale numerator/denominator in parameters

For further details, refer to ‘3.6.2.10 Pulse Scale numerator/denominator’.

Pulse scale numerator and denominator values are the same when the product is shipped, so the pulse value is displayed. Data setting range in pulse value is 0 to 8,388,607. Even if Step 4 is set to [Enable], if you set home search offset to 0, the movement is not available. Likewise, even if the home search offset is set, if you do not set Step 4 as [Enable], the movement is not available.

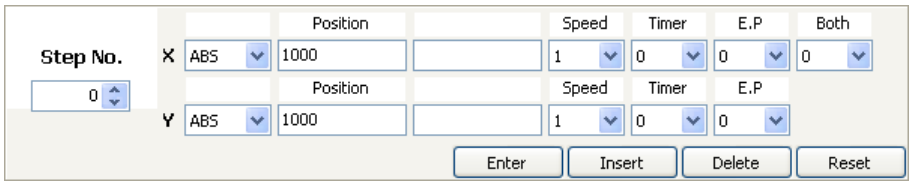
3.7 Program Commands

There are 17 program commands as listed in the table below.

Command Type	Command	Description	Remarks
Drive command	ABS	Absolute position movement	
	INC	Relative position movement	
	HOM	Home search	
	LID	2-axis linear interpolation	Only for PMC-2HSP series
	CID	2-axis clockwise circle interpolation	
	FID	2-axis CW circular interpolation	
	RID	2-axis CCW circular interpolation	
Input/output command	ICJ	Jump input condition	
	IRD	Waiting input	
	OPC	ON/OFF output port	
	OPT	Output port ON pulse	
Program control command	JMP	Jump	
	REP	Start repetition	
	RPE	End repetition	
	END	End the program	
Other command	TIM	Timer	
	NOP	No operation	

3.7.1 ABS (Absolute position movement)

A specified distance based on home is moved by using the absolute movement command.



For further details, refer to '5.1.1 Fixed Pulse and Continuous Pulse Drive'.

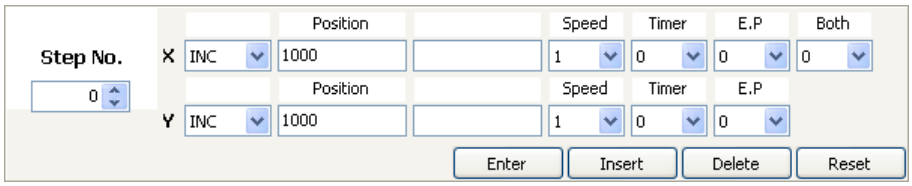
- Position: Enter moving position in absolute value.
  It is able to set this value in mm or inches using pulse scale numerator/denominator in parameters.
  For further details, refer to '3.6.2.10 Pulse Scale numerator/denominator'. Pulse scale numerator and denominator values are the same when the product is shipped, so the pulse value is displayed. Input range is -8,388,608 to +8,388,607.
- Speed: Select drive speed.
  Set drive speed 1 to 4 for the purpose in [Drive Speed] on [Parameter].
- Timer: Specifies wait time between completion of movement to next step. Set timer 1 to 3 for the purpose in [Post Timer] on [Parameter]. Select timer 0 if you do not need to set wait time.
- E.P (End Pulse): When you select 1, it outputs end drive pulse to n DRIVE/END output signal of parallel I/F. End pulse must be set to [Enable] in [End Pulse] on [Operation Mode], and end pulse width must be set in [End Pulse Width] on [Parameter].
- Both: Set to 0 when X axis and Y axis are operated independently. Set to 1 when X axis and Y axis are started at the same time. If [Both] are set to 1, the one axis that reaches the specified step first waits for the other to get to the step and then they execute the command simultaneously. Even though they start at the same time, the axis that finishes the command first processes the next step first.

Note

[Both] is applied to only ABS, INC and HOM commands. If X axis uses one of ABS, INC, HOM commands and sets [Both] as 1, the same command must be set for Y axis of the same step number. If they have different commands, an error occurs. In PMC-2HSP series, for interpolation commands (LID, CID, FID, RID), each axis starts at the same time without an additional [Both] setting.

3.7.2 INC (Relative position movement)

Starting from the current position, INC moves specified distance to relative position.



For further details, refer to '5.1.1 Fixed Pulse and Continuous Pulse Drive'.

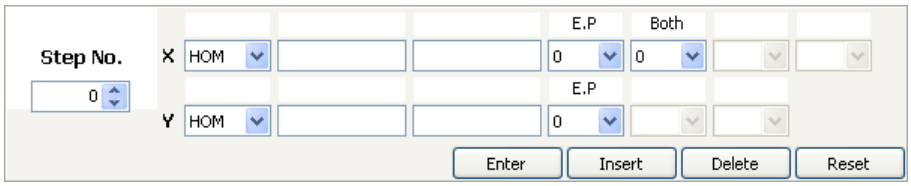
- Position: Enter the moving position in relative value.
  It is able to set this value in mm or inches using pulse scale numerator/denominator in parameters
  For further details, refer to '3.6.2.10 Pulse Scale numerator/denominator'. Pulse scale numerator and denominator values are the same when the product is shipped, so the pulse value is displayed. Input range is -8,388,608 to +8,388,607.
- Speed: Select drive speed.
  Set drive speed 1 to 4 for the purpose in [Drive Speed] on [Parameter].
- Timer: Specifies wait time between completion of movement to next step. Set timer 1 to 3 for the purpose in [Post Timer] on [Parameter]. Select timer 0 if you do not need to set wait time.
- E.P (End Pulse): When you select 1, it outputs end drive pulse to n DRIVE/END output signal of parallel I/F. End pulse must be set to [Enable] in [End Pulse] on [Operation Mode], and end pulse width must be set in [End Pulse Width] on [Parameter].
- Both: Set to 0 when X axis and Y axis are operated independently. Set to 1 when X axis and Y axis are started at the same time. If [Both] are set to 1, the one axis that reaches the specified step first waits for the other to get to the step and then they execute the command simultaneously. Even though they start at the same time, the axis that finishes the command first processes the next step first.

Note

[Both] is applied to only ABS, INC and HOM commands. If X axis uses one of ABS, INC, HOM commands and sets [Both] as 1, the same command must be set for Y axis of the same step number. If they have different commands, an error occurs. In PMC-2HSP series, for interpolation commands (LID, CID, FID, RID), each axis starts at the same time without an additional [Both] setting.

3.7.3 HOM (Home search)

Runs home search in order that has been set in home search mode.



For further details, refer to '3.6.3 Home Search Mode'.

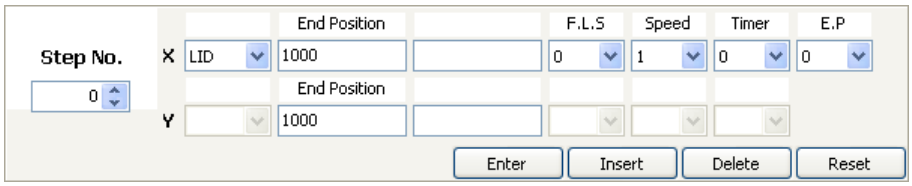
- E.P (End Pulse): When you select 1, it outputs end drive pulse to n DRIVE/END output signal of parallel I/F. End pulse must be set to [Enable] in [End Pulse] on [Operation Mode], and end pulse width must be set in [End Pulse Width] on [Parameter].
- Both: Set to 0 when X axis and Y axis are operated independently. Set to 1 when X axis and Y axis are started at the same time. If [Both] are set to 1, the one axis that reaches the specified step first waits for the other to get to the step and then they execute the command simultaneously. Even though they start at the same time, the axis that finishes the command first processes the next step first.

Note

[Both] is applied to only ABS, INC and HOM commands. If X axis uses one of ABS, INC, HOM commands and sets [Both] as 1, the same command must be set for Y axis of the same step number. If they have different commands, an error occurs. In PMC-2HSP series, for interpolation commands (LID, CID, FID, RID), each axis starts at the same time without an additional [Both] setting.

3.7.4 LID (2-axis linear interpolation)- only for PMC-2HSP series

Performs 2-axis linear interpolation from present coordinate toward the end coordinate.

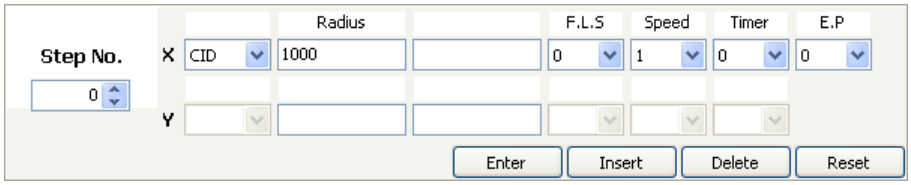


For further details, refer to '5.2.1 Linear Interpolation (Command: LID)'.

- End Position: This is the end coordinate, and the interpolation command is processed toward this coordinate when doing 2-axis linear interpolation. Specify this position as a relative coordinate against the present coordinate. Input range is -8,388,608 to +8,388,607.
- F.L.S (Fixed Line Speed): 1 operates the command with constant linear velocity. Constant linear velocity is a function that makes the resultant velocity constant during interpolation. For further details, refer to '5.2.4 Constant Linear Velocity'.
- Speed: Select drive speed. Set drive speed 1 to 4 for the purpose in [Drive Speed] on [Parameter].
- Timer: Specifies wait time between completion of movement to next step. Set timer 1 to 3 for your purpose in post timer parameters. Select timer 0 if you do not need to set wait time.
- E.P (End Pulse): When you select 1, it outputs end drive pulse to n DRIVE/END output signal of parallel I/F. End pulse must be set to [Enable] in [End Pulse] on [Operation Mode], and end pulse width must be set in [End Pulse Width] on [Parameter].

3.7.5 CID (2-axis clockwise circle interpolation)- only for PMC-2HSP series

Runs a circle interpolation drive in clockwise direction of X,Y axes.



For further details, refer to '5.2.2 Circle Interpolation (Command: CID)'.

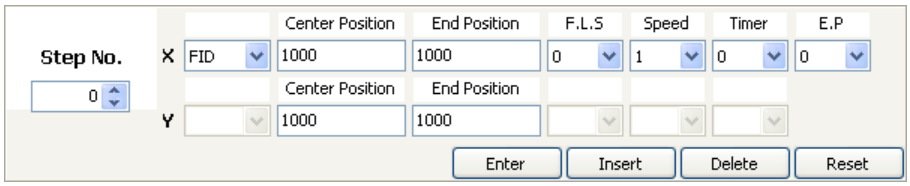
- Radius: Sets the radius of a circular interpolation. Specify a relative value against present coordinate. Input range is 0 to 8,388,607.
- Manual deceleration point: Manual deceleration point must be set because there is no auto-deceleration for circular interpolation. Manual deceleration point is automatically computed when the radius is entered, so it is not needed to enter a value for this field. However, because of this manual deceleration point setting, 2 steps are required to enter CID command. Select [Option]-[Calculator]-[Manual Deceleration Point] to see the result.
- F.L.S (Fixed Line Speed): 1 operates the command with constant linear velocity. Constant linear velocity is a function that makes the resultant velocity constant during interpolation.
  For further details, refer to '5.2.4 Constant Linear Velocity'.
- Speed: Select drive speed. Set drive speed 1 to 4 for the purpose in [Drive Speed] on [Parameter].
- Timer: Specifies wait time between completion of movement to next step. Set timer 1 to 3 for your purpose in post timer parameters. Select timer 0 if you do not need to set wait time.
- E.P (End Pulse): When you select 1, it outputs end drive pulse to n DRIVE/END output signal of parallel I/F. End pulse must be set to [Enable] in [End Pulse] on [Operation Mode], and end pulse width must be set in [End Pulse Width] on [Parameter].

Caution

For CID (circle interpolation) command, [S Curve] on [Operation Mode] should be set as [Disable]. If not, it may not move as the set drive speed. When doing interpolation drive, drive speed of each axis varies and it performs linear and circle. However, [Speed] of [Node Information] in MotionStudio displays the set drive speed of X axis which is different from the actual driving speed.

3.7.6 FID (Clockwise circular interpolation) – only for PMC-2HSP series

Runs a circular interpolation drive in clockwise direction of X,Y axes.



For further details, refer to '5.2.3 Circular Interpolation (Command: FID/RID)'.

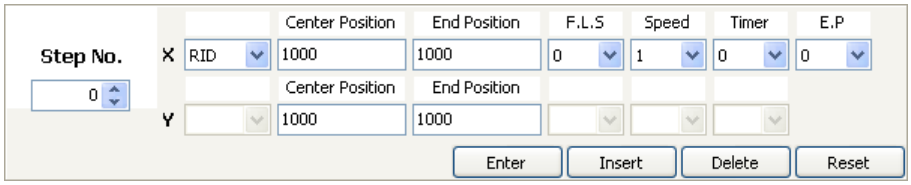
- Center Position: Sets center coordinate of each axis. Specify this position as a relative coordinate against the present coordinate.
- End Position: Sets end coordinate of each axis. Specify this position as a relative coordinate against the present coordinate.
- Manual deceleration point: Manual deceleration point must be set because there is no auto-deceleration for circular interpolation. Manual deceleration point is automatically computed when the radius is entered, so it is not needed to enter a value for this field. However, because of this manual deceleration point setting, 2 steps are required to enter CID command. Select [Option]-[Calculator]-[Manual Deceleration Point] to see the result.
- F.L.S (Fixed Line Speed): 1 operates the command with constant linear velocity. Constant linear velocity is a function that makes the resultant velocity constant during interpolation.
  For further details, refer to '5.2.4 Constant Linear Velocity'.
- Speed: Select drive speed. Set drive speed 1 to 4 for the purpose in [Drive Speed] on [Parameter].
- Timer: Specifies wait time between completion of movement to next step. Set timer 1 to 3 for your purpose in post timer parameters. Select timer 0 if you do not need to set wait time.
- E.P (End Pulse): When you select 1, it outputs end drive pulse to n DRIVE/END output signal of parallel I/F. End pulse must be set to [Enable] in [End Pulse] on [Operation Mode], and end pulse width must be set in [End Pulse Width] on [Parameter].

Caution

For FID (circle interpolation) command, [S Curve] on [Operation Mode] should be set as [Disable]. If not, it may not move as the set drive speed. When doing interpolation drive, drive speed of each axis varies and it performs linear and circle. However, [Speed] of [Node Information] in MotionStudio displays the set drive speed of X axis which is different from the actual driving speed.

3.7.7 RID (Counterclockwise circular interpolation)- only for PMC-2HSP series

Runs a circular interpolation drive in counter-clockwise direction of X,Y axes.



For further details, refer to '5.2.3 Circular Interpolation (Command: FID/RID)'.

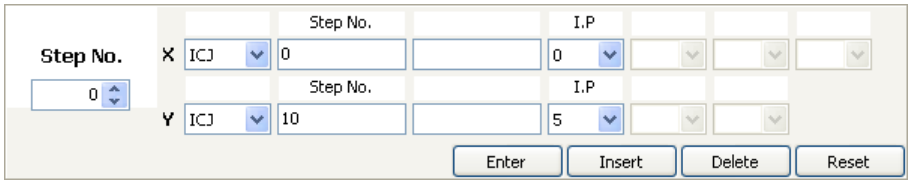
- Center Position: Sets center coordinate of each axis. Specify this as a relative coordinate against present coordinate.
- End Position: Sets end coordinate of each axis. Specify this as a relative coordinate against present coordinate.
- Manual deceleration point: Manual deceleration point must be set because there is no auto-deceleration for circular interpolation. Manual deceleration point is automatically computed when the radius is entered, so it is not needed to enter a value for this field. However, because of this manual deceleration point setting, 2 steps are required to enter CID command. Select [Option]-[Calculator]-[Manual Deceleration Point] to see the result.
- F.L.S (Fixed Line Speed): 1 operates the command with constant linear velocity. Constant linear velocity is a function that makes the resultant velocity constant during interpolation.
  For further details, refer to '5.2.4 Constant Linear Velocity'.
- Speed: Select drive speed. Set drive speed 1 to 4 for the purpose in [Drive Speed] on [Parameter].
- Timer: Specifies wait time between completion of movement to next step. Set timer 1 to 3 for your purpose in post timer parameters. Select timer 0 if you do not need to set wait time.
- E.P (End Pulse): When you select 1, it outputs end drive pulse to n DRIVE/END output signal of parallel I/F. End pulse must be set to [Enable] in [End Pulse] on [Operation Mode], and end pulse width must be set in [End Pulse Width] on [Parameter].

Caution

For RID (circle interpolation) command, [S Curve] on [Operation Mode] should be set as [Disable]. If not, it may not move as the set drive speed. When doing interpolation drive, drive speed of each axis varies and it performs linear and circle. However, [Speed] of [Node Information] in MotionStudio displays the set drive speed of X axis which is different from the actual driving speed.

