Panasonic

Programmable Controller

FP-XH M4 series

User Manual

Applicable models

FP-XH M4 control unit

- Transistor Output Type (Model AFPXHM4T16T)
- Linear Driver Output Type (Model AFPXHM4L16T)

WUMC-FPXHM4-03

2015.11 | panasonic.net/id/pidsx/global

SAFETY PRECAUTIONS

To prevent accidents or personal injuries, please be sure to comply with the following items.
Prior to installation, operation, maintenance and check, please read this manual carefully for proper use.
Before using, please fully understand the knowledge related to the equipment, safety precautions and all other precautions.
Safety precautions are divided into two levels in this manual: Warning and Caution.

⚠ WARNING **Incorrect operation may lead to death or serious injury.**

- Take appropriate safety measures to the external circuit of the product to ensure the security of the whole system in case of abnormalities caused by product failure or external.
- Do not use this product in areas with inflammable gases.
  Otherwise it may lead to an explosion.
- Do not put this product into a fire.
  Otherwise it could cause damage to the battery or other electronic parts.
- Do not impact, charge or heat the lithium battery, and do not put it into a fire.
  Otherwise it may lead to fire or damage.

⚠ CAUTION **Incorrect operation may lead to injury or material loss.**

- To prevent the excessive exothermic heat or smoke generation of the product, a certain margin is required for guaranteed characteristics and performance ratings of relative products.
- Do not decompose or transform it.
  Otherwise it will lead to the excessive exothermic heat or smoke generation of the product.
- Do not touch terminal blocks during power-on.
  Otherwise it may result in an electric shock.
- Set an emergency stop and interlock circuit in the external devices.
- Connect wires and connectors reliably.
  Otherwise it may lead to the excessive exothermic heat or smoke generation of the product.
- Ground the protective earth (PE) terminal with Class D grounding (grounding resistance at 100Ω or below).
  Otherwise it may result in an electric shock.
- There shall be no foreign matters such as liquids, flammable materials and metals inside the product.
  Otherwise it will lead to the excessive exothermic heat or smoke generation of the product.
- Do not carry out construction (wiring, removal, etc.) during power-on.
  Otherwise it may result in an electric shock.

Description on Copyright and Trademarks

Foreword

Thanks a lot for purchasing Panasonic products! Before using, please carefully read the User Manual to fully understand relevant contents. Make sure to use this product properly.

Type of Manual

- FP-XH M4 series user manual types are as follows. Please use it according to the used unit and its usage.
- Download the manual from the company's home page http://industrial.panasonic.com/ac/c/dl_center/manual/.

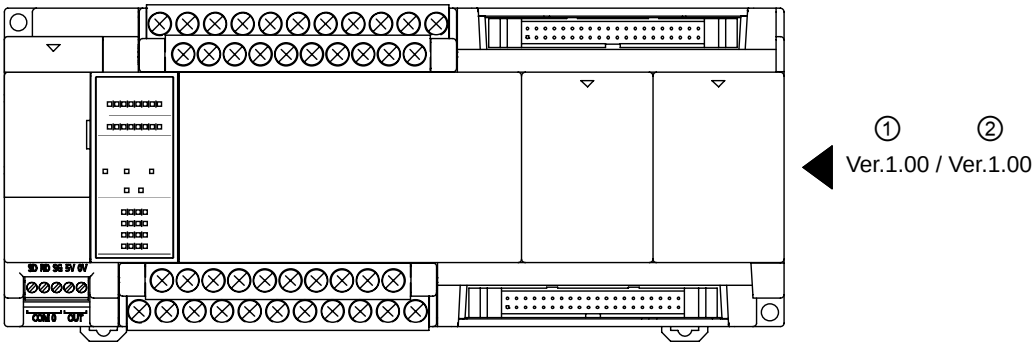
Unit Name or Usage	Manual Name	Manual Symbol
FP-XH M4 Control Unit	FP-XH M4 Control Unit User's Manual	WUMC-FPXHM4
	FP Series Instruction Manual	ARCT1F353C
Communication Function	FP-XH User Manual (Communication Section)	WUMC-FPXHBAS
FP-X Expansion (Communication) Card		
FP-X Expansion Unit	FP-X Series User Manual	ARCT1F409C
FP-X Function Card		

Control Unit Version

The version of the control unit can be confirmed according to the nameplate on the side of the product body or on the menu of the tool software.

■ Marking of the product body

2 CPU versions are marked on the nameplate on the side of the product body.



	Description
①	The "Main CPU" version for overall operation is marked.
②	The "Motion CPU" version for motion control is marked.

■ Confirmation based on the tool software

The version of the Main CPU can be confirmed according to Status Display of FPWIN GR7.

The version of Motion CPU can be confirmed via the Status Display dialog box of Configurator PM7. The dialog box displays the "firmware version".

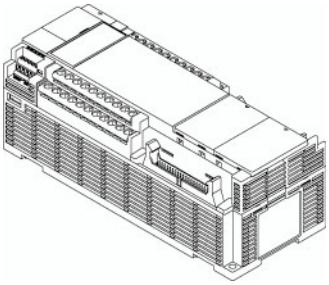
Contents

1

System Structure

1.1 Unit List

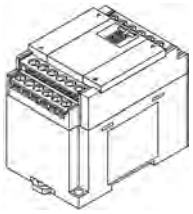
1.1.1 FP-XH M4 Control Unit

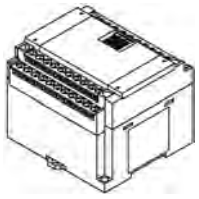


Divided into the following types according to points, power supply and output type.

Points	General I/O part: 16 points, motion control part (equipped with I/O for 4-axis control)
Power supply	100-240 VAC
Output	General output part: transistor (NPN output)
	I/F part for motion control: transistor (NPN output) or linear driver output

1.1.2 FP-X / FP-X0 Expansion Unit





Divided into the following types according to points, power supply and output type. Can be used with the old models FP-X, FP-X0.

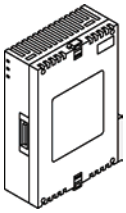
■ FP-X Expansion Unit

Points	14 points (for output) / 16 points (for input) / 16 points	30 points
Power supply	No power supply	100-240 VAC or 24 VDC
Output	Relay or transistor (NPN output or PNP output)	

■ FP-X0 Expansion Unit

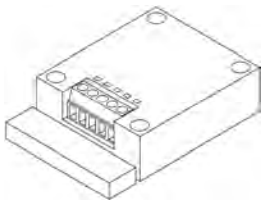
Points	24 points	40 points
Power supply	No power supply	24 VDC
Output	Relay or transistor (NPN output or PNP output)	

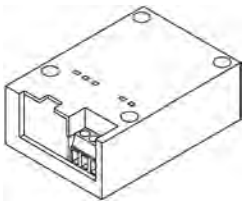
1.1.3 FP-X Expansion FP0 Adapter



Interface adapters enabling connection with FP0 series expansion unit / high function unit.

1.1.4 FP-X Expansion Card (Communication Card)

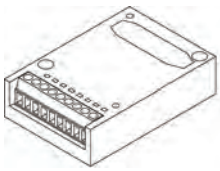


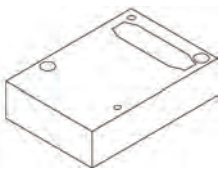


Divided into the following types according to the type of communication interface and the number of channels.

Communication pattern	RS-232C (5-wire) × 1ch
	RS-232C (3-wire) × 2ch
	RS-485 / RS-422 × 1ch
	RS-485 × 1ch + RS-232C (3-wire) × 1ch
	RS-485 × 2ch
	Ethernet × 1ch + RS-232C (3-wire) × 1ch

1.1.5 FP-X Expansion Card (Function Card)





Divided into the following types according to the output type and function.

Analog input and output	Analog input × 2ch Analog output × 2ch Analog input × 2ch + analog output × 1ch
Digital input and output	Input 8 points, transistor output 8 points Input 4 points + transistor output 3 points
Pulse input and output	High-speed counter × 2ch + pulse output × 1ch
Main memory	Main memory + real-time clock

1.2 Unit Type Summary

1.2.1 FP-XH M4 Control Unit

Product Name	Specification		Order Number
	Input / Output Specifications	Power supply	
FP-XH M4T16T Control Unit	DC input 8 points, transistor output 8 points I/F 4-axis type for motion control Transistor output for pulse output	100-240 VAC	AFPXHM4T16T
FP-XH M4L16T Control Unit	DC input 8 points, transistor output 8 points I/F 4-axis type for motion control Linear driver output for pulse output	100-240 VAC	AFPXHM4L16T

1.2.2 FP-X Expansion Unit

Product Name	Specification		Order Number
	Input / Output Specifications	Power supply	
FP-X E16 expansion I/O unit	DC input 8 points, relay output 8 points	-	AFPX-E16R
	DC input 8 points, transistor output (NPN) 8 points	-	AFPX-E16T
	DC input 8 points, transistor output (PNP) 8 points	-	AFPX-E16P
FP-X E30 expansion I/O unit	DC input 16 points, relay output 14 points	100-240 VAC	AFPX-E30R
		24 VDC	AFPX-E30RD
	DC input 16 points, transistor output (NPN) 14 points	100-240 VAC	AFPX-E30T
		24 VDC	AFPX-E30TD
	DC input 16 points, transistor output (PNP) 14 points	100-240 VAC	AFPX-E30P
		24 VDC	AFPX-E30PD
FP-X E16 expansion input unit	DC input 16 points	-	AFPX-E16X
FP-X E14R expansion output unit	Relay output 14 points	-	AFPX-E14YR

(Note) Comes with expansion cables (8 cm type).

1.2.3 FP-X0 Expansion Unit

Product Name	Specification		Order Number
	Input / Output Specifications	Power supply	
FP-X0 E24 expansion I/O unit	DC input 16 points, relay output 8 points	-	AFPX0E24R
	DC input 16 points, transistor output (NPN) 8 points	-	AFPX0E24T
	DC input 16 points, transistor output (PNP) 8 points	-	AFPX0E24P
FP-X0 E40 expansion I/O unit	DC input 24 points, relay output 16 points	24 VDC	AFPX0E40RD
	DC input 24 points, transistor output (NPN) 16 points	24 VDC	AFPX0E40TD
	DC input 24 points, transistor output (PNP) 16 points	24 VDC	AFPX0E40PD

(Note) Comes with expansion cables (8 cm type).

1.2.4 FP-X Expansion FP0 Adapter

Name	Specification	Order Number
FP-X Expansion FP0 Adapter	Used to connect with the FP0 expansion unit	AFPX-EFP0

(Note) Comes with expansion cables (8 cm type).

1.2.5 FP-X Expansion Card (Communication Card)

Name	Specification	Order Number
FP-X communication card	RS-232C 5-wire × 1 channel	AFPX-COM1
	RS-232C 3-wire × 2 channel	AFPX-COM2
	RS-485 / RS-422 (insulated) × 1 channel	AFPX-COM3
	RS-485 (insulated) × 1 channel + RS-232C 3-wire × 1 channel	AFPX-COM4
	RS-485 (insulated) × 2 channels (non-insulated between channels)	AFPX-COM6
	Ethernet port + RS-232C 3-wire × 1 channel	AFPX-COM5

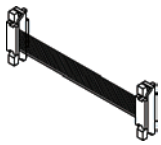
1.2.6 FP-X Expansion Card (Function Card)

Name		Specification	Order Number
Analog input and output	FP-X analog input card	Analog input (non-isolated) × 2 channels	AFPX-AD2
	FP-X analog output card	Analog output (insulated) × 2 channels (insulated between channels)	AFPX-DA2
	FP-X analog I/O card	Analog input (insulated) × 2 channels (non-insulated between channels) + analog output (insulated) × 1 channel	AFPX-A21
	FP-X thermocouple card	Thermocouple input (insulated) × 2 channels (insulated between channels)	AFPX-TC2
	FP-X temperature measuring resistor card	Temperature measuring resistor input (insulated) × 2 channels (insulated between channels)	AFPX-RTD2
Digit input and output	FP-X input card	8-point DC input	AFPX-IN8
	FP-X output card	8-point transistor output (NPN)	AFPX-TR8
	FP-X output card	6-point transistor output (PNP)	AFPX-TR6P
	FP-X input and output card	4-point DC input + 3-point transistor output (NPN)	AFPX-IN4T3
FP-X pulse input and output card		High-speed counter 2ch + pulse output 1ch	AFPX-PLS
FP-X main memory card		Main memory + real-time clock	AFPX-MRTC

1.2.7 Options

Name	Specification	Order Number
FP-XH backup battery	Required when expanding operational memory keeping area and using the calendar clock function.	AFPXHBATT

1.2.8 Repair Parts

	Name	Specification	Order Number
	FP-X expansion cable (note)	8cm	AFPX-EC08
		30cm	AFPX-EC30
		80cm	AFPX-EC80
	FP0 power cable	For expansion FP0 adapters, 1 m long	AFP0581

(Note 1): The FP0 expansion unit and high-function unit include 8 cm expansion cables. Please limit the total length to less than 160 cm when using.

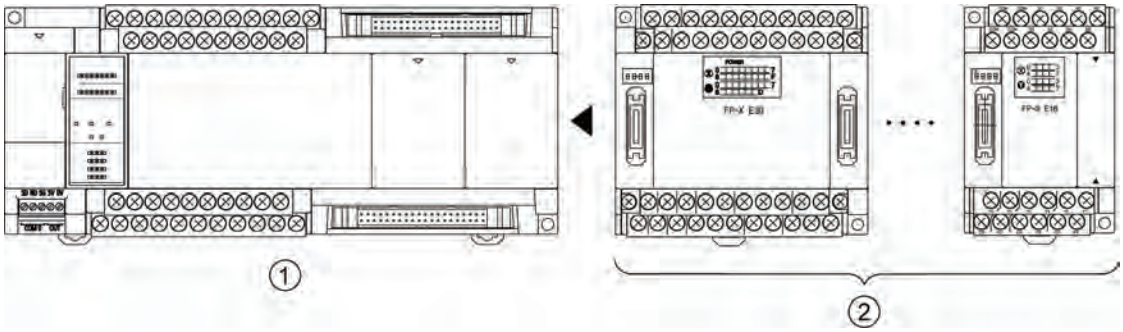
(Note 2): when using long expansion cables, I/O checking error may occur due to noises and other effects. In this case, it is recommended to take measures such as using ferrite cores.

1.3 Unit Combination Restrictions

1.3.1 Use Restrictions of FP-X/FP-X0 Expansion Units

■ Expansion Number and Order Limitations (1)

- Connect up to 8 expansion units.



①	FP-XH M4 control unit	②	FP-X / FP-X0 Expansion Unit

■ Maximum Control I/O Points

Type of Control Unit	I/O Points for Single Control Unit	I/O Points for FP-X-E30 Expansion	I/O Points for FP-X0-E40
FP-XH M4 control unit	16 points (note)	Maximum 256 points	Maximum 336 points

(Note) Points mentioned in the table above means the I/O points of the general I/O part.

■ Expansion Cable Combination Limitations

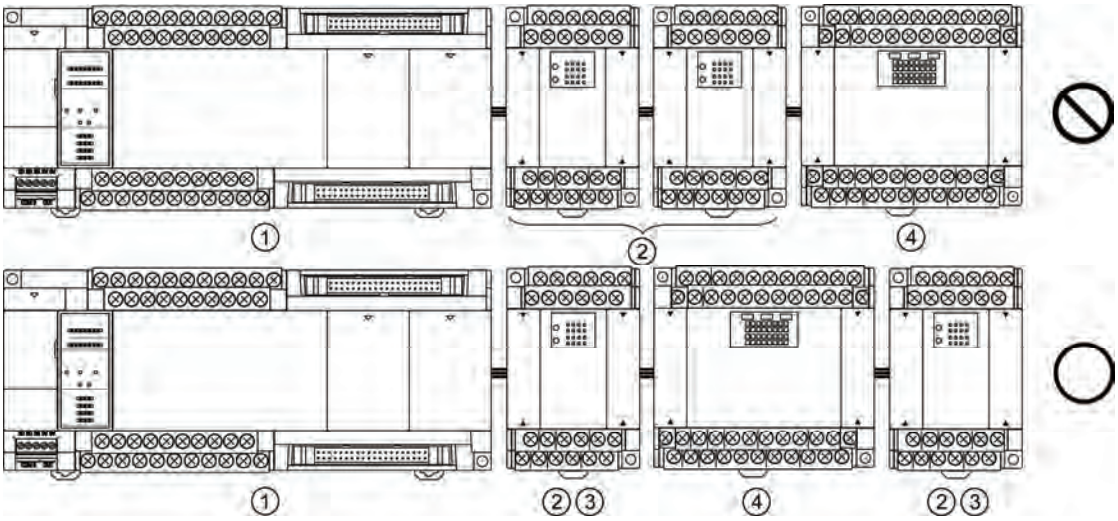
- Please limit the total length of the expansion cable to less than 160 cm.

■ Expansion Cable Combination Limitations (2)

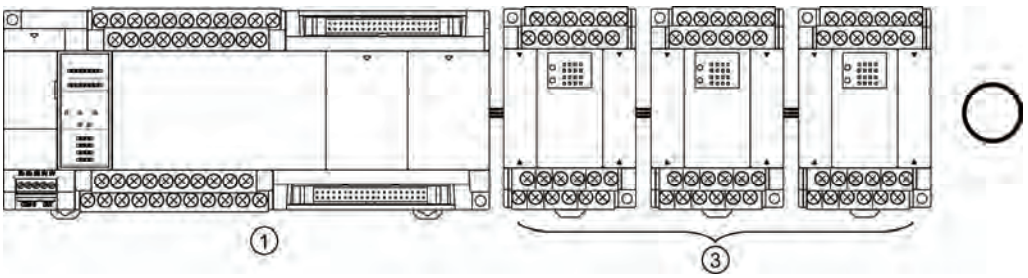
- The number of expansion units can be connected and expanded varies with its types.

	Unit Type		Remarks
①	FP-XH M4 control unit		
②	FP-X Expansion I/O Unit	E14YR, E16R	Expansion I/O unit without built-in power supply
		E16X, E16T, E16P Ver.3.0 or below	
③	FP-X Expansion I/O Unit	E16X, E16T, E16P Ver.3.0 or above	Expansion I/O unit without built-in power supply
	FP-X0 Expansion I/O Unit	E24R, E24T, E24P	
④	FP-X Expansion I/O Unit	E30	Expansion I/O unit with built-in power supply
	FP-X0 Expansion I/O Unit	E40	

- In the FP-X expansion I/O unit, continuously connecting two units in group ② shown in the above table is not possible. However, it can be expanded on the right side of the expansion I/O unit with built-in power supply.



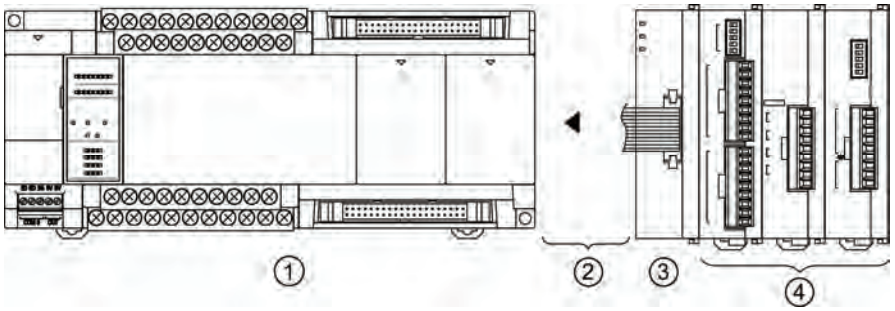
- In the unit without built-in power supply of the FP-X expansion I/O unit, up to three units in group ③ shown in the above table can be connected.



1.3.2 Use Restrictions of FP-X Expansion Adapter

■ Expansion position of FP-X expansion FP0 adapter

- With the FP-X expansion FP0 adapter, up to three FP0 expansion units can be connected.
- When using the FP-X expansion FP0 adapter, up to seven FP-X expansion units can be connected.
- The end of the FP-X expansion bus can only connect with one FP-X expansion FP0 adapter. Please expand on the right side of FP-X / FP-X0 expansion units.



①	FP-XH M4 Control Unit	②	FP-X / FP-X0 Expansion Unit	③	FP-X Expansion FP0 Adapter	④	FP0 Expansion Unit High Function Unit

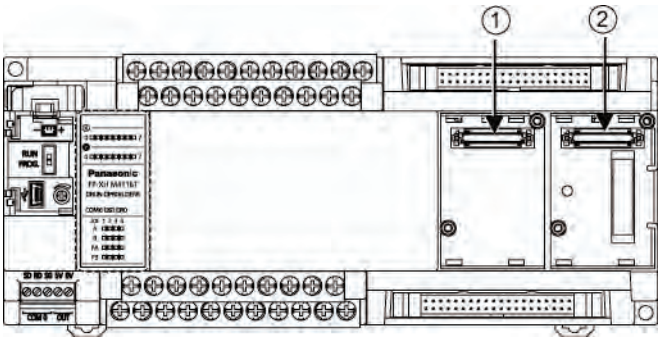
■ Expansion sequence of FP0 expansion unit / FP0 high functional unit

- Please connect the FP0 thermocouple input unit to the right side of the other FP0 units. Connecting to the left side reduces overall accuracy.
- Please connect the FP0 CC-Link unit to the right side of the other FP0 units. No expansion connector.

1.3.3 Limitations on Expansion Card Combination

■ Expansion card installation position (1)

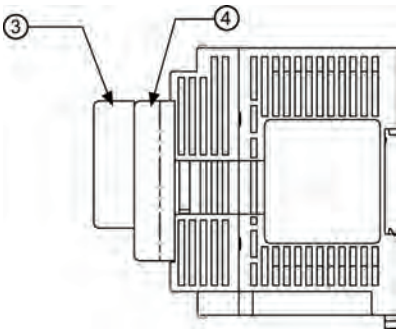
- The FP-XH M4 control unit contains 2 expansion card installation parts.



①	Card installation part 1	②	Card installation part 2

■ Expansion card installation position (2)

- Function and communication card can be overlapped and installed into the same card installation part. In this case, make sure the communication card is installed over the function card.



③	Communication card	④	Function card

■ Number of Expansion Cards that Can be Installed

- Up to 2 function cards and 2 communication cards can be installed.

■ Expansion card type and installation location (●: available, ○: conditional, no notation: not available)

Card type			Installation part of the control unit	
Type	Product Name	No.	Card installation part 1	Card installation part 2
Communication card (note 1)	Communication card	AFPX-COM1	● (Note 2)	● (Note 2)
		AFPX-COM2	●	●
		AFPX-COM3	●	●
		AFPX-COM4	●	●
		AFPX-COM5	●	●
		AFPX-COM6	●	●
Function card (Note 3)	Analog input card	AFPX- AD2	●	●
	Analog output card	AFPX-DA2	●	●
	Analog I/O card	AFPX-A21	●	●
	Thermocouple card	AFPX-TC2	●	●
	Temperature measuring resistor card	AFPX-RTD2	●	●
	Input card	AFPX-IN8	●	●
	Output card	AFPX-TR8	●	●
	Output card	AFPX-TR6P	●	●
	Input / output card	AFPX-IN4T3	●	●
	Pulse input / output card	AFPX-PLS	(Note 4)	(Note 4)
	Main memory card	AFPX-MRTC	○ (note 5)	○ (note 5)

(Note 1): When installed with the function card together, mount it over the function card.

(Note 2): RS / CS control available for AFPX-COM1.

(Note 3): When installing the function card on FP-XH M4 control unit, it can be installed at card installation part 1 or card installation part 2.

(Note 4): You can not install pulse input and output card on the FP-XH M4 control unit. If installed, a self-diagnosis error will occur (27: Unit installation is restricted).

(Note 5): Only one FP-X main memory card can be installed. A self-diagnosis error will occur if 2 sets are installed (27: Unit installation is restricted).

1.3.4 limitations on Communication Function

- When using the standard communication port and communication card of the control unit, the following limitations exist depending on the different functions of use.
- The communication port number assigned varies according to the card installation position.

■ Type of communication port / communication card (●: available, no notation: not available)

Order Number	Communication Interface	Communication Port No. Assigned				
		Master computer	Card installation part 1		Card installation part 2	
		COM0	COM1	COM2	COM3	COM4
Control unit standard configuration	RS-232C (3-wire) × 1 channel	●				
AFPX-COM1	RS-232C (5-wire) × 1 channel		●		●	
AFPX-COM2	RS-232C (3-wire) × 2 channel		●	●	●	●
AFPX-COM3	RS-485 / RS-422 × 1 channel		●		●	
AFPX-COM4	RS-485 × 1 channel		●		●	
	RS-232C (3-wire) × 1 channel			●		●
AFPX-COM5	Ethernet × 1 channel		●		●	
	RS-232C (3-wire) × 1 channel			●		●
AFPX-COM6	RS-485 × 2 channel		●	●	●	●

(Note 1): With 5-wire RS-232C, the RS / CS control can be enabled for the RS-232C port of the AFPX-COM1.

(Note 2): Choose either of the RS-485 or RS-422 when using AFPX-COM3. It can be shifted by the switch on the communication card.

(Note 3): AFPX-COM4 can use RS-485 × 1 channel and RS-232C (3-wire) × 1 channel.

(Note 4): AFPX-COM5 can use Ethernet × 1 channel and RS-232C (3-wire) × 1 channel.

■ Function of the communication port (●: available, ○: conditional, no notation: not available)

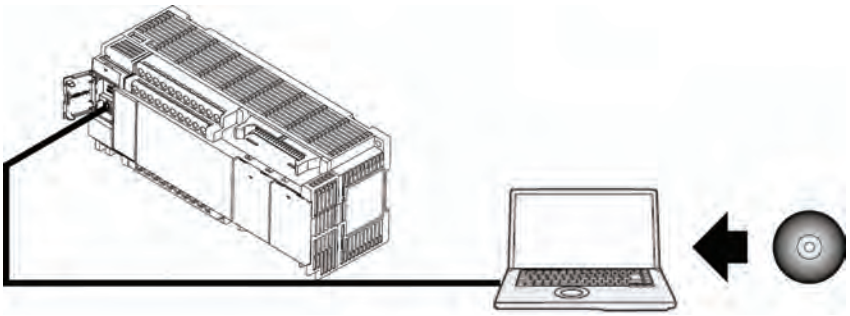
Communication Function Used		Communication Port No. Assigned				
		Master computer	Card installation part 1		Card installation part 2	
		COM0	COM1	COM2	COM3	COM4
PLC Link		○	○			
MEWTOCOL-COM	Master station	●	●	●	●	●
	Slave station	●	●	●	●	●
MODBUS-RTU	Master station	●	●	●	●	
	Slave station	●	●	●	●	
General Communication		●	●	●	●	

(Note 1): PLC link can only use either the COM0 port comes with the control unit or COM1 port on the card.

(Note 2): The COM4 port only supports MEWTOCOL-COM communication. In addition, the communication parameters (station number, communication format, communication speed) when the power is ON are same as the settings of the COM3 port. After RUN, you can also change the conditions by SYS1 instruction.

1.4 Programming Tools

1.4.1 Required Tools



1.4.2 Software Environment and Applicable Cables

■ **Programming Tool Software**

Software Category	OS	Hard Drive Capacity	Order Number
FPWIN GR Chinese Version	Windows® XP SP3 / Windows® Vista SP2 / Windows® 7 SP1 or above / Windows® 8 / Windows® 8.1 (32bit/64bit version)	100MB or more	AFPSGR7CN
FPWIN Pro7 Chinese Version	Windows® XP SP3 / Windows® Vista SP2 / Windows® 7 SP1 or above / Windows® 8 / Windows® 8.1 (32bit/64bit version)	200MB or more	AFPSPR7A

(Note 1): When upgrading to the latest version, you can use the company HP (http://industrial.panasonic.com/ac/c/dl_center/software/) for a free upgrade. Please use the latest version.