3.7.8 ICJ (Jump input condition)

If the selected input port is in active state, jump to the specified step (Step No.). If the input port is not in active state, proceed to the next step.



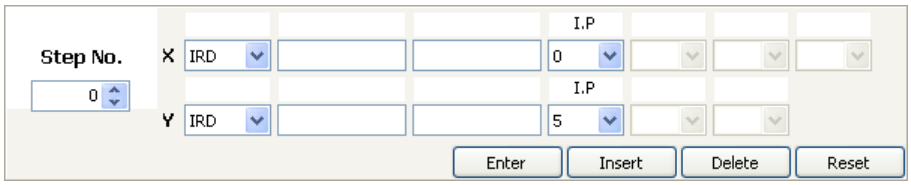
- Step No. : Specifies the step number to jump to. The range is 0 to 199.
- I.P No. (Input Port No.): Selects an input port number.
  For more information about input port numbers, refer to '3.7.18 I/O Port'.

Caution

Do not use ICJ command in a loop between REP and RPE commands.

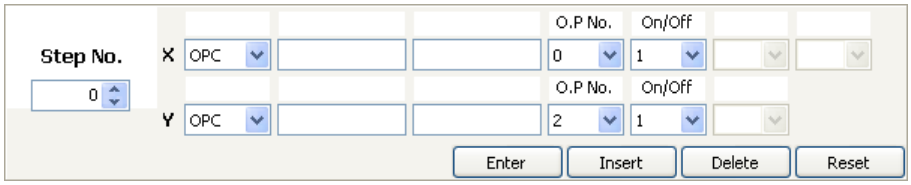
3.7.9 IRD (Waiting input)

It moves to the next step when selected input port becomes active. If the input port is not in active state, it remains in the current step until the port becomes active.



- I.P No. (Input Port No.): Selects an input port number.
  For more information about input port numbers, refer to '3.7.18 I/O Port'.

3.7.10 OPC (ON/OFF output port)

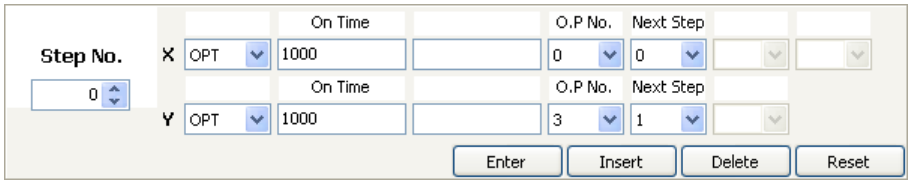


It turns ON/OFF a selected output port (It turns ON/OFF the output of the open collector transistor).

- O.P No. (Output Port No.): Selects output port number.
  For more information about input port numbers, refer to '3.7.18 I/O Port'.
- OFF/ON: 1 turns it ON. 0 turns it OFF.

3.7.11 OPT(Output port ON pulse)

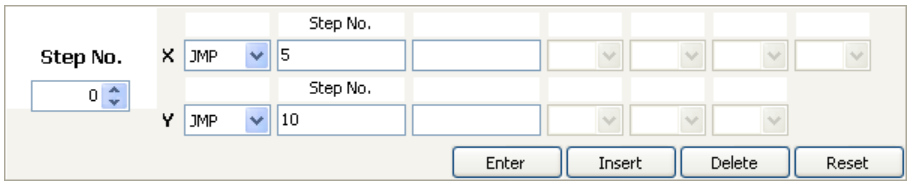
It turns ON a selected output port for the ON time period (It turns ON the output of the open collector transistor).



- ON Time: Sets the duration to keep the output port ON. The range is 0 to 65,535 msec.
- O.P No. (Output Port No.): Selects output port number.
  For more information about input port numbers, refer to '3.7.18 I/O Port'.
- Next Step
  - ON: Moves to the next step regardless of output operation.
  - OFF: Turns ON a selected output port for preset ON time period and moves to the next step when the time period elapses.

3.7.12 JMP (Jump)

It jumps to the specified step (Step No.).



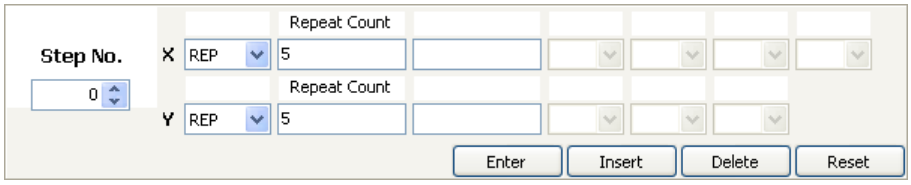
- Step No. : Specifies the step number to jump to. The range is 0 to 199.

Caution

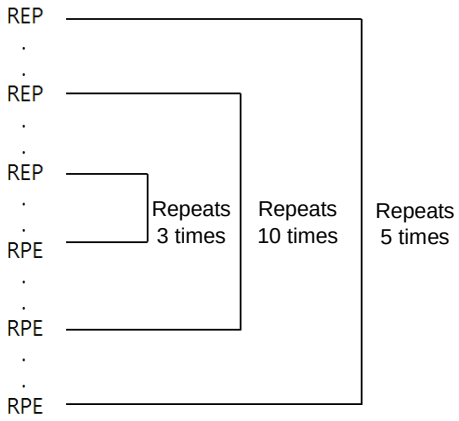
When using JMP command, pay attention to END command position.
Do not use JMP command in a loop between REP and RPE commands.

3.7.13 REP (Start repetition)

It repeats the commands for specified times from the next step of this command to RPE (stop repetition).

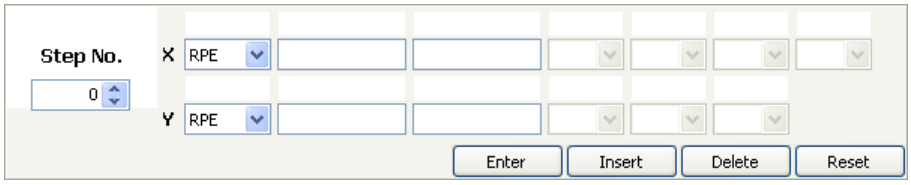


- Repeat Count: Specifies repeat times. The range is 1 to 255. RPE must be set below the REP (greater step number). Low level repetition loop can be set up to 3 times.



3.7.14 RPE (End repetition)

This is a stop command for REP (start repetition).

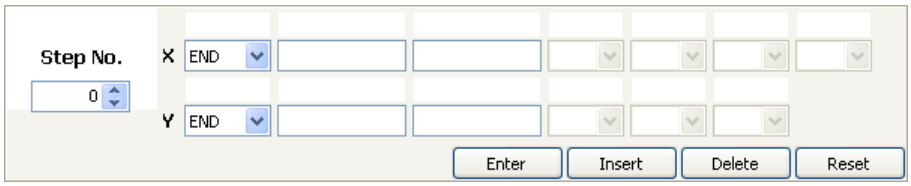


Caution

Do not use JMP or ICJ command in a loop between REP and RPE commands.

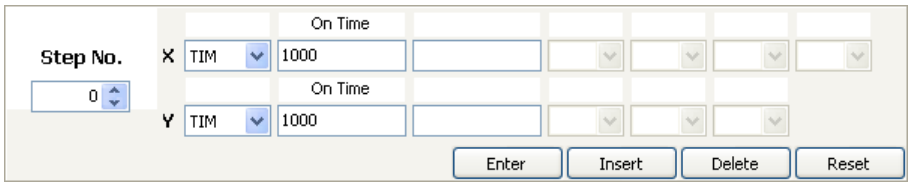
3.7.15 END (End the program)

It ends the program. This command must be entered at the end of a program.



3.7.16 TIM (Timer)

It performs waiting command for a specified time..



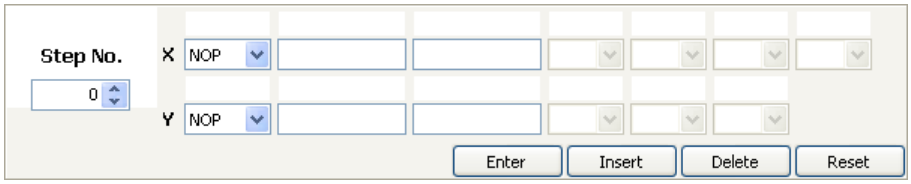
- On Time: Specifies the wait time in msec. The range is 0 to 65,535 msec.

Note

The actual TIM (timer) value runs longer than set value (msec).

3.7.17 NOP

It does not process anything.



Note

If there are empty steps within the program range, use NDP to eliminate any blank steps. Blank steps after END are not related.

3.7.18 I/O Port

(1) Input ports list

Input port	Connector	Pin number	Pin description	Signal	Active state
0	CN4	7	General purpose input 0	X axis input	Low/High active setting available
1		8	General purpose input 1		
2		9	Encoder Z-phase		
3		10	Home		
4		11	Near home		
5	CN5	7	General purpose input 0	Y axis input	
6		8	General purpose input 1		
7		9	Encoder Z-phase		
8		10	Home		
9		11	Near home		
10	CN3	6	STEPSL0	Parallel I/F input	Fixed to low active
11		7	STEPSL1		
12		8	STEPSL2		
13		9	STEPSL3		
14		10	STEPSL4		

(2) Output ports list

Output port	Connector	Pin number	Pin description	Signal	Signal state
0	CN4	5	General purpose output 0	X axis output	ON/OFF
1		6	General purpose output 1		
2	CN5	5	General purpose output 0	Y axis output	
3		6	General purpose output 1		

4 Basic Control using MotionStudio and Parallel I/F

Motion Controller has home search and 4 other run modes as described in the table below. There are two ways to run each mode; using a PC program, MotionStudio, and using inputs through Parallel I/F (CN3).

Run mode using Parallel I/F

Mode	Overview	Mode0(12)	Mode1(13)
Home search	Runs home search	-	-
Index mode	Selects a step from commands stored in a program and runs only that step.	OFF	OFF
Jog mode	Outputs drive only while command input signal is ON in +/- directions.	ON	OFF
		Jog 1 mode: JOG (10) OFF Jog 2 mode: JOG (10) ON	
Continuous mode	Starts drive output when the command input signal turns ON in +/- directions once, and stops output when at STOP.	OFF	ON
Program mode	Operates by registered program.	ON	ON

Note

In this chapter, mode numbers are expressed in 'signal name (pin number)' format.
Mode0 (12): Mode 0 is Pin12 of parallel I/F connector.

Caution

Do not execute commands with parallel I/F while motion controller and PC (MotionStudio) are communicating.
Do not execute commands with MotionStudio while motion controller and parallel I/F are communicating.(It is able to use for monitoring.) Double input may result in incorrect operation.

4.1 Index Mode

Index mode selects and runs only one step from commands stored in a program.

(1) Index drive using MotionStudio

1st Run MotionStudio and select [Program] tab of [Operation] section.

2nd In [Control] section, enter the desired step number to run in [Step No.] field.

3rd Click [Step] to run the desired step.

For further details, refer to '3.4.7.2 Program'.

(2) Index drive with Parallel I/F(CN3) input

Index drive with parallel I/F(CN3) input is an operation that runs only one step selected from stored programs and includes one of ABS, INC, LID, CID, FID and RID commands. To run index drive, the relevant command must be included in the specified program step. If you execute other than the relevant command, an error occurs.

1st Assign run modes: Mode0(12)=OFF, Mode1(13)=OFF

2nd Assign axes: X(4), Y(5)

3rd Assign step number: You can assign a step number from 0 to 63 as a combination of STEPSL5 to STEPSL0. You cannot assign step numbers 64 to 199.

4th Turn input signal STROBE(3) ON for more than 10 msec, and it runs the specified step.

Ex.

If Step 10 is selected, it combines STEPSL5 to STEPSL0 as a binary number and enters 001010.

For more information about assigning step numbers, refer to example of assigning program steps in of '2.4.3 Parallel I/F Connector(CN3) (5) Pin number 6, Pin number 7.'

Note

For PMC-2HSP series, precautions for executing interpolation commands (LID, CID, FID, RID).

- Both X and Y axes must be selected at the same time.
- Make sure to assign starting step numbers for CID (2 steps) and FID, RID (3 step) commands.

4.2 Jog Mode

Jog mode outputs drive pulse in the + or - direction while input signal is ON.

(1) Jog drive using MotionStudio

1st Run MotionStudio and select [Manual] tab of [Operation] section.

2nd In [Control] section, select [Jog] in [Mode Select].

3rd Click [CW(+)] or [CCW(-)] to run the drive.

4th The drive operation stops when the clickings are stoped.

For further details, refer to '3.4.7.1 Manual'.

(2) Jog drive with Parallel I/F(CN3) input

Jog 1 and Jog 2 modes are for jog drive with parallel I/F(CN3) input.
Jog 1 mode, comprised of a signal for assigning X(4), Y(5) axes and a signal for running RUN+(6), RUN-(7), operates in the same direction when running both axes.
Jog 2 mode has separate run signals for + and - directions (JOG X+(6), JOG X-(7), JOG Y+(4), JOG Y-(5)), so you have a variety of run directions to choose from.
Refer to the following table to set each jog mode.

Jog 1 mode	Jog 2 mode
▪ Assign run modes : Mode0(12)=ON, Mode1(13)=OFF ▪ Assign jog 1 mode: Assign JOG (10)=OFF ▪ Assign axes: X(4), Y(5) ▪ Assign drive speed: Select one from drive speed 1 to 4 as a combination of SPD0 (8) and SPD1(9). (It is able to change the speed while driving.) For further details, refer to '2.4.3 Parallel I/F Connector(CN3) **(6)** Pin number 8, Pin number 9'. ▪ Enter run signal: RUN+(6), RUN-(7)	▪ Assign run modes : Mode0(12)=ON, Mode1(13)=OFF ▪ Assign jog 2 mode: Assign JOG (10)=ON ▪ Assign drive speed: Select one from drive speed 1 to 4 as a combination of SPD0 (8) and SPD1(9). (It is able to change the speed while driving.) For further details, refer to '2.4.3 Parallel I/F Connector(CN3) **(6)** Pin number 8, Pin number 9'. ▪ Enter run signal: X axis + direction: JOG X+(6) X axis - direction: JOG X-(7) Y axis + direction: JOG Y+(4) Y axis - direction: JOG Y-(5)

4.3 Continuous Mode

Continuous mode outputs pulse consecutively in a specified direction when drive signal is activated. It stops when STOP signal is ON or limit signal in the progressive direction becomes active.

(1) Continuous drive using MotionStudio

1st Run MotionStudio and select [Manual] tab of [Operation] section.

2nd In [Control] section, select [Continuous] in [Mode Select].

3rd Select a speed from the select mode box in [Control] section. (It is able to change the speed while driving.)

4th Click [CW(+)] or [CCW(-)] to run the drive.

5th It stops when the stop(■) button is clicked or limit signal in the progressive directionbecomes active.

For further details, refer to '3.4.7.1 Manual'.

(2) Continuous drive with Parallel I/F(CN3) input

1st Assign run modes : Mode0(12)=OFF, Mode1(13)=ON

2nd Assign axes: X(4), Y(5)

3rd Assign drive speed: Select one from drive speed 1 to 4 as a combination of SPD0 (8) and SPD1(9). (It is able to change the speed while driving For further details, refer to '2.4.3 Parallel I/F Connector(CN3) (6) Pin number 8, Pin number 9'.

4th Turn ON RUN+(6), RUN-(7) inputs to run the drive.

5th It stops when STOP(11) was ON or limit signal in the progressive directionbecomes active.

4.4 Program Mode

Program mode runs a registered program.

(1) Program drive using MotionStudio

1st Run MotionStudio and select [Program] tab of [Operation] section.

2nd Enter program commands in [Edit] section.

3rd Click [Run] to run program drive.

For further details, refer to '3.4.7.2 Program'.

(2) Program drive with Parallel I/F(CN3) input

The program must be stored in Motion Controller's memory to run program drive with parallel I/F (CN3) input.

1st Assign run modes : Mode0(12)=ON, Mode1(13)=ON

2nd Assign axes: X(4), Y(5)

3rd Assign starting program step number: It is able to select a step number from 0 to 63 as a combination of STEPSL5 to STEPSL0. However, it is not able to assign step numbers 64 to 199.

4th Turn ON input signal STROBE(3) for more than 10 msec to run the drive.

For more information about assigning step numbers, refer to example of assigning program steps in of '2.4.3 Parallel I/F Connector(CN3) (5) Pin number 6, Pin number 7.'

 Ex.

If step 10 is selected, it combines STEPSL5 to STEPSL0 as a binary number and enters 001010.

4.5 Home Search

Home search runs according to the set value for the mode in the properties section.
For further details, refer to '3.6.3 Home Search Mode'.

(1) Home search using MotionStudio

1st Run MotionStudio and select [Manual] tab of [Operation] section.