(Note 2): To use FP-XH in FPWINPro7, setup file should also be installed. For details, please refer to the homepage above.

■ **Computer connection cable**

- Use a commercially available USB cable.

Cable Type	Length
USB 2.0 cable (A: miniB)	Up to 5 m

1.4.3 Corresponding Version of the Software

The following versions of software are required for using the FP-XH.

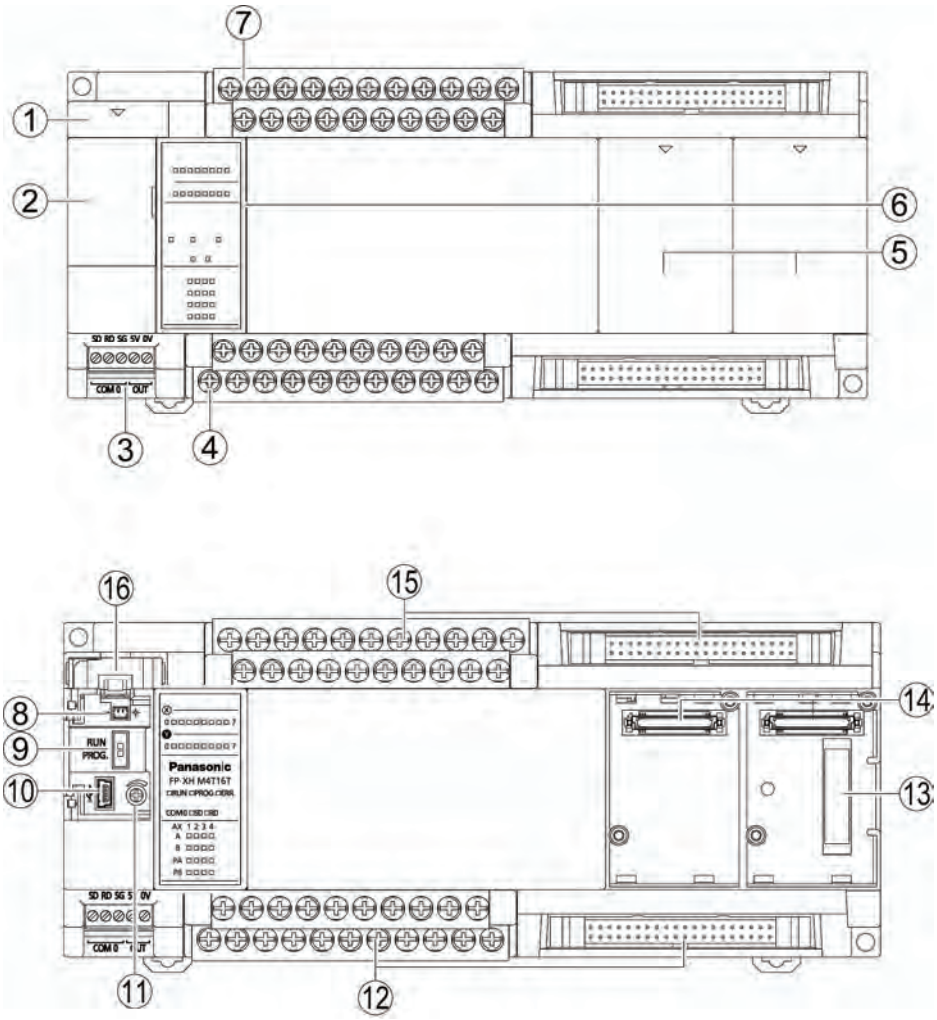
Item		Corresponding Version
Programming Software FPWIN GR7 / FPWIN Pro7		FPWIN GR7 Ver.2.7 or above FPWIN Pro7 Ver.7.11 or above
	Configurator PMX	Setting of position control parameters and data Embedded in the FPWIN GR7 / FPWIN Pro7, started through the Options menu.

2

Control Unit Specifications

2.1 Name and Function of Each Part

2.1.1 Name and Function of Each Part

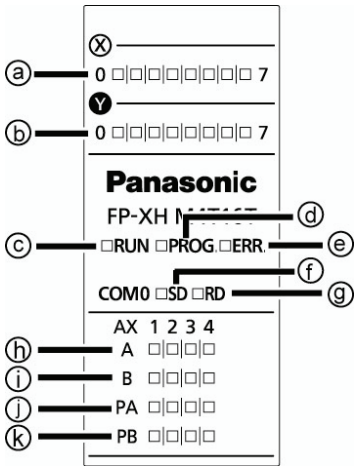


■ Name and Function of Each Part

No.	Name	Function	
①	Battery cover	Backup battery insertion space for options.	
②	Operating unit cap	Has built-in battery connector, RUN / PROG. mode switch, USB port connector and analog potentiometer.	
③	COM0 port	3-wire RS-232C port. Also equipped with a 5V power supply terminal for connecting to GT series monitor.	
④	General power supply terminals for input	Can be used as a universal power supply for input circuit.	
⑤	Card installation part cover	Installation space for communication card and function card of the options.	
⑥	Status display LED / input / output display LED	Displays operation mode, error conditions and the communication status and input / output status of the COM0 port. Input/output status of the motion control interface part will also be displayed.	
⑦	Power supply terminals	Connected to the drive control unit power supply.	
⑧	Battery connector	Insert special battery (AFPXHBATT) connector.	
⑨	RUN / PROG. mode switch	RUN (upper)	Set to RUN mode. Program execution begins.
		PROG. (lower)	Set to programming mode.
⑩	USB port connector	Connecting to a PC using the tool software.	
⑪	Analog potentiometer	The special DT value changes when rotating potentiometer. It can be applied to analog timers etc.	
⑫	Output terminal	Connect with the output device.	
⑬	Expansion unit connector	Connect with an expansion cable for installing expansion unit.	
⑭	Expansion card connector	For installing an optional expansion card (communication card or function card).	
⑮	Input terminal	Connect with input devices.	
⑯	Battery holder	When using the calendar clock function, it is used to install a special battery when expanding the backup region of memory region for operation. The special Battery (AFPXHBATT) is required to purchase separately.	
⑰	DIN hook	Used for DIN rail fixing.	
⑱	Motion control I/F (for 1-axis/axis-2)	Input/output for motion control is configured to various axes. Input: origin input, near origin input, limit+input, limit-input, pulse input (A, B) Output: pulse input (A, B), deviation counter removal output, servo ON output	
⑲	Motion control I/F (for axis-3/axis-4)		

(Note 1): Whether the switch is on "RUN" or "PROG", the mode can be switched by tool software via remote operation. When the power is reconnected, it will operate under the mode at the switch position.

2.1.2 Action Display LED Unit Specifications



No.	Controller Display		Color	Display Content		
ⓐ	X		Green	Indicate the status of inputs.		
ⓑ	Y		Green	Indicate the status of outputs.		
ⓒ	RUN		Green	On	Lighted when running the program in RUN mode.	
				Flashes	When performing the mandatory input and output function, RUN / PROGLED will flash alternately.	
ⓓ	PROG.		Green	On	Lighted when stopping running in PROG. mode.	
				Flashes	When performing the mandatory input and output function, RUN / PROGLED will flash alternately.	
ⓔ	ERR.		Red	On	The light is on during hardware exceptions, program operation stagnation and monitoring timer operation.	
				Flashes	Flashing when detecting errors through self diagnosis.	
ⓕ	COM0	SD	Green	Flashes when COM0 port is sending data.		
ⓖ		RD	Green	Flashes when COM0 port is receiving data.		
ⓗ	Motion output part				Upon Pulse/Sign output setting	CW/CCW output setting
		A	Green	On	— (Note 1)	— (Note 1)
				Flashes	During pulse output	During pulse output (direct rotation)
				Out	During stop	During stop (direct rotation)
ⓘ		B	Green	On	Inverse direction instruction	—
				Flashes	—	During pulse output (reverse rotation)
				Out	Forward direction instruction	During stop (reverse rotation)
ⓙ		PA	Green	Lit during Phase-A pulse input (Note 2)		
ⓚ		PB	Green	Lit during Phase-B pulse input (Note 2)		

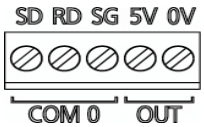
(Note 1): during the operation of the electronic clutch or electronic cam, the light will still be on even when the pulse input is stopped.

(Note 2): pulse input signals (PA) and (PB) indicate input status of pulse signals.

2.1.3 COM0 Port Specifications

- Universal 3-wire RS-232C port.
- Equipped with a 5 V power supply terminal for supplying power to the GT02 / GT02L series programmable display.

■ Terminal arrangement



Controller Display		Description	
COM 0	SD	Send data (unit → external device)	Universal 3-wire RS-232C port.
	RD	Receive data (external device → unit)	
	SG	Signal ground	
OUT	5V	As power supply for GT series display, 5 VDC output.	
	0V		

2.2 Power Specifications

■ AC Power Specifications

Item	Specification
Rated voltage	100 - 240 VAC
Allowable voltage range	85 - 264 VAC
Impact current (240 VAC, at 25 ℃ ambient temperature)	45A or less
Allowable temporal outage time	10 ms (when using 200 VAC)
Frequency	50 / 60Hz (47 - 63Hz)
Leakage current	0.75 mA or less between input - protection ground terminals
Built-in power supply unit to ensure long service life	30,000 hours (at 55 ℃ ambient temperature)
Fuse	Built-in (not replaceable)
Insulation mode	Transformer insulation
Terminal screw	M3

■ Specifications of Universal Power Supply for Input Circuit

Item	Specification
Rated voltage	24 VDC
Allowable voltage range	21.6 - 26.4 VDC
Rated output current	0.4A
Over-current protection	Yes
Terminal screw	M3

2.3 Input / Output Specifications (Universal input/output part)

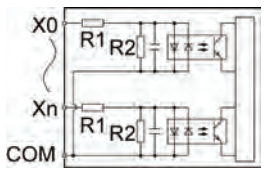
2.3.1 Input Specifications

■ Specification

Item		Specification
Rated input voltage		24 VDC
Service voltage range		21.6 - 26.4 VDC
Rated input current		About 4.7mA
COM mode		8 points/ COM (+/- polarity of the input power supply are both allowable)
Minimum ON voltage / minimum ON current		19.2 VDC / 3 mA
Maximum OFF voltage / maximum OFF current		2.4 VDC / 1 mA
Input resistance		About 5.1 kΩ
Response time (note)	OFF → ON	135 μs or less (general input) 50 μs or less (high-speed counter, pulse catch, interrupt input setting)
	ON → OFF	Ditto
Action indication		LED

(Note): Specifications at rated voltage of 24 VDC and the ambient temperature of 25 ℃.

■ Internal circuit diagram

X0-X7

X0-X7: R1 = 5.1 kΩ, R2 = 3 kΩ

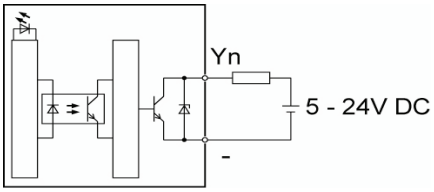
2.3.2 Output Specifications

■ Specification

Item		Specification
Output type		NPN open collector
Rated load voltage		5 - 24 VDC
Allowable load voltage range		4.75 - 26.4 VDC
Rated load current		0.5 A
Maximum impact current		1.5 A
OFF leakage current		1 μA or less
ON maximum voltage drop		0.3 VDC or less
COM mode		8-point COM
Response time (note)	OFF → ON	1 ms or less
	ON → OFF	1 ms or less
Surge suppressor		Zener diode
Action indication		LED

(Note) Specifications at 25 ℃ ambient temperature.

■ Internal circuit diagram

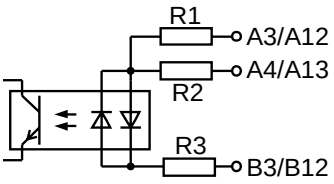


2.4 Input / Output Specifications (Motion Control Part)

■ Origin input (Z5/Z24)

Item		Specification	
		For 5 V DC input	For 24 V DC input
Rated input voltage		5 VDC	24 VDC
Service voltage range		3.5-5.25 V DC	21.6 - 26.4 VDC
Rated input current		About 6.9mA	About 6.1mA
COM mode		Independent COM (+/- polarity of the input power supply are both allowable)	
Minimum ON voltage / minimum ON current		3 V DC/4mA	19.2 V DC/5.5mA
Maximum OFF voltage / maximum OFF current		1 V DC/0.5mA	2 V DC/1.2mA
Input resistance		About 720 Ω	About 4 kΩ
Response time	OFF → ON	100 μs or less	
	ON → OFF	100 μs or less	
Action indication		No	

■ Internal circuit diagram

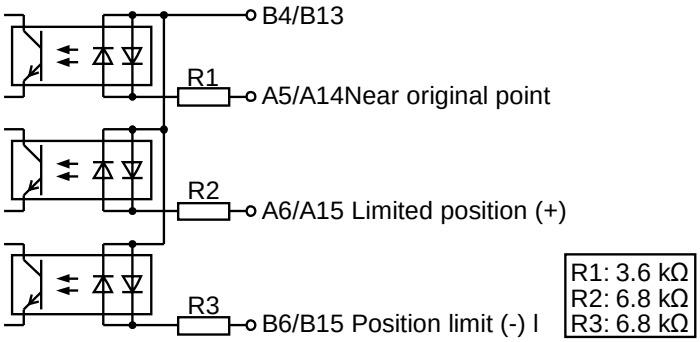


R1: 3.6 kΩ
R2: 360 Ω
R3: 360 Ω

■ Near origin input (DOG) and limit + / - input

Item		Specification	
		Near origin input	Limit + / —input
Rated input voltage		24 VDC	
Service voltage range		21.6 - 26.4 VDC	
Rated input current		About 6.7 mA	About 3.5 mA
COM mode		Com terminals of different axes (+/- polarity of the input power supply are both allowable, but must be consistent)	
Minimum ON voltage / minimum ON current		19.2 V DC/5.5mA	
Maximum OFF voltage / maximum OFF current		2 V DC/1.5mA	
Input resistance		About 3.6 kΩ	About 6.8 kΩ
Response time	OFF → ON	100 μs or less	
	ON → OFF	100 μs or less	
Action indication		No	

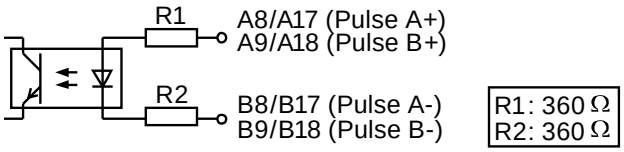
■ Internal circuit diagram



■ Pulse input

Item		Specification
Rated input voltage		5 VDC
Service voltage range		3.5-5.25 V DC
Rated input current		About 6.9mA
COM mode		Independent COM
Minimum ON voltage / minimum ON current		3V DC/3.2 mA
Maximum OFF voltage / maximum OFF current		1V DC/0.5 mA
Input resistance		About 720Ω
Response time	OFF → ON	0.5 μs or less
	ON → OFF	0.5 μs or less
Action indication		LED

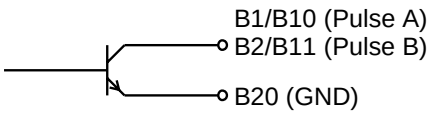
■ Internal circuit diagram



■ Pulse Output (Transistor Output Type (Model AFPXHM4T16T)

Item		Specification
Output type		NPN open collector
Rated load voltage		5 - 24 VDC
Allowable load voltage range		4.75 - 26.4 VDC
Rated load current		15mA
ON maximum voltage drop		0.6 VDC or less
COM mode		COM (for pulse output signals only)
Response time	OFF → ON	0.5 μs or less
	ON → OFF	0.5 μs or less
Surge suppressor		Zener diode
Action indication		LED

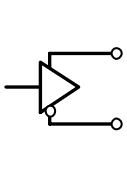
■ Internal circuit diagram



■ Pulse Output (Linear Driver Output Type: Model AFPXHM4L16T)

Item	Specification
Output type	Linear Driver Output Type Equivalent to AM26C31

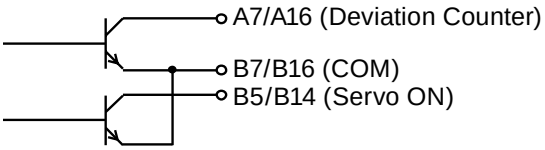
■ Internal circuit diagram



■ Deviation counter clear time, servo ON

Item		Specification
Output type		NPN open collector
Rated load voltage		5 - 24 VDC
Allowable load voltage range		4.75 - 26.4 VDC
Rated load current		10 mA
OFF leakage current		5 μA or less
ON maximum voltage drop		1.5 VDC or less
COM mode		Common use for different axes
Response time	OFF → ON	1 ms or less
	ON → OFF	1 ms or less
Surge suppressor		Zener diode
Action indication		No

■ Internal circuit diagram



3

I/O Allocation

3.1 Basic I/O Assignment

3.1.1 Counting Method of I/O Numbers

■ Counting method and representation of I/O numbers

- I/O numbers are counted in 16 points, representing the next bit combination of device type symbol and decimal and hexadecimal numbers.
- For external input, represented as X0-X9, XA-XF. For external output, represented as Y0-Y9, YA-YF.

<Decimal number>
0, 1, 2, 3...9

1	2	7	F

<Hexadecimal number>
0, 1, 2, 3...9, A, B...F

3.1.2 I/O Number Assignment Method

■ I/O numbers of control unit

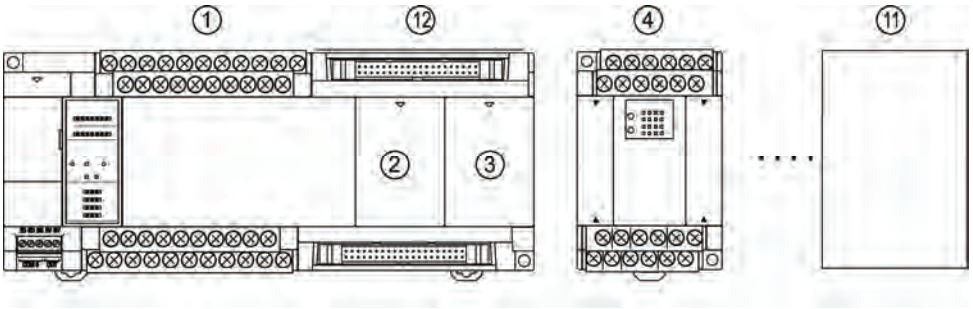
I/O numbers are assigned a fixed region.

■ I/O numbers of expansion unit

The starting number assigned to each expansion unit will change depending on the installation location.

■ I/O number assigned to each function card

Depending on the installation location, I/O number assigned a fixed region.



■ I/O numbers list

Unit Type and Installation Location		Input		Output	
		I/O Number		I/O Number	
①	Control unit	X0-X9F	WX0-WX9	Y0-Y9F	WY0-WY9
②	Card installation part 1 (slot 0)	X100-X19F	WX10-WX19	Y100-Y19F	WY10-WY19
③	Card installation part 2 (slot 1)	X200-X29F	WX20-WX29	Y200-Y29F	WY20-WY29
④	1st expansion	X300-X39F	WX30-WX39	Y300-Y39F	WY30-WY39
⑤	2nd expansion	X400-X49F	WX40-WX49	Y400-Y49F	WY40-WY49
⑥	3rd expansion	X500-X59F	WX50-WX59	Y500-Y59F	WY50-WY59
⑦	4th expansion	X600-X69F	WX60-WX69	Y600-Y69F	WY60-WY69
⑧	5th expansion	X700-X79F	WX70-WX79	Y700-Y79F	WY70-WY79
⑨	6th expansion	X800-X89F	WX80-WX89	Y800-Y89F	WY80-WY89
⑩	7th expansion	X900-X99F	WX90-WX99	Y900-Y99F	WY90-WY99
⑪	8th expansion	X1000-X109F	WX100-WX109	Y1000-Y109F	WY100-WY109
⑫	Motion Control Part	X1100-X119F X1200-X129F	WX110-WX119 WX120-WX129	Y1100-Y119F Y1200-Y129F	WY110-WY119 WY120-WY129

(Note): The I/O number can be used practically varies from the types of cards and expansion units.

3.2 List of I/O Numbers for Units

3.2.1 FP-XH M4 control unit (COM I/O part)

■ I/O numbers list (COM input and output part)

Input		Output	
Input Points	I/O Number	Output Points	I/O Number
8 points	X0-X7	8 points	Y0-Y7

3.2.2 FP-XH M4 control unit (motion control part)

■ I/O numbers list (input)

Signal name	I/O Number					
	Axis 1	Axis 2	Axis 3	Axis 4	Virtual axis	Full axis
Position control preparation completion	–	–	–	–	–	X1100
Tools running	–	–	–	–	–	X1104
Axis group settings completed	–	–	–	–	–	X1105
Recalculation completed	–	–	–	–	–	X1107
Servo locked	X1110	X1111	X1112	X1113	X1117	–
BUSY	X1118	X1119	X111A	X111B	X111F	–
Action Completion	X1120	X1121	X1122	X1123	X1127	–
Origin return completion	X1128	X1129	X112A	X112B	X112F	–
Origin	X1130	X1131	X1132	X1133	–	–
Near original point	X1138	X1139	X113A	X113B	–	–
Aux. contact	X1148	X1149	X114A	X114B	X114F	–
Limited position +	X1150	X1152	X1154	X1156	–	–
Limited position -	X1151	X1153	X1155	X1157	–	–
Error prompt	X1130	X1161	X1162	X1163	X1167	–
Warning	X1168	X1169	X116A	X116B	X116F	–
Synchronization settings completed	X1180	X1181	X1182	X1183	–	–
Synchronization canceling notice	X1188	X1189	X118A	X118B	–	–
Notice on synchronization of slave station gear ratio change	X1190	X1191	X1191	X1193	–	–
Notice on synchronization of slave station clutch engagement	X1198	X1199	X119A	X119B	–	–
Notice on receipt of request for position control speed change	X1210	X1211	X1212	X1213	X1217	–
Notice on receipt of request for position control movement change	X1218	X1219	X121A	X121B	X121F	–

■ I/O numbers list (output)

Signal name	I/O Number					
	Axis 1	Axis 2	Axis 3	Axis 4	Virtual axis	Full axis
System stop	—	—	—	—	—	Y1100
Axis group settings request	—	—	—	—	—	Y1105
Recalculation request	—	—	—	—	—	Y1107
Servo ON request	Y1108	Y1109	Y110A	Y110B	—	—
Position control startup	Y1110	Y1111	Y1112	Y1113	Y1117	—
Origin return start	Y1118	Y1119	Y111A	Y111B	Y111F	—
JOG forward	Y1120	Y1122	Y1124	Y1126	Y112E	—
JOG reverse	Y1121	Y1123	Y1125	Y1127	Y112F	—
Emergency stop	Y1130	Y1131	Y1132	Y1133	Y1137	—
Ramp-to-stop	Y1138	Y1139	Y113A	Y113B	Y113F	—
Pulse generator running allowed	Y1140	Y1141	Y1142	Y1143	Y1147	—
Speed change of Point J	Y1148	Y1149	Y114A	Y114B	Y114F	—
Serve OFF request	Y1150	Y1151	Y1152	Y1153	—	—
Position control of Point J start	Y1158	Y1159	Y115A	Y115B	Y115F	—
Clear error request	Y1160	Y1161	Y1162	Y1163	Y1167	—
Clear warning request	Y1168	Y1169	Y116A	Y116B	Y116F	—
Synchronizing settings request	Y1180	Y1181	Y1182	Y1183	—	—
Request for synchronization of status clearing	Y1188	Y1189	Y118A	Y118B	—	—
Request for synchronization of slave station gear ratio change	Y1190	Y1191	Y1192	Y1193	—	—
Request for synchronization of slave station clutch ON	Y1198	Y1199	Y119A	Y119B	—	—
Request for synchronization of slave station clutch OFF	Y1200	Y1201	Y1202	Y1203	—	—
Request for position control speed change	Y1210	Y1211	Y1212	Y1213	Y1217	—
Request for position control movement change	Y1218	Y1219	Y121A	Y121B	Y121F	—

3.2.3 FP-X Expansion Unit

■ I/O numbers list

Unit Type	Input		Output	
	Input Points	I/O Number	Output Points	I/O Number
E16	8 points	X300-X307	8 points	Y300-Y307
E30	16 points	X300-X309, X30A-X30F	14 points	Y300-Y309, Y30A-Y30D
E16X	16 points	X300-X309, X30A-X30F	-	-
E14YR	-	-	14 points	Y300-Y309, Y30A-Y30D

(Note): I/O numbers in the above table represent the I/O number for expansion units connected to the first unit. The I/O number varies from the installation order.

3.2.4 FP-X0 Expansion Unit

■ I/O numbers list

Unit Type	Input		Output	
	Input Points	I/O Number	Output Points	I/O Number
E24	16 points	X300-X309, X30A-X30F	8 points	Y300-Y307
E40	24 points	X300-X309, X30A-X30F X310-X317	16 points	Y300-Y309, Y30A-Y30F

(Note): I/O numbers in the above table represent the I/O number for expansion units connected to the first unit. The I/O number varies from the installation order.

3.2.5 FP-X Function Card

■ I/O numbers list (analog input and output cards)

Installation Location	Type	Input		Output	
		Input Points	I/O Number	Output Points	I/O Number
Insert card install part 1	Analog input card AD2	2ch	WX10, WX11	-	-
	Analog output DA2	-	-	2ch	WY10, WY11
	Analog input and output card A21	2ch	WX10, WX11	1ch	WY10
	TC2 thermocouple input card	2ch	WX10, WX11	-	-
	Temperature measuring resistor card RTD2	2ch	WX10, WX11	-	-
Insert card install part 2	Analog input card AD2	2ch	WX20, WX21	-	-
	Analog output DA2	-	-	2ch	WY20, WY21
	Analog input and output card A21	2ch	WX20, WX21	1ch	WY20
	TC2 thermocouple input card	2ch	WX20, WX21	-	-
	Temperature measuring resistor card RTD2	2ch	WX20, WX21	-	-

■ I/O numbers list (digital input and output cards)

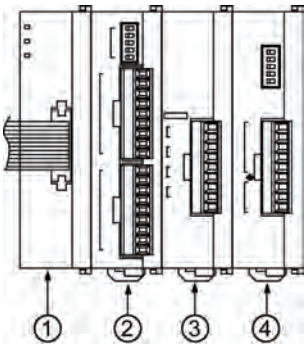
Installation Location	Type	Input		Output	
		Input Points	I/O Number	Output Points	I/O Number
Insert card install part 1	Input card IN8	8 points	X100-X107	-	-
	Output card TR8	-	-	8 points	Y100-Y107
	Output card TR6P	-	-	6 points	Y100-Y105
	Input and output card IN4T3	4 points	X100-X103	3 points	Y100-Y102
Insert card install part 2	Input card IN8	8 points	X200-X207	-	-
	Output card TR8	-	-	8 points	Y200-Y207
	Output card TR6P	-	-	6 points	Y200-Y205
	Input and output card IN4T3	4 points	200-X203	3 points	Y200-Y202

3.3 Assignment of FP0 Expansion Units

3.3.1 I/O Number Assignment Method

■ I/O numbers of FP0 expansion units and FP0 high function units

- The starting number assigned to each FP0 expansion block varies from the installation location of FP-X expansion FP0 adapters.
- The starting number assigned to each unit varies from the installation sequences of FP0 expansion units and FP0 high function units.