2nd Select an axis (X or Y) from [Select Axis] in [Home Search] section.

3rd Click [Run] to run home search.

4th Home search runs according to the set value for the mode in the properties section.

For further details, refer to '3.4.7.1 Manual'.

(2) Home search with Parallel I/F(CN3) input

1st Assign run modes: X(4), Y(5)

2nd Turn ON input signal HOME(2) for more than 10 msec to run home search on specified axis. Home search runs according to the set value for the mode stored in motion controller memory.

5 Motion Controller Function

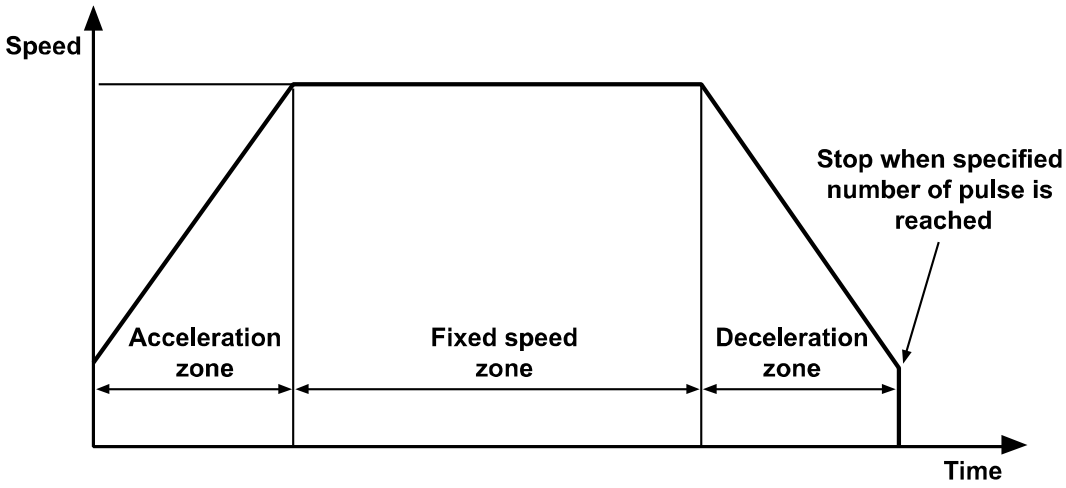
5.1 General Drive

5.1.1 Fixed Pulse and Continuous Pulse Drive

Drive pulse output on each axis is basically in +/- directions by drive commands of a fixed or continuous pulse.

5.1.1.1 Fixed Pulse Drive

Fixed pulse drive is used to move something a fixed amount. It performs fixed speed or accelerated/decelerated drive for a specified number of output pulses. Accel/decel fixed pulse drive starts to reduce speed when remaining output pulse is less than the pulse used for acceleration. It ends drive when it finishes generating pulse, as shown in the image below.



Speed multiplier, initial speed, drive speed, and acceleration rate must be set in [Parameter] to run fixed pulse acceleration/deceleration drive. For asymmetry acceleration/deceleration drive, it is needed to select [Decel] for [Deceleration Value] in [Operation Mode] and then set the deceleration rate separately.

5.1.1.2 Continuous Pulse Drive

Continuous pulse drive outputs drive pulse sequentially until the stop command from the high level or external stop signal becomes active. Continuous mode and home search mode are in this category. Decelerating stop and immediate stop are in stop commands. Slow stop is applied in almost every case except when drive speed is lower than initial speed, reset and emergency stop.

Relative and Absolute position movement: For drive movement, there are relative and absolute position movements. Absolute and relative movements belong to fixed pulse drive.

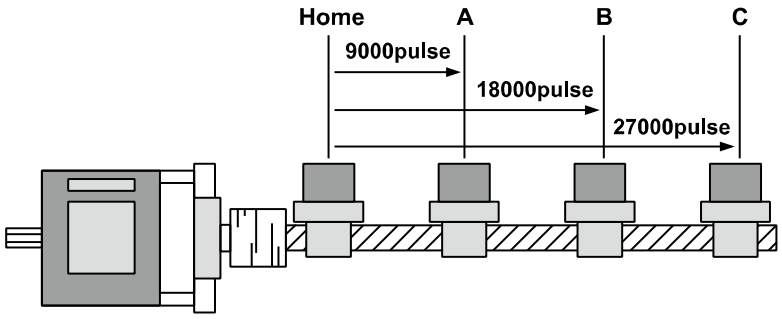
- Absolute position movement drives from home (0, 0) to the position of a specified distance. This is ABS command in program mode.

Ex.

Example of absolute position movement

Absolute position movement uses home (0, 0) as a base point for movement command, unlike relative position movement.

For example, if you execute the absolute position movement command ABS for 9,000 pulse 3 times, it moves to A in the image. In order to move to points A, B, C, as in a absolute position movement, you need to set ABS commands for each of 9,000/18,000/27,000 pulse.

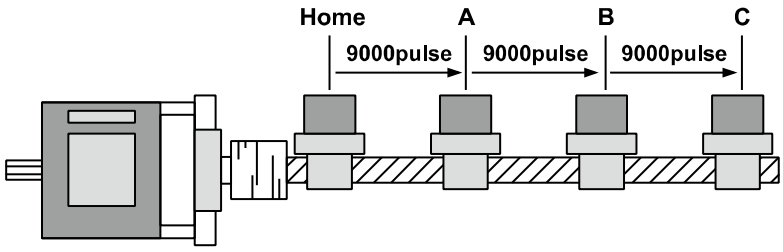


- Relative position movement sets a distance to drive from present coordinates. This is INC, LID, CID, FID, or RID command in program mode, and preset mode of [Manual] tap.

Ex.

Example of relative position movement
Move relative position works as shown in the image below.

For example, if you execute relative position movement command INC for 9.000 pulse 3 times, it moves to points A→B→C.

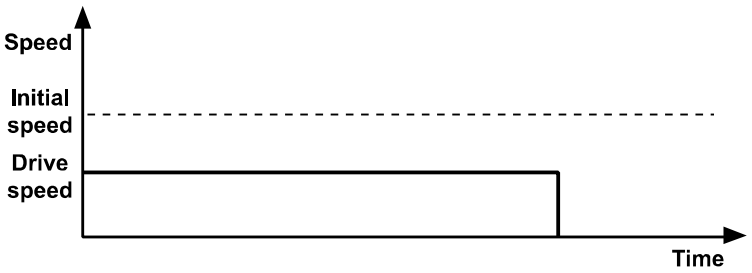


5.1.2 Speed Curve

Drive pulse generation on each axis is performed by +/- direction fixed pulse drive command or continuous pulse drive command. However, it can be performed with fixed speed, trapezoidal acceleration/deceleration, and S acceleration/deceleration speed curve by operation mode setting or by use of parameter values.

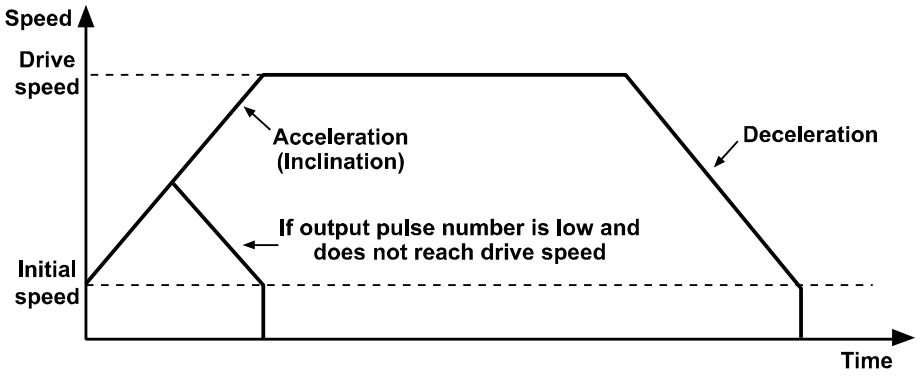
5.1.2.1 Constant Speed Drive

Constant speed drive outputs pulse at a constant speed. When drive speed is less than or equal to initial speed, motion controller performs constant speed drive. In order to run constant speed drive, speed multiplier, initial speed and drive speed must be set in parameters.



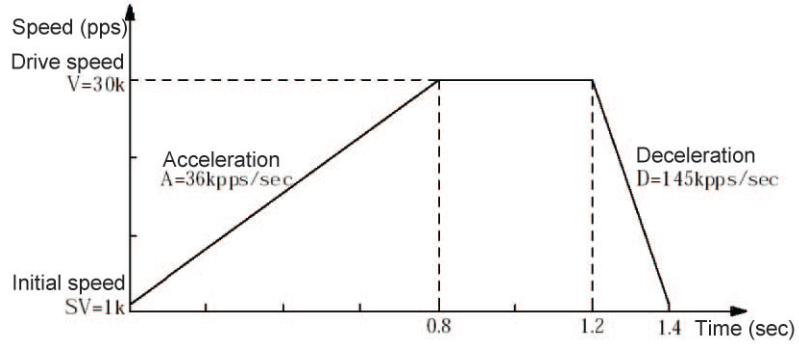
5.1.2.2 Symmetric Trapezoidal Acceleration/Deceleration Drive

- Trapezoidal acceleration/deceleration drive accelerates from initial speed to drive speed Trapezoidally with an inclination of specified acceleration.
- It is required to select [Accel] for [Deceleration Value] in [Operation Mode], and set speed multiplier, acceleration rate, start speed and drive speed in [Parameter].
- It counts the pulses consumed while accelerating to a specified drive speed, and starts decelerating when the remaining output pulse becomes less than accelerating pulse. This decelerating drive reduces speed to initial speed with specified acceleration. In continuous pulse drive, it decelerates to initial speed when the stop signal is activated, and stops immediately when it reaches initial speed.

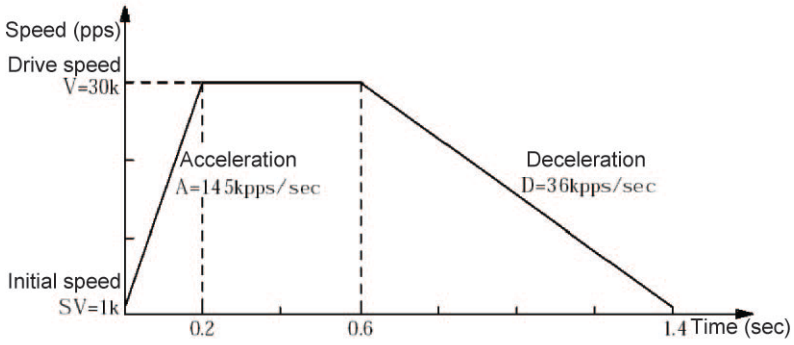


5.1.2.3 Asymmetric Trapezoidal Acceleration/Deceleration drive

- Asymmetric trapezoidal acceleration/deceleration drive (acceleration and deceleration speeds are not equal) is available in motion controller. There are cases you must apply different acceleration and deceleration speeds for vertical movement. This is because an acceleration caused by gravity is applied to an object when you move the object vertically, as in the case of a stacking machine for semiconductor wafers. Asymmetric trapezoidal acceleration/deceleration drive is used for cases like this.
- It is required to select [Decel] for [Deceleration Value] in [Operation Mode], and set speed multiplier, acceleration rate, deceleration rate, start speed and drive speed in [Parameter].
  - When deceleration is greater than acceleration



  - When acceleration is greater than deceleration



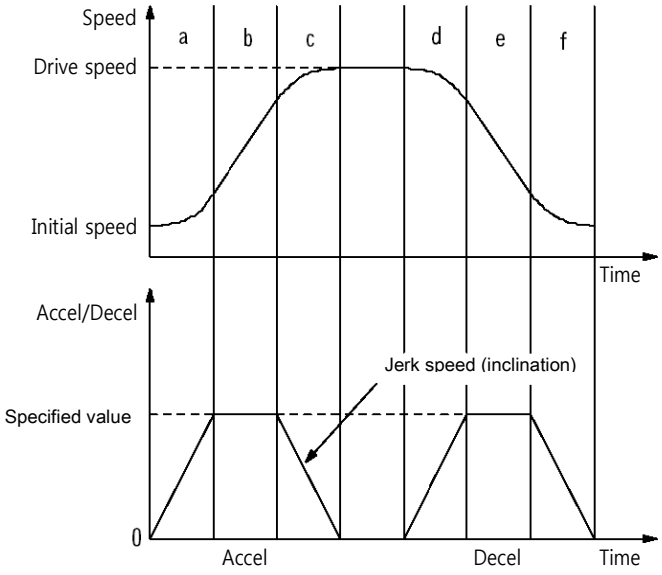
5.1.2.4 S Curve

S curve generates an S shape speed curve according to linear increase/decrease of drive acceleration/deceleration. It smoothly increases and reduces speed when starting and stopping, and helps achieve smoother operation. When the drive starts and is accelerating, acceleration increases linearly from 0 to a specified value (A) with an inclination of the the jerk speed (K). In this case, the speed curve becomes an S-shape parabola. S curve supports symmetric type only.

Caution

Precautions for S curve acceleration/deceleration drive

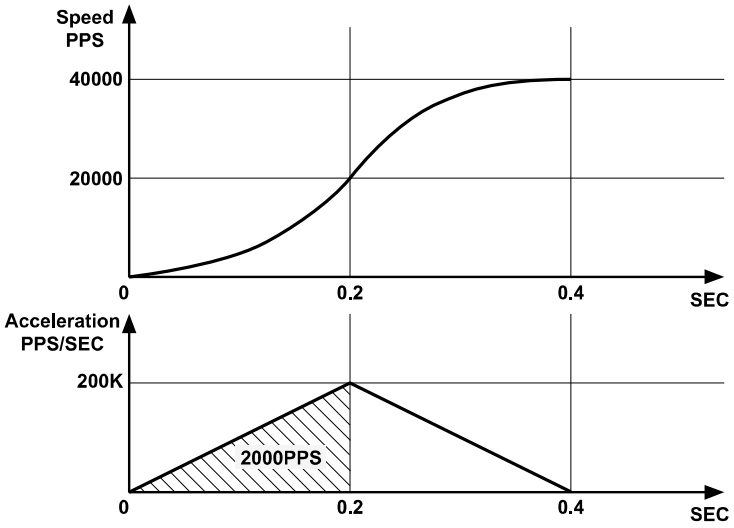
- In a fixed pulse S curve acceleration/deceleration drive, you cannot change speed while driving.
- For PMC-2HSP series, S curve acceleration/deceleration drive cannot be cannot be performed in a circular or circle interpolation.
- For a fixed pulse S curve drive, if you set the initial speed too low, the drive pulse may end before the speed drops to initial speed when decelerating; or even after it reaches the initial speed. It may not stop there and outputs the remaining drive pulse.



Ex.

Examples of setting S curve acceleration/deceleration drive in [Parameter]
(Full S curve acceleration/deceleration)

It drives S curve for 0.4 seconds from initial speed 100 pps to drive speed 40 Kpps. Acceleration is increased/decreased with constant jerk speed (K) when accelerating, therefore the speed becomes parabola like S shape. Refer to the following graph.



1st Initial speed as 0 is ignored.

2nd This is full S curve, so linearly accelerate to 20,000 pps for 0.2 seconds.

3rd Linearly decelerate to 40,000 pps for the remaining 0.2 seconds.

4th Acceleration increases linearly for 0.2 seconds and the speed, which is an integral value of acceleration, is 20,000 pps. V = 20,000pps = 1/2 X 0.2 X A

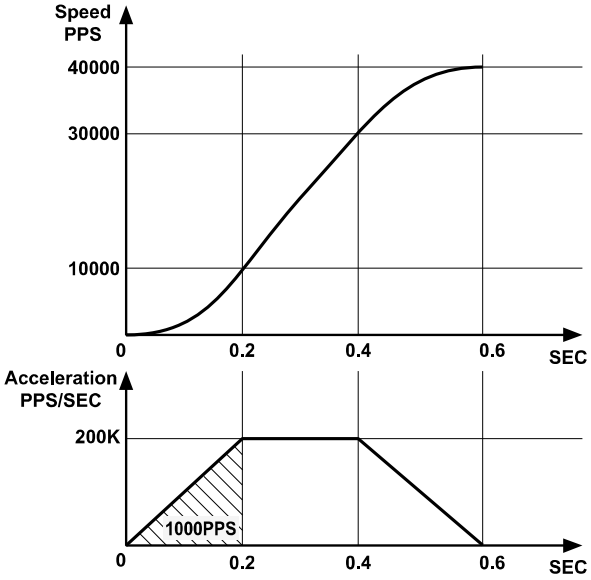
According to the above formula, acceleration speed after 0.2 seconds is 20,000 X 2/0.2 = 200Kpps/sec, and the jerk speed (increased acceleration) is 200K/0.2 = 1,000Kpps/sec2.

Calculated actual values differ from set parameter values. Refer to the following table for parameter and set value.

Parameter	Set value	Calculated actual value
Speed Multiplier	10	-
Jerk Speed	K = 625	$((62.5 \times 10^6) / 625) \times 10 = 1{,}000Kpps/sec^2$
Acceleration Rate	A = 160	125 X 160 X 10 = 200Kpps/sec
Start Speed	SV = 100	100 X 10 = 1Kpps
Drive Speed	V = 4,000	4,000 X 10 = 40Kpps

Examples of setting S curve acceleration/deceleration drive in [Parameter]
(Partial S curve acceleration/deceleration)

It drives a partial S curve acceleration for 0.6 seconds from initial speed 100 pps to 40 Kpps. Refer to the following graph.



1st Initial speed as 0 is ignored.

2nd Linearly accelerate to 10,000 pps for 0.2 seconds.

3rd Maintains constant acceleration until it reaches 30,000 pps for the next 0.2 to 0.4 seconds.

4th Linearly decelerate to 40,000 pps for the remaining 0.2 seconds.

Acceleration increases linearly for the first 0.2 seconds and the speed, an integral value of acceleration, will reach 10,000 pps. V = 10,000pps = 1/2 X 0.2 X A

With the above formula, acceleration at 0.2 seconds is 10,000 X 2/0.2 = 100 Kpps/sec, and the jerk speed, the increased acceleration, is 100 K/0.2 = 500 Kpps/sec2. Calculated actual values differ from parameter set values. Refer to the following table for parameter and set value.

Parameter	Set value	Calculated actual value
Speed Multiplier	10	-
Jerk Speed	K = 1250	((62.5 X 10^6) / 1,250) X 10 =500Kpps/sec^2
Acceleration Rate	A = 80	125 X 80 X 10 = 100Kpps/sec
Start Speed	SV = 100	100 X 10 = 1Kpps
Drive Speed	V = 4,000	4,000 X 10 = 40Kpps

Comparing S curve and Trapezoid acceleration/deceleration drive

Trapezoid acceleration/deceleration may cause problems at start and end points in a very sensitive system. When used for a system that must be heavy, fast and accurate, and acceleration sharply changes at start and end points, it is hard on the system. On the other hand, S curve smoothly increases acceleration at the start point and decreases it smoothly at the end point. Therefore S curve acceleration/deceleration is recommended for sensitive systems.

5.2 Interpolation Functions- only for PMC-2HSP series

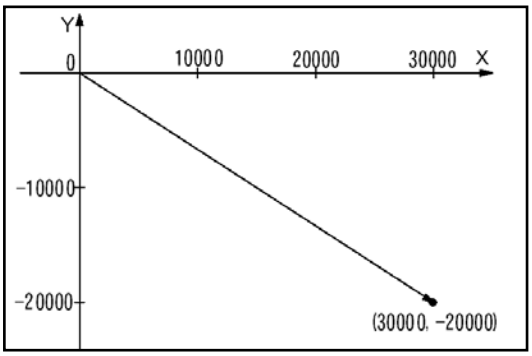
You can use interpolation functions by entering relevant commands (LID, CID, FID, RID) in program mode.

Note

Interpolation commands in PMC-2HSP series operate each step command individually, and accel/decel occurs between interpolation commands. Therefore, it is not recommended to use this function for applications that require constant speed without accel/decel on consecutive interpolation (e.g., laser processors).

5.2.1 Linear Interpolation (Command: LID)

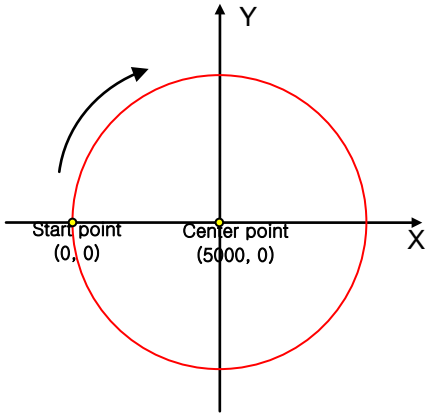
Linear interpolation moves from the present position to end coordinates (target) in a straight line. Interpolation drive requires setting relative end coordinates (X, Y) value for the present coordinates (0, 0). The degree of position precision for the line is ±0.5 LSB within all ranges.



The above image shows motion when the end coordinates are set to (30000, -20000) from the present coordinates (0, 0). The coordinate range of X, Y axes is –8,388,608 to +8,388,607.

5.2.2 Circle Interpolation (Command: CID)

Set radius for present coordinates to execute circle interpolation command in CW direction. Radius must be set as a relative value for present coordinates. CID is a command for beginners. Simply entering a radius can run circle interpolation.

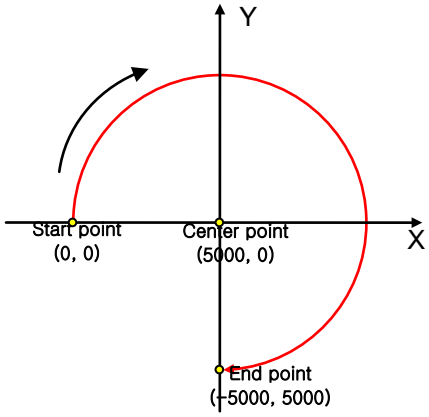


The above image shows the motion of CID command with the radius set to 5000 from the present position (0, 0). The radius of the circle is 5000, and it drives from present coordinates (0, 0) to center coordinates (5000, 0) in CW direction. Radius range is -8,388,608 to +8,388,607.

5.2.3 Circular Interpolation (Command: FID/RID)

Set center and end coordinates for present coordinates to run a CW circular interpolation command (FID), or CCW circular interpolation command (RID).

Center and end coordinates must be set as relative values for present coordinates. Circular interpolation sets present coordinates to (0, 0) before starting interpolation drive, determines the radius according to the center coordinates value and traces a circular arc.
Setting the end coordinates to (0, 0) runs circle interpolation.

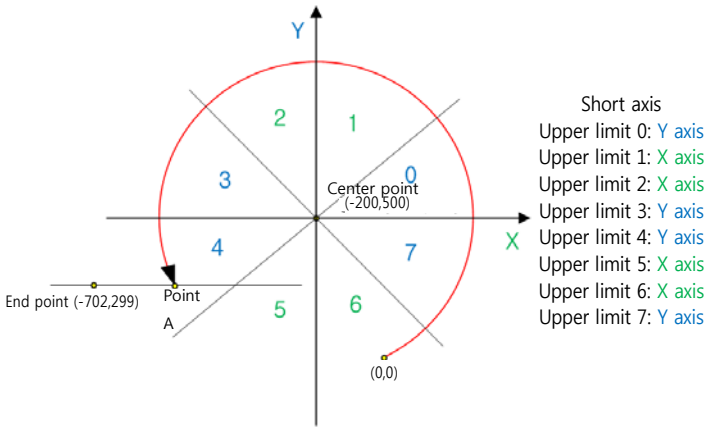


In the above image, center coordinates (5000, 0) and end coordinates (5000, -5000) are set from present coordinates (0, 0) using FID command. The radius of the circle is 5000, and it drives from present coordinates (0, 0) to end coordinates (5000, -5000) in CW direction.

Determining the end point in circular interpolation

Circular interpolation sets present coordinates to (0, 0) before it starts interpolation drive. Radius is determined by the center coordinate value, and it is used to trace a circular arc. Circular arc computing error is ±1 LSB throughout the interpolation coordinate range, so the specified end point is not guaranteed to be on the trace of the circular arc. Therefore we determine the point of time when the high limit of each end point is equal to the value of the short axis, as the end of circular interpolation. (Refer to the image and note below.) The error tolerance for a specified arc

curve is ±1 LSB throughout all interpolation ranges and the interpolation speed is 1 pps to 4 Mpps. The interpolation coordinate range is -8,388,608 to +8,388,607.



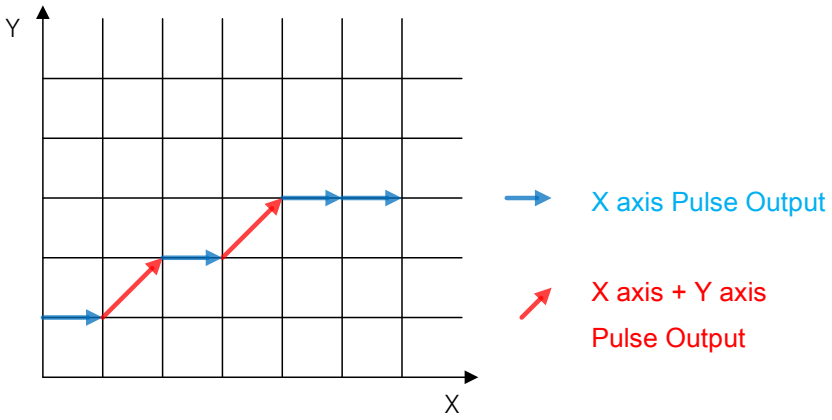
In the above image, center coordinates (-200, 500) and end coordinates (-702, 299) are set from present coordinates (0, 0) using RID command. It starts drive in CCW direction with the radius defined by present and center coordinates. The specified end coordinates are on upper limit 4. Therefore the Y axis is the short axis. When the Y axis value of the end coordinate reaches 299, it is considered the end of interpolation.

Note

The short axis is the axis always with a lesser value when the values of X and Y are compared at a random point within the relevant upper limit range. For example, within the range of upper limit 0, Y axis is shorter because the values of Y axis are always less than that of X axis at any point.

5.2.4 Constant Linear Velocity

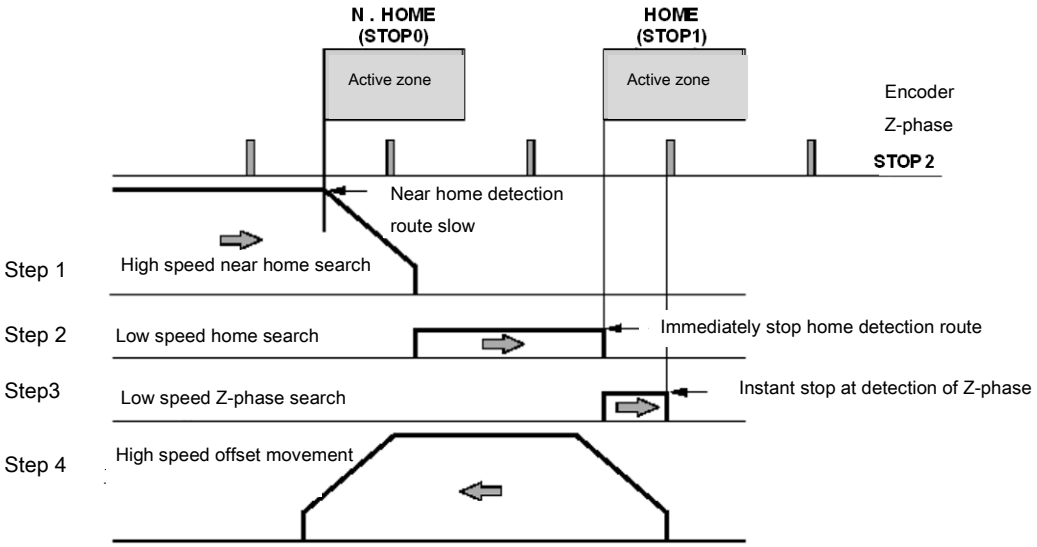
Constant linear velocity control is a function that maintains constant resultant velocity of the axis being interpolated based on the Pythagoras' theorem. The following image shows a trace of 2-axis interpolation. As shown in the image, when drive pulse is being generated on both X and Y axes, it moves a distance of 1.414 times compared to when drive pulse is generated on one axis. Therefore resultant velocity of both axes becomes faster because it moves 1.414 times further distance in the same time. If you need to keep the resultant velocities of both axes constant, the drive pulse speeds of both axes must be set to 1/1.414 times. When executing circle interpolation and circular interpolation, use of constant linear velocity function is recommended for stable drive.



5.3 Home Search

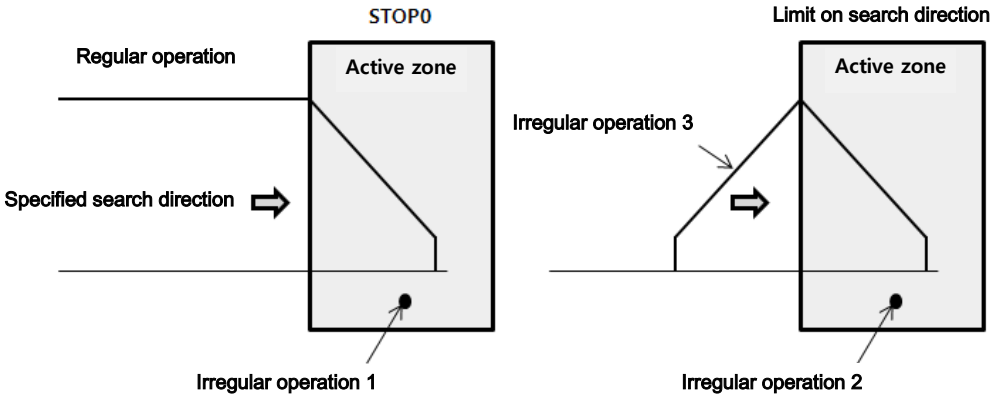
As in the image below, home search is comprised of steps 1 to 4. To use home search function, you need to set [Enable]/[Disable] for each step in home search mode and set the search direction. Steps 1 and 4 perform search with the speed that set in home search high speed, and steps 2 and 3 perform search with the speed set in home search low speed. Generally, set step 2 home search low speed as default and set the remaining steps according to the user environment. When running all 4 steps, run them in the order as shown below.

Step 1 high speed near home search → Step 2 low speed home search → Step 3 low speed Z-phase search → Step 4 high speed offset movement



5.3.1 High Speed Near Home Search (Step 1)

It outputs drive pulse until near home signal (n STOP0) becomes active, in the direction specified in home search mode and with the speed set in home search high speed. In order to run high speed search, set the home search high speed value higher than initial speed. When high speed near home search has started, it executes acceleration drive. The drive conducts a deceleration stop when near home signal (n STOP0) becomes active.

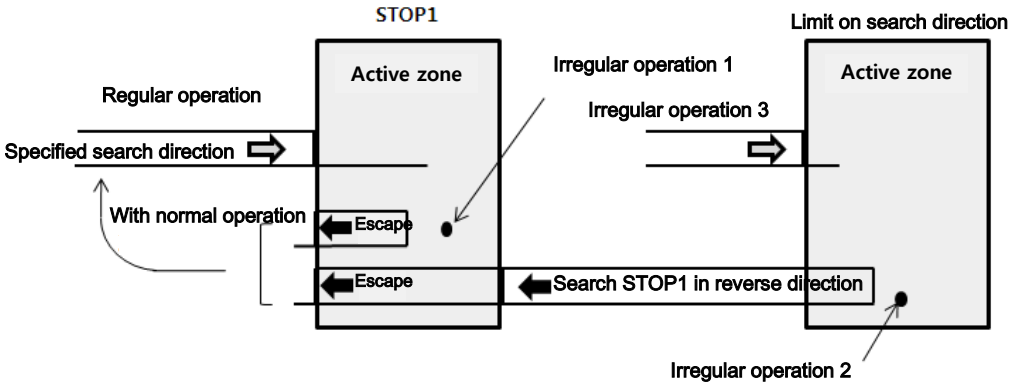


Irregular operation

- Irregular operation 1: Near home signal (n STOP0) is active before start Step 1 → Process Step 2
- Irregular operation 2: Limit signal in search direction is active before starting Step 1 → Process Step 2
- Irregular operation 3: Limit signal in search direction is active while running → stop drive, process Step 2

5.3.2 Low Speed Home Search (Step 2)

Outputs drive pulse until home signal (n STOP1) becomes active in the direction specified in home search mode and with the speed that was set in home search low speed. In order to run low speed search, set the home search low speed value lower than initial speed. When low speed home search has started, it executes constant speed drive. The drive immediately stops when home signal (n STOP1) becomes active.



Irregular operation

- Irregular operation 1: Home signal (n STOP1) is active before starting Step 2 → Move until home signal (n STOP1) becomes inactive in the opposite search direction with home search low speed → Process Step 2 when home signal (n STOP1) becomes inactive
- Irregular operation 2: Activate the limit signal in the search direction before starting step 2 → Move in the opposite search direction at home search low speed until home signal (n STOP1) becomes active → When home signal (n STOP1) becomes active, move in the opposite search direction at home search low speed until it becomes inactive → When home signal (n STOP1) becomes inactive, process step 2
- Irregular operation 3: Limit signal in search direction is active while running → Stop drive → Perform irregular operation 2.