①	FP-X Expansion FP0 Adapter	②	FP0 Expansion Unit 1	③	FP0 Expansion Unit 2	④	FP0 Expansion Unit 3

■ I/O numbers list

FP-X Expansion FP0 Adapter Installation Location	Installation Sequence of FP0 Expansion Units					
	Expansion Unit 1		Expansion Unit 2		Expansion Unit 3	
	Input	Output	Input	Output	Input	Output
1st expansion	X300-X31F	Y300-Y31F	X320-X33F	Y320-Y33F	X340-X35F	Y340-Y35F
2nd expansion	X400-X41F	Y400-Y41F	X420-X43F	Y420-Y43F	X440-X45F	Y440-Y45F
3rd expansion	X500-X51F	Y500-Y51F	X520-X53F	Y520-Y53F	X540-X55F	Y540-Y55F
4th expansion	X600-X61F	Y600-Y61F	X620-X63F	Y620-Y63F	X640-X65F	Y640-Y65F
5th expansion	X700-X71F	Y700-Y71F	X720-X73F	Y720-Y73F	X740-X75F	Y740-Y75F
6th expansion	X800-X81F	Y800-Y81F	X820-X83F	Y820-Y83F	X840-X85F	Y840-Y85F
7th expansion	X900-X91F	Y900-Y91F	X920-X93F	Y920-Y93F	X940-X95F	Y940-Y95F
8th expansion	X1000 -X101F	Y1000 -Y101F	X1020 -X103F	Y1020 -Y103F	X1040 -X105F	Y1040 -Y105F

(Note): The I/O number can be used practically varies from the types of cards and expansion units.

3.3.2 Types and I/O Numbers of FP0 Expansion Units

I/O numbers when the FP-X expansion FP0 adapter connecting as the first expansion unit of the control unit are shown below.

■ I/O numbers list (first expansion unit)

Unit Type		Points Assigned	Expansion Unit 1	Expansion Unit 2	Expansion Unit 3
FP0R expansion unit	AFP0RE8X	Input (8 points)	X300 - X307	X320 - X327	X340 - X347
	AFP0RE8R	Input (4 points)	X300 - X303	X320 - X323	X340 - X343
		Output (4 points)	Y300 - Y303	Y320 - Y323	Y340 - Y343
	AFP0E8YT/P AFP0RE8YR	Output (8 points)	Y300 - Y307	Y320 - Y327	Y340 - Y347
	AFP0RE16X	Input (16 points)	X300 - X30F	X320 - X32F	X340 - X34F
	AFP0RE16R AFP0RE16T/P	Input (8 points)	X300 - X307	X320 - X327	X340 - X347
		Output (8 points)	Y300 - Y307	Y320 - Y327	Y340 - Y347
	AFP0RE16YT/P	Input (16 points)	Y300 - Y30F	Y320 - Y32F	Y340 - Y34F
	AFP0RE32T/P	Input (16 points)	X300 - X30F	X320 - X32F	X340 - X34F
		Output (16 points)	Y300 - Y30F	Y320 - Y32F	Y340 - Y34F
FP0R analog input unit	AFP0RAD4 (Note 1) AFP0RAD8	Input (16 points) CH0,2,4,6	WX30 (X300~X30F)	WX32 (X320-X32F)	WX34 (X340-X34F)
		Input (16 points) CH1,3,5,7	WX31 (X310-X31F)	WX33 (X330~X33F)	WX35 (X350~X35F)
		Output (16 points) Range setting	WY30 (Y300~Y30F)	WY32 (Y320-Y32F)	WY34 (Y340-Y34F)
		Output (16 points) Averaging setting	WY31 (Y310-Y31F)	WY33 (Y330-Y33F)	WY35 (Y350-Y35F)
FP0R analog output unit	AFP0RDA4	Input (32 points) Status	WX30 (X300~X30F)	WX32 (X320-X32F)	WX34 (X340-X34F)
			WX31 (X310-X31F)	WX33 (X330~X33F)	WX35 (X350~X35F)
		Output (16 points) CH0,2 (Note 2)	WY30 (Y300~Y30F)	WY32 (Y320-Y32F)	WY34 (Y340-Y34F)
		Output (16 points) CH0,3 (Note 2)	WY31 (Y310-Y31F)	WY33 (Y330-Y33F)	WY35 (Y350-Y35F)
FP0R analog input output unit	AFP0RAD4 (Note 3) AFP0RA42	Input (16 points) CH0,2	WX30 (X300~X30F)	WX32 (X320-X32F)	WX34 (X340-X34F)
		Input (16 points) CH1,3	WX31 (X310-X31F)	WX33 (X330~X33F)	WX35 (X350~X35F)
		Output (16 points) CH0 (Note 4)	WY30 (Y300~Y30F)	WY32 (Y320-Y32F)	WY34 (Y340-Y34F)
		Output (16 points) CH1 (Note 4)	WY31 (Y310-Y31F)	WY33 (Y330-Y33F)	WY35 (Y350-Y35F)

(Note 1): processing data of CH0-CH3 when AFP0RAD4.

(Note 2): also used for switching output ranges in 14-digit mode.

(Note 3): processing data of input CH0/CH1 and output CH0 when AFP0RA21.

(Note 4): also used for switching of output ranges, averaging setting upon input, and output range in 14-digit mode.

3.3.3 Types and I/O Numbers of FP0 Expansion Units

I/O numbers when the FP-X expansion FP0 adapter connecting as the first expansion unit of the control unit are shown below.

■ I/O numbers list (first expansion unit)

Unit Type		Points Assigned	Expansion Unit 1	Expansion Unit 2	Expansion Unit 3
FP0 expansion unit	FP0-E8X	Input (8 points)	X300 - X307	X320 - X327	X340 - X347
	FP0-E8R	Input (4 points)	X300 - X303	X320 - X323	X340 - X343
		Output (4 points)	Y300 - Y303	Y320 - Y323	Y340 - Y343
	FP0-E8YT/P FP0-E8YR	Output (8 points)	Y300 - Y307	Y320 - Y327	Y340 - Y347
	FP0-E16X	Input (16 points)	X300 - X30F	X320 - X32F	X340 - X34F
	FP0-E16R FP0-E16T/P	Input (8 points)	X300 - X307	X320 - X327	X340 - X347
		Output (8 points)	Y300 - Y307	Y320 - Y327	Y340 - Y347
	FP0-E16YT/P	Output (16 points)	Y300 - Y30F	Y320 - Y32F	Y340 - Y34F
	FP0-E32T/P	Input (16 points)	X300 - X30F	X320 - X32F	X340 - X34F
		Output (16 points)	Y300 - Y30F	Y320 - Y32F	Y340 - Y34F
FP0 analog I/O unit	FP0-A21	Input (16 points) CH0	WX30 (X300-X30F)	WX32 (X320-X32F)	WX34 (X340-X34F)
		Input (16 points) CH1	WX31 (X310-X31F)	WX33 (X330-X33F)	WX35 (X350-X35F)
		Output (16 points)	WY30 (Y300-Y30F)	WY32 (Y320-Y32F)	WY34 (Y340-Y34F)
FP0 A / D converter unit FP0 thermocouple unit	FP0-A80 FP0-TC4 FP0-TC8	Input (16 points) CH0, 2, 4, 6	WX30 (X300-X30F)	WX32 (X320-X32F)	WX34 (X340-X34F)
		Input (16 points) CH1, 3, 5, 7	WX31 (X310-X31F)	WX33 (X330-X33F)	WX35 (X350-X35F)
FP0 D / A converter unit	FP0-A04V FP0-A04I	Input (16 points)	WX30 (X300-X30F)	WX32 (X320-X32F)	WX34 (X340-X34F)
		Output (16 points) CH0, 2	WY30 (Y300-Y30F)	WY32 (Y320-Y32F)	WY34 (Y340-Y34F)
		Output (16 points) CH1, 3	WY31 (Y310-Y31F)	WY33 (Y330-Y33F)	WY35 (Y350-Y35F)
FP0 I/O link unit	FP0-IOL	Input 32 points	X300 - X31F	X320 - X33F	X340 - X35F
		Output 32 points	Y300 - Y31F	Y320 - Y33F	Y340 - Y35F

(Note 1): The channel datum of FP0 A / D converter unit (FP0-A80), FP0 thermocouple unit (FP0-TC4 / FP0-TC8) and FP0 D / A converter unit (FP0-A04V / FP0-A04I) are shifted, read and wrote according to the user program including conversion data switching flags.

(Note 2): For FP0 CC-Link slave unit, please confirm it according to the appropriate manual (the starting address must be read).

3.4 Detailed I/O Information of Motion Control Part

Contact distribution		Target axis	Name	Contents
WX110	X1100	Full axis	Position control preparation completion	indicates initial preparation inside the control unit is completed and notifies the system to start running.
	X1101-X1103	—	—	—
	X1104	Full-axis	Tools running	contacts during tools running. cannot start from I/O during tools running, otherwise, warning will be triggered.。
	X1105	Full-axis	Axis group settings completed	changes axis group settings inside the unit via the axis group settings request contact (Y1105) = ON after change of the axis group settings with program. This contact is ON change of settings.
	X1105	—	—	—
	X1107	Full-axis	Recalculation completed	controls the reconstruction of the position control data (standard region) of the storage position via the recalculation request contact (Y1107)=ON, and this contact turns ON after the reconstruction. this contact turns OFF after the recalculation request contact (Y1107) is turned ON again. Note) Used only when altering the position control data with the ladder diagram program.
	X1108-X110F	—	—	—
WX111	X1110-X1113	Axis 1	Servo locked	This contact is ON only during Servo ON output via Servo ON signals (Y1108-Y110B).
		Axis 2		
		Axis 3		
		Axis 4		
	X1114-X1116	—	—	—
	X1117	Virtual axis	Servo locked	Servo status of the virtual axis. (normal on)
	X1118	Axis 1	BUSY	This contact is ON when the corresponding axis in under operation.
	X1119	Axis 2		
	X111A	Axis 3		
	X111B	Axis 4		
	X111C-X111E	—	—	—
	X111F	Virtual axis	BUSY	This contact is ON when the virtual axis in under operation.

Contact distribution		Target axis	Name	Contents
WX112	X1120	Axis 1	Action Completion	This contact is ON when the position deviation is within the preset completion range after completion of the operation instruction to corresponding axis. This contact is ON after all data sheets are executed during auto running of P-point control and C-point control. The ON status will be held till the next control starts after this contact is turned ON.
	X1121	Axis 2		
	X1122	Axis 3		
	X1123	Axis 4		
	X1124-X1126	—	—	—
	X1127	Virtual axis	Action Completion	This contact is ON upon completion of the operation instruction sent to the virtual axis.
	X1128	Axis 1	Origin return completion	This contact is ON after turning to the origin of corresponding axis. The ON status will be held till the next control starts after this contact is turned ON.
	X1129	Axis 2		
	X112A	Axis 3		
	X112B	Axis 4		
	X112C-X112E	—	—	—
	X112F	Virtual axis	Origin return completion	This contact is ON after turning to the origin of virtual axis.
WX113	X1130	Axis 1	Origin	the contact that monitors the external origin input signals of corresponding axis. The input logic can be changed via the parameter setting menu of the "Configurator PM7.
	X1131	Axis 2		
	X1132	Axis 3		
	X1133	Axis 4		
	X1134-X1137	—	—	—
	X1138	Axis 1	Near original point	the contact that monitors the external near-origin input signals of corresponding axis. The input logic can be changed via the parameter setting menu of the "Configurator PM7.
	X1139	Axis 2		
	X113A	Axis 3		
	X113B	Axis 4		
	X113C-X113F	—	—	—

Contact distribution		Target axis	Name	Contents
WX114	X1140-X1147	—	—	—
	X1148	Axis 1	Aux. contact	This contact is On after executing control data sheets of corresponding locations to corresponding axis.
	X1149	Axis 2		
	X114A	Axis 3		
	X114B	Axis 4		
	X114C-X114E	—	—	—
	X114F	Virtual axis	Aux. contact	This contact is On after executing control data sheets of corresponding locations to the virtual axis.
WX115	X1150	Axis 1	Limited position +	monitoring contacts of corresponding limit + / —input executes declaration stop when the limit input on the extension line of the operation direction upon location control running, JOG operation or pulse generator operation. The declaration stop time of limit input can be changed with the position control storage. the contact for auto reverse operation when the origin returns. The input logic can be changed via the parameter setting menu of the "Configurator PM7.
	X1151		Limited position -	
	X1152	Axis 2	Limited position +	
	X1153		Limited position -	
	X1154	Axis 3	Limited position +	
	X1155		Limited position -	
	X1156	Axis 4	Limited position +	
	X1157		Limited position -	
	X1158-X115F	—	—	—
WX116	X1130	Axis 1	Error prompt	This contact is ON when the corresponding axis in error. contacts of the whole axis are ON upon errors targeting the whole axis. The error content can be confirmed with the error notification region of the position control storage.
	X1161	Axis 2		
	X1162	Axis 3		
	X1163	Axis 4		
	X1164-X1166	—	—	—
	X1167	Virtual axis	Error prompt	This contact is ON when the virtual axis in error.
	X1168	Axis 1	Warning	This contact is ON when the corresponding axis in warning. contacts of the whole axis are ON upon warnings targeting the whole axis. The warning content can be confirmed with the warning notification region of the position control storage.
	X1169	Axis 2		
	X116A	Axis 3		
	X116B	Axis 4		
	X116C-X116E	—	—	—
	X116F	Virtual axis	Warning	This contact is ON when the virtual axis in warning.
WX117	X1170-X117F	—	—	—

Contact distribution		Target axis	Name	Contents
WX118	X1180	Axis 1	Synchronization settings completed	changes axis group settings inside the unit via the synchronous control settings request contacts (Y1180-Y1183) = ON after change of the synchronous control settings with program. This contact is ON after change of settings. this contact turns OFF when the synchronous control contacts (Y1180-Y1183) are turned OFF.
	X1181	Axis 2		
	X1182	Axis 3		
	X1183	Axis 4		
	X1184-X1187	—	—	—
	X1188	Axis 1	Synchronization canceling notice	This contact turns ON when the synchronous control settings request contacts Y1188-Y118B) are turned OFF. Axes which are ON for this contact cannot execute synchronization.
	X1189	Axis 2		
	X118A	Axis 3		
	X118B	Axis 4		
	X118C-X118F	—	—	—
WX119	X1190	Axis 1	Notice on synchronization of slave station gear ratio change	Changes the gear ratio with the contacts for synchronization of slave station gear ratio change (Y1190-Y1193) This contact is ON after changing gear ratio settings.
	X1191	Axis 2		
	X1191	Axis 3		
	X1193	Axis 4		
	X1194-X1197	—	—	—
	X1198	Axis 1	Slave station axis clutch operation notification	The clutch operation starts with the contacts for clutch ON request contacts (Y1198-Y119B) or clutch OFF request contacts (Y1200-1203) of slave station. This contact is ON after completion of clutch operation.
	X1199	Axis 2		
	X119A	Axis 3		
	X119B	Axis 4		
	X119C-X119F	—	—	—
WX120	X1200-X120F	—	—	—
WX121	X1210	Axis 1	Notice on receipt of request for position control speed change	The speed change starts when the position control speed change contacts (Y1210-Y1217) are ON. This contact of corresponding axis is ON upon receipt of the request.
	X1211	Axis 2		
	X1212	Axis 3		
	X1213	Axis 4		
	X1214 -X1216	—		
	X1217	Virtual axis		
	X1218	Axis 1	Notice on receipt of request for position control movement change	Movement change starts when the position control movement change request contacts (Y1218-Y121F) are ON. This contact of corresponding axis is ON upon receipt of the request.
	X1219	Axis 2		
	X121A	Axis 3		
	X121B	Axis 4		
	X121C -X121E	—		
	X121F	Virtual axis		

Contact distribution		Target axis	Name	Contents
WY110	Y1100	Full-axis	System stop	It is the stop request contact of the system. When it is ON, all axes stop at zero deceleration time.
	Y1101	—	—	—
	Y1102	—	—	—
	Y1103	—	—	—
	Y1104	—	—	—
	Y1105	Full-axis	Axis group settings change request	This contact is turned ON after changing axis group settings
	Y1106	—	—	—
	Y1107	Full-axis	Recalculation request	Please set this signal to ON after altering various position control data (standard region) of the position control storage recalculation. Setting this signal to ON allows reconstruction position control data after the number of recalculation start data sheet set by the position control storage to enter the executable status. The recalculation completion contact (X1107) is turned ON after reconstruction of the position control data. Note) Used only when altering the position control data with the ladder diagram program.
	Y1108	Axis 1	Servo ON	Servo ON signals of corresponding axis is outputted on the edge of ON of the present contact. The Servo ON signal will not be automatically turned OFF in the Program mode. To turn the Servo ON signal OFF, please turn the Servo OFF request contacts (Y1150-Y1153) to ON. (Pulse edge type operation)
	Y1109	Axis 2		
	Y110A	Axis 3		
	Y110B	Axis 4		
	Y110C-Y110F	—	—	—
WY111	Y1110	Axis 1	Position control startup	Request for position control of corresponding axis. Executes the start data sheet, settings within the region designated by the start position control data sheet number of the position control storage. (Pulse edge type operation) Warning will be outputted when this contact is ON during tools running.
	Y1111	Axis 2		
	Y1112	Axis 3		
	Y1113	Axis 4		
	Y1114-Y1116	—	—	—
	Y1117	Virtual axis	Position control startup	Request for position control of virtual axis.
	Y1118	Axis 1	Origin return start	Request for origin returning of corresponding axis. (Pulse edge type operation) Warning will be outputted when this contact is ON during tools running.
	Y1119	Axis 2		
	Y111A	Axis 3		
	Y111B	Axis 4		
	Y111C-Y111E	—	—	—
	Y111F	Virtual axis	Origin return start	Request for origin returning of virtual axis. Request for origin returning of virtual axis is available only in the "Data Settings" mode.

Contact distribution		Target axis	Name	Contents
WY111	Y1120	Axis 1	JOG forward	Request for JOG operation of corresponding axis. (level type operation) Warning will be outputted when this contact is ON during tools running.
	Y1121		JOG reverse	
	Y1122	Axis 2	JOG forward	
	Y1123		JOG reverse	
	Y1124	Axis 3	JOG forward	
	Y1125		JOG reverse	
	Y1126	Axis 4	JOG forward	
	Y1127		JOG reverse	
	Y1128-Y112E	—	—	—
	Y112E	Virtual axis	JOG forward	Request for JOG operation of virtual axis. (level type operation)
	Y112F		JOG reverse	
WY113	Y1130	Axis 1	Emergency stop	Request for emergency stop of corresponding axis. (level type operation) Note) Deviation counter cannot be cleared.
	Y1131	Axis 2		
	Y1132	Axis 3		
	Y1133	Axis 4		
	Y1134-Y1136	—	—	—
	Y1137	Virtual axis	Emergency stop	Request for emergency stop of virtual axis.
	Y1138	Axis 1	Ramp-to-stop	Request for deceleration stop of corresponding axis. (level type operation) Note) Deviation counter cannot be cleared.
	Y1139	Axis 2		
	Y113A	Axis 3		
	Y113B	Axis 4		
	Y113C-Y113E	—	—	—
	Y113F	Virtual axis	Ramp-to-stop	Request for deceleration stop of virtual axis.

Contact distribution		Target axis	Name	Contents
WY114	Y1140	Axis 1	Pulse generator running allowed	Request for allowance of pulse generator running of corresponding axis. (level type operation)
	Y1141	Axis 2		
	Y1142	Axis 3		
	Y1143	Axis 4		
	Y1144-Y1146	—	—	—
	Y1147	Virtual axis	Pulse generator running allowed	Request for allowance of pulse generator running of virtual axis.
	Y1148	Axis 1	Speed change of Point J	When this signal is ON during the operation of the JOG position control of corresponding axis, the speed will change to the target speed at the specified acceleration/deceleration time/mode (Pulse edge type operation)
	Y1149	Axis 2		
	Y114A	Axis 3		
	Y114B	Axis 4		
	Y114C-Y114E	—	—	—
	Y114F	Virtual axis	Speed change of Point J	The speed will change to the target speed during the operation of the JOG position control of virtual axis.
WY115	Y1150	Axis 1	Serve OFF request	Turns OFF the Servo ON signals of corresponding axis. Turns OFF the Servo ON signals on the edge of ON of the present contact. (Pulse edge type operation)
	Y1151	Axis 2		
	Y1152	Axis 3		
	Y1153	Axis 4		
	Y1154-Y1157	—	—	—
	Y1158	Axis 1	Position control of Point J start	Turn ON this signal during the operation of the JOG position control of corresponding axis to turn to the next data sheet for processing (Pulse edge type operation)
	Y1159	Axis 2		
	Y115A	Axis 3		
	Y115B	Axis 4		
	Y115C-Y115E	—	—	—
	Y115F	Virtual axis	Position control of Point J start	Turn ON this signal during the operation of the JOG position control of virtual axis to turn to the next data sheet for processing

Contact distribution		Target axis	Name	Contents
WY116	Y1160	Axis 1	Clear error request	Request for error clearing of corresponding axis. Turn ON this signal to execute error recovery and clear error logs. Note) Unrecoverable errors can not be recovered even if this signal is turned ON,
	Y1161	Axis 2		
	Y1162	Axis 3		
	Y1163	Axis 4		
	Y1164-Y1166	—	—	—
	Y1167	Virtual axis	Clear error request	Request for error clearing of virtual axis.
	Y1168	Axis 1	Clear warning request	Request for warning clearing of corresponding axis. Turn this signal ON to clear warning logs.
	Y1169	Axis 2		
	Y116A	Axis 3		
	Y116B	Axis 4		
	Y116C-Y116E	—	—	—
	Y116F	Virtual axis	Clear warning request	Request for warning clearing of virtual axis.
WY117	Y1170-Y117F	—	—	—
WY118	Y1180	Axis 1	Synchronizing settings request	This contact is turned ON after changing synchronized running settings Please turn this contact ON to reflect changes in settings of the general region of synchronous control of the position control storage. This symbol is a pulse edge trigger.
	Y1181	Axis 2		
	Y1182	Axis 3		
	Y1183	Axis 4		
	Y1184-Y1187	—	—	—
	Y1188	Axis 1	Request for synchronization clearing	Turn ON contacts for axes to be subject to synchronization clearing Units don't execute synchronized operation of axes for which this contact is turned ON. Please set this contact ON if it is required to temporarily cancel the synchronization status during synchronous control. Please set this contact OFF to reset to the synchronization status.
	Y1189	Axis 2		
	Y118A	Axis 3		
	Y118B	Axis 4		
	Y118C-Y118F	—	—	—

Contact distribution		Target axis	Name	Contents
WY119	Y1190	Axis 1	Request for gear ratio change of slave station shaft axis	Turn this contact of corresponding axis to ON for gear ratio change. (Pulse edge type operation)
	Y1191	Axis 2		
	Y1192	Axis 3		
	Y1193	Axis 4		
	Y1194 -Y1197	—	—	—
	Y1198	Axis 1	Request for synchronization of slave station clutch ON	Turn this contact of corresponding axis to ON to start clutch ON operation. Axes not using clutches will not operate. (level-type, rising edge, falling edge operations for selection)
	Y1199	Axis 2		
	Y119A	Axis 3		
	Y119B	Axis 4		
	Y119C -Y119F	—	—	—
WY120	Y1200	Axis 1	Request for synchronization of slave station clutch OFF	Turn this contact of corresponding axis to ON to start clutch OFF operation. Axes not using clutches will not operate. (rising edge, falling edge operations for selection) These signals are invalid when the request for slave station clutch ON is set to level type.
	Y1201	Axis 2		
	Y1202	Axis 3		
	Y1203	Axis 4		
	Y1204- Y120F	—	—	—
WY121	Y1210	Axis 1	Notice on receipt of request for position control speed change	Turn this contact of corresponding axis to ON for target speed change. (Pulse edge type operation)
	Y1211	Axis 2		
	Y1212	Axis 3		
	Y1213	Axis 4		
	Y1214 -Y1216	—		
	Y1217	Virtual axis		
	Y1218	Axis 1	Notice on receipt of request for position control movement change	Turn this contact of corresponding axis to ON for target speed change. (Pulse edge type operation)
	Y1219	Axis 2		
	Y121A	Axis 3		
	Y121B	Axis 4		
	Y121C -Y121E	—		
	Y121F	Virtual axis		

4

Installation

4.1 Installation

4.1.1 Installation Environment and Space

■ Installation environment

Please install and use it in the range of the general specifications.

- Ambient temperature: 0 to +55°C
- Humidity: 10-95%RH (non-condensing at 25℃)
- Contamination level: 2
- Operating altitude: 2000 m or less
- Overvoltage category: Ⅱ or less
- Site of installation: within control cabinets with the protection level of over IP54 (metal materials with enough toughness)

It can be used in the above environments.

Do not use it in the following environments.

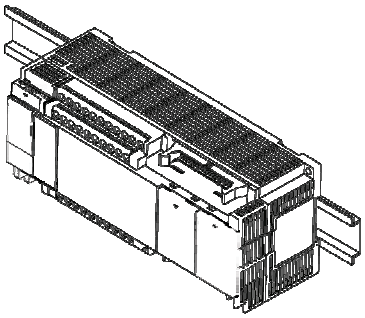
- Locations subject to direct sunlight
- Places where sudden temperature changes may cause condensation
- Environments containing corrosive gases and flammable gases
- Places containing much dust, iron powder and salt, etc.
- Places and environments may be contaminated by dust, gasoline, thinner, and alcohol or other organic solvents or ammonia, sodium hydroxide and other strong alkaline substances.
- Facilities which may be directly affected by vibration or shock and places directly exposed to water splashes
- Near high voltage power lines, high voltage equipment, power lines, power equipment or amateur radio transmitting apparatus and equipment that may generate large switching impact current (must be at least 100 mm away)

■ Static electricity

- In order to prevent damage caused by static electricity, release static electricity from the body before operating.
- Do not directly touch the connector pins.

■ Heat dissipation considerations

- In order to facilitate heat dissipation, set the LED display section on the left side.



- Vertical, horizontal or upside down installation are prohibited because they will result in insufficient heat dissipation, leading to abnormal internal heat.
- Do not install directly above the heater, transformer, large capacity resistance and other equipment with large heat radiation.

■ Installation space

- To ensure ample ventilation space, please separate its upper and lower part and other equipment with the trunking etc. by 50 mm when installing.
- To avoid being affected by the radiation, the surface of each unit and the power line or electromagnetic switches should be separated by 100 mm or more when installing. Make sure it separated with other devices by a certain distance, especially when it is installed on the back side of the control cabinet.
- Please ensure space for the cable connecting to the programming tool.

4.2 Backup Battery Installation

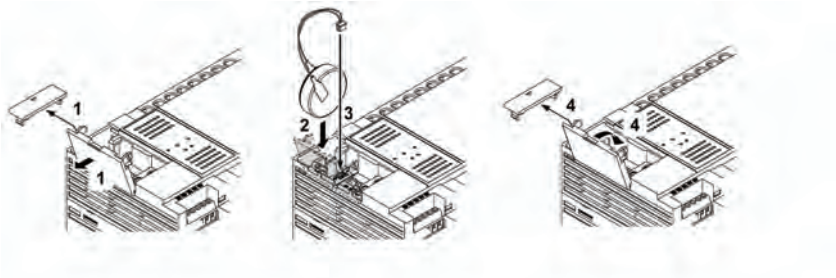
4.2.1 Backup Battery Installation

- Please install the backup battery according to the following steps.

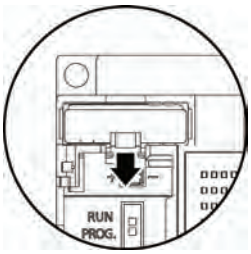
■ **Installation steps**

◆ Steps

1. Open the operating unit cover and battery cover.
2. Insert the backup battery into the battery holder.
3. Connect the battery connector.
4. Close the operating unit cover and battery cover.



- When removing the backup battery, push the push rod portion.



◆ Emphasis

- **Backup battery is used for calendar clock function and the expansion of the backup region of the operational storage.**
- **As for the role of the backup battery, its battery life and setup of storage region, please refer to 21.1 Storage Backup.**

4.3 Expansion Card Installation

4.3.1 Precautions for Installing Expansion Cards

- Use the supplied screws to fix the expansion card on the control unit.
- The screw tightening torque is 0.3 - 0.5 N · m, please fasten it securely.

■ **Recommended screws**

Type	Input	Number
Self-tapping screw	Material: SW coil (+) P fasten 2.6-16 Zinc plated, trivalent chromate (black)	2/1 card

◆ CAUTION!

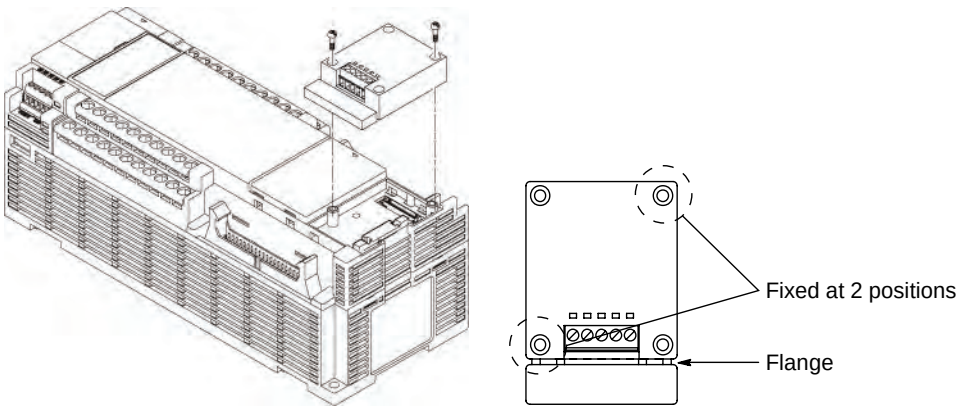
- **Make sure to turn off the power to install. Installing with the control unit is powered ON will cause failure.**
- **Do not touch the back of the expansion card and connector. Otherwise, IC may be damaged due to static electricity.**

4.3.2 Communications Card Installation

The communication card can be installed on the control unit or function card.

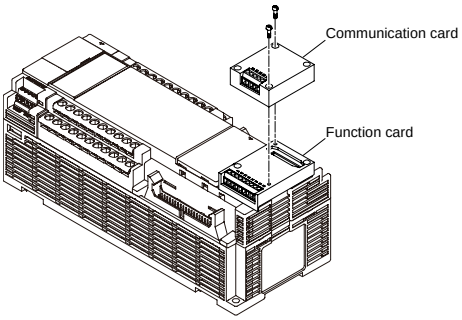
■ **Mounted on the control unit**

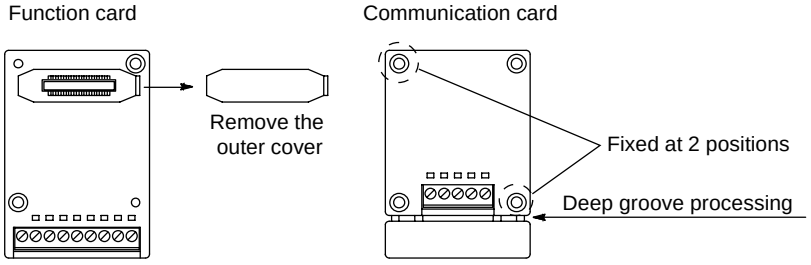
- Connect the connector on the back of the communication card and the connector of the control unit card installation part, fix the communication card with screws at the bottom left and upper right.
- If the flange is retained, there shouldn't be any problem. AFPX-COM5 does not have flange.



■ Mounted on the function card

- Connect the connector on the back of the function card and the connector of the control unit card installation part, fix the function card with screws at the bottom left and upper right.



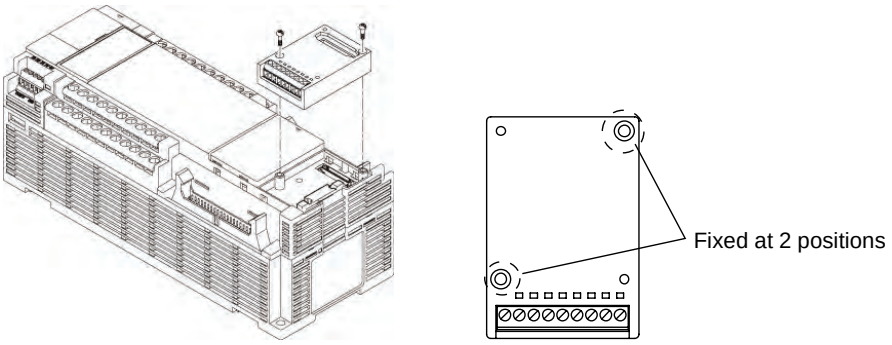


4.3.3 Function Card Installation

The communication card can be installed on the control unit.

■ Mounted on the control unit

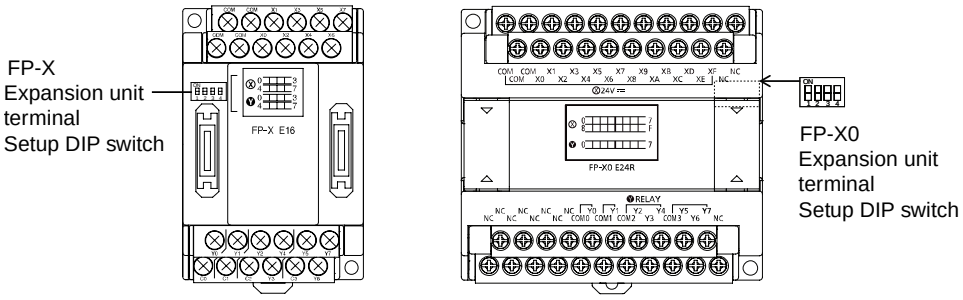
- Connect the connector on the back of the function card and the connector of the control unit card installation part, fix the function card with screws at the bottom left and upper right.



4.4 Connecting FP-X/FP-X0 expansion unit

4.4.1 Setup of Terminal Setting Switches

- Set all terminal setting DIP switches of the expansion unit to ON.
  Set all terminal setting DIP switches of the expansion unit to OFF.



4.4.2 Confirmation of FP-X Expansion Cables

- FP-X expansion units and FP-X expansion FP0 adapters are connected to the control unit via a dedicated expansion cable.
- FP-X expansion units and FP-X expansion FP0 adapters come with an 8 cm type expansion cable (AFPX-EC08).
- When setting the unit on the upper and lower part, a long expansion cable must be used, please order 30 cm type (AFPX-EC30) or 80 cm type (AFPX-EC80) separately.

◆ CAUTION!

- **Please limit the total length of the expansion cable to less than 160 cm when using.**
- **Please try to keep the expansion cable (AFPX-EC30, EC80) away from interfering devices and wires.**

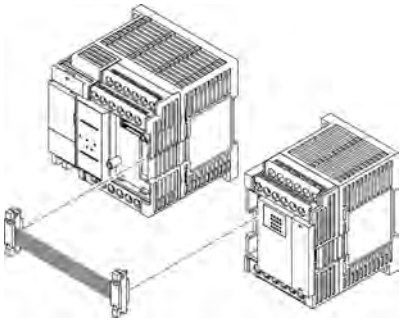
4.4.3 Connecting FP-X expansion unit

Please connect FP-X expansion unit in accordance with the following procedure.

■ **Installation steps**

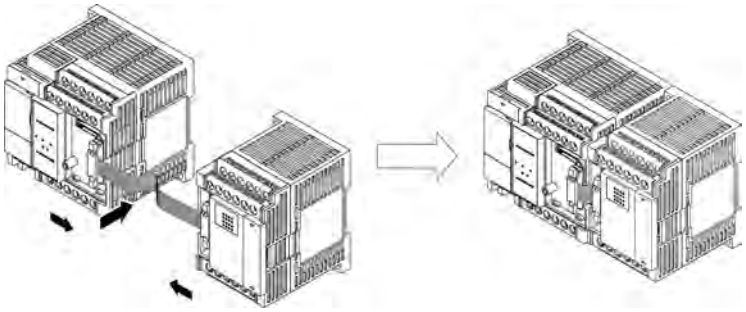
◆ Steps

1. **Remove the control unit, the expansion unit expansion cover.**
2. **Install an expansion connector cable on the control unit expansion connector portion and expansion I/O unit expansion connector portion (left).**



The figure shows a similar product of FP-XH, with the same installation method.

3. **Units should be close together to ensure that the expansion cable is housed** between the units.



4. **Install expansion cover.**

4.5 Connecting FP0 Expansion Unit

4.5.1 Connecting FP0 Expansion Unit

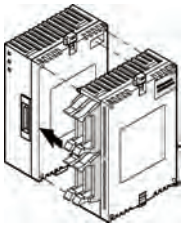
- FP0 expansion units (expansion unit, high function unit) shall expand on the right side of FP-X expansion FP0 adapters.
- When the unit is expanded, use the FP0 right connector for expansion and the expansion hook on the side of the unit.

■ Installation steps

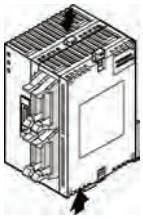
◆ Steps

1. **Please use a screwdriver to move the expansion hook.**
2. **Install after the lug bosses on the expanded unit side are aligned.**

   Please make the connector tightly fitted to eliminate the gap between the units.



3. **Please lift the expansion hook according to step 1 to fix the unit.**



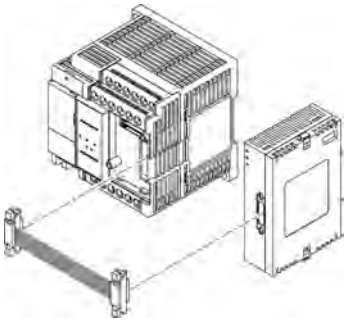
4.5.2 Connecting FP-X Expansion FP0 Adapter

Please connect FP-X expansion unit in accordance with the following procedure.

■ **Installation steps**

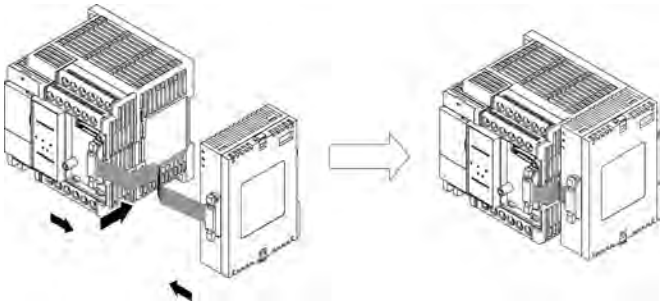
◆ Steps

1. **Remove the control unit, the expansion unit expansion cover.**
2. **Install an expansion connector cable on the control unit expansion connector portion and FP-X expansion FP0 adapter expansion connector portion (left).**



The figure shows a similar product of FP-XH, with the same installation method.

3. **Units should be close together to ensure that the expansion cable is housed between the units.**



4. **Install expansion cover.**

◆ Emphasis

- **The expansion FP0 adapter has no terminal setting switch, but the terminal is set inside it. Set the terminal setting switch of other expansion units to OFF.**

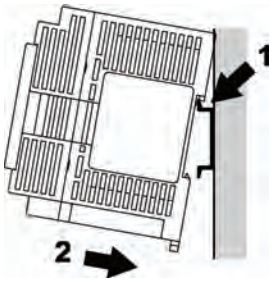
4.6 Installation

4.6.1 Installation and Removal for DIN Rail

■ Installation steps

◆ Steps

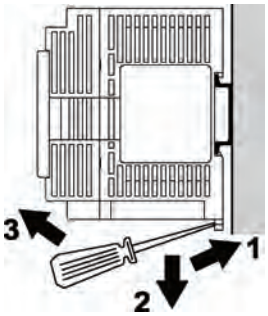
1. Pull out all DIN rail mounting stems on the back of the unit from underside.
2. Embed the upper part of the unit installing part into the DIN rail.
3. Embed the lower part of the unit installing part into the DIN rail while pushing the unit installing part into the DIN rail.
4. Push up the DIN rail mounting stem on the back of the unit and lock until you hear a "click" sound.



■ Removal steps

◆ Steps

1. Pull out all DIN rail mounting stems on the back of the unit from underside.
2. Pull the lower side of the unit toward you.
3. Remove it from the DIN rail while lifting the unit.



4.6.2 Mounting with Screws

Please use M4 screws for mounting.

◆ Reference

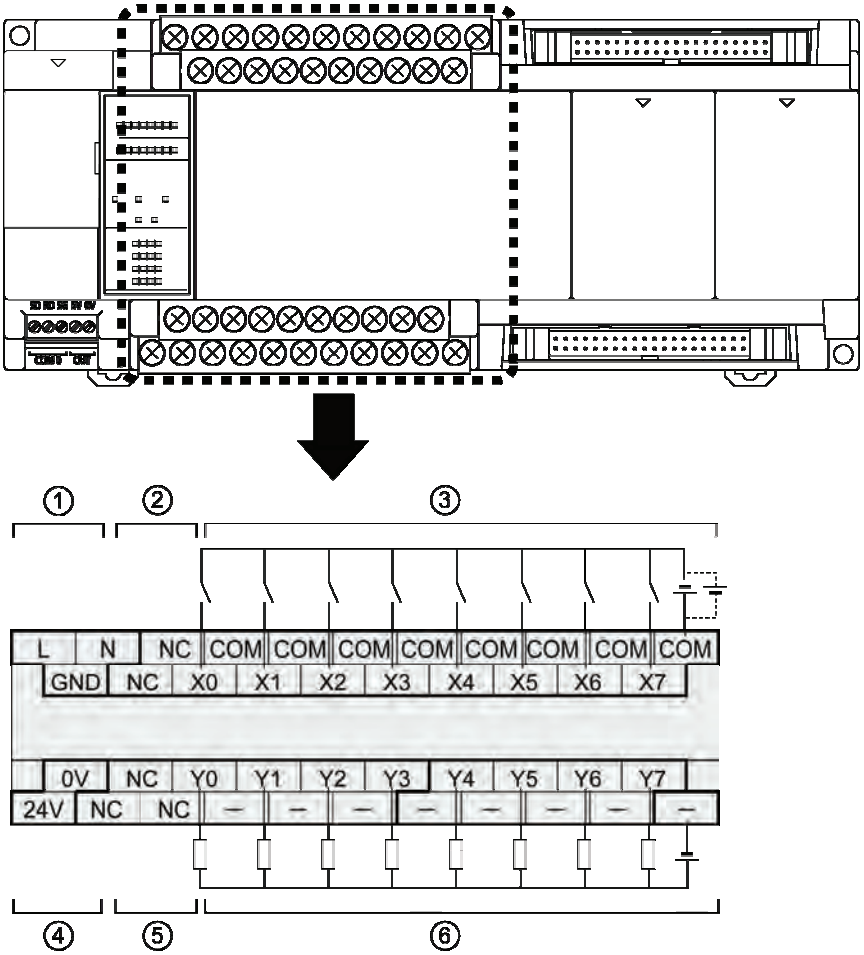
For installation dimensions, refer to "26.8.2 Installation Dimensions".

5

Wiring of Power Supply and COM I/O Parts

5.1 Terminal arrangement

5.1.1 Power supply and COM I/O parts



No.	Description	CAUTION
①	AC power supply terminal (input)	
②	Unused	No connection is allowed.
③	Input terminal	All COM terminals of the input side are connected internally.
④	General power supply terminals for input circuit	
⑤	Unused	No connection is allowed.
⑥	Output terminal	All (–) terminals of the input side are connected internally.

5.2 Power Wiring

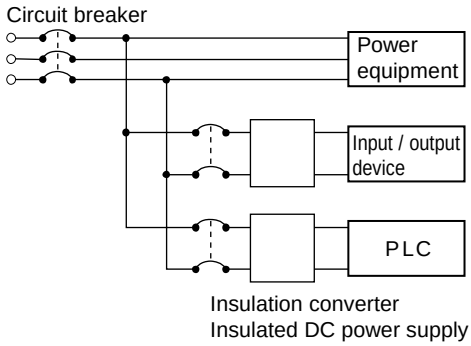
5.2.1 General Precautions

■ Power supply selection

- Please use a power supply with less interference whenever possible.
- Although overlap in the power line interference has sufficient interference tolerance, but we still recommend using the insulated transformer / insulated power supply for further interference attenuation.

■ Isolation of power system

Please separate wires for the unit, input and output device, and power equipment.

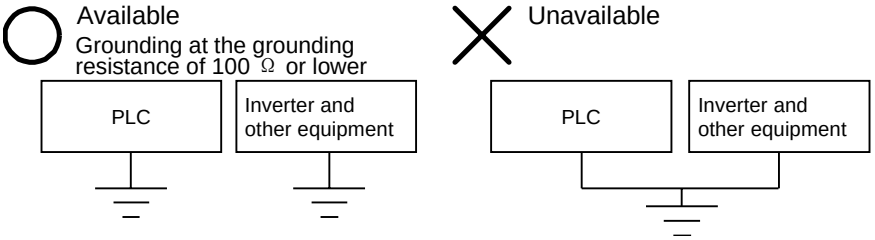


■ Power sequence

- Take the power sequence into consideration and cut off the PLC power supply before the power supply for input and output is shut off.
- If the input and output power is shut off before cutting off the PLC power supply, the control unit may sometimes detect the change of the input value and cause an unexpected sequence of actions.

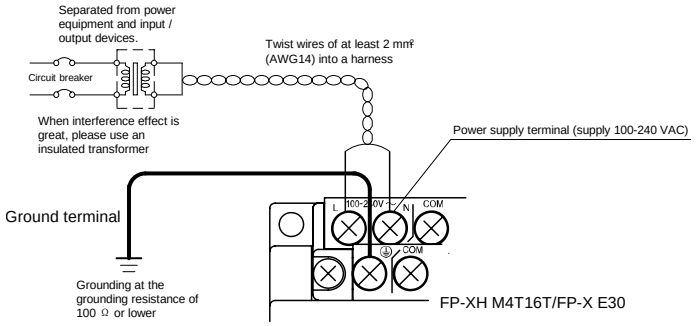
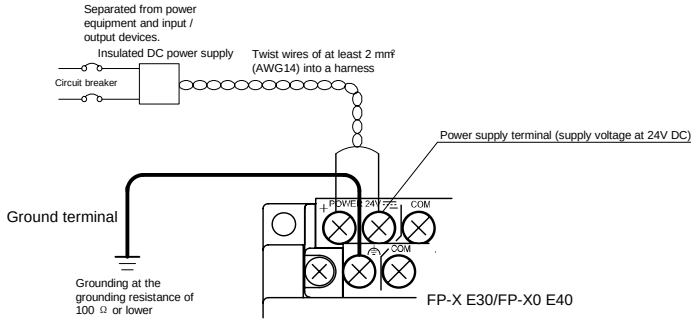
5.2.2 Grounding

- To obtain adequate anti-interference performance, please make sure the power supply is grounded.
- Grounding location shall be as close as possible to the PLC to shorten the length of the grounding wire.
- When used in common with other devices, it can sometimes lead to an opposite effect, so dedicated grounding must be used.
- For grounding terminal of the AC power supply unit, carry out the grounding with a grounding resistance at 100Ω or lower.



5.2.3 Power Supply of Control Unit / Expansion Unit

■ Power wiring (FP-XH M4 control unit and FP-X/FP-X0 expansion unit)

Unit	Wiring Diagram
AC power supply type	
DC power source type	

■ Supply voltage

Please confirm that the voltage of the power supply to be connected is within the allowed range.

Model	Rated input voltage	Allowable voltage range	Rated frequency	Allowable frequency range
AC Power Supply Type	100 - 240 VAC	85 - 264 VAC	50±60Hz	47 - 63 Hz
DC Power Supply Type	24 VDC	20.4 - 28.8 VDC	—	—

■ Power supply cables

- To reduce the voltage drop, use a wire that is at least 2 mm^2 (AWG14).
- To reduce the influence of interference, the power cable shall be stranded (strand processing).

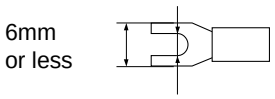
■ Applicable wires

Applicable wires	Tightening torque
AWG22-14 (0.3 mm^2-2.0 mm^2)	0.5 - 0.6 N m

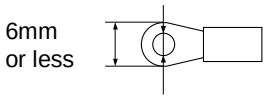
■ Applicable crimp terminals

M3 terminal screws are used for the terminals. Please use the following crimp terminals to connect terminals.

Fork type terminal



Ring type terminal



■ Applicable crimp terminals

Shape	Model	Applicable wires
Round	2-MS3	1.04-2.63 mm^2
Fork type	2-N3A	

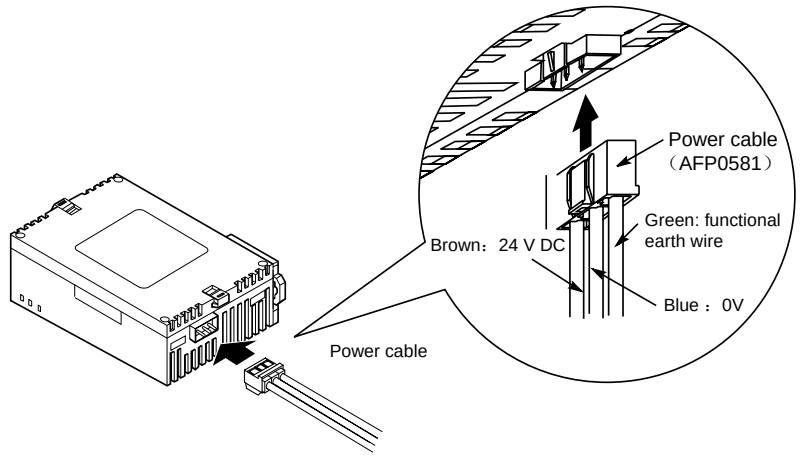
(Note) Use a wire that is at least 2 mm^2.

◆ CAUTION!

- **If the voltage or frequency of the power supply exceeds the allowable range, or a wire outside the specified range is used, the power unit of the PLC may fail.**

5.2.4 Power Supply of FP-X Expansion FP0 Adapter / FP0 Expansion Unit

■ Power wiring (FP-X expansion FP0 adapter / FP0 expansion unit)

Unit	Wiring Diagram
FP-X FP0 expansion adapter FP0 expansion unit FP0 high function unit	

■ About power supply selection

- To prevent against the abnormal voltage from the power line, use a insulated power with built-in protection circuit (reinforced insulation or double insulation wire).
- The built-in regulator of the unit uses a non-insulated type.
- In order to simultaneously start the power supply, the power of the expansion FP0 adapter shall be supplied by a universal power supply for FP-XH control unit input.

■ Supply voltage

- Please confirm that the voltage of the power supply to be connected is within the allowed range.

Rated input voltage	Allowable voltage range
24 VDC	20.4 - 28.8 VDC

■ Power supply cables

- Use the supplied power cable (model: AFP0581) to connect the power supply.
  Brown: 24 VDC Blue: 0 V Green: functional earth wire
- To reduce the influence of interference, the power cable shall be stranded (strand processing).

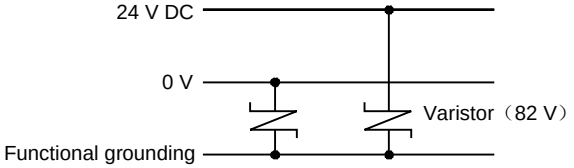
■ Power sequence

- In order to effectively and easily achieve the expansion FP0 adapter power sequence, the power of the expansion FP0 adapter shall be supplied by a universal power supply for FP-XH M4 control unit input.
- Power on the FP0 expansion unit before turning on the FP-XH M4 system power.
- Note the power sequence, the power of the FP-XH M4 system and the FP0 expansion unit shall be turned off before the input and output power is switched off. If the input and output power is shut off first, the control unit may sometimes detect the change of the input value and cause an unexpected sequence of actions.

Operation	Power sequence
ON	FP0 power → FP-XH M4 power, expansion FP0 adapter → input and output power
OFF	FP-XH M4 power, expansion FP0 adapter → FP0 power → input and output power

■ Grounding of the FP-X expansion FP0 adapter and FP0 expansion unit

- The functional grounding wire (green) of the included cable shall be grounded. Depending on the different service environments, sometimes there will be problems if grounded.
- The power line of the FP-X expansion FP0 adapter connects to the functional grounding through a varistor. The varistor may be shorted when there is an abnormal potential between the power line and the ground.



Extended FP0 adapter power circuit

5.3 Input and Output Wiring

5.3.1 Common Considerations for Input and Output

■ Wiring location

The input wire, output wire and power line shall be separated from each other, try to keep their distance when wiring. Don't put them in the same conduit or tie them up. The input wire, output wire, power line and high-voltage line shall be separated by at least 100 mm.

■ Wire selection

When wiring the input line and output line, select the wire diameter according to the current capacity.

■ Power supply

Switch off the PLC power supply before wiring. The control units, expansion units and all cards shall be connected with the power supply switched off. If you make the connection with the power supply switched on, a failure or malfunction may occur.

5.3.2 Universal Power for Input and Output (Control Unit and Expansion Unit E30)

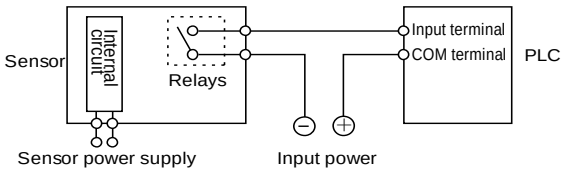
■ Uses of the universal power for input

- Please use it for the input circuit and expansion FP0 adapter.
- For the power of the FP0 expansion unit, use an external power supply.
- For other devices, make the connection after the consumption current of the device is fully recognized.
- If overcurrent condition is continued for a prolonged time, it may cause damage to the power supply.

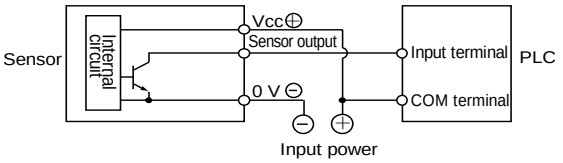
5.3.3 Wiring of the Input Side

■ Connection with photoelectric sensors and proximity sensors

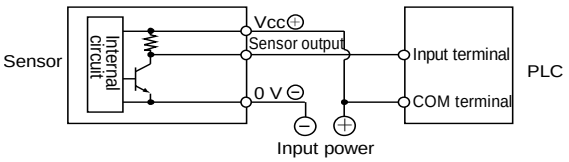
Relay Output Type



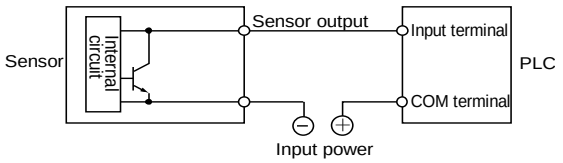
NPN Open Collector Output Type



Voltage Output Type

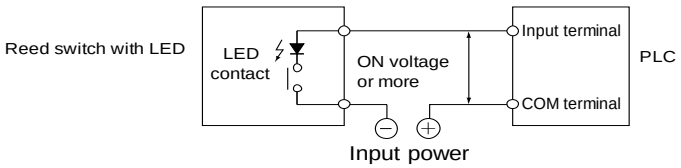


Two-Wire Output Type



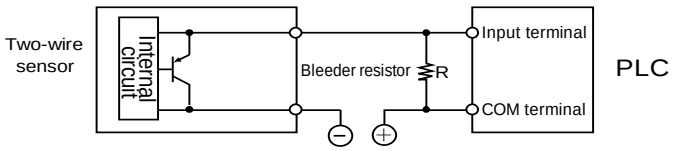
■ Precautions when using a reed switch with LED

If the LED is connected in series to the input contacts (such as a reed switch with LED, etc.), apply a voltage greater than the ON voltage to the input terminal of the PLC. Please pay special attention when several switches are connected in series.