5.3.3 Low Speed Z-phase Search (Step 3)

Outputs drive pulse until encoder Z-phase signal (n STOP2) becomes active, in the direction specified in home search mode and with the speed set in home search low speed. In order to run low speed search, set the home search low speed value lower than initial speed. When low speed Z-phase search has started, it executes constant speed drive. The drive immediately stops when encoder Z-phase signal (n STOP2) becomes active.

Caution

- ERROR 1: The encoder Z-phase signal (n STOP2) is active before starting Step 3 → End home search with error status (make sure to adjust the system so step 3 starts when encoder Z-phase signal (n STOP2) is in a stably inactive state.)
- ERROR 2: Limit signal in search direction is active before starting step 3 → End home search with error status
- ERROR 3: Limit signal in search direction is active while running → End home search with error status

5.3.4 High Speed Offset Move (Step 4)

Outputs drive pulse to the amount assigned in home search offset, in the direction specified in home search mode and with the speed that was set in home search high speed. This function is used to move from the mechanical home position to working home position. You can end the movement using the position clear setting and then initialize logical position and present position counters.

Irregular operation

Limit signal in moving direction is active before starting step 4 or while running→ End home search

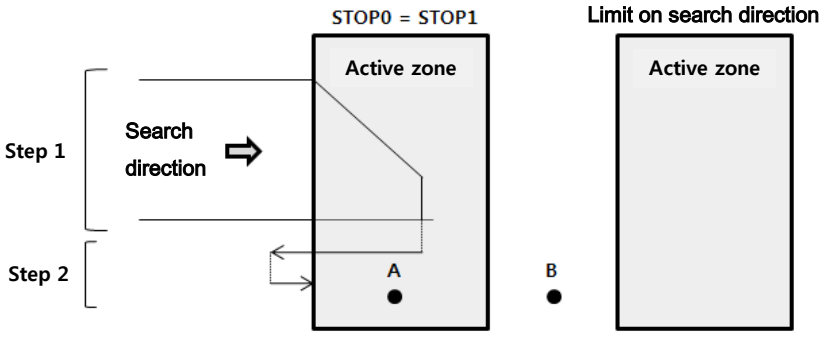
5.3.5 Home Search Mode Setting Example

5.3.5.1 Setting Home Search with Only Home signal

This accomplishes home search with only one home signal by using both side terminals of STOP0 and STOP1 as the home signal. The following table shows an example.

Ex.

	Input Signal and Logical Level	Search Direction	Search Speed
Step 1	STOP0 signal, low (connect GEX)	- direction	20,000pps
Step 2	STOP1 signal, low (connect GEX)	- direction	200pps
Step 3	Do not run		
Step 4	Move 3,500 pulse offset to + direction	+ direction	20,000pps



- Runs high speed home search (20,000 pps) with Step 1 and then slow when home signal becomes active. The stop position is inside the active zone of home signal. So if an irregular operation 1 of Step 2 occurs, it escapes in the opposite direction of search, and then runs Step 2 normally to search home. If stop position of Step 1 is out of home signal active zone, search direction limit is active. Irregular operation 3 will be performed.
- If home search start position is on A, Step 1 is not run and irregular operation 1 in Step 2 will be performed.
- If home search start position is on B, it runs Step 1 and then irregular operation 2 in Step 2 after the limit in search direction becomes active.

Note

Install a limit sensor at the end of search direction and connect the signal to limit input (LMT+/-). As Step 1 and Step 2 use the same signal, set the same logical level and search direction for each of them.

(1) Setting Parameter

Item	Description	Set value	Remarks
Speed Multiplier	Speed multiplier	10	
Acceleration Rate	Acceleration rate	400	Set this to slow stop within home signal active zone
Start Speed	Initial speed	50	

(2) Search Home Search Mode

Item	Description	Set value	Remarks
Step 1 Enable	Enable/disable Step 1	Enable	Enable
Step 1 Direction	Step 1 search direction	-	- direction
Step 2 Enable	Enable/disable Step 2	Enable	Enable
Step 2 Direction	Step 2 search direction	-	- direction
Step 3 Enable	Enable/disable Step 3	Disable	Disable
Step 3 Direction	Step 3 search direction	-	
Step 4 Enable	Enable/disable Step 4	Enable	Enable
Step 4 Direction	Step 4 search direction	+	+ direction
Home Search Low Speed	Home search low speed	20	Set a value that is smaller than initial speed
Home Search High Speed	Home search high speed	2,000	
Home Search Offset	Home search offset	3,500	
Position Clear	Position clear	Enable	After home search is complete position clear.
Near Home Signal Level	n STOP0 logical level	Low	Active by connecting GEX
Home Signal Level	n STOP1 logical level	Low	This is the same signal as STOP0, so logical level is the same as STOP0.
Z Signal Level	n STOP2 logical level	Low	Not used

5.4 Other Functions

5.4.1 Limit Operation

Hardware and software limits can be used to stop drive.

- Hardware limit

  Install a limit sensor to the machine to monitor system operation directly. Connect n LMT+/- (Pin12, 13) to X and Y axes I/O connector (CN4, 5) in order to use it. Set limit stop mode to instant/slow under operation mode.

- Software limit

  Unlike the input of hardware limit signal by external sensor, this limit function is set using internal position data. To operate software limit, it must be set to enable in operation mode. High and low limit values can be set separately for X and Y axes in software limit +/- item in parameters.

Operation Mode	Set value	Parameter	Set value
Software Limit	Enable	Software Limit+	100,000
		Software Limit-	-50,000

If set values are like these, position values work only within the range -50,000 to 100,000. When out of this range, the drive slow stops.

Note

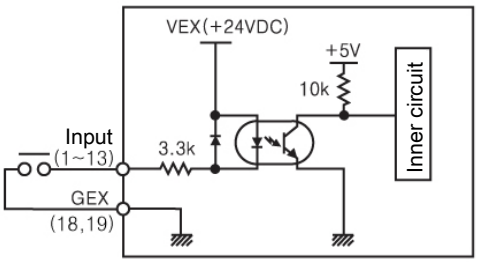
Hardware limit works independently regardless of the software limit settings, and only hardware limit is operated during home search.

5.4.2 General Purpose I/O Function

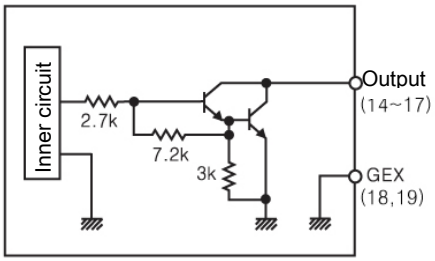
General purpose I/O function is able to set by application.

X, Y axes I/O connectors (CN4, 5)

Pin number	Signal name	Input/Output	Description
5	n OUT0	Output	General purpose output 0
6	n OUT1	Output	General purpose output 1
7	n IN0	Input	General purpose input 0
8	n IN1	Input	General purpose input 1



<General input signal circuit>



<General output signal circuit>

- To use the general input function, set Input0, 1 Level (general input 0, 1 low/high) in parameters.
- You can control ON/OFF of general output with program operation. A simple test is also available in MotionStudio's I/O status window. (Double click the relevant output box to generate pulse.)
- Program commands that use general purpose I/O function are ICJ (jump input condition), IRD (input waiting), OPC (ON/OFF output port) and OPT (output port ON pulse).

For more information about each command, refer to '3.7.8 ICJ (Jump input condition)', '3.7.9 IRD (Waiting input)', 3.7.10 OPC (ON/OFF output port)', '3.7.11 OPT(Output port ON pulse)'.

5.4.3 Initialization Function

This function resets motion controller to its default values.
For further details, refer to '3.4.1.1 File (2)Initialization'.

6 Communication Specification

6.1 Communication Overview

Serial communication port has USB, RS232C and RS485 interfaces.
The following table describes communication interfaces by model.

Model	PMC-2HSP/2HSN-USB	PMC-2HSP/2HSN-485
Communication	USB/RS232C	RS232C/RS485

Baudrate can be set to one of 9,600, 19,200, 38,400, 57,600 and 115,200 bps.
Supports all COM PORTs that OS offers. (COM 1 to 254)

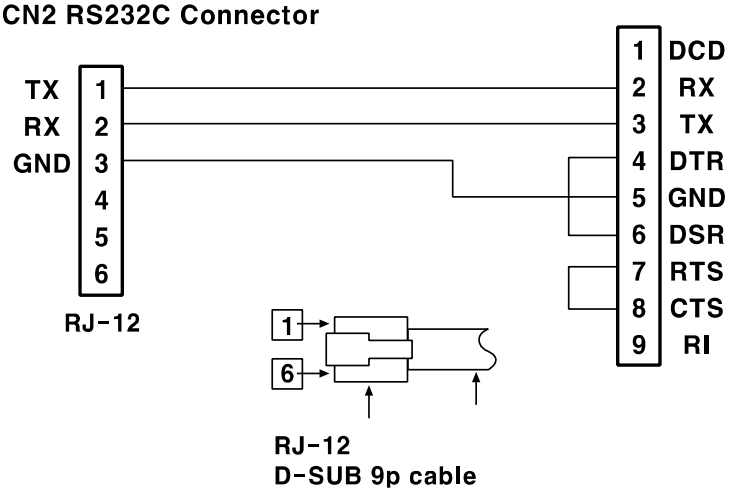
6.2 USB Communication

To use USB communication, connect USB connector (CN6) and PC's USB port with a designated cable.

6.3 RS232C Communication

To use RS232C communication, connect RS232C connector (CN2) and PC's serial port with designated cable.

PMC-2HSP, PMC-2HSN
CN2 RS232C Connector

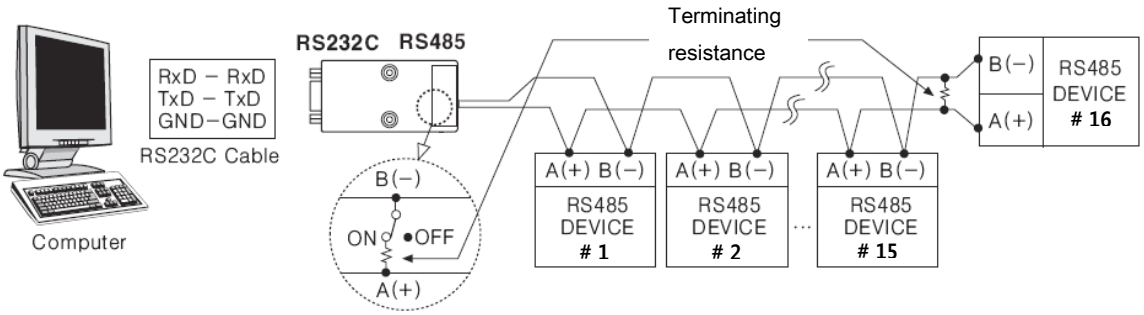


6.4 RS485 Communication

With RS485 multi-drop communication, you can connect up to 16 nodes as shown in the image below. A node concurrently controls 2 axes, so you can control a total of 32 axes at the same time with RS485 communication.

In order to communicate PC with RS485, you need 232 to 485 converter.

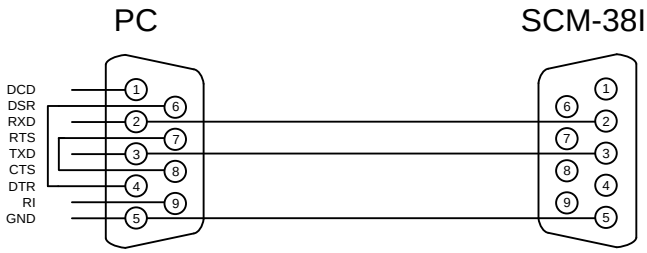
(1) Connecting PC and Nodes



(The connected communication converter is SCM-38I of Autonics.)

(2) Wiring RS232C and SCM-38I cable

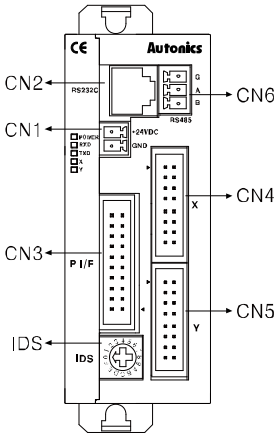
Refer to the following diagram to learn how to connect 232 to 485 converter and PC.



- We recommend to use twisted pair (Thickness: AWG-24) as the communication cable. If you are not using twisted pair, we suggest you maintain the same lengths for A(+) and B(-) cables.
- Effective communication range is within 800 m, and a maximum 16 nodes can be connected.
- Attach terminating resistance (100 Ω to 120 Ω) to both ends of the communication line after SCM-38I and lower level systems are connected. RS485 communications has advantages such as faster baud rate and longer available communication distance. However, it generates reflective waves due to impedance if a mismatch occurs among communications lines, driver of RS485 and receiver. Use terminating resistance at both ends of the network. This is because reflective waves can cause transmission error when the wiring distance gets longer or when you use multi-drop communication. (Terminating resistance: 100 to 120 Ω)
- For more information about SCM-38I, refer to "SCM series user guide".

(3) Node ID select

To control multi-axis with multi-drop communication, each node must be given a relevant ID like below.



IDS	Designated ID	IDS	Designated ID
0	1	8	9
1	2	9	10
2	3	A	11
3	4	B	12
4	5	C	13
5	6	D	14
6	7	E	15
7	8	F	16

For PMC-2HSP/2HSN-485 model, you can assign 16 IDs (0 to F) with the ID select switch (IDS).
ID Select switch values are determined when the machine is being initialized with initial power supply, so changing ID Select switch after power was ON cannot change IDs.
PMC-2HSP/2HSN-USB model does not have ID select switch but it has ID 1 by default.

Caution

It may cause malfunction and product damage if you enter a duplicate node ID. Make sure to check the ID before use.

7 Communication Protocol

7.1 Specifications

Item	Description
Communication protocol	Modbus RTU
Protocol type	Single master multi slave
Communication type	RS485(RS232C uses single master single slave)

7.2 Interface

Item	Description
Applied standard	EIA RS 485-compliant
Max. number of connections	16 (address: 01 - 16)
Communication method	Two-wire, half duplex
Sync/Async communication	Asynchronous
Effective communication range	Max. 800 m
BPS (Bits Per Second).	9,600, 19,200, 38,400, 57,600, 115,200 bps (※Device factory default: 9,600bps)
Response waiting time	5 ms to 99 ms
Start bit	1 bit (fixed)
Data bit	8 bit (fixed)
Parity bit	None (fixed)
Stop bit	1 bit (fixed)
Protocol	Modbus RTU

7.3 Communication Sequence

1st Communication sequence is Modbus RTU(PI-MBUS-300-REV.J).

2nd The high level system initiates communication for more than 1 second (1000 ms) after power is supplied.

3rd The high level system (PC) has the right to transmit first. When the high level system initiates request, the lower level system (PMC) initiates response.

7.4 Setting Slave Address

Slave addresses (IDs) must be set for Modbus Protocol communication frame.
PMC-2HSP/2HSN series uses RS232C communication or RS485 communication according to the model. But RS232C communication is not a standard serial communication supporting single master-multi slave. Therefore, in order to perform RS232C communication using Modbus Protocol you need to set slave addresses as below.

Seires	Communication	ID Setting Method	Assigned ID
PMC-2HSP/2HSN-485	RS232C	Set value with ID select switch (IDS)	01
	RS485		01 to 16
PMC-2HSP/2HSN-USB	RS232C	Fixed value	01

The slave addresses designated by ID select switch (IDS) setting are as below.

IDS	Designated ID	IDS	Designated ID
0	01	8	09
1	02	9	10
2	03	A	11
3	04	B	12
4	05	C	13
5	06	D	14
6	07	E	15
7	08	F	16

7.5 Other Communication Rules

When to perform Broadcast command, reserve separate broadcast addresses by the product family to be used for slave addresses. OR the 80H to use function. Slave addresses that are different to other in-house models must be assigned.

- Support for broadcast command are available only for force single coil (Func 05 – 05 H), preset single registers (Func 06 – 06 H) and preset multiple registers (Func 16 – 10 H), and you need to OR the 80H to use each of these functions.
- Slave addresses have 0x00 to 0xFF (0 to 255) of data range. You can use and manage broadcast commands with slave addresses as in the table below.
- When writing broadcast command preset multiple registers, you cannot use more than two commands.

Slave address	Descriptioin
1 to 124	Unicast Slave address
128	Broadcast PMC series

A list of PMC-2HSP/2HSN series broadcast commands is as below.