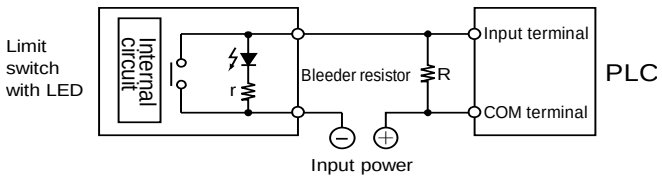
■ Precautions when using a two-wire sensor

When using a two-wire photoelectric sensor or proximity sensor, if cutting off the input current flowing to PLC is not possible due to the leakage current, connect the bleeder resistor as shown in the left chart.



■ Precautions when using a limit switch with LED

When using a limit switch with LED, if cutting off the input current flowing to PLC is not possible due to the leakage current, connect the bleeder resistor as shown in the left chart.

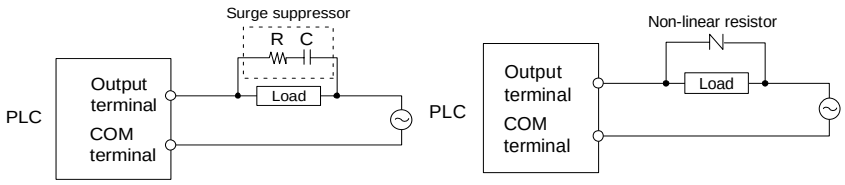


5.3.4 Wiring of the Output Side

■ Protection circuit of the inductive load

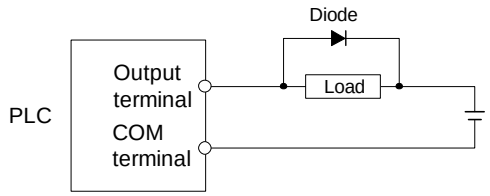
For inductive load, please install a protection circuit parallel with the load. When the DC inductive load is switched on/off, the protection circuit has a great positive influence on the service life, particularly for the relay output type. Therefore, make sure the diode is connected at both ends of the load.

For AC load



Example of surge suppressor Resistance at 50Ω
Capacity 0.47 μF

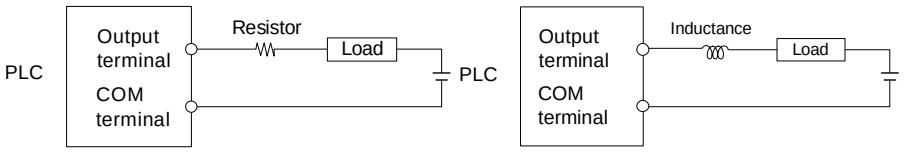
For DC load



Diode Reverse voltage Higher than 3 times the rated load voltage
Average rectified current Greater than the load current

■ Precautions on using capacitive loads

When connecting a load with a large impact current, please set up the protection circuit as the following figure to minimize its impact.



5.4 Terminal Block Wiring

5.4.1 Applicable wires

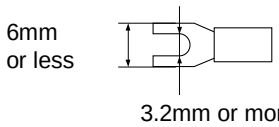
■ Applicable wires

Applicable wires	Tightening torque
AWG22-14 (0.3 mm^2-2.0 mm^2)	0.5 - 0.6 N · m

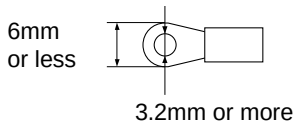
■ Applicable crimp terminals

- M3 terminal screws are used for the terminals. Please use the following crimp terminals to connect terminals.
- When using round terminals, remove the terminal block cover before operating.

Fork type terminal

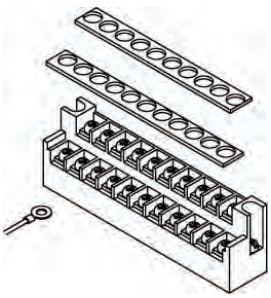


Ring type terminal



5.4.2 Terminal Block Cover

- When using round terminals, remove the terminal block cover before operating.



◆ CAUTION!

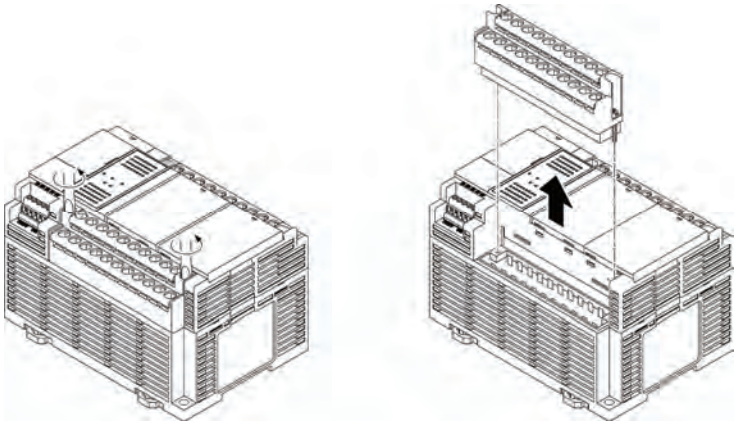
- **To prevent electric shock, make sure to install the terminal block outer cover as is after wiring.**

5.4.3 Installation and removal of the terminal block

The terminal block is screw-fixed and can be installed and removed.

■ Removal of the terminal block

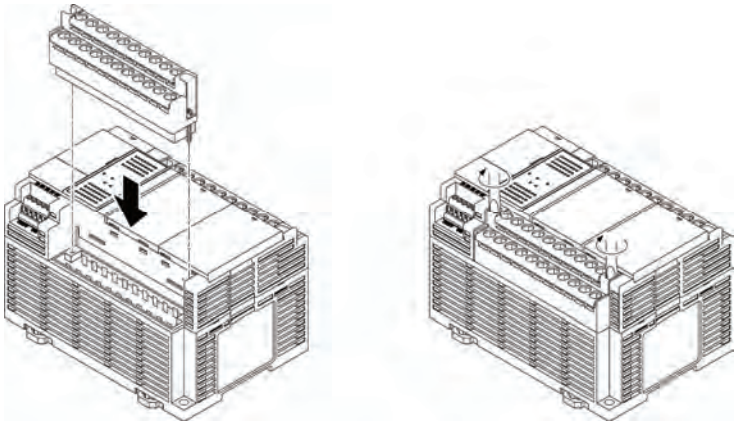
Loosen the 2 mounting screws to remove the terminal block. The screws are fixed on the terminal block, they can not be removed.



The figure shows a similar product of FP-XH, with the same removal method.

■ Installation of the terminal block

- Tighten the screws when the terminal block is lifted up. After tightening the screws, the terminal box is fixed.
- Please set tightening torque to 0.25 - 0.35N · m.



The figure shows a similar product of FP-XH, with the same installation method.

5.5 Safety Measures

5.5.1 Safety Measures

■ Precautions on system design

- In a system using PLC, a malfunction may occur due to the following causes.
  - The start and stop time between the PLC power supply and the input / output device and power equipment are inconsistent.
  - Response time deviation caused by momentary power failure.
  - PLC unit, external power supplies and other devices are abnormal.

Take safety measures to prevent the entire system from anomalies or accidents caused by this malfunction.

■ Setting of the interlock circuit

- Set the interlock circuit outside the PLC when controlling forward, reverse and other operations of the motor.

■ Setting of the emergency stop circuit

- In an emergency, the circuit to cut off the power supply of the output device shall be set up outside of the PLC.

■ Power sequence

- Start the PLC after the input and output device and power equipment are started.
- When stopping the PLC, please also stop running the PLC before stopping input and output devices and power equipment.

■ Grounding

- When installing PLC near the device that will generate high voltage due to the switching action of inverters, etc., common grounding shall be avoided. Please use at least a dedicated grounding of D type grounding (third grounding).

■ Electric shock prevention

- Do not forget to install the terminal cover after wiring.

5.5.2 Temporal Outage

■ Actions during temporal outage

- If the temporal outage time of the power supply is shorter than 10 ms, the FP-XH M4 control unit will continue to operate. When it exceeds 10 ms, the action of the control unit will be changed according to the conditions such as combination of the unit and the supply voltage. Sometimes the same action as the power supply reset will generate.
- Although the temporal outage time of the expansion FP0 adapter is 10 ms, please determine the allowable time of the system after confirming the allowable temporal outage time of the DC power supplying power to the expansion FP0 adapter. In addition, the power of the FP-XH M4 expansion FP0 adapter shall be supplied by a universal power supply for FP-X control unit input.

- When using the expansion unit including other power (E30, expansion FP0 adapter), according to the temporal outage time, sometimes one of the units will experience temporal outage and I/O checking error. In this case, reconnect the power supply.

5.5.3 Watchdog Timer

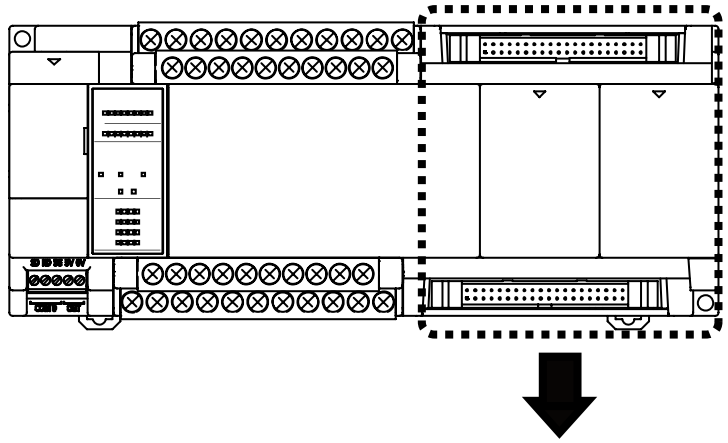
- The watchdog timer detects abnormal program or hardware.
- When using the FP-XH M4 control unit, it is set to 640 ms.
- The ERR.LED at the front of the controller unit lights up after the watchdog timer is operated. At this time, the output of all output units turned to OFF and brought to a standstill.

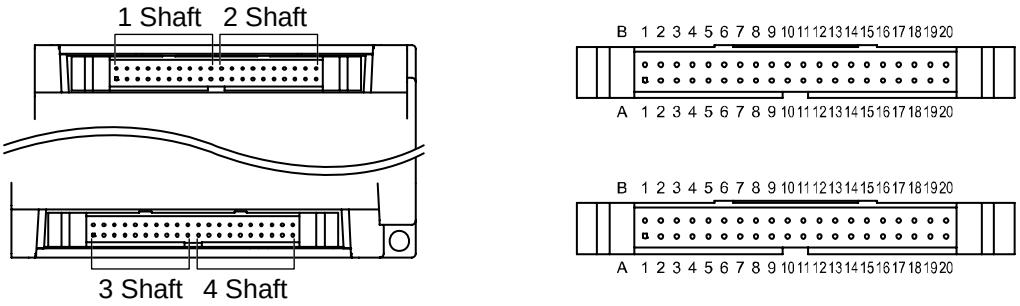
6

Wiring of motion I/O parts

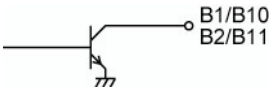
6.1 Terminal arrangement

6.1.1 Motion Control Part

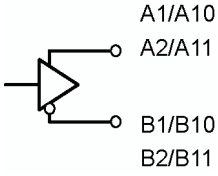




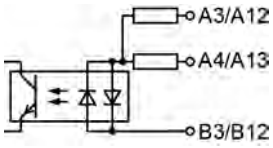
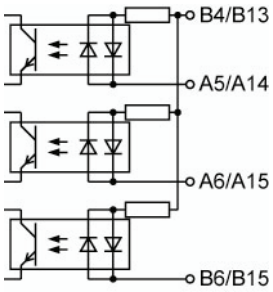
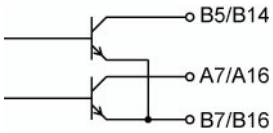
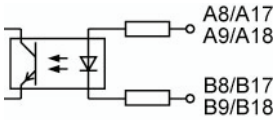
■ Transistor Output Type (AFPXM4T16T)

Pin No.		Signal name	Circuit	
1/3 shaft	2/4 shaft			
A1	A10	–	–	–
A2	A11	–	–	–
B1	B10	Pulse output A: NPN Open Collector		Output
B2	B11	Pulse output B: NPN Open Collector		

■ Linear Driver Output Type (AFPXM4L16T)

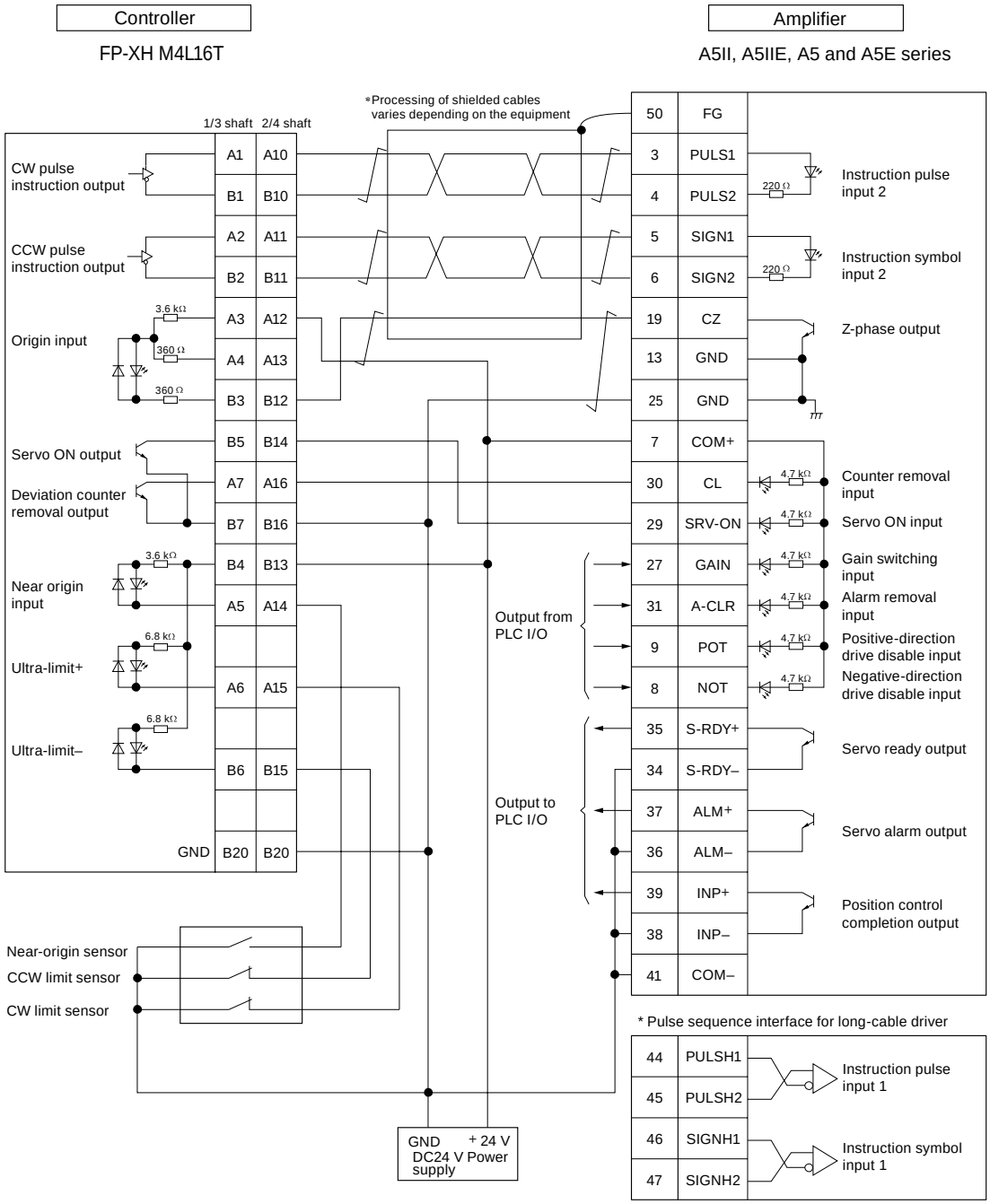
Pin No.		Signal name	Circuit	
1/3 shaft	2/4 shaft			
A1	A10	Pulse output A: linear driver (+)		Output
A2	A11	Pulse output B: linear driver (+)		
B1	B10	Pulse output A: linear driver (–)		
B2	B11	Pulse output B: linear driver (–)		

■ Universal

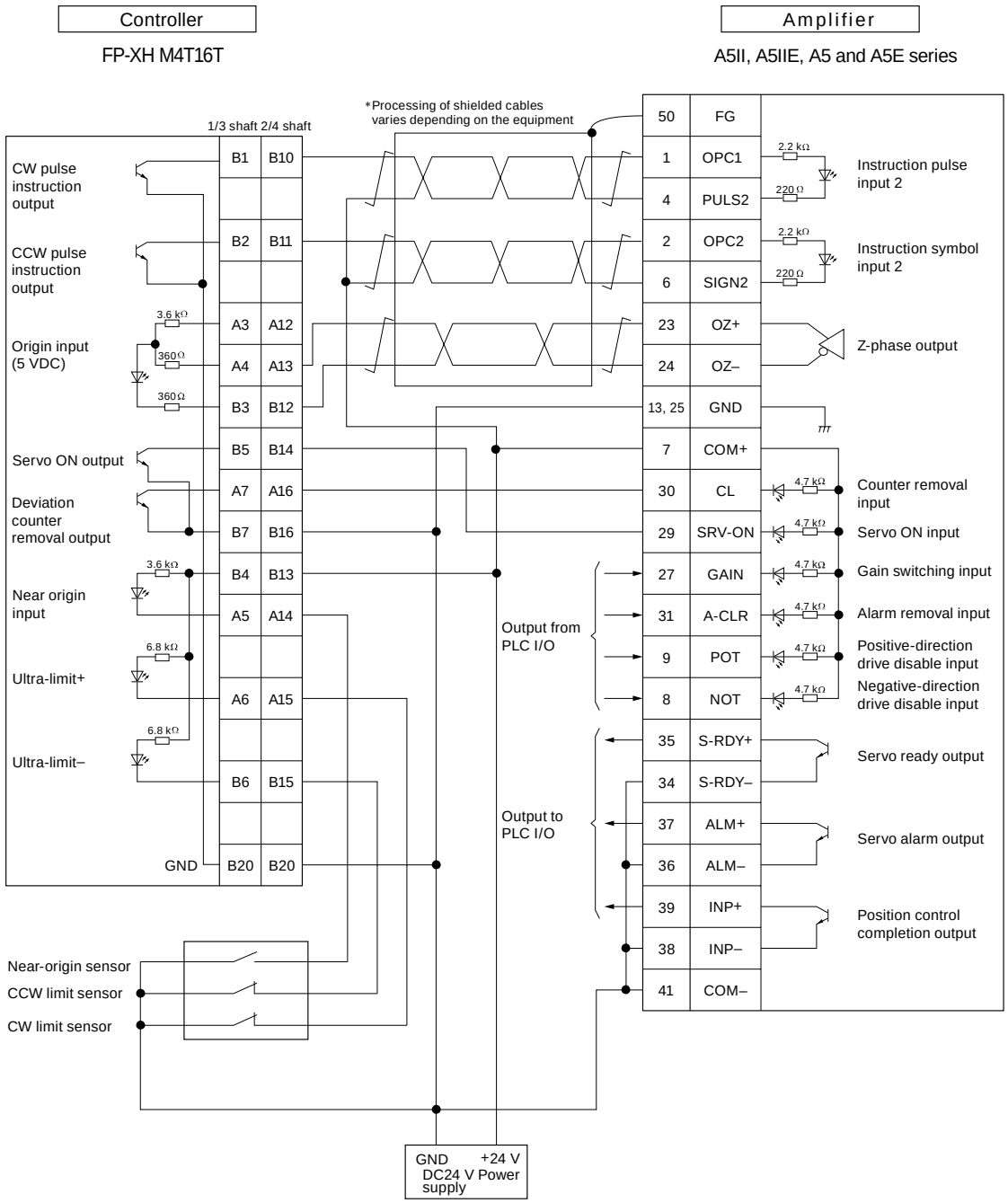
Pin No.		Signal name	Circuit	
1/3 shaft	2/4 shaft			
A3	A12	Origin input 24V DC SELV (+)		Input
A4	A13	Origin input 5V DC SELV (+)		
B3	B12	Origin input (–)		
B4	B13	COM [24V DC SELV (+)] (electrical insulation between axes)		Input
A5	A14	Near origin input (DOG)		
A6	A15	Limit input (+)		
B6	B15	Limit input (–)		
B5	B14	Servo ON output (+)		Output
A7	A16	Deviation counter clear (+)		
B7	B16	COM (electrical insulation between axes)		
A8	A17	Pulse input A (+)		Input
B8	B17	Pulse input A (-)		
A9	A18	Pulse input B (+)		
B9	B18	Pulse input B (-)		
A19	B19	–	–	–
A20		–	–	–
B20		GND for pulse output (connected internally with COM output terminals)		GND

6.2 Connection with the Servo Motor Amplifier

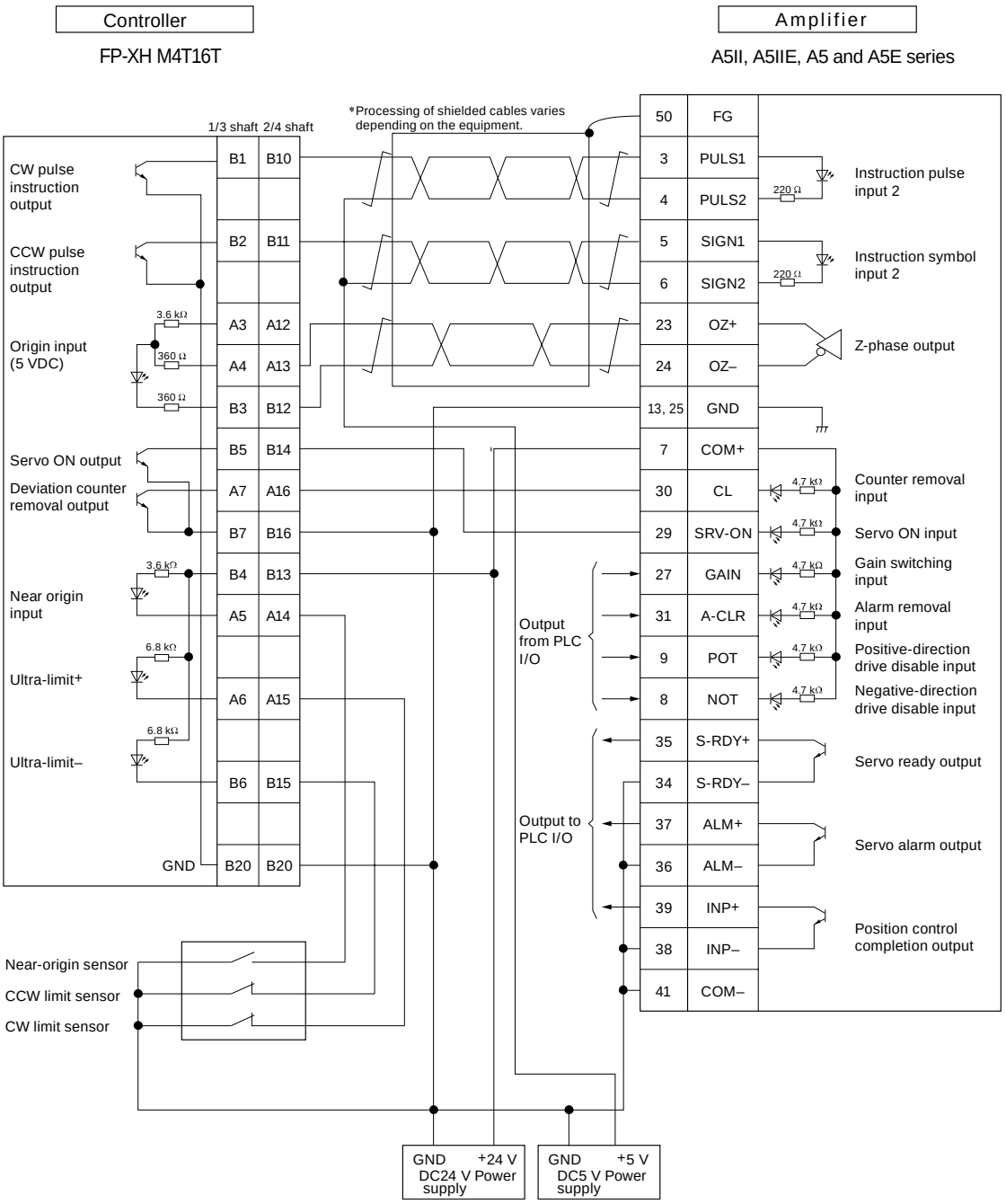
6.2.1 Linear Driver Output Type



6.2.2 Transistor Output Type (pulse instruction 24 V connection)



6.2.3 Transistor Output Type (pulse instruction 5V connection)



6.2.4 Precautions on Connection

■ Connection of each signal

Signal Type	Emphasis
Pulse instruction output	● Connection with the instruction pulse input of the servo amplifier. ● For control unit of linear driver output type using pulse instruction frequencies within the range of 500kbps-4Mpps, please use the pulse serial port specially for linear driver on the amplifier side. ● For control unit of transistor output, connect to the terminal of the embedded current-limiting resistor to ensure the current to be below 15mA. Please connect external resistors for connection with external amplifies. ● Connect them with a twisted-pair cable.
Origin input	● Please connect the phase-Z NPN Open Collector output (mark CZ) on the amplifier side of the servo amplifier to the B3/B12 terminal on the PLC side. ● Please connect them with B3/B12 terminals of PLC when using external sensors for origin input in a 24 VDC circuit. ● Connect them with a twisted-pair cable.
Near origin input	● Connect it to the near-origin sensor according to the system constitution.
CCW ultra-limit input	● Connect it to the ultra-limit switch according to the system constitution.
CW ultra-limit input	
Deviation counter removal output	● Connect it to the counter removal input of the servo amplifier. ● Via the Configurator PM7's "Parameter Settings" dialog box, specify the length of the deviation counter removal signal within 1-100ms.
Servo ON output	● Connection it with the Servo ON input on the servo amplifier side.

(Note 1): Terminals B4 and B13 are COM terminals for near origin input, limit (+) input and limit (-) input.

(Note 2): The input logics of origin input, near origin input, ultra-limit input are set via "Configurator PM7 or user program.

◆ Emphasis

- **Use a twisted-pair cable for the unit output and wiring between servo amplifiers.**

6.3 Connection with the Stepping Motor Driver

6.3.1 Precautions on Connection

■ Connection of each signal

Signal Type	Emphasis
Pulse instruction output	● Connection with the instruction pulse input of the Stepping Motor Driver ● For connection with 24 VDC NPN Open Collector, the current is limited to be connected with the embedded terminal with the resistance of about 2.2kΩ to ensure the current to be lower than 15mA. Please connect external resistors for connection with external amplifies. ● Connect them with a twisted-pair cable.
Origin input	● Please connect them with B3/B12 terminals of PLC when using external sensors for origin input in a 24 VDC circuit. ● Connect them with a twisted-pair cable.
Near origin input	● Connect it to the near-origin sensor according to the system constitution.
CCW ultra-limit input	● Connect it to the ultra-limit switch according to the system constitution.
CW ultra-limit input	

(Note 1): Terminals B4 and B13 are COM terminals for near origin input, limit (+) input and limit (-) input.

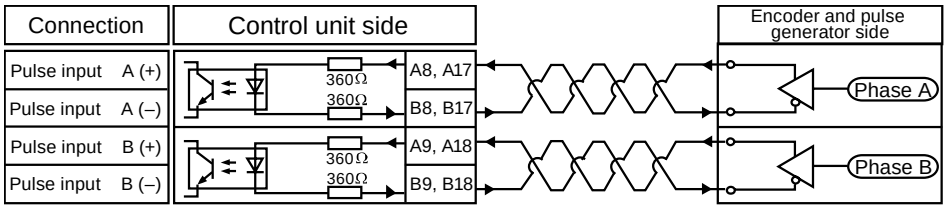
(Note 2): The input logics of origin input, near origin input, ultra-limit input are set via "Configurator PM7 or user program.

◆ Emphasis

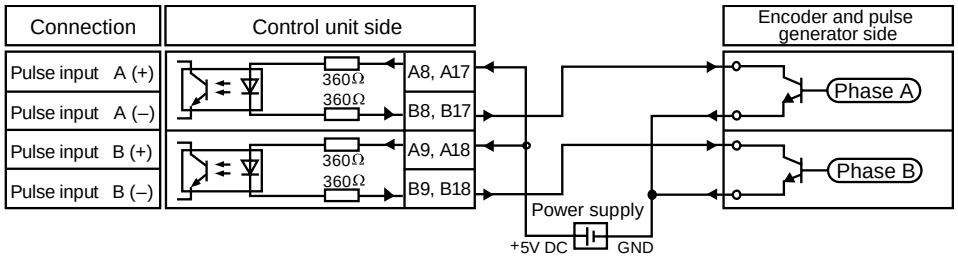
- **Use a twisted-pair cable for the unit output and wiring between motor drivers.**

6.4 Pulse input connection

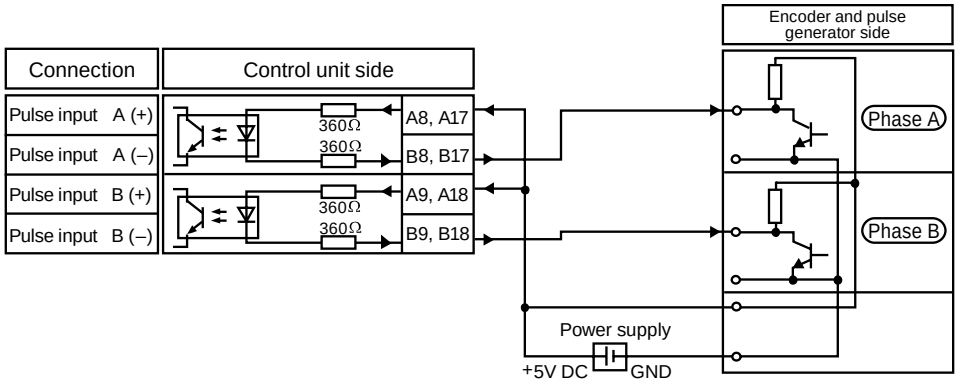
6.4.1 Linear driver type



6.4.2 Transistor open-collector type



6.4.3 Transistor resistor pulling up type



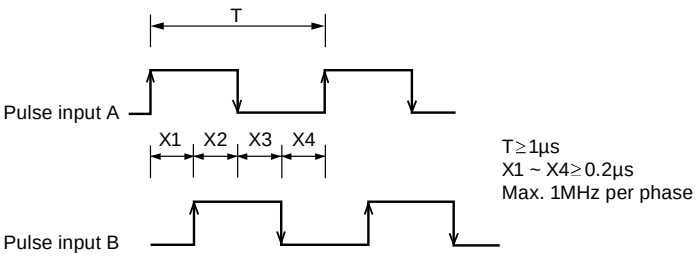
Emphasis

- **Pulse generator input operation and feedback pulse counter use the same pulse input terminal, so any of the above may be selected.**
- **It is recommended to connect them with a twisted-pair cable.**
- **When counting 2-phase input of coder, etc., to avoid wrong counting, please set the pulse input counting frequency multiplication to X4 or X2 via the control codes.**

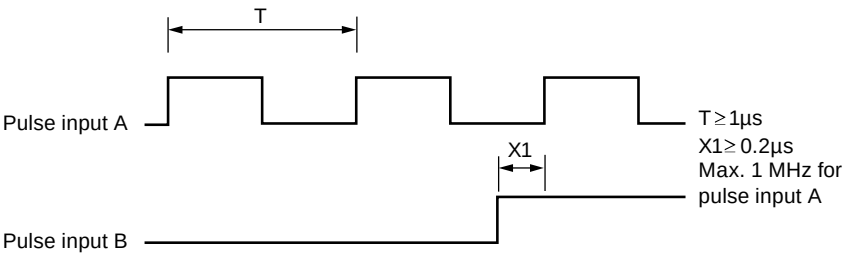
Note: please use pulse input A and pulse input B signals within the following specifications.

■ When pulse input A and pulse input B are used in 2-phase

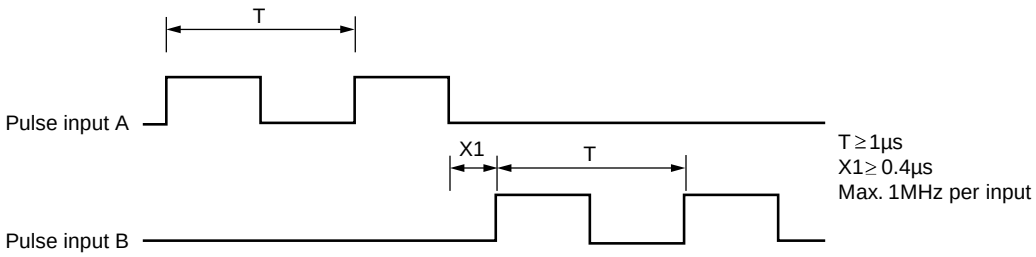
It is 2-phase input when used as pulse generator input.



■ When pulse input A and pulse input B are used as direction judgment input



■ When pulse input A and pulse input B are used as separate input



6.5 Precautions on wiring

- Use a twisted-pair cable for the unit output and wiring between servo amplifiers and motor drivers.
- It is recommended to use a twisted-pair cable for pulse input connection.
- Please control the following wiring lengths within the range shown in the table.

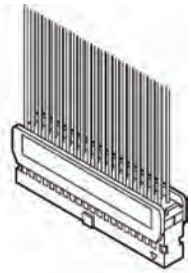
■ Wiring Length

Input / Output signal	Wiring Length
Pulse output	within 3m
Other Inputs / Outputs	within 30m

6.6 Connection with scattered cable connectors

6.6.1 Specifications of scattered cable connectors

Connectors used for scattered cable connector need not to be peeled off the insulation layer. Connect them with special tools.



Scattered cable connector（40P）

■ Applicable wires (stranded wire)

Specification	Nominal cross-section area	Insulation layer O.D.	Rated current
AWG#22	0.3 mm^2	ϕ1.5-ϕ1.1	3 A
AWG#24	0.2 mm^2		

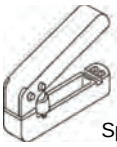
■ Scattered cable connector (unit accessories)

Manufacturer	Parts composition	Quantity
The company	enclosures (40P)	1PC / 2 sets
	Half-open enclosures (40P)	2PC2 / 2 sets
	Contact head (AW22, 24) 5-pin	8PC2 / 2 sets

(Note): For separate order, please specify AFP2801 (2 sets).

■ Special tools

Manufacturer	Order Number
The company	AXY52000FP



Special tools

6.6.2 Usage of scattered cable connector

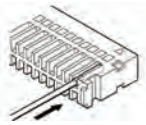
The insulation layer can be crimped to save wiring time.

Steps

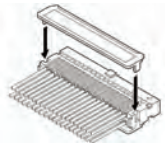
1. Remove the contact piece from the carrier and crimp it into the tool.

2. Insert the wire with the insulation layer directly into the contact piece, slightly grip the tool for crimping.

3. Insert the wire into the terminal box after the crimping.

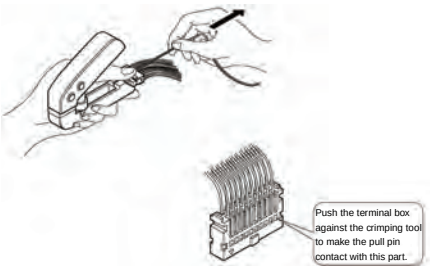


4. Close the cover after insertion of the wire.



Emphasis

- **Contact pull pin can be used for correction in case of wrong wiring.**
  Wrong wiring or wrong crimping of wire can be corrected with the attached contact pull pin.



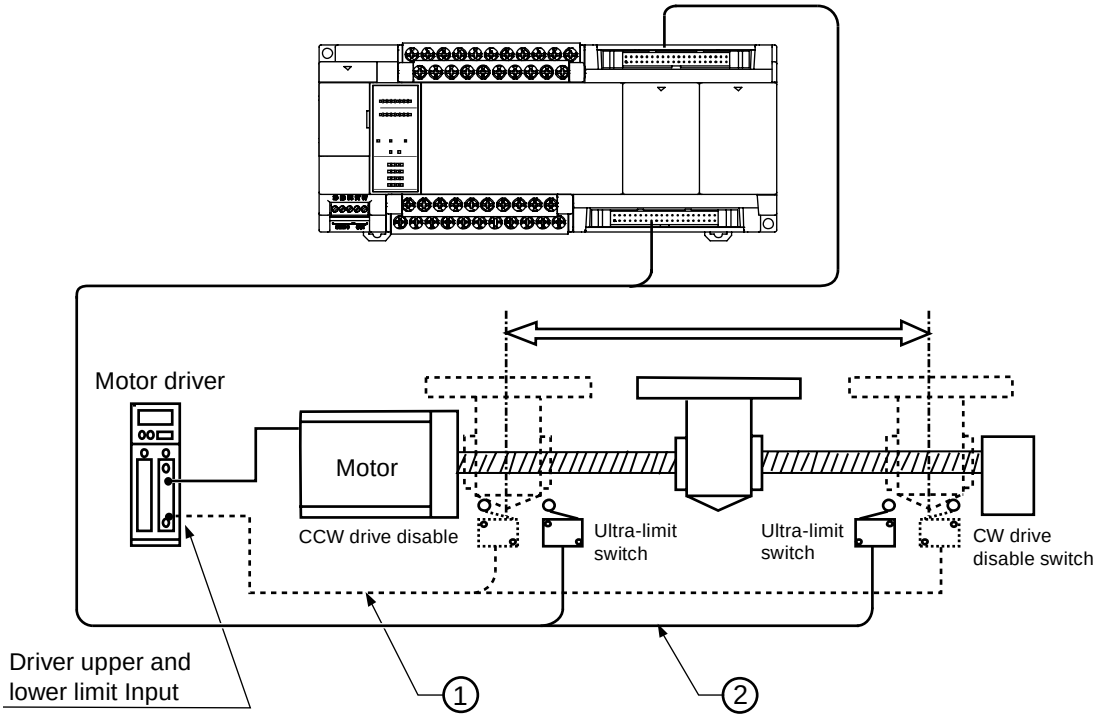
7

Power Supply ON/OFF and Confirmation Matters

7.1 Design of the Safety Circuit

System Configuration Instance

Installation of the Limit Switch

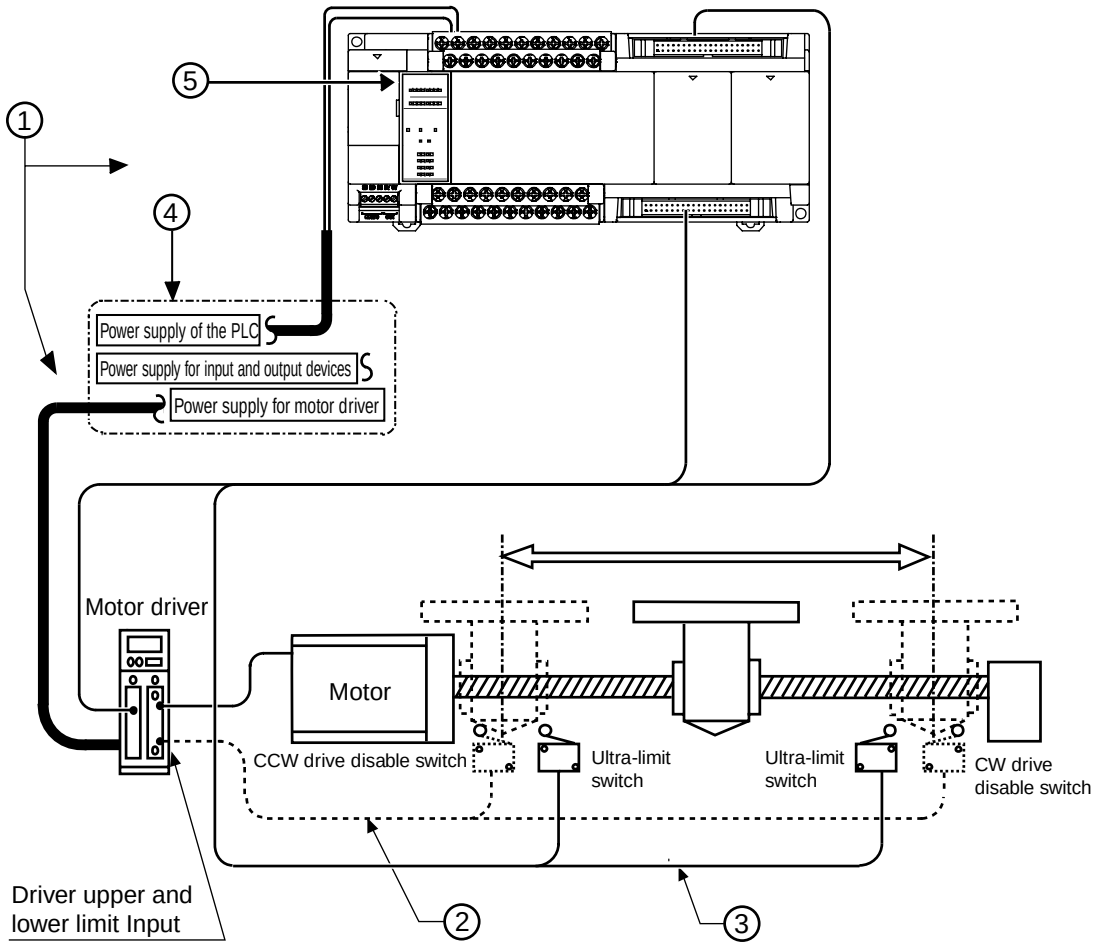


■ Confirmation of the Safety Circuit

No.	Item	Confirmation Contents
①	The realization of safety circuit by use of the external circuit	To be set as the safety circuit recommended by the motor manufacturer.
②	The safety circuit based on a unit	Install the ultra-limit switch as shown above. Connect the ultra-limit switch input on the (+) side and the (−) side to the PLC's input circuit.

7.2 Before the Power Supply is Turned on

System Configuration Instance



■ Confirmation matters before the power supply is turned on

No.	Item	Confirmation Contents
①	Confirm connection of each device	Check and ensure that each device has been designed and connected.
②	Confirm the setting of the external safety circuit	Check and ensure that the safety circuit (wiring and installation of the ultra-limit switch) has been safely connected based on the external circuit.
③	Confirm setting of the safety circuit based on a unit	Please confirm connection of each unit and ultra-limit switch. Also confirm the setting of the ultra-limit switch.
④	Confirm the sequence setting of turning on the power supply	Please verify whether the steps for turning on the power supply are set according to the requirements of the "Steps for Turning on the Power Supply".
⑤	Confirmation of mode switch of the control unit.	Set the control unit as PROG. mode. Setting as RUN mode may lead to neglectful actions.

7.3 Steps for turning on the power supply

7.3.1 Steps for turning on the power supply

To turn on the power supply of the unit system to be used, consider the performance and status of the external device connected to fully avoid the occurrence of unexpected actions.

Steps

1. Turn on the power supply connecting PLC input and output devices.
2. Turn on the power supply of the PLC.
3. Turn on the power supply of the motor driver.

7.3.2 Steps for turning off the power supply

Steps

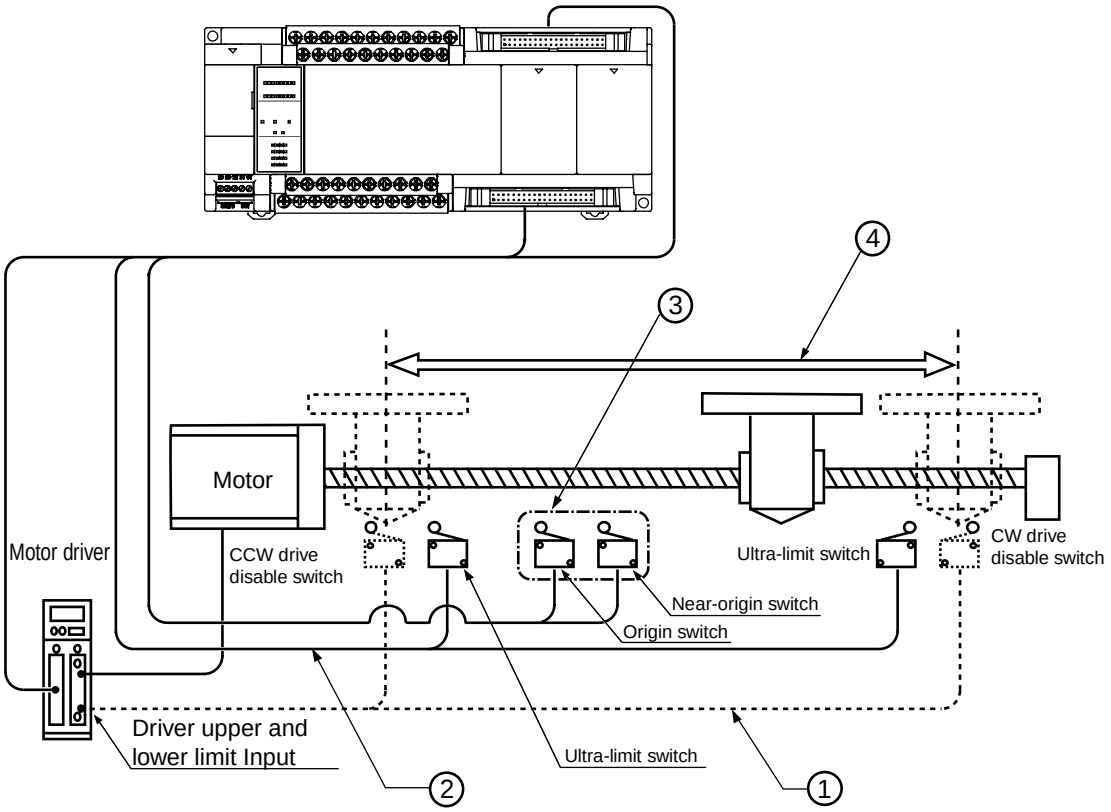
1. First confirm that the motor has stopped running and then turn off the power supply of the motor driver.
2. Turn off the power supply of the PLC.
3. Turn off the power supply of input and output devices connected to the PLC.

7.4 Confirmation of Power-on Status

7.4.1 Confirmation matters after the power supply is turned on

System Configuration Instance

It can be generally divided into four stages for confirmation.



■ **Confirmation matters before the power supply is turned on**

No.	Item	Confirmation Contents
①	Check the external safety circuit	Check and ensure that the safety circuit (wiring and installation of the ultra-limit switch) has been safely connected based on the external circuit.
②	Check the safety circuit based on the PLC unit	Please confirm connection of each unit and ultra-limit switch. Also confirm the setting of the ultra-limit switch.
③	Confirm the near origin input and origin input	Confirm that the near origin input and origin input are imported as the PLC input or carry out the practical operation after implementing the JOG operation and origin return operation.
④	Confirm the rotation, movement direction and distance	Confirm the rotation, movement direction and distance through the JOG operation and position control operation.

7.4.2 Check the external safety circuit

Turn on the CW/CCW drive disable switch of the external circuit and check the safety circuit recommended by the motor manufacturer to verify the power-off function and other functions of the motor driver.

7.4.3 Confirmation of the safety circuit based on a unit

Step 1

Please confirm that the limit input has been normally imported to the input on the PLC side for forced operation of the ultra-limit switch.

Step 2

As required, input the program to start the JOG operation and confirm that the motor has stopped for the limit input. The valid logic of the limit input can be changed via the parameter setting menu of the "Configurator PM7".

Step 3

Check the ultra-limit switch for normal operation through the JOG operation action.

■ Limit Input Operation

Conditions	Direction	Limit Status	Operation
When JOG operation starts	Forward run	Limit (+) input: ON	Can not start with errors
		Limit (−) input: ON	Can be started
	Reverse run	Limit (+) input: ON	Can be started
		Limit (−) input: ON	Can not start with errors
When JOG operation is in action	Forward run	Limit (+) input: ON	Limit stop with errors
		Limit (−) input: ON	Limit stop with errors
	Reverse run	Limit (+) input: ON	Limit stop with errors
		Limit (−) input: ON	Limit stop with errors

7.4.4 Check operation of the near origin switch and the origin switch

Step 1

Confirm that it has been normally imported as the input signal on the PLC side for forced operation of the origin input and the near origin input.

Step 2

Input the origin return program to start origin return and confirm that it has been switched to the deceleration operation via the near origin input.

Check point

The valid input logic of the origin input and the near origin input can be set via the parameter setting menu of the "Configurator PM7".

Step 3

Repeat the JOG operation and the origin return operation to confirm that the mobile station exactly stop at the origin without offset.

Check point

Sometimes an offset occurs as the position and reset speed of the near origin input and the origin input vary.

Step 4

If the mobile station doesn't exactly stop at the origin, change the position of the near origin input or reduce the origin return speed to make it accurately stop at the origin.

7.4.5 Check the rotation, movement direction and distance

Step 1

Check whether the rotation and movement direction is correct through the JOG operation or automatic acceleration and deceleration operation.

Check point

The rotation direction depends on the installation of ball screws and the "CW/CCW Direction Setting" of parameters.

Step 2

Perform the JOG operation or position control operation and confirm whether the movement distance is consistent with the design.

Check point

The movement distance depends on the pitch of ball screws, reduction gear ratio and the set movement amount of the position control data.

8

Steps Before Running

8.1 Before Turning on the Power

8.1.1 Check Items

After wiring, check the following items before turning on the power.

■ Check Items

	Item	Contents
1	Unit mounting	● The name of each unit matches the device list as designed. ● Mounting screws on the unit are securely tightened. No looseness.
2	Wiring	● The terminal screws are securely tightened. No looseness. ● Wiring and signal names of the terminals are consistent. ● Wire specifications fully fit the current size.
3	Cable connection	● Cables are securely connected.
4	Mode setting	● The mode toggle switch is set to "PROG." mode.
5	Others	● Please carefully confirm the possibility of accidents.

8.1.2 Steps Before Running

For configuration after wiring, the steps before running are as follows.

1. Power ON

(1) Before turning on the power, please check."7 Power Supply ON/OFF and Confirmation Matters" and "8.1.1 Check Items".

(2) After switching on the power of the control unit, please confirm that the control unit's PROG. LED (green) is lit.

2. Input the program

(1) Use the tool software to create a program.

(2) Use the "Overall Check Function" of the tool software to check for syntax errors.

3. Confirm the output wiring

Use the mandatory input / output function etc. to check the output wiring.

4. Confirm the input wiring

Check the input wiring through the input display LED or the monitoring function of the tool software.

5. Test run

(1) Set the mode toggle switch to "RUN" mode, confirm that the "RUN" LED is lit.

(2) Confirm the serial actions.

6. Commissioning

(1) When there is an abnormal action, use the monitoring function of the tool software to confirm the program's abnormality.

(2) Modify the program.

7. Save the program

Save the program created.

8.2 Offline Editing of the Program

8.2.1 Program Elements

Create the following items as program data according to the following steps.

■ **Program composition**

Type	Contents
Program	Any program
Comments	Maximum 1MB I/O comments, description, comments between the lines
System register	Set the allocation for hold area using the operational memory, the operation mode during an abnormality, communications, high-speed counter when using pulse output function.
Position control parameter Position control data sheet data	Set via the Configurator PM7. Save the position control parameters and position control data sheet information to be set as partial program files. You can export or import it via the Configurator PM7, and save only the position control related data as other file.

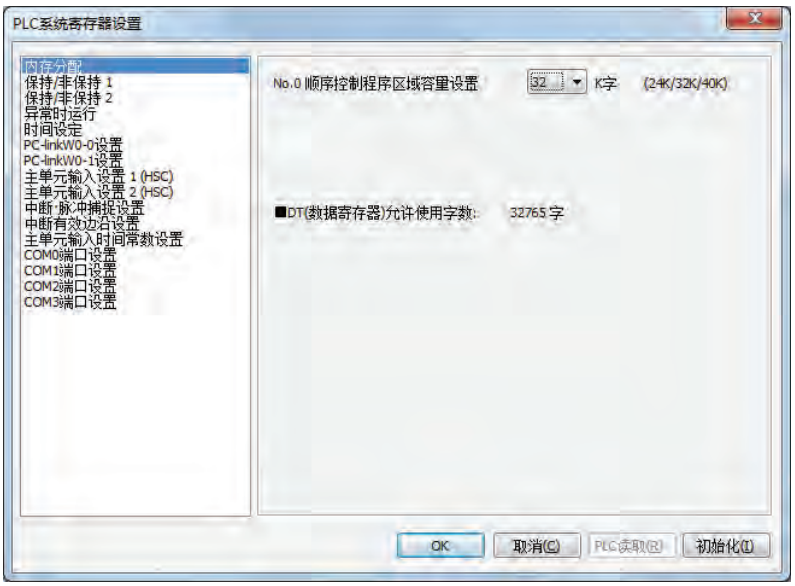
8.2.2 Settings of the System Register

Follow these steps to set the system register. Explain it as belows assuming that the FPWIN GR7 has been started.

◆ Steps

1. **In the menu bar, select "Option"→"PLC System Register Setting".**

   The "PLC System Register Setting" dialog box displays.



2. **Select any item to set.**
3. **Click the [OK] button.**

   The contents have been set are saved as part of the program.

■ **Type of system registers**

Type	Contents
Memory allocation	Set when changing program capacity.
Hold / non-hold	Set when changing hold area of internal relays, data registers and other operational storages. To ensure these settings are effect, you must install the memory backup battery (sold separately).
Operate during abnormality	Select the operating mode used when an operation error occurs. In addition, the abnormality warning function shall be set as active when installing memory backup battery.
Time setting	Set the timeout time when using the communication function and the time for constant scanning.
PC link W0 setting	Allocate the station number and the link area when using the inter-PLC link function.
Master input setting (HSC)	Allocate the input and output signal and channel when using HSC (High Speed Counter).
Interruption and pulse catch setting	Specify the inputs allocated when using interrupt input or pulse catch input. When the input is interrupted, an effective pulse edge can be selected.
Interrupt pulse edge setting	
Constant setting for controller input	Assign a input for time constant filter when the input is set as active.
COM port setting	Set the station number and communication speed, transmission format and other communication parameters via the COM port when using the communication function.

◆ Emphasis

- **Set the system register when using functions and changing the hold area from default state. There is no need to set when the appropriate function is not in use.**

8.2.3 Setting of Position Control Parameters

Position control parameters are set via the Configurator PM7. Start the Configurator PM7 from the "Options" menu of FPWIN GR7.

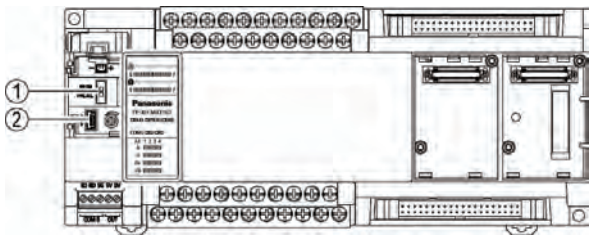
◆ Reference

- **For setting of position control parameters, please refer to "Chapter 9 Setting of Position Control Parameters".**
- **For details on the system register, refer to "26.4System Register List".**

8.3 Program Download and Run

8.3.1 Before Turning on the Power

Before turning on the power, verify the mode toggle switch of the control unit. According to the different states when the power is on, the behavior will change as following.