Item	Function	No(Address)
Reset	Force Single Coil	00011(000A)
Emergency Stop		00012(000B)
Continuous drive	Preset Single Register Preset Multiple Register	40001(0000)
Run Home Search		40001(0000)
End Home Search		40001(0000)
Pause Program		40001(0000)
End Program		40001(0000)
Restart Program		40001(0000)
Set communication speed		40001(0000)
Start Program	Preset Multiple Register	40002(0001) to 40003(0002)
Start Program Step		40002(0001) to 40004(0003)

- When requesting data successively, up to 123 data (246 bytes) are available.
- It is not able to read/write more than 2EA parameter setting group data successively. (Error process: It processes as Error Code "03".)
- A group of 50 addresses are configured/assigned to each parameter setting group and data read/write is only possible within the same group. You cannot read/write data from address 20 (parameter 1 setting group) to 70 (parameter 2 setting group).
- If CRC16 error occurrs, you need to resend the relevant frame from the beginning.

Caution

If master sends commands with broadcast to slave, there is no individual response from slave. Be careful to use broadcast command.

7.6 Exception Response-Error Code

If a communication error occurrs, set (1) uppermost bit of received command (function), send response command and then transmit the exception code.

Slave Address	Function(Command) +80 H	Exception Code	Error Check(CRC16)	
			Lo(Low level)	Hi(High level)
1 Byte	1 Byte	1 Byte	1 Byte	1 Byte

CRC16

1st ILLEGAL FUNCTION (Exception Code: 01 H)

The command is not supported.

2nd ILLEGAL DATA ADDRESS (Exception Code: 02 H)

The starting address of requested data does not match the address that the system can transmit.

3rd ILLRGAL DATA VALUE (Exception Code: 03 H)

The number of requested data does not match the number that the system can transmit.

4th SLAVE DEVICE FAILURE (Exception Code: 04 H)

Unable to normally process the requested command.

Ex.

Master tries to read output status (ON: 1, OFF: 0) of non-exist ing coil 01001(03E8 H) on slave (address 01) side,

Request (Master)

Slave Address	Function (Command)	Starting Address		No. of Points		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
01 H	01 H	03 H	E8 H	00 H	01 H	## H	## H

Response (Slave)

Slave Address	Function(Command)+80 H	Exception Code	Error Check(CRC16)	
			Lo(Low level)	Hi(High level)
01 H	81 H	02 H	## H	## H

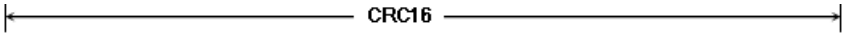
7.7 Communication Command Frame Composition

7.7.1 Read Coil Status (Func 01 – 01 H)

- It reads output (OX reference, coil) ON/OFF state inside slave device.
- It does not support broadcast.

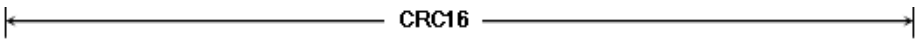
Request (Master)

Slave Address	Function (Command)	Starting Address		No. of Points		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte



Response (Slave)

Slave Address	Function (Command)	Byte Count (Number of data byte)	Data	Data	Data	Error Check(CRC16)	
						Lo(Low level)	Hi(High level)
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte



Ex.

Master tries to read output state (ON: 1, OFF:0) of 10 EA inside the coil 00001(0000 H) to 00010(0009 H) on slave (address 01) side,

Request (Master)

Slave Address	Function (Command)	Starting Address		No. of Points (Number of data byte)		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
01 H	01 H	00 H	00 H	00 H	0A H	## H	## H

If the slave side coil 00008(0007 H) to 00001(0000 H) value is ON-ON-OFF-OFF-ON-ON-OFF-ON, and 00010(0009 H) to 00009(0008 H) value is OFF-ON,

Response (Slave)

Slave Address	Function (Command)	Byte Count (Number of data byte)	Data (00008 to 00001)	Data (00010 to 00009)	Error Check(CRC16)	
					Lo(Low level)	Hi(High level)
01 H	01 H	02 H	CD H	01 H	## H	## H

7.7.2 Read Input Status (Func 02 – 02 H)

It reads input (2X reference) ON/OFF state inside slave device.

It does not support broadcast.

Request (Master)

Slave Address	Function (Command)	Starting Address		No. of Points (Number of data byte)		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

Response (Slave)

Slave Address	Function (Command)	Byte Count (Number of data byte)	Data	Data	Data	Error Check(CRC16)	
						Lo(Low level)	Hi(High level)
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

Ex.

Master tries to read input state (ON: 1, OFF:0) of 10 EA inside 10001(0000 H) to 10010(0009 H) on slave (address 01) side,

Request (Master)

Slave Address	Function (Command)	Starting Address		No. of Points (Number of data byte)		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
01 H	02 H	00 H	00 H	00 H	0A H	## H	## H

If Slave side 10008 (0007 H) to 10001 (0000 H) value is “ON-ON-OFF-OFF-ON-ON-OFF-ON” and 10010 (0009 H) to 10009 (0008 H) value is “OFF-ON”,

Response (Slave)

Slave Address	Function (Command)	Byte Count (Number of data byte)	Data (00008 to 00001)	Data (00010 to 00009)	Error Check(CRC16)	
					Lo(Low level)	Hi(High level)
01 H	02 H	02 H	CD H	01 H	## H	## H

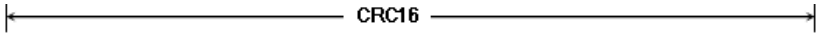
7.7.3 Read Holding Registers (Func 03 – 03 H)

It reads holding registers (4X reference) binary data inside slave device.

It does not support broadcast..

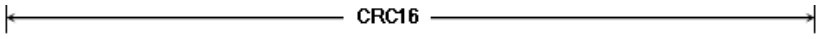
Request (Master)

Slave Address	Function (Command)	Starting Address		No. of Points (Number of data byte)		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte



Response (Slave)

Slave Address	Function (Command)	Byte Count (Number of data byte)	Data		Data		Error Check(CRC16)	
			Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte



Ex.

Master tries to read the value of 2EA inside holding register 40001(0000 H) to 40002 (0001 H) on slave (address 01) side,

Request (Master)

Slave Address	Function (Command)	Starting Address		No. of Points (Number of data byte)		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
01 H	03 H	00 H	00 H	00 H	02 H	## H	## H

If slave side 40001(0000 H) value is 555(22B H) and 40002(0001 H) value is 100(64 H),

Response (Slave)

Slave Address	Function (Command)	Byte Count (Number of data byte)	Data		Data		Error Check(CRC16)	
			Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
01 H	03 H	04 H	02 H	2B H	00 H	64 H	## H	## H

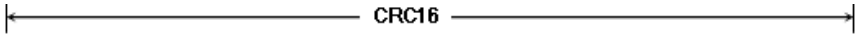
7.7.4 Read Input Registers (Func 04 – 04 H)

It reads binary data in input registers (3X reference: 30001 to 31050) inside slave device.

It does not support broadcast.

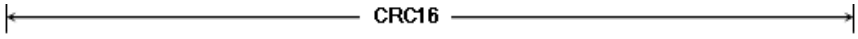
Request (Master)

Slave Address	Function (Command)	Starting Address		No. of Points (Number of data byte)		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte



Response (Slave)

Slave Address	Function (Command)	Byte Count (Number of data byte)	Data		Data		Error Check(CRC16)	
			Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte



Ex.

Master tries to read the value of 2EA inside input register 30001(0000 H) to 30002(0001 H) on slave (address 01) side,

Request (Master)

Slave Address	Function (Command)	Starting Address		No. of Points (Number of data byte)		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
01 H	04 H	00 H	00 H	00 H	02 H	## H	## H

If save side 30001(0000 H) value is 10(A H) and 30002(0001 H) value is 20(14 H),

Response (Slave)

Slave Address	Function (Command)	Byte Count (Number of data byte)	Data		Data		Error Check(CRC16)	
			Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
01 H	04 H	04 H	00 H	0A H	00 H	14 H	## H	## H

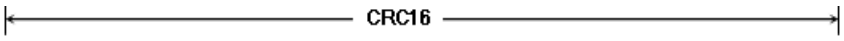
7.7.5 Force Single Coil (Func 05 – 05 H)

When tuning to ON (FF00 H) or OFF(0000 H), the state of single coil (0X reference: 00001 to 00050) inside slave device,

It supports boradcast.

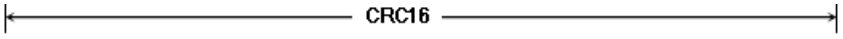
Request (Master)

Slave Address	Function (Command)	Coil Address(address)		Force Data(data)		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte



Response (Slave)

Slave Address	Function (Command)	Coil Address(address)		Force Data(data)		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte



Ex.

Master tries to turn ON coil 00001(0000 H) on slave (address 01) side,

Request (Master)

Slave Address	Function (Command)	Coil Address(address)		Force Data(data)		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
01 H	05 H	00 H	00 H	FF H	00 H	## H	## H

Response (Slave)

Slave Address	Function (Command)	Coil Address(address)		Force Data(data)		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
01 H	05 H	00 H	00 H	FF H	00 H	## H	## H

7.7.6 Preset Single Registers (Func 06 – 06 H)

Writes single holding register (4X reference: 40001 to 41150) binary data inside slave device.

It supports boradcast.

Request (Master)

Slave Address	Function (Command)	Register Address(address)		Preset Data(data)		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

Response (Slave)

Slave Address	Function (Command)	Register Address(address)		Preset Data(data)		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

Ex.

Master tries to write 10 (A H) to holding register 40001(0000 H) on slave (Address 01) side,

Request (Master)

Slave Address	Function (Command)	Register Address(address)		Preset Data(data)		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
01 H	06 H	00 H	00 H	00 H	0A H	## H	## H

Response (Slave)

Slave Address	Function (Command)	Register Address(address)		Preset Data(data)		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
01 H	06 H	00 H	00 H	00 H	0A H	## H	## H

7.7.7 Preset Multiple Registers (Func 16 – 10 H)

Successively writes binary data to holding register (4X reference: 40001 to 41150) inside slave device.

It supports boradcast.

Request (Master)

Slave Address	Function (Command)	Starting Address		No. of Register		Byte Count (Number of data byte)	Data		Data		Error Check (CRC16)	
		Hi (High level)	Lo (Low level)	Hi (High level)	Lo (Low level)		Hi (High level)	Lo (Low level)	Hi (High level)	Lo (Low level)	Hi	Lo
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

Response (Slave)

Slave Address	Function (Command)	Starting Address		No. of Register		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte	1Byte

CRC16

Ex.

Master tries to write 10(A H) to all holding register 40001(0000 H) to 40002 (0001 H) on slave (address 01) side,

Request (Master)

Slave Address	Function (Command)	Starting Address		No. of Register		Byte Count (Number of data byte)	Data		Data		Error Check (CRC16)	
		Hi (High level)	Lo (Low level)	Hi (High level)	Lo (Low level)		Hi (High level)	Lo (Low level)	Hi (High level)	Lo (Low level)	Hi	Lo
01 H	10 H	00 H	00 H	00 H	02 H	04H	00 H	0A H	00 H	0A H	## H	## H

Response (Slave)

Slave Address	Function (Command)	Starting Address		No. of Register		Error Check(CRC16)	
		Hi(High level)	Lo(Low level)	Hi(High level)	Lo(Low level)	Lo(Low level)	Hi(High level)
01 H	10 H	00 H	00 H	00 H	02 H	## H	## H

7.7.8 Read Coil Status (Func 01) / Force Single Coil (Func 05)

No. (Address)	Func	R/W	Description	Set range	Unit	Remarks
00001 to 00002	01/05	R/W	Reserved			
00003 (0002)	01/05	R/W	X axis general output 0	0: OFF / 1: ON	-	-
00004 (0003)	01/05	R/W	X axis general output 1	0: OFF / 1: ON	-	-
00005 (0004)	01/05	R/W	X axis DRIVE	0: OFF / 1: ON	-	-
00006 (0005)	01/05	R/W	X axis ERROR	0: OFF / 1: ON	-	-
00007 (0006)	01/05	R/W	Y axis general output 0	0: OFF / 1: ON	-	-
00008 (0007)	01/05	R/W	Y axis general output 1	0: OFF / 1: ON	-	-
00009 (0008)	01/05	R/W	Y axis DRIVE	0: OFF / 1: ON	-	-
00010 (0009)	01/05	R/W	Y axis ERROR	0: OFF / 1: ON	-	-
00011 (000A)	05	W	Broadcast Reset command	1: Reset	-	Broad cast
00012 (000B)	05	W	Broadcast Emergency stop command	1: Emergency Stop	-	
00013 to 00050	01/05	R/W	Reserved			

7.7.9 Read Input Status (Func 02)

No.(Address)	Func	R/W	Description	Set range	Unit	Remarks
10001 (0000)	02	R	X axis near home	0: OFF / 1: ON	-	-
10002 (0001)	02	R	X axis home	0: OFF / 1: ON	-	-
10003 (0002)	02	R	X axis encoder Z-phase	0: OFF / 1: ON	-	-
10004 (0003)	02	R	X axis limit+	0: OFF / 1: ON	-	-
10005 (0004)	02	R	X axis limit-	0: OFF / 1: ON	-	-
10006 (0005)	02	R	X axis EMG	0: OFF / 1: ON	-	-
10007 (0006)	02	R	X axis general input 0	0: OFF / 1: ON	-	-
10008 (0007)	02	R	X axis general input 1	0: OFF / 1: ON	-	-
10009 (0008)	02	R	Y axis near home	0: OFF / 1: ON	-	-
10010 (0009)	02	R	Y axis home	0: OFF / 1: ON	-	-
10011 (000A)	02	R	Y axis encoder Z-phase	0: OFF / 1: ON	-	-
10012 (000B)	02	R	Y axis limit+	0: OFF / 1: ON	-	-
10013 (000C)	02	R	Y axis limit-	0: OFF / 1: ON	-	-
10014 (000D)	02	R	Y axis EMG	0: OFF / 1: ON	-	-
10015 (000E)	02	R	Y axis general input 0	0: OFF / 1: ON	-	-
10016 (000F)	02	R	Y axis general input 1	0: OFF / 1: ON	-	-
10017 (0010)	02	R	HOME	0: OFF / 1: ON	-	-

No.(Address)	Func	R/W	Description	Set range	Unit	Remarks
10018 (0011)	02	R	STROBE	0: OFF / 1: ON	-	-
10019 (0012)	02	R	X	0: OFF / 1: ON	-	-
10020 (0013)	02	R	Y	0: OFF / 1: ON	-	-
10021 (0014)	02	R	MODE0	0: OFF / 1: ON	-	-
10022 (0015)	02	R	MODE1	0: OFF / 1: ON	-	-
10023 (0016)	02	R	STEPSL0	0: OFF / 1: ON	-	-
10024 (0017)	02	R	STEPSL1	0: OFF / 1: ON	-	-
10025 (0018)	02	R	STEPSL2	0: OFF / 1: ON	-	-
10026 (0019)	02	R	STEPSL3	0: OFF / 1: ON	-	-
10027 (001A)	02	R	STEPSL4	0: OFF / 1: ON	-	-
10028 (001B)	02	R	STEPSL5	0: OFF / 1: ON	-	-
10029 to 10100	02	R	Reserved			

7.7.10 Read Input Registers (Func 04)

No.(Address)	Func	R/W	Description	Set range	Unit	Remarks
30001 to 30100	04	R	Reserved			
30101 (0064)	04	R	Software version 1	-	-	ASCII code
30102 (0065)	04	R	Software version 2	-	-	
30103 (0066)	04	R	Software version 3	-	-	
30104 (0067)	04	R	Software version 4	-	-	
30105 (0068)	04	R	Model name 1	-	-	
30106 (0069)	04	R	Model name 2	-	-	
30107 (006A)	04	R	Model name 3	-	-	
30108 (006B)	04	R	Model name 4	-	-	
30109 (006C)	04	R	Model name 5	-	-	
30110 (006D)	04	R	Model name 6	-	-	
30111 (006E)	04	R	Reserved	-	-	-
30112 (006F)	04	R	Reserved	-	-	-
30113 (0070)	04	R	Reserved	-	-	-
30114 (0071)	04	R	Reserved	-	-	-
30115 (0072)	04	R	Reserved	-	-	-
30116 (0073)	04	R	Reserved	-	-	-
30117 (0074)	04	R	Reserved	-	-	-
30118 (0075)	04	R	Coil status Start Address	-	-	-
30119 (0076)	04	R	Coil status Quantity	-	-	-