①	Mode toggle switch	②	USB port

■ Difference between mode behaviors

Type	Contents
When the power is turned on in PROG. mode	● When the power is turned on, show as the state of data saved in the control unit controller and computer (program, comments, system register data, data register). ● Through the operation of the tool software, it can change to status: computer → download to the control unit controller, or control unit → upload to your computer. ● If the program and other required data are not written in the control unit controller, turn on the power via PROG. mode.
When the power is turned on in the RUN mode	● When the power is turned on, transmit the datum saved in the control unit controller's built-in memory (F-ROM) to the control unit Controller memory, then start running. ● When the program and other required data have been saved, turn on the power via RUN mode when running.

■ Mode switch based on the tool software

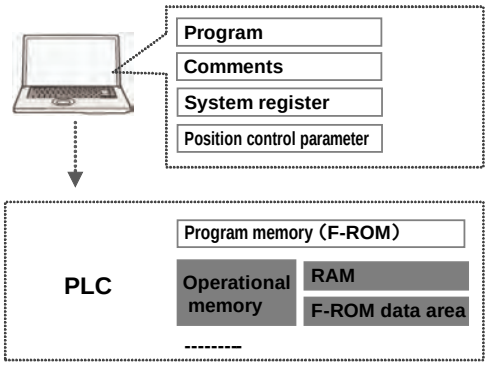
- If it is online after the power is on, the operation mode can be switched by the tool software. However, when the power is turned on again after the power is turned off, run in the the mode selected by the mode toggle switch.

■ Connection of the computer and control unit

- The USB port of the control unit is connected to the computer. Use USB 2.0 cable (A: mini B) when connecting

8.3.2 Program Downloading and Mode Switching

- Programs created by the tool software can be downloaded to the control unit controller.
- The downloaded program are saved to the program memory (F-ROM). It can be saved even in case of power outage.



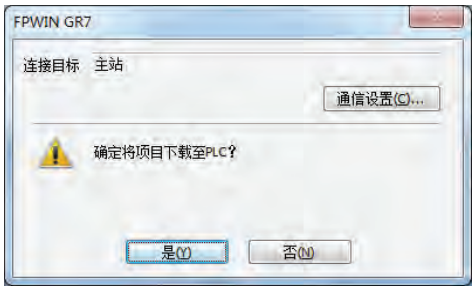
■ Download steps

Use the following steps to download the program data. Explain it as belows assuming that the FPWIN GR7 has been started.

◆ Steps

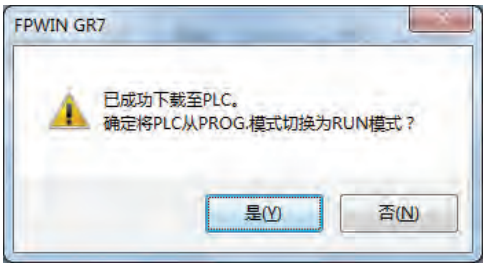
1. **Select "Online" → "Switch to Online Editing" from the menu bar.**
2. **Select "Online"→"Download to PLC" (whole file) from the menu bar.**

   The confirmation dialog box is displayed.



3. **Click the [Yes] button.**

   Perform the download. In addition, the information dialog box for confirming whether to switch the mode displays.



4. **Click [Yes] or [No] button.**

   Click "Yes" to switch to RUN mode. Click "No" to switch to monitoring mode.

◆ Steps

- **When you switch to RUN mode, switch it after confirming that there will be no danger even the PLC is in motion.**
- **When you switch to RUN mode, the ERR LED lights up after an error occurs, and then return to PROG. mode. Please refer to "20.2 Troubleshooting Exceptions".**

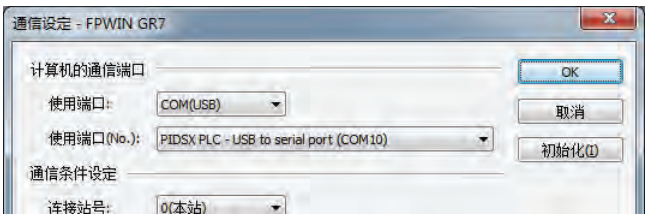
■ When "MEWNET device open circuit error" appears

Follow these steps to clear the error status.

Steps

1. Verify that the power of the control unit is switched on.
2. Verify that the computer and the control unit are connected via a USB cable.
3. Select "Options" → "Communication Setting" from the menu bar.

   The "Communication Setting" dialog displays.

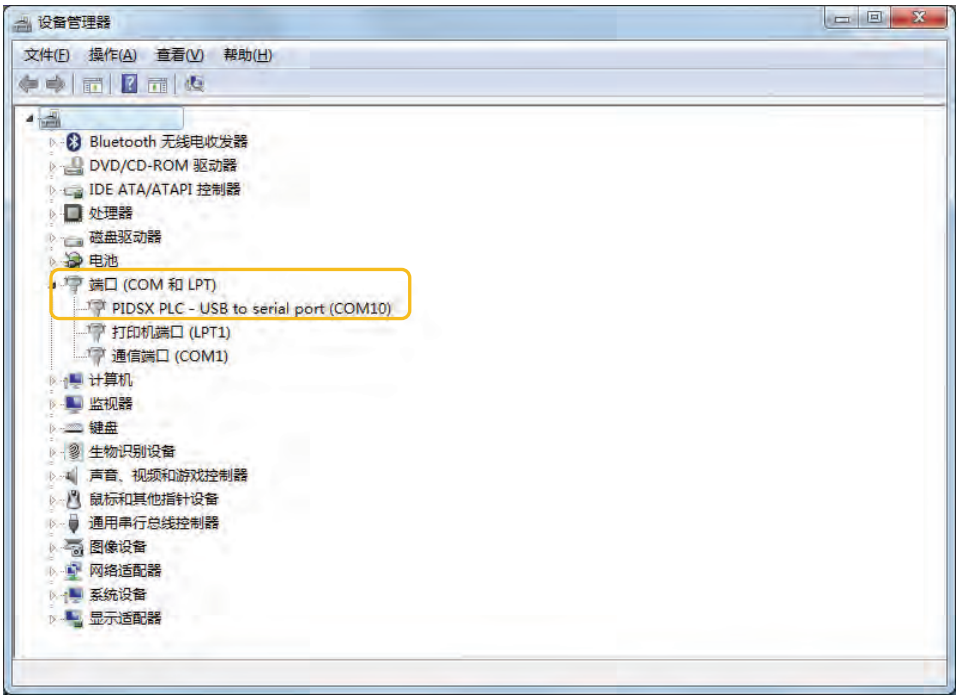


4. Confirm the port number and click [OK] button.

   Make sure the computer and the control unit can communicate.

Emphasis

- Port No. can be confirmed through the computer's device manager.



8.3.3 Overall Program Check

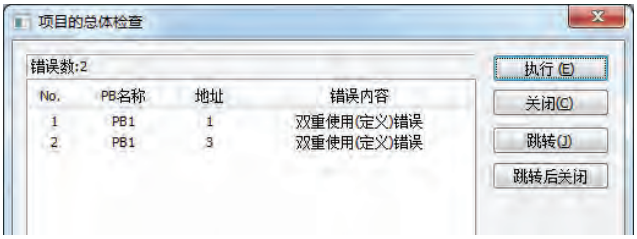
- Use the Overall Check Function of the tool software to check for syntax errors.
- You can check for dual use of the coil and match instruction (MC and MCE, JP and LBL, SUB and RET, etc.) defects.

◆ Steps

1. **Select "Online" → "Switch to Online Editing" from the menu bar.**
2. **Select "Debug" → "Overall Check of Program" from the menu bar.**

   The overall check dialog box displays.
3. **Click the [Run] button.**

   The check result displays. When there is an error, click the "Jump" button to jump to the appropriate location.



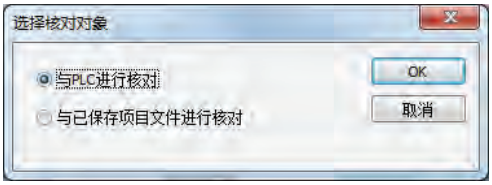
8.3.4 Program Check

To confirm that the program being edited on the computer is the same as that on the control unit controller, check it when necessary. Explain it as belows assuming that the FPWIN GR7 has been started.

◆ Steps

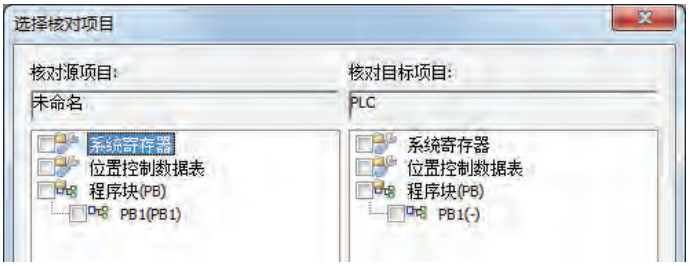
1. **Select "Online" → "Switch to Online Editing" from the menu bar.**
2. **Select "Debug" → "Program Check" from the menu bar.**

   The Program Check dialog box displays.



3. **Select the object to be checked and click the [OK] button.**

The "Select Item to Check" dialog box is displayed.



4. **Select the item and click the [Run] Button.**

The check result is displayed. Inconsistent items will be shown in peach. Then double click this item to show details.

■ **Check result**

Check contents	Example in case of inconsistency
System register	Shows inconsistent error when the setting contents of the system register are not consistent.
Position control data sheet	Shown as inconsistent error when the position control parameters and position control data sheet are different.
PB1	Displays inconsistent program block numbers.

◆ Emphasis

- **When switching from offline to online, if the program and system register are inconsistent, the message box showing the content is displayed.**

8.4 Online Editing

8.4.1 Online Editing Summary

In the FP-XH M4 control unit, even if the computer and the PLC are connected online, it can also be edited using the following conditions.

■ Online Editing

Type	Mode		Emphasis
	PROG	RUN	
Program	Possible	Possible	● For pixel input mode, up to 512 steps can be rewritten. ● To ensure the compatibility of the program, rewriting in RUN mode is conditional. ● You can download the program and all comments even in RUN mode.
Comments	Possible	Possible	● You can modify the program and comments even in RUN mode.
System register	Possible	Unavailable	● Rewriting is only possible in PROG. mode. To rewrite in RUN mode, it will show a confirmation message box to switch to PROG. mode.
Position control data	Possible	Unavailable	● Rewriting is only possible in PROG. mode. To rewrite in RUN mode, it will show a confirmation message box to switch to PROG. mode.

(Note 1): In case of online editing, although the entered comments show, you can not save them to the memory of the control unit.

8.4.2 Online Editing of the Program

WARNING	**When changing the program during operation, make sure it is safe before changing.**

■ Online Editing of the Program

You can execute online editing of the program in PROG. mode or RUN mode.

Reference

- **For details and restrictions on rewriting during RUN, refer to FP-X User Manual (No.ARCT1F409C).**

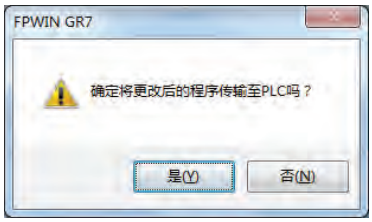
■ Block rewrite steps

You can change the program in PROG. mode or RUN mode. The following is a description of the contents being edited online by FPWIN GR7.

◆ Steps

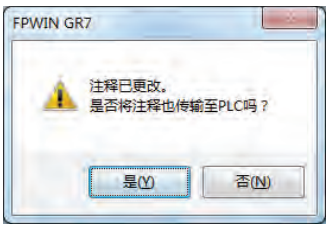
1. **After changing any program, press <Ctrl> button + <F1> button to perform PG conversion.**

   The confirmation dialog box is displayed.



2. **Click the [Yes] button.**

   The confirmation dialog box for comment change displays.



3. **Click the [Yes] button.**

   At the end of the normal conversion, the information is displayed in the status bar.

◆ Emphasis

- **The line comment is connected with the Boolean address of the program and managed within the PLC. When changing the program online, download the program to match the position of the line comment. In addition, confirm the position of the line comment address via the FPWIN GR block comment list dialog box.**

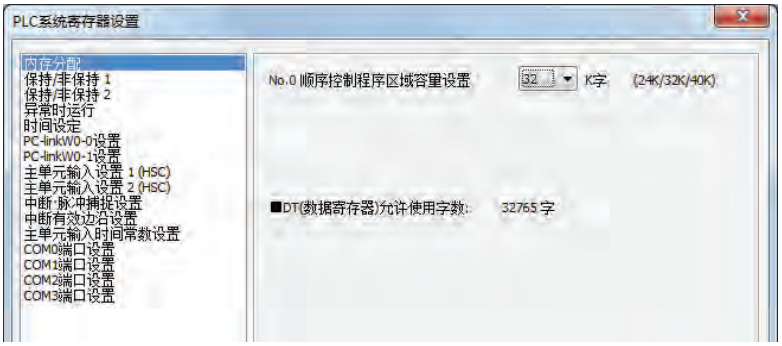
8.4.3 Online Editing of the System Register

Changing the system register is only possible in PROG. mode. The following is a description of the contents being edited online by FPWIN GR7.

Steps

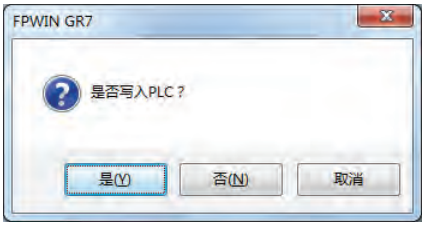
1. **In the menu bar, select "Option"→"System Register Setting".**

   The "PLC System Register Setting" dialog box is displayed.



2. **Change any system register and click [OK] button.**

   The confirmation dialog box is displayed.



3. **Click the [Yes] button.**

   The information indicating system register writing is completed shows in the PLC.

Emphasis

- **Please change the system register No.0 in PROG. mode.**

8.5 Program block

8.5.1 Program block summary

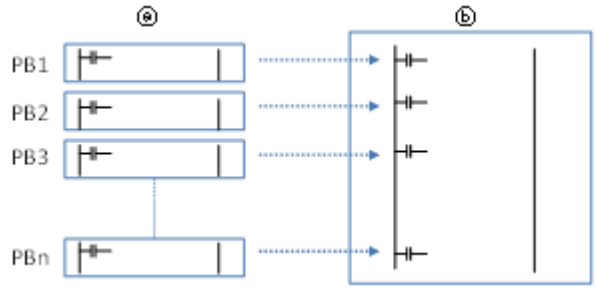
In FPWIN GR7, programs can be divided into several program blocks (PB) for edition.

■ Restrictions for program blocks (FP-XH)

Item	Description
Max. number of PBs	up to 256
Program step number of each PB	No limit

■ Execution sequence of PBs

- The PBs are executed as a program after being combined.
- Please describe only 1 ED instruction at the end of the main program. Programs before the ED instruction will be executed circularly.
- Please set the secondary programs (interruption programs, subprograms) after the ED instruction. "Match not established error" and "instruction position error" will be displayed in case of incorrect sequence.



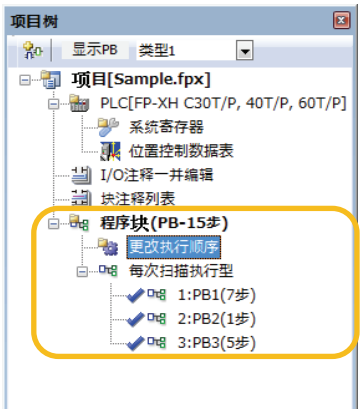
ⓐ	Program block	ⓑ	Program after PBs are connected

8.5.2 Change sequence of PBs

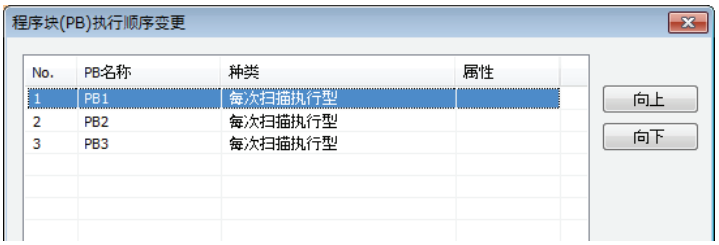
The execution sequence of PBs can be altered freely after compiling the PBs. Explain it as below assuming that the 3 PBs has been compiled.

Steps

1. **Double click "Change Execution Sequence" from the file tree.**



The "Change PB Execution Sequence" dialog box is displayed.



2. **Select the PB for which the execution sequence is to be changed, click the [Up] or [Down] button.**
3. **Click the [Yes] button.**

   The name of the PB is displayed on the file tree according to the changed execution.

9

Setting of Position Control Parameters

9.1 Assignment of axes to be used

9.1.1 Set via the Configurator PM7

Assign all channels to be used and their usage via the Configurator PM7. The following steps are performed with the Configurator PM7 that has been started as a premise.

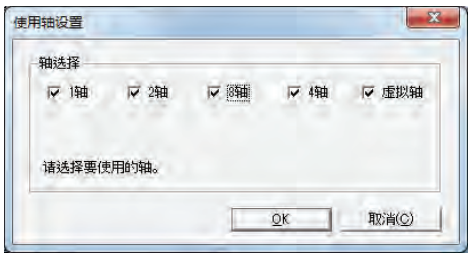
Steps

1. **Select "Options"→"Settings of the Position Control Data Sheet" from the menu bar. Or double click the "Position control data sheet" from the file tree.**

   The "Configurator PM7" configuration menu is started.

2. **Select "Axis Setting"→"Axis Change" from the menu bar.**

   The dialog box of for setting of the axis to be used appears.



3. **Select the axis to be used and click [OK].**

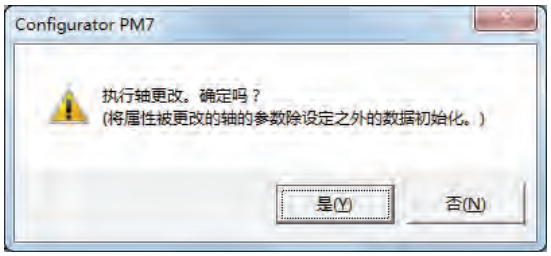
   The dialog box for setting interpolation operation group appears.

4. **Drag icons assigned to the interpolation operations to the interpolation group region.**

   The figure below shows the cases when axis 1 and axis 2 are assigned to the interpolation operation group.

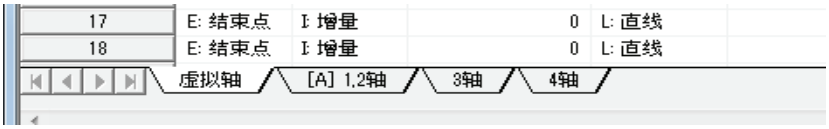
5. **Click the [OK] button.**

   The confirmation message displays.



6. **Confirm the change and click [Yes].**

   Create the data sheet tab respectively according to the set group.



Emphasis

- **After setting the interpolation group, settings for the movements of the X-axis, Y-axis or Z-axis and the interpolation operations will be added to the data sheet and displayed on the tab as group [A] and [B].**
- **Virtual axes and slave station axes under synchronized control cannot be set to the interpolation operation groups.**
- **Press × to close during the edition to cancel and exit.**

9.2 Parameter settings

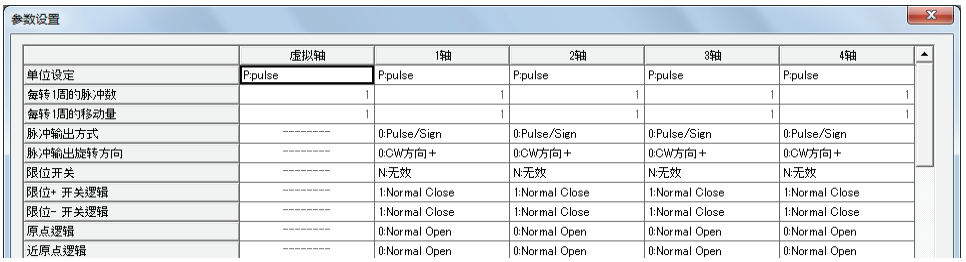
9.2.1 Set the parameters via the Configurator PM7

The most basic parameters in the position control can be assigned via the Configurator PM7, such as motor rotation direction, pulse output mode (CW/CCW, Pulse+Sign), origin input and limit input logic. The following steps are performed with the Configurator PM7 that has been started as a premise.

Steps

1. **Select "Axis Setting"→"Parameter Setting" from the menu bar.**

   The dialog box of "Parameter Settings" appears.



2. **Set the necessary parameters according to the purpose and press [OK].**
3. **Select "File"→"Save Settings" from the menu bar.**

Emphasis

- **Press × to close during the edition to cancel and exit.**

9.2.2 Parameter setting items

Parameter Name	Contents	Related Page
Unit setting	Setting units used on different axes	7.4 Confirmation of Power-on Status
Pulses per rotation	Pulses per rotation of the motor (note 1)	
Movement per rotation	Movement per rotation of the motor (note 1)	
Pulse output mode	Pulse output mode: Pulse/Sign, CW/CCW	
Pulse output rotation direction	CW+ : set to CW in the +direction of elapsed value CCW+ : set to CCW via the +direction of elapsed value	
Limit switch	Limit switch valid/invalid	
Limit + switch logic	+ direction limit switch logic	
Limit - switch logic	– direction limit switch logic	
Origin logic	Origin switch logic	14.1 Type of the origin return
Near origin logic	Near-origin switch logic	
Input Time Constant - pulse input	Time constant per pulse input signal	—
Input Time Constant - origin input	Time constant for origin input signal	
Pulse input application	Application of pulse input	17.6 Pulse input
Pulse input rotation direction	Pulse input rotation (CW/CCW) direction	
Pulse input mode	2-phase input, separate input, direction identification input	
Pulse input multiplication	Input multiplication of pulse input	
Soft limit (position control)	Soft limit valid/invalid during position control	17.2 Soft limit
Soft limit (origin return)	Soft limit valid/invalid during origin return	
Soft limit (JOG operation)	Soft limit valid/invalid during JOG operation	
Upper limit of soft limit	Upper limit of soft limit set in the software	
Lower limit of soft limit	Lower limit of soft limit set in the software	
Auxiliary output mode	Operation modes of the auxiliary output contact and auxiliary output codes	17.3 Auxiliary output
Auxiliary output ON time (ms)	Auxiliary output contact ON time (ms)	
Auxiliary output Delay ratio (%)	Ratio of output in the Delay mode during auxiliary output.	
Movement check operation	Movement check operation during movement check	17.6 Pulse input
Movement check value (Pulse)	Check threshold of movement check	
Movement check correction numerator	Execution of movement check by multiplying pulse input value by the following ratios. (Movement check correction numerator)/(movement check correction denominator)	
Movement check correction denominator		
Movement check interval (ms)	Time interval when executing movement check	

(Note 1): Only set when units are set to μm, inch or degree. Reduction of fractions with movement per rotation is required.

◆ Emphasis

- **In the control unit, as the direction of movement, the direction for increase of elapsed value is set to CW, and the direction for decrease of elapsed value is set to CCW. Therefore, limit input is limit + in the CW direction and limit−in the CCW direction.**

Parameter Name	Contents	Related Page
Startup speed	Start speed (initial speed) upon running of all	17.7 Startup speed
Origin return - reset code	Origin return mode	14.1 Type of the origin return
Origin return - reset direction	Origin return direction	
Origin return-reset acceleration time (ms)	Acceleration time upon origin return	
Origin return-reset deceleration time (ms)	Acceleration time upon origin return	
Origin return - reset target speed	Target speed upon origin return	
Origin return - reset creep speed	Speed to search the origin after near origin input	
Origin return - origin coordinates	Unit system converted to the current value after origin return	
Origin return - Deviation counter clear time (ms)	Output time of the deviation counter removal signal	
JOG run - acceleration and deceleration mode	Acceleration and deceleration mode during JOG operation	13.1 Setting and action of the JOG operation
JOG run -JOG acceleration time (ms)	Acceleration time during JOG operation	
JOG run -JOG deceleration time (ms)	Deceleration time during JOG operation	
JOG run - target speed	Target speed of JOG operation	
Emergency-stop deceleration time (ms)	Deceleration time to request for emergency-stop via the input contact	16.1 Types and settings of the stop function
Limit-stop deceleration time (ms)	Deceleration time of the deceleration during limit input	
Deceleration time upon error stop (ms)	Deceleration time of the deceleration upon error stop	
J-point - running setting code	Acceleration/deceleration mode during operation of J-point (speed point)	11.1 Basic Operations/ 11.1.5 Settings and operations of the J-point control
J-point - acceleration time (ms)	Acceleration time during operation of J-point (speed point)	
J-point - deceleration time (ms)	Deceleration time during operation of J-point (speed point)	
J point - target speed	Target speed during operation of J-point (speed point)	
Pulse generator running setting code	Pulse generator inputs (1-4) during operation of the pulse generator	17.6 Pulse input
Pulse generator input mode	Input mode during operation of the pulse generator	
Numerator of pulse generator running ratio	Multiply the pulse number of the pulse generator by the following ratio to get the number of moving pulses. (Numerator of pulse generator running ratio)/(Denominator of pulse generator running ratio)	
Denominator of pulse generator running ratio		
Max. speed of pulse generator running	Max. running speed of pulse generator	

9.3 Synchronization parameter settings, cam curve settings

9.3.1 Synchronization parameter settings

Parameters required for synchronous control are set via the Configurator PM7. The following steps are performed with the Configurator PM7 that has been started as a premise.

Steps

1. Select "Axis Setting"→"Synchronization Parameter Setting" from the menu bar.

The dialog box of "Synchronization Parameter Settings" appears.

2. Set the necessary parameters according to the purpose and press [OK].

Emphasis

- **Press × to close during the edition to cancel and exit.**

Reference

For setting of synchronous control parameters, please refer to "Chapter 12 Free running (synchronous control)".

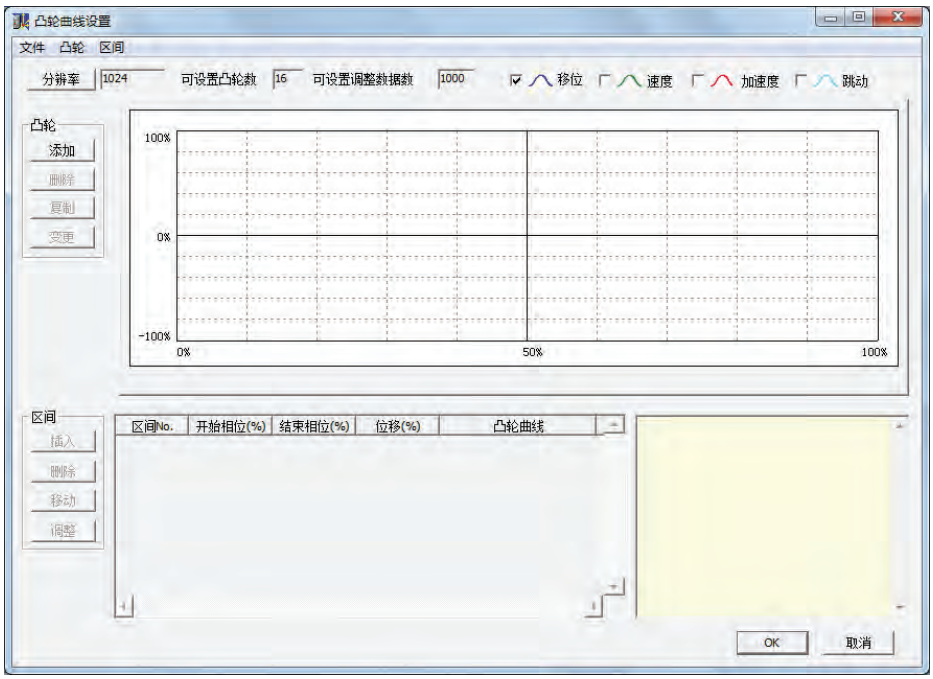
9.3.2 Cam curve settings

Electronic cam settings are required when using electronic cam Required parameters are set via the Configurator PM7. The following steps are performed with the Configurator PM7 that has been started as a premise.

Steps

1. **Select "Axis Setting"→"Cam Curve Setting" from the menu bar.**

   The dialog box for cam curve settings appears.



2. **Set the necessary parameters according to the purpose and press [OK].**
3. **Select "File"→"Save Settings" from the menu bar.**

Emphasis

- **The saved parameters can be read on the Configurator PM7.**
- **During synchronous control, basic input and output parameters will also operate according to "9.2 Parameter settings".**

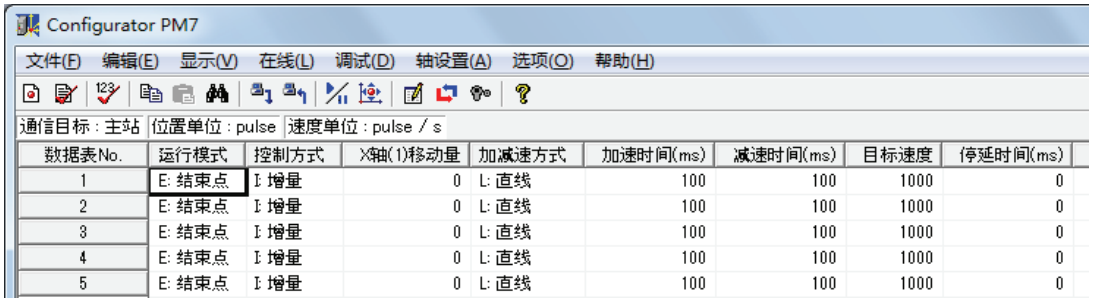
9.4 Creating the position control data sheet

9.4.1 Structure of the position control data sheet

The Position Control Data Sheet are assigned via the Configurator PM7. The following steps are performed with the Configurator PM7 that has been started as a premise.

■ Initial display of the Configurator PM7

- The form is assigned by each axis to set data sheets.



■ Setting items

Parameter Name	Contents
Operation Mode	Select any one of the following operation modes. E-Point: trapezoid control of 1 data sheet C-Point: continuous trapezoid control E-point is specified at the end of C-point control. P-Point: continuous speed change control. E-point is specified at the end of P-point control. J-point: speed change) E-point is specified at the end of J-point control.
Control mode	Select any one of the increment and the absolute values.
X-axis movement amount	Input the movement of the X-axis. The movement unit system is specified via parameter setting.
Acceleration and deceleration mode	Select the acceleration and deceleration mode
Acceleration time (ms)	Set the acceleration time. Set the unit to ms.
Deceleration time (ms)	Set the deceleration time. Set the unit to ms.
Target speed	Set the target speed. Set the units to pps, μm/s, inch/s and rev/s.
Dwell time (ms)	Set the time from the end of the position instruction in the E-point control to the end of the position control completion marked with ON. The dwell time is the waiting time between data sheets in the C-point control. In P-point control, the dwell time is ignored.
Auxiliary output	Set the auxiliary output code. When auxiliary output is enabled in parameter settings, the auxiliary output code set here will be outputted.
Comments	Any comment can be inputted in the data sheets.

(Note 1): Details of parameter settings are displayed in the navigation bar.

(Note 2): When the interpolation control is selected, items like interpolation, Y-axis and Z-axis movements, X-axis auxiliary point, Y-axis auxiliary point, Z-axis auxiliary point and interpolation speed will also display.

9.4.2 Select type of position control data setting region

The position control data setting regions are classified into the 600-point standard region and the 25-point extension region with the features shown in the following table. Please use this function according to the applications.

■ Comparison between the standard region and the extension region

Item	Standard region	Extension region
Position control data sheet number	600 Data Sheets	25 Data Sheets +75 Data Sheets (Note 3)
Data sheet No.	1-600	10001-10100 (Note 3)
Position control parameters are set via the Configurator PM7 (note 1)	Optional	Optional
Position control data are set via the Configurator PM7 (note 2)	Optional The set data will be downloaded to the control unit along with programs and other file data. The position control data will be calculated to make the operations available to start when the power is turned on or the control unit enters the RUN mode.	Unavailable
Position control data are set by user program (Note 2)	Optional Send the data to the region of position control storage via user program to send request for recalculation and make the operations available to start.	Optional Send the data to the region of position control storage via user program to make the operations available to start. Recalculation request is not required.
Characteristics	Compared with using the extension region, starting by presetting the position control data via the Configurator PM7 is faster.	Compared with using the standard region, starting by setting the position control data via user program is faster.
Usage	Applications where position control data like movement and target speed are preset.	Applications where position control data change with the results of PLC operation.

(Note 1): Position control parameters mean JOG operation and origin return conditions, limit input logic, deceleration time upon stop, etc.

(Note 2): Position control parameters mean movement, target speed, acceleration/deceleration time, running mode and other individual position control operation information.

(Note 3): Data sheets No.10026-10100 are supported by control units above Motion CPU Ver.1.50.

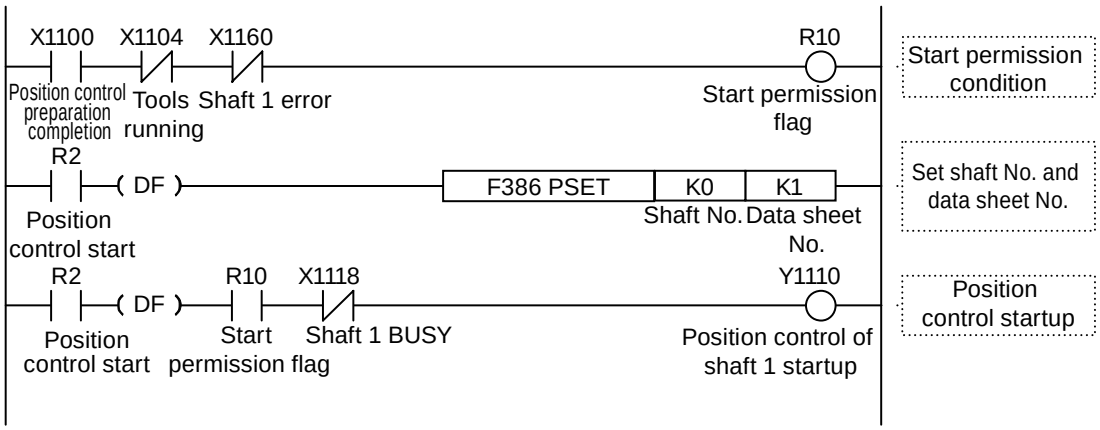
■ Reconstruction calculation of standard region

After altering the position control data region with user program, reconstruction calculation (recalculation) is required. If no recalculation is conducted after altering the position control data sheets with program, the position control data sheets with operate as before the altering. The recalculation should follow the steps below.

1. Change the position control data sheet on the position control storage
2. Set the recalculation signal (Y1107) of the I/O region to ON
3. Confirm the recalculation signal (Y1107) of the I/O region and start any operation

9.4.3 Data sheet No. and position control startup

- The data sheet No. of the Configurator PM7 is specified via the PSET instruction in the user program.
- After specifying the axis No. and data sheet No. with the PSET instruction, when the corresponding position control starting point of is ON, execute control according to the settings in the data sheet.

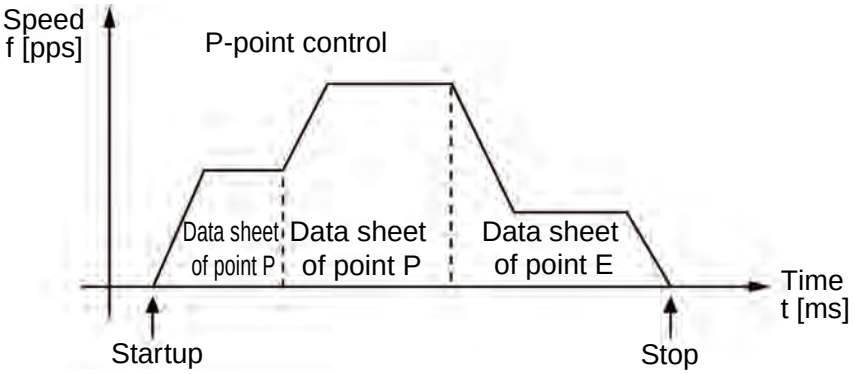


9.4.4 Running Mode and Data Sheet

- Multiple data sheets are used when the position control mode is P-point control (speed change control), C-point control (continuance point control) or J-point control (JOG position control).
- When executing such controls, the data sheets will be continuously created in the Configurator PM7, and select "E-point Control" for the operation mode for the final data sheet.
- Specify the starting data sheet No. of each control in the program.

Eg.) During P-point control (speed change control)

Create 3 position control data sheets and select "E: End Point" for the final data sheet. In addition, start the initial data sheet No. from the user program.



数据表No.	运行模式	控制方式	X轴(虚拟)移动量	加减速方式
1	P: 通过点	I: 增量	50000	L: 直线
2	P: 通过点	I: 增量	100000	L: 直线
3	E: 结束点	I: 增量	30000	L: 直线

◆ Reference

For control details, please refer to Chapter "Chapter 11 Free running (Position Control)".

9.5 Saving parameters

9.5.1 Saving and reading parameters

- The set basic parameters and position control parameters can be saved to and read from the Configurator PMX.
- Parameters and position control data sheet information saved can be used repeatedly in multiple units and files.

Steps

1. **Select "File"→"Save Settings" from the menu bar.**

   The save location and file name appear.

2. **Input the save path and file name, and press [Save].**

   Parameter information and position control data sheet information are saved as files with an extension of ".pm7". Saved files may be read by "File" →"Read Settings".

Emphasis

- **After saving the settings, information to be set via the parameter setting menu are also saved with the position control data sheet information.**
- **Press × to close during the edition to cancel and exit.**

10

Send parameter information to the controller and start test run

10.1 Confirmation of setting contents

10.1.1 Data check of parameters

- The following steps are performed with the Configurator PM7 that has been started as a premise.

◆ Steps

1. **Select "Debug" →"Check Parameters and Data Values" from the menu bar.**

   A message box appears to notify the check results. If an error occurs to the setting contents of the position control data sheet, the cursor will be moved to the appropriate location with the message displayed.

10.1.2 Parameter information check

- The parameters being edited and saved can be checked in Configurator PM7. The following steps are performed with the Configurator PM7 that has been started as a premise.

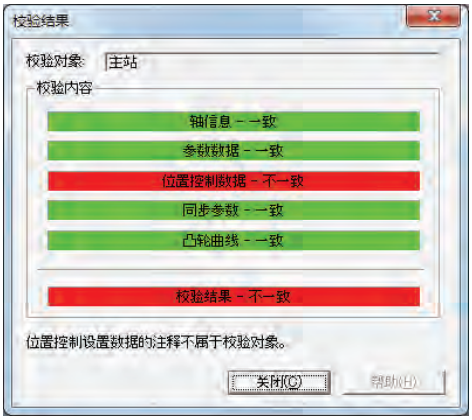
◆ Steps

1. **Select "Debug" → "Check"→"File" or "PLC" from the menu bar.**

   After selecting the file, the "Select File to Check" dialog box appears. After selecting PLC, the parameters being edited and configuration information saved in the PLC can be compared in Configurator PM7, and then the results are displayed.

2. **Select the file from the "Select File to Check" dialog box and click the [OK] button.**

   Compare the parameters being edited and configuration information saved in the PLC in Configurator PM7, and then display the results.


校验结果
校验对象: 主站
校验内容
轴信息 - 一致
参数数据 - 一致
位置控制数据 - 不一致
同步参数 - 一致
凸轮曲线 - 一致
校验结果 - 不一致
位置控制设置数据的注释不属于校验对象。
关闭(C)
帮助(H)

10.2 Transfer of parameters

10.2.1 Write parameters to the unit

- Transfer the set parameter information into the unit together with other configuration information as part of the file information.
- The following steps are performed with the Configurator PM7 that has been started as a premise.

◆ Steps

1. **Select "File"→""Finish" from the Configurator PM7 menu bar.**
2. **"Apply setting data?" After a message appears, click [Yes (Y)].**
3. **Select "Online"→"Download to PLC" (whole file) from the menu bar of FPWIN GR7.**

   Download the position control parameters to the control unit together with programs and other configuration information.
4. **Set the control unit as RUN mode.**

   Configuration information takes effect in the unit to enter the status available to test run via I/O signals or Configurator PM7.
5. **Select "Options"→"Settings of the Position Control Data Sheet" from the menu bar.**

   Configurator PM7 is started. Select [Online]→[Data Monitoring], [Status Display], [Run Tools] to enter the status available to execute different menus of the unit.

◆ Emphasis

- **When using FP-XH M4 control unit, you can upload and download parameters and position control data via Configurator PM7.**

10.3 Monitor via the Configurator PM7

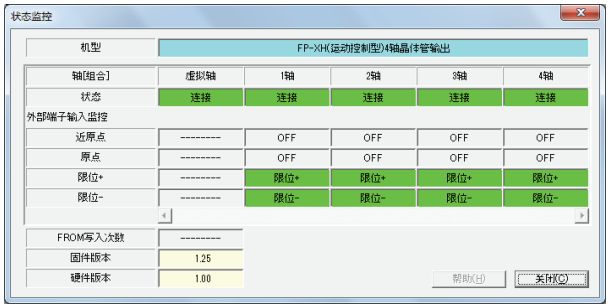
10.3.1 Status display

- Monitors the connection status of each axis and the input status of each external terminal.
- The following steps are performed with the Configurator PM7 that has been started as a premise.

Steps

1. Select "Online" → "Status Display" from the menu bar.

Displays the status monitoring dialog box.



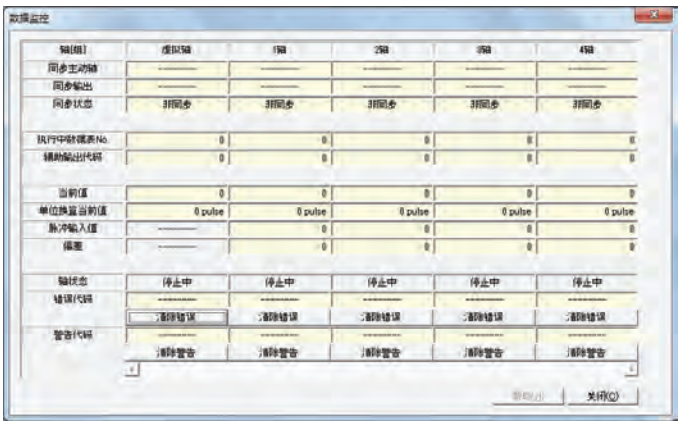
10.3.2 Data monitoring

- Monitors the connection status of each axis and the input status of each external terminal.

Steps

1. **Select "Online" → "Status Display" from the menu bar.**

   The data monitoring dialog box displays.



■ Item monitoring

Item	Contents	Related Page
Synchronization of the main station axis	When set as the main station axis, "Main Station" will be displayed. When set as the slave station axis, the main station axis based on such axis will be displayed. E.g.) When axis-2 is set to be a slave station following axis-1 as the main station, "axis-1" will be displayed in the line of axis-2". Axes not used for synchronized control will be displayed as [--------].	12.1 Synchronous Control
Synchronized output	Displays the synchronous running function set to the slave axis. Gear, clutch, cam gear+clutch, gear+cam, clutch+cam gear+clutch+cam Axes not used for main station axis and synchronized control will be displayed as [--------].	
Synchronization status	Displays the set status (synchronous/non-synchronous) of each axis.	
No. of data sheets in execution	No. of data sheets being executed or executed by position control data	9.4 Creating the position control data sheet
Auxiliary output code	When auxiliary output is enabled, the output codes are outputted within the scope of 0-65536.	17.3 Auxiliary output
Current value	Displays the current value of the control unit. "0" upon origin return	17.4 Origin coordinates 17.5 Current value update
Current value after unit conversion	Displays the current value of the control unit after unit conversion. "0" upon origin return If the origin coordinates are set, the coordinates will be preset to the origin coordinates upon return completion.	
Pulse input value	When the pulse input function is enabled, the inputted pulse values display. "0" is displayed for virtual axis or when the function is disabled.	17.6 Pulse input
Deviation	The deviation value is displayed when the movement auto check is enabled. "0" is displayed for virtual axis or when the function is disabled.	
Axis status	Displays running or stopping. "Error" is displayed in case of an error.	
Error code	The latest error code is displayed in case of an error. Click [Clear Error] to remove the error.	19.3 Error Code List
Warning code	The latest warning code is displayed in case of a warning. Click [Clear Warning] to clear the warning.	19.4 Warning Codes List

◆ CAUTION!

- **Click [Clear Error] to clear the error upon recoverable error of the control unit.**
- **Click [Clear Warning] to clear the warning upon warning of the control unit.**

10.4 Running tools

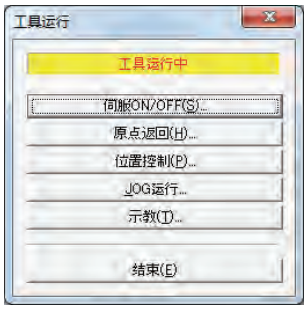
10.4.1 Tools running function

- In the Configurator PM7, a test run can be performed via the tool software before actually starting the user program.
- Make sure to save the settings to download the file to the control unit before running the tools.
- The following steps are performed with the Configurator PM7 that has been started as a premise.

Steps

1. **Select "Online" → "Running Tools" from the menu bar.**

   The dialog box for tools running displays.



■ **Types of tools running**

Item	Contents
Servo ON/OFF	Specifies servo ON/OFF of each axis.
Origin return	Executes origin return to the origin of the mechanical coordinates according to the parameter values
Position Control	Operates according to the settings in the position control data sheet from the start data sheet No.
JOG operation	Specified axis moves towards specified direction at specified speed when the operation instruction is ON.
Demonstration	Manually control the axis according the operation the same to the JOG operation to reflect the position address of the control result to the data edition menu.

Emphasis

- **It can not be converted to tools running when running in the user program.**
- **The request for I/O signal operation is invalid during tools running**
- **In case of communication exception during tools running, the control unit will detect the exception and automatically stop.**
- **The tools running mode will be canceled forcibly at the next startup if it is stopped upon exception due to causes like communication exception.**

10.4.2 Servo ON/OFF based on tools running function

The following steps are performed with the Configurator PM7 that has been started as a premise.

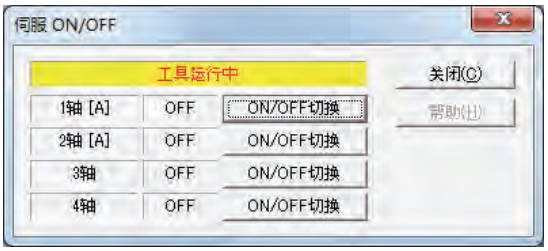
Steps

1. **Select "Online" → "Running Tools" from the menu bar.**

   The dialog box for tools running displays.

2. **Select "Servo ON/OFF" from the "Tools Running" dialog box.**

   Displays the "Servo ON/OFF" dialog box.



3. **Press the [ON/OFF] button of any axis.**

   The Serve ON/Serve OFF status is switched.

4. **Confirm the Servo ON/OFF of any axis and press the [Close] button.**

   Return to the "Tools Running" dialog box.

Emphasis

- **When controlling the Servo ON/OFF status with the ladder diagram program, the Servo Locked of OFF status before start of tools running can be maintained for conversion to tools running.**
- **Even if the user exits from the tools running mode, Servo Locked of OFF status before start of tools running will still be maintained.**

10.4.3 Execute JOG operation with the tools running function

- In the Configurator PM7, a test run is allowed before actually starting the user program.
- The following steps are performed with the Configurator PM7 that has been started as a premise.

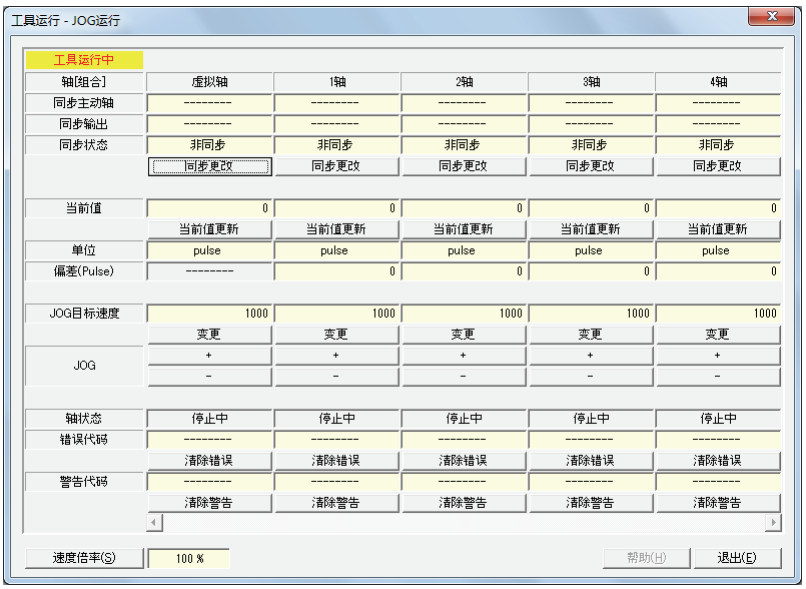
Steps

1. **Select "Online" → "Running Tools" from the menu bar.**

   The dialog box for tools running displays.

2. **Select "JOG operation" from the Tools Running dialog box.**

   The dialog box for tools running - JOG operation is displayed.



3. **Press the [+] or [-] button in the field of JOG.**

   Execute JOG operation.

4. **Upon completion of JOG operation, click the [Finish] button.**

Emphasis

- **Click [Clear Error] to clear the error upon recoverable error of the control unit.**
- **Click [Clear Warning] to clear the warning upon warning of the control unit.**
- **This dialog box cannot be closed during the operation.**

■ Dialog box items

Item	Contents	Related Page
Synchronization of the main station axis	When set as the main station axis, "Main Station" will be displayed. When set as the slave station axis, the main station axis based on such axis will be displayed. E.g.) When the 2-axis is set to be a slave station following the 1-axis as the main station, "1-axis" will be displayed in the line of 2-axis". Axes not used for synchronized control will be displayed as [--------].	12.1 Synchronous Control
Synchronized output	Displays the synchronous running function set to the slave axis. Gear, clutch, cam gear+clutch, gear+cam, clutch+cam gear+clutch+cam Axes not used for main station axis and synchronized control will be displayed as [--------].	
Synchronization status	Displays the set status (synchronous/non-synchronous) of each axis.	
Current value	Monitors the feedback values of various axes after unit conversion. Press the [Update Current Value] button to display the value input dialog box, which allows change of the current value.	17.5 Current value update
Unit	Displays the position units of different axes set in parameter settings.	
Deviation (Pulse)	The deviation value is displayed when the movement auto check is enabled. "0" is displayed for virtual axis or when the function is disabled.	17.6Pulse input
JOG target speed	Monitors and displays the target speed of JOG operation. Click the [Change] button to change the target speed of JOG operation.	13.1 Setting and action of the JOG operation
JOG [+]	Click the [+] button to execute JOG forward running.	
JOG [–]	Click the [-] button to execute JOG backward running.	
Axis status	Displays running or stopping. "Error" is displayed in case of an error.	
Error code	The latest error code is displayed in case of an error. Click [Clear Error] to remove the error.	19.3 Error Code List
Warning code	The latest warning code is displayed in case of a warning. Click [Clear Warning] to clear the warning.	19.4 Warning Codes List
Speed Multiplier	It allows setting the target speed of JOG operation of different axes set in parameter settings as 100% to specify the speed multiplier operation. Click the [Speed Multiplier] button to display the value input dialog box.	

10.4.4 Execute origin return with tools running

- When the power is on, the coordinates of the origin of the mechanical position is inconsistent with that of the control unit. Please execute origin return before starting position control operation.
- In the Configurator PM7, a test run is allowed before actually starting the user program.
- The following steps are performed with the Configurator PM7 that has been started as a premise.

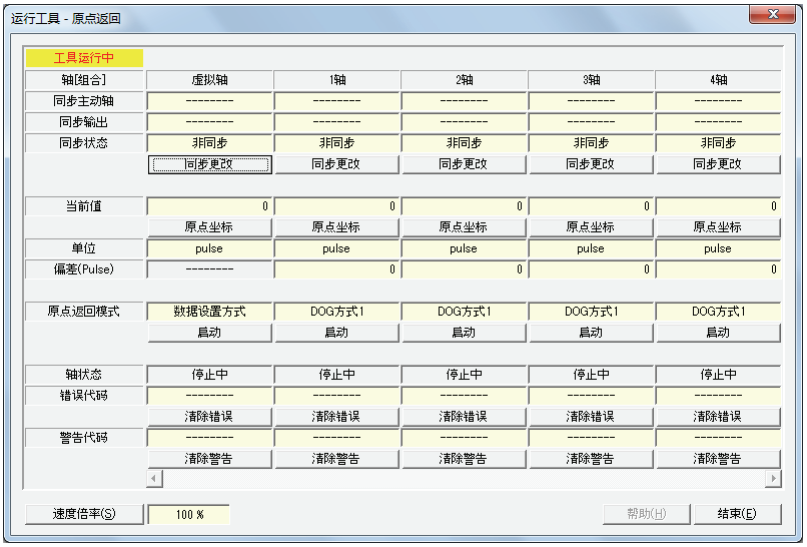
Steps

1. **Select "Online" → "Running Tools" from the menu bar.**

   The dialog box for tools running displays.

2. **Select "Origin Return" from the Tools Running dialog box.**

   The dialog box for tools running - origin return displays.



3. **Click the [Start] button of the axis to be subject origin return.**

   Execute origin return.

4. **Upon completion of origin return, click the [Finish] button.**

Emphasis

- **Click [Clear Error] button to clear the error upon recoverable error of the control unit.**
- **Click [Clear Warning] to clear the warning upon warning of the control unit.**
- **This dialog box cannot be closed during the operation.**

■ Dialog box items

Item	Contents	Related Page
Synchronization of the main station axis	When set as the main station axis, "Main Station" will be displayed. When set as the slave station axis, the main station axis based on such axis will be displayed. E.g.) When axis-2 is set to be a slave station following axis-1 as the main station, "axis-1" will be displayed in the line of axis-2". Axes not used for synchronized control will be displayed as [--------].	12.1 Synchronous Control
Synchronized output	Displays the synchronous running function set to the slave axis. Gear, clutch, cam gear+clutch, gear+cam, clutch+cam gear+clutch+cam Axes not used for main station axis and synchronized control will be displayed as [--------].	
Synchronization status	Displays the set status (synchronous/non-synchronous) of each axis.	
Current value	Displays the current value of the axes after unit conversion. Click [Origin Coordinates] to display the value input dialog box to change the value after origin return.	17.4 Origin coordinates 17.5 Current value update
Unit	Displays the position units of different axes set in parameter settings.	
Deviation (Pulse)	The deviation value is displayed when the movement auto check is enabled. "0" is displayed for virtual axis or when the function is disabled.	17.6 Pulse input
Origin return mode	Displays the content of origin return setting code that logs in to the position control settings data	14.1 Type of the origin return
Start/stop	Executes Start/Stop operation of origin • Click the [Start] button to execute origin return, and the button name is changed to [Stop]. • Press the [Stop] button to execute deceleration stop, and the button name is changed to [Stop].	
Axis status	Displays running or stopping. "Error" is displayed in case of an error.	
Error code	The latest error code is displayed in case of an error. Click [Clear Error] to remove the error.	19.3 Error Code List
Warning code	The latest warning code is displayed in case of a warning. Click [Clear Warning] to clear the warning.	19.4 Warning Codes List
Speed Multiplier	It allows setting the target speed of origin return of different axes set in parameter settings as 100% to specify the speed multiplier operation. Click the [Speed Multiplier] button to display the value input dialog box.	

10.4.5 Executing position control with tools running

Specify the start data sheet No. with the tools running function and confirm whether the position control can operate correctly from the start data sheet.

Steps