No.(Address)	Func	R/W	Description	Set range	Unit	Remarks
30120 (0077)	04	R	Input status Start Address	-	-	-
30121 (0078)	04	R	Input status Quantity	-	-	-
30122 (0079)	04	R	Holding Register Start Address	-	-	-
30123 (007A)	04	R	Holding Register Quantity	-	-	-
30124 (007B)	04	R	Input Register Start Address	-	-	-
30125 (007C)	04	R	Input Register Quantity	-	-	-
30126 to 31000	04	R	Reserved			
31001 (03E8)	04	R	Present position coordinate H (X axis)	High 1 byte within -8,388,608 to +8,388,607	-	-
31002 (03E9)	04	R	Present position coordinate L (X axis)	Low 2 bytes within -8,388,608 to +8,388,607	-	-
31003 (03EA)	04	R	Present position coordinate H (Y axis)	High 1 byte within -8,388,608 to +8,388,607	-	-
31004 (03EB)	04	R	Present position coordinate L (Y axis)	Low 2 bytes within -8,388,608 to +8,388,607	-	-
31005 (03EC)	04	R	Drive speed (X axis)	1 to8,000	-	-
31006 (03ED)	04	R	Drive speed (Y axis)	1 to8,000	-	-
31007 (03EE)	04	R	Running program STEP number (X axis)	0 to 199	-	-
31008 (03EF)	04	R	Running program STEP number (Y axis)	0 to 199	-	-
31009 (03F0)	04	R	Baud rate reading	1: 9,600 / 2: 19,200 / 3: 38,400 / 4: 57,600 / 5: 115,200	-	-
31010 (03F1)	04	R	Whether connected to main system or not ※1	0: OFF / 1: ON	-	-
31011 (03F2)	04	R	X axis near home	0: OFF / 1: ON	-	Bit 0
			X axis home	0: OFF / 1: ON	-	Bit 1
			X axis encoder Z-phase	0: OFF / 1: ON	-	Bit 2
			X axis limit+	0: OFF / 1: ON	-	Bit 3
			X axis limit-	0: OFF / 1: ON	-	Bit 4
			X axis EMG	0: OFF / 1: ON	-	Bit 5
			X axis general input 0	0: OFF / 1: ON	-	Bit 6
			X axis general input 1	0: OFF / 1: ON	-	Bit 7
31012 (03F3)	04	R	Y axis near home	0: OFF / 1: ON	-	Bit 0
			Y axis home	0: OFF / 1: ON	-	Bit 1
			Y axis encoder Z-phase	0: OFF / 1: ON	-	Bit 2
			Y axis limit+	0: OFF / 1: ON	-	Bit 3

No.(Address)	Func	R/W	Description	Set range	Unit	Remarks
			Y axis limit-	0: OFF / 1: ON	-	Bit 4
			Y axis EMG	0: OFF / 1: ON	-	Bit 5
			Y axis general input 0	0: OFF / 1: ON	-	Bit 6
			Y axis general input 1	0: OFF / 1: ON	-	Bit 7
31013 (03F4)	04	R	HOME	0: OFF / 1: ON	-	Bit 0
			STROBE	0: OFF / 1: ON	-	Bit 1
			X	0: OFF / 1: ON	-	Bit 2
			Y	0: OFF / 1: ON	-	Bit 3
			MODE0	0: OFF / 1: ON	-	Bit 4
			MODE1	0: OFF / 1: ON	-	Bit 5
			STEPSL0	0: OFF / 1: ON	-	Bit 6
			STEPSL1	0: OFF / 1: ON	-	Bit 7
			STEPSL2	0: OFF / 1: ON	-	Bit 8
			STEPSL3	0: OFF / 1: ON	-	Bit 9
			STEPSL4	0: OFF / 1: ON	-	Bit A
			STEPSL5	0: OFF / 1: ON	-	Bit B
31014 (03F5)	04	R	X axis software Limit+ error	0: OFF / 1: ON	-	Bit 0
			X axis software Limit- error	0: OFF / 1: ON	-	Bit 1
			X axis hardware Limit+ error	0: OFF / 1: ON	-	Bit 2
			X axis hardware Limit- error	0: OFF / 1: ON	-	Bit 3
			Error on X axis emergency stop	0: OFF / 1: ON	-	Bit 4
			X axis program mode error	0: OFF / 1: ON	-	Bit 5
			X axis home search mode error	0: OFF / 1: ON	-	Bit 6
			X axis index mode error	0: OFF / 1: ON	-	Bit 7
			Y axis software Limit+ error	0: OFF / 1: ON	-	Bit 8
			Y axis software Limit- error	0: OFF / 1: ON	-	Bit 9
			Y axis hardware Limit+ error	0: OFF / 1: ON	-	Bit A
			Y axis hardware Limit- error	0: OFF / 1: ON	-	Bit B
			Error at Y axis emergency stop	0: OFF / 1: ON	-	Bit C

No.(Address)	Func	R/W	Description	Set range	Unit	Remarks
			Y axis program mode error	0: OFF / 1: ON	-	Bit D
			Y axis home search mode error	0: OFF / 1: ON	-	Bit E
			Y axis index mode error	0: OFF / 1: ON	-	Bit F
31015 (03F6)	04	R	Run X axis Home search mode	0: OFF / 1: ON	-	Bit 0
			X axis Jog mode	0: OFF / 1: ON	-	Bit 1
			Run X axis Program mode	0: OFF / 1: ON	-	Bit 2
			Run Y axis Home search mode	0: OFF / 1: ON	-	Bit 3
			Run Y axis Jog mode	0: OFF / 1: ON	-	Bit 4
			Run Y axis Program mode	0: OFF / 1: ON	-	Bit 5
31016 to 31050	04	R	Reserved			

※1. No data is provided for a command to check whether the device is connected to the main system or not when master transmits the command, slave responds with ON only.

7.7.11 Read Holding Registers (Func 03) / Preset Single Registers (Func 06) / Preset Multiple Registers (Func 16)

7.7.11.1 Parameter 0 Setting Group

No(Address)	Func	R/W	Description	Set range	Unit	Remarks
40001 (0000)	06	W	Parameter 0	High 1 byte: Command Low 1 byte: Setting	-	P0 Command table
40002 (0001)	16	W	Parameter 1	High 1 byte: Command Low 1 byte: Setting	-	P1 Command table
40003 (0002)	16	W		High 1 byte: Setting Low 1 byte: Setting	-	
40004 (0003)	16	W		High 1 byte: Setting Low 1 byte: Setting	-	
40005 (0004)	16	W		High 1 byte: Setting Low 1 byte: Setting	-	
40006 (0005)	16	W		High 1 byte: Setting Low 1 byte: Setting	-	
40007 (0006)	16	W		High 1 byte: Setting Low 1 byte: Setting	-	
40008 (0007)	16	W		High 1 byte: Setting Low 1 byte: Setting	-	
40009 (0008)	16	W		High 1 byte: Setting Low 1 byte: Setting	-	
40010 (0009)	16	W		High 1 byte: Setting Low 1 byte: Setting	-	
40011 to 40050	03/06/16	R/W	Reserved			

Parameter 0 and Parameter 1 in Parameter 0 setting group do not distinguish commands with register address number. Communication commands that have PG0 and PG1 parameter values use memory sharing, which uses a parameter at high 1 byte of data to separate commands. Refer to P0, P1 command tables.

(1) P0 Command table

Preset data (2 byte)		Remarks
Hi (High level)	Lo(Low level)	
01 H: Continuous pulse drive BROADCAST available	(X axis)10 H:-, 20 H:+ (Y axis)01 H:-, 02 H:+	Same time X, Y axes assignment possible by using OR.
02 H: Relative position clear	01 H: X axis, 02 H: Y axis	
03 H: Absolute position clear	01 H: X axis, 02 H: Y axis	
04 H: Select speed	(X axis)10 H: 1, 20 H: 2, 30 H: 3, 40 H: 4 (Y axis)01 H: 1, 02 H: 2, 03 H: 3, 04 H: 4	
05 H: Slow stop	01 H: X axis, 02 H: Y axis,	
06 H: Run home search	01 H: X axis, 02 H: Y axis,	
07 H: End home search	01 H: X axis, 02 H: Y axis,	
08 H: Pause program	01 H: X axis, 02 H: Y axis,	
09 H: Force end program	01 H: X axis, 02 H: Y axis,	
0A H: Restart program mode	01 H: X axis, 02 H: Y axis,	
0B H: Set BPS (Bits Per Second) BROADCAST available	01 H: 9,600, 02 H: 19,200, 03 H: 38,400, 04 H: 57,600, 05 H: 115,200	-
0C H: Reset motion IC	01 H: ON	-

Preset data (2 byte)		Remarks
0D H: Initialize motion IC	01 H: ON	-

(2) P1 Command table 4byte DATA

DATA (4byte)			
DATA		DATA	
Hi	Lo	Hi	Lo
51 H: Start program BROADCAST available	01 H: X axis 02 H: Y axis 03 H: X, Y axes	00 H to C7 H	00 H to C7 H
		X axis run address: 0 to 199	Y axis run address: 0 to 199
52 H: Start program step	01 H: X axis 02 H: Y axis 03 H: X, Y axes	00 H to C7 H	00 H to C7 H
		X axis run address: 0 to 199	Y axis run address: 0 to 199

(3) P1 Command table 6byte DATA

DATA (6byte)					
DATA		DATA		DATA	
Hi	Lo	Hi	Lo	Hi	Lo
61 H: Set speed	01 H: X axis 02 H: Y axis 03 H: X, Y axes	0001 H to 1F40 H		0001 H to 1F40 H	
		X axis speed: 1 to 8,000		Y axis speed: 1 to 8,000	

(4) P1 Command table 8byte DATA

DATA (8byte)							
DATA		DATA		DATA		DATA	
Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo
71 H: Absolute position movement	01 H: X axis 02 H: Y axis 03 H: X, Y axes	800000 H to 7FFFFF H		800000 H to 7FFFFF H			
		X axis absolute coordinates: -8,388,608 to +8,388,607		Y axis absolute coordinates: -8,388,608 to +8,388,607			
72 H: Relative position movement	01 H: X axis 02 H: Y axis 03 H: X, Y axes	800000 H to 7FFFFF H		800000 H to 7FFFFF H			
		X axis relative movement coordinates: -8,388,608 to +8,388,607		Y axis relative movement coordinates: -8,388,608 to +8,388,607			
73 H Linear interpolation※1	Constant linear velocity 00 H: OFF, 01 H: ON	800000 H to 7FFFFF H		800000 H to 7FFFFF H			
		X axis end point: -8,388,608 to +8,388,607		Y axis end point: -8,388,608 to +8,388,607			

※1. This is only for PMC-2HSP series.

(5) P1 Command table 10byte DATA (only for PMC-2HSP series)

DATA (10byte)									
DATA		DATA		DATA		DATA		DATA	
Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo
81 H: Circle interpolation	Constant linear velocity 00 H: OFF, 01 H: ON	0 to 7FFFFF H		0 to FFFFFFF H					Do not care
		Radius: 0 to 8,388,607		Manual deceleration point: 0 to 268,435,455					

(6) P1 Command table 18byte DATA(only for PMC-2HSP series)

DATA (18byte)																	
DATA		DATA		DATA		DATA		DATA		DATA		DATA		DATA		DATA	
Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo	Hi	Lo
91 H: CW Circular interpolation	Constant linear velocity 00 H: OFF, 01 H: ON	800000 H to 7FFFFF H		800000 H to 7FFFFF H		800000 H to 7FFFFF H		800000 H to 7FFFFF H				0 H to FFFFFFF H					
		X axis center point: -8,388,608 to +8,388,607		Y axis center point: -8,388,608 to +8,388,607		X axis end point: -8,388,608 to +8,388,607		Y axis end point: -8,388,608 to +8,388,607				Manual deceleration point: 0 to 268,435,455					
92 H: CCW Circular interpolation	Constant linear velocity 00 H: OFF, 01 H: ON	800000 H to 7FFFFF H		800000 H to 7FFFFF H		800000 H to 7FFFFF H		800000 H to 7FFFFF H				0 H to FFFFFFF H					
		X axis center point: -8,388,608 to +8,388,607		Y axis center point: -8,388,608 to +8,388,607		X axis end point: -8,388,608 to +8,388,607		Y axis end point: -8,388,608 to +8,388,607				Manual deceleration point: 0 to 268,435,455					

Between -8,388,608 and +8,388,607, use 2's complement for negative hex number expression.

7.7.11.2 Parameter 1 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit
40051 (0032)	03/06/16	R/W	Program mode X axis STEP0	X axis STEP0 High 2 byte	-
40052 (0033)	03/06/16	R/W	Program mode X axis STEP0	X axis STEP0 Low 2 bytes	-
~	03/06/16	R/W	~	~	-
40099 (0062)	03/06/16	R/W	Program mode X axis STEP24	X axis STEP24 High 2 byte	-
40100 (0063)	03/06/16	R/W	Program mode X axis STEP24	X axis STEP24 Low 2 bytes	-

7.7.11.3 Parameter 2 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit
40101 (0064)	03/06/16	R/W	Program mode X axis STEP25	X axis STEP25 High 2 byte	-
40102 (0065)	03/06/16	R/W	Program mode X axis STEP25	X axis STEP25 Low 2 bytes	-
~	03/06/16	R/W	~	~	-
40149 (0094)	03/06/16	R/W	Program mode X axis STEP49	X axis STEP49 High 2 byte	-
40150 (0095)	03/06/16	R/W	Program mode X axis STEP49	X axis STEP49 Low 2 bytes	-

7.7.11.4 Parameter 3 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit
40151 (0096)	03/06/16	R/W	Program mode X axis STEP50	X axis STEP50 High 2 byte	-
40152 (0097)	03/06/16	R/W	Program mode X axis STEP50	X axis STEP50 Low 2 bytes	-
~	03/06/16	R/W	~	~	-
40199 (00C6)	03/06/16	R/W	Program mode X axis STEP74	X axis STEP74 High 2 byte	-
40200 (00C7)	03/06/16	R/W	Program mode X axis STEP74	X axis STEP74 Low 2 bytes	-

7.7.11.5 Parameter 4 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit
40201 (00C8)	03/06/16	R/W	Program mode X axis STEP75	X axis STEP75 High 2 byte	-
40202 (00C9)	03/06/16	R/W	Program mode X axis STEP75	X axis STEP75 Low 2 bytes	-
~	03/06/16	R/W	~	~	-
40249 (00F8)	03/06/16	R/W	Program mode X axis STEP99	X axis STEP99 High 2 byte	-
40250 (00F9)	03/06/16	R/W	Program mode X axis STEP99	X axis STEP99 Low 2 bytes	-

7.7.11.6 Parameter 5 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit
40251 (00FA)	03/06/16	R/W	Program mode X axis STEP100	X axis STEP100 High 2 byte	-
40252 (00FB)	03/06/16	R/W	Program mode X axis STEP100	X axis STEP100 Low 2 bytes	-
~	03/06/16	R/W	~	~	-
40299 (012A)	03/06/16	R/W	Program mode X axis STEP124	X axis STEP124 High 2 byte	-
40300 (012B)	03/06/16	R/W	Program mode X axis STEP124	X axis STEP124 Low 2 bytes	-

7.7.11.7 Parameter 6 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit
40301 (012C)	03/06/16	R/W	Program mode X axis STEP125	X axis STEP125 High 2 byte	-
40302 (012D)	03/06/16	R/W	Program mode X axis STEP125	X axis STEP125 Low 2 bytes	-
~	03/06/16	R/W	~	~	-
40349 (015C)	03/06/16	R/W	Program mode X axis STEP149	X axis STEP149 High 2 byte	-
40350 (015D)	03/06/16	R/W	Program mode X axis STEP149	X axis STEP149 Low 2 bytes	-

7.7.11.8 Parameter 7 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit
40351 (015E)	03/06/16	R/W	Program mode X axis STEP150	X axis STEP150 High 2 byte	-
40352 (015F)	03/06/16	R/W	Program mode X axis STEP150	X axis STEP150 Low 2 bytes	-
~	03/06/16	R/W	~	~	-
40399 (018E)	03/06/16	R/W	Program mode X axis STEP174	X axis STEP174 High 2 byte	-
40400 (018F)	03/06/16	R/W	Program mode X axis STEP174	X axis STEP174 Low 2 bytes	-

7.7.11.9 Parameter 8 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit
40401 (0190)	03/06/16	R/W	Program mode X axis STEP175	X axis STEP175 High 2 byte	-
40402 (0191)	03/06/16	R/W	Program mode X axis STEP175	X axis STEP175 Low 2 bytes	-
~	03/06/16	R/W	~	~	-
40449 (01C0)	03/06/16	R/W	Program mode X axis STEP199	X axis STEP199 High 2 byte	-
40450 (01C1)	03/06/16	R/W	Program mode X axis STEP199	X axis STEP199 Low 2 bytes	-

7.7.11.10 Parameter 9 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit
40451 (01C2)	03/06/16	R/W	Program mode Y axis STEP0	Y axis STEP0 High 2 byte	-
40452 (01C3)	03/06/16	R/W	Program mode Y axis STEP0	Y axis STEP0 Low 2 bytes	-
~	03/06/16	R/W	~	~	-
40499 (01F2)	03/06/16	R/W	Program mode Y axis STEP24	Y axis STEP24 High 2 byte	-
40500 (01F3)	03/06/16	R/W	Program mode Y axis STEP24	Y axis STEP24 Low 2 bytes	-

7.7.11.11 Parameter 10 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit
40501 (01F4)	03/06/16	R/W	Program mode Y axis STEP25	Y axis STEP25 High 2 byte	-
40502 (01F5)	03/06/16	R/W	Program mode Y axis STEP25	Y axis STEP25 Low 2 bytes	-
~	03/06/16	R/W	~	~	-
40549 (0224)	03/06/16	R/W	Program mode Y axis STEP49	Y axis STEP49 High 2 byte	-
40550 (0225)	03/06/16	R/W	Program mode Y axis STEP49	Y axis STEP49 Low 2 bytes	-

7.7.11.12 Parameter 11 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit
40551 (0226)	03/06/16	R/W	Program mode Y axis STEP50	Y axis STEP50 High 2 byte	-
40552 (0227)	03/06/16	R/W	Program mode Y axis STEP50	Y axis STEP50 Low 2 bytes	-
~	03/06/16	R/W	~	~	-
40599 (0256)	03/06/16	R/W	Program mode Y axis STEP74	Y axis STEP74 High 2 byte	-
40600 (0257)	03/06/16	R/W	Program mode Y axis STEP74	Y axis STEP74 Low 2 bytes	-

7.7.11.13 Parameter 12 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit
40601 (0258)	03/06/16	R/W	Program mode Y axis STEP75	Y axis STEP75 High 2 byte	-
40602 (0259)	03/06/16	R/W	Program mode Y axis STEP75	Y axis STEP75 Low 2 bytes	-
~	03/06/16	R/W	~	~	-
40649 (0288)	03/06/16	R/W	Program mode Y axis STEP99	Y axis STEP99 High 2 byte	-
40650 (0289)	03/06/16	R/W	Program mode Y axis STEP99	Y axis STEP99 Low 2 bytes	-

7.7.11.14 Parameter 13 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit
40651 (028A)	03/06/16	R/W	Program mode Y axis STEP100	Y axis STEP100 High 2 byte	-
40652 (028B)	03/06/16	R/W	Program mode Y axis STEP100	Y axis STEP100 Low 2 bytes	-
~	03/06/16	R/W	~	~	-
40699 (02BA)	03/06/16	R/W	Program mode Y axis STEP124	Y axis STEP124 High 2 byte	-
40700 (02BB)	03/06/16	R/W	Program mode Y axis STEP124	Y axis STEP124 Low 2 bytes	-

7.7.11.15 Parameter 14 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit
40701 (02BC)	03/06/16	R/W	Program mode Y axis STEP125	Y axis STEP125 High 2 byte	-
40702 (02BD)	03/06/16	R/W	Program mode Y axis STEP125	Y axis STEP125 Low 2 bytes	-
~	03/06/16	R/W	~	~	-
40749 (02EC)	03/06/16	R/W	Program mode Y axis STEP149	Y axis STEP149 High 2 byte	-
40750 (02ED)	03/06/16	R/W	Program mode Y axis STEP149	Y axis STEP149 Low 2 bytes	-

7.7.11.16 Parameter 15 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit
40751 (02EE)	03/06/16	R/W	Program mode Y axis STEP150	Y axis STEP150 High 2 byte	-
40752 (02EF)	03/06/16	R/W	Program mode Y axis STEP150	Y axis STEP150 Low 2 bytes	-
~	03/06/16	R/W	~	~	-
40799 (031E)	03/06/16	R/W	Program mode Y axis STEP174	Y axis STEP174 High 2 byte	-
40800 (031F)	03/06/16	R/W	Program mode Y axis STEP174	Y axis STEP174 Low 2 bytes	-

7.7.11.17 Parameter 16 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit
40801 (0320)	03/06/16	R/W	Program mode Y axis STEP175	Y axis STEP175 High 2 byte	-
40802 (0321)	03/06/16	R/W	Program mode Y axis STEP175	Y axis STEP175 Low 2 bytes	-
~	03/06/16	R/W	~	~	-
40849 (0350)	03/06/16	R/W	Program mode Y axis STEP199	Y axis STEP199 High 2 byte	-
40850 (0351)	03/06/16	R/W	Program mode Y axis STEP199	Y axis STEP199 Low 2 bytes	-
40851 ~ 41000	03/06/16	R/W	Reserved		

7.7.11.18 Parameter 17 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit	Remarks
41001 (03E8)	03/06/16	R/W	X axis limit stop mode	0: Instant / 1: Slow	-	Bit 0
			X axis limit Logical signal level	0: Low / 1: High	-	Bit 1
			X axis S Curve accel/decel	0: Disable / 1: Enable	-	Bit 2
			X axis end pulse	0: Disable / 1: Enable	-	Bit 3
			Select X axis deceleration speed	0: Accel / 1: Decel	-	Bit 4
			X axis software limit	0: Enable / 1: Disable	-	Bit 5
			X axis power ON home search Auto start	0: Disable / 1: Enable	-	Bit 6
			X axis power ON program Auto start	0: Disable / 1: Enable	-	Bit 7
			X axis general input 0	0: Low / 1: High	-	Bit 8
			X axis general input 1	0: Low / 1: High	-	Bit 9
41002 (03E9)	03/06/16	R/W	Y axis limit stop mode	0: Instant / 1: Slow	-	Bit 0
			Y axis limit Logical signal level	0: Low / 1: High	-	Bit 1
			Y axis S Curve accel/decel	0: Disable / 1: Enable	-	Bit 2
			Y axis end pulse	0: Disable / 1: Enable	-	Bit 3
			Select Y axis deceleration speed	0: Accel / 1: Decel	-	Bit 4
			Y axis software limit	0: Enable / 1: Disable	-	Bit 5

No.(Address)	Func	R/W	Description	Set range	Unit	Remarks
			Y axis power ON home search Auto start	0: Disable / 1: Enable	-	Bit 6
			Y axis power ON program Auto start	0: Disable / 1: Enable	-	Bit 7
			Y axis general input 0	0: Low / 1: High	-	Bit 8
			Y axis general input 1	0: Low / 1: High	-	Bit 9
41003 to 41050	03/06/16	R/W	Reserved			

7.7.11.19 Parameter 18 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit	Remarks
41051 to 41052	03/06/16	R/W	Reserved			
41053 (041C)	03/06/16	R/W	Enable/disable X axis step 1	0: Disable / 1: Enable	-	Bit 0
			X axis step 1 search direction	0: + / 1: -	-	Bit 1
			Enable/disable X axis step 2	0: Disable / 1: Enable	-	Bit 2
			X axis step 2 search direction	0: + / 1: -	-	Bit 3
			Enable/disable X axis step 3	0: Disable / 1: Enable	-	Bit 4
			X axis step 3 search direction	0: + / 1: -	-	Bit 5
			Enable/disable X axis step 4	0: Disable / 1: Enable	-	Bit 6
			X axis step 4 search direction	0: + / 1: -	-	Bit 7
			Clear X axis position counter	0: Disable / 1: Enable	-	Bit 8
			X axis near home signal Logical level (STOP0)	0: Low / 1: High	-	Bit A
			X axis home signal Logical level (STOP1)	0: Low / 1: High	-	Bit B
			X axis encoder Z-phase signal Logical level (STOP2)	0: Low / 1: High	-	Bit C
41054 (041D)	03/06/16	R/W	X axis low speed home search speed	1 to 8,000	-	-
41055 (041E)	03/06/16	R/W	X axis high speed home search speed	1 to 8,000	-	-
41056 (041F)	03/06/16	R/W	X axis home offset amount H	High 1 byte within -8,388,608 to +8,388,607	-	-
41057 (0420)	03/06/16	R/W	X axis home offset amount L	Low 2 bytes within -8,388,608 to +8,388,607	-	-
41058 (0421)	03/06/16	R/W	Enable/disable Y axis step 1	0: Disable / 1: Enable	-	Bit 0
			Y axis step 1 search direction	0: + / 1: -	-	Bit 1
			Enable/disable Y axis step 2	0: Disable / 1: Enable	-	Bit 2
			Y axis step 2 search direction	0: + / 1: -	-	Bit 3

No.(Address)	Func	R/W	Description	Set range	Unit	Remarks
			Enable/disable Y axis step 3	0: Disable / 1: Enable	-	Bit 4
			Y axis step 3 search direction	0: + / 1: -	-	Bit 5
			Enable/disable Y axis step 4	0: Disable / 1: Enable	-	Bit 6
			Y axis step 4 search direction	0: + / 1: -	-	Bit 7
			Clear Y axis position counter	0: Disable / 1: Enable	-	Bit 8
			X axis near home signal Logical level (STOP0)	0: Low / 1: High	-	Bit A
			Y axis home signal Logical level (STOP1)	0: Low / 1: High	-	Bit B
			Y axis encoder Z-phase signal Logical level (STOP2)	0: Low / 1: High	-	Bit C
41059 (0422)	03/06/16	R/W	Y axis low speed home search speed	1 to 8,000	-	-
41060 (0423)	03/06/16	R/W	Y axis high speed home search speed	1 to 8,000	-	-
41061 (0424)	03/06/16	R/W	Y axis home offset amount H	High 1 byte within -8,388,608 to +8,388,607	-	-
41062 (0425)	03/06/16	R/W	Y axis home offset amount L	Low 2 bytes within -8,388,608 to +8,388,607	-	-
41063 to 41100	03/06/16	R/W	Reserved			

7.7.11.20 Parameter 19 Setting Group

No.(Address)	Func	R/W	Description	Set range	Unit	Remarks
41101 to 41102	03/06/16	R/W	Reserved			
41103 (044E)	03/06/16	R/W	X axis speed multiplier:	1 to 500	-	-
41104 (044F)	03/06/16	R/W	X axis acceleration:	1 to 8,000	-	-
41105 (0450)	03/06/16	R/W	X axis deceleration speed:	1 to 8,000	-	-
41106 (0451)	03/06/16	R/W	X axis initial speed	1 to 8,000	-	-
41107 (0452)	03/06/16	R/W	X axis drive speed 1	1 to 8,000	-	-
41108 (0453)	03/06/16	R/W	X axis drive speed 2	1 to 8,000	-	-
41109 (0454)	03/06/16	R/W	X axis drive speed 3	1 to 8,000	-	-
41110 (0455)	03/06/16	R/W	X axis drive speed 4	1 to 8,000	-	-
41111 (0456)	03/06/16	R/W	X axis post-timer 1	1 to 65,535	-	-
41112 (0457)	03/06/16	R/W	X axis post-timer 2	1 to 65,535	-	-
41113 (0458)	03/06/16	R/W	X axis post-timer 3	1 to 65,535	-	-
41114 (0459)	03/06/16	R/W	X axis software Limit + H	High 1 byte within -8,388,608 to	-	-

No.(Address)	Func	R/W	Description	Set range	Unit	Remarks
				+8,388,607		
41115 (045A)	03/06/16	R/W	X axis software Limit + L	Low 2 bytes within -8,388,608 to +8,388,607	-	-
41116 (045B)	03/06/16	R/W	X axis software Limit - H	High 1 byte within -8,388,608 to +8,388,607	-	-
41117 (045C)	03/06/16	R/W	X axis software Limit - L	Low 2 bytes within -8,388,608 to +8,388,607	-	-
41118 (045D)	03/06/16	R/W	X axis end pulse width	1 to 65,535	-	-
41119 (045E)	03/06/16	R/W	X axis pulse scale numerator	1 to 65,535	-	-
41120 (045F)	03/06/16	R/W	X axis pulse scale denominator	1 to 65,535	-	-
41121 (0460)	03/06/16	R/W	Y axis speed multiplier:	1 to 500	-	-
41122 (0461)	03/06/16	R/W	Y axis acceleration:	1 to 8,000	-	-
41123 (0462)	03/06/16	R/W	Y axis deceleration speed:	1 to 8,000	-	-
41124 (0463)	03/06/16	R/W	Y axis initial speed	1 to 8,000	-	-
41125 (0464)	03/06/16	R/W	Y axis drive speed 1	1 to 8,000	-	-
41126 (0465)	03/06/16	R/W	Y axis drive speed 2	1 to 8,000	-	-
41127 (0466)	03/06/16	R/W	Y axis drive speed 3	1 to 8,000	-	-
41128 (0467)	03/06/16	R/W	Y axis drive speed 4	1 to 8,000	-	-
41129 (0468)	03/06/16	R/W	Y axis post-timer 1	1 to 65,535	-	-
41130 (0469)	03/06/16	R/W	Y axis post-timer 2	1 to 65,535	-	-
41131 (046A)	03/06/16	R/W	Y axis post-timer 3	1 to 65,535	-	-
41132 (046B)	03/06/16	R/W	Y axis software Limit + H	High 1 byte within -8,388,608 to +8,388,607	-	-
41133 (046C)	03/06/16	R/W	Y axis software Limit + L	Low 2 bytes within -8,388,608 to +8,388,607	-	-
41134 (046D)	03/06/16	R/W	Y axis software Limit - H	High 1 byte within -8,388,608 to +8,388,607	-	-
41135 (046E)	03/06/16	R/W	Y axis software Limit - L	Low 2 bytes within -8,388,608 to +8,388,607	-	-
41136 (046F)	03/06/16	R/W	Y axis end pulse width	1 to 65,535	-	-

No.(Address)	Func	R/W	Description	Set range	Unit	Remarks
41137 (0470)	03/06/16	R/W	Y axis pulse scale numerator	1 to 65,535	-	-
41138 (0471)	03/06/16	R/W	Y axis pulse scale denominator	1 to 65,535	-	-
41139 (0472)	03/06/16	R/W	X axis jerk speed:	1 to 65,535	-	-
41140 (0473)	03/06/16	R/W	Y axis jerk speed:	1 to 65,535	-	-
41141 (0474)	03/06/16	R/W	Not used-			
41142(0475)	03/06/16	R/W	1/2 pulse mode	1: 1 pulse mode 2: 2 pulse mode	-	-
41143 to 41150	03/06/16	R/W	Reserved			

ISO-9001 CE

Autonics

Sensors & Controllers

www.autonics.com

Distributor

■ **Major products**

Proximity sensors • Photoelectric sensors • Area sensors • Fiber optic sensors • Door/Door Side sensors • Pressure sensors • Rotary encoders • Sensor controllers • Switching power supply • Temp. controllers • Temperature/Humidity transducers • Power controllers • Recorders • Tachometer/Pulse(Rate) meters • Panel meters • Indicators • Signal convertors • Counters • Timers • Display units • Graphic panel • Stepping Motors & Drivers & Motion controllers

■ **Any proposal for a product improvement and development: Product@autonics.com**

◉ **Headquarters**
41-5, Yongdang-dong, Yangsan-si, Gyeongnam, 626-847, Korea

◙ **Overseas Business Dept.**
Bldg. 402 3rd Fl., Bucheon Techno Park, 193, Yakdae-dong, Wonmi-gu, Bucheon-si, Gyeonggi-do, 420-734, Korea
Tel: 82-32-610-2730/ Fax: 82-32-329-0728 / E-mail: sales@autonics.com

■ **Brazil** Autonics do Brasil Comercial Importadora Exportadora Ltda
Tel : 55-11-3055-1660 / Fax: 55-11-3055-1661/ E-mail: vendas@autonics.com.br

■ **China** Autonics electronic(Jiaxing) Corporation
Tel: 86-573-8216-1900 / Fax: 86-573-8216-1917 / E-mail: china@autonics.com

■ **India** Autonics Corporation - India Liaison Office
Tel : 91-22-2781-4305 / Fax : 91-22-2781-0538 / E-mail: india@autonics.com

■ **Indonesia** PT. Autonics Indonesia
Tel: 62-21-6586-6740 / Fax: 62-21-6586-6741 / E-mail: autonics@cbn.net.id

■ **Japan** Autonics Japan Corporation
Tel: 81-3-5730-0568 / Fax: 81-3-5730-0569 / E-mail: ja@autonicsjp.co.jp

■ **Malaysia** Mal-Autonics Sensor Sdn. Bhd.
Tel : 60-3-7805-7190(Hunting) / Fax : 60-3-7805-7193 / E-mail: malaysia@autonics.com

■ **Mexico** Autonics Mexico Sales Office
Tel : 52-55-5207-0019 / Fax : 52-55-5207-0099 / E-mail: ventas@autonics.com

■ **Russia** Autonics Corp. Russia Representative Office
Tel/Fax : 7-495-745-2343 E-mail : russia@autonics.com

■ **Turkey** Autonics Otomasyon Ticaret Ltd. Sti.
Tel : 90-212-222-0117 (PBX) / Fax : 90-212-222-0108 / E-mail : info@autonics.com.tr

■ **USA** Autonics USA, Inc.
Tel: 1-847-680-8160 / Fax: 1-847-680-8155 / E-mail: sales@autonicsusa.net

■ **Vietnam** Autonics Vietnam Representative Office
Tel : 84-8-3925-6563 / Fax: 84-8-3925-6564 / E-mail: vietnam@autonics.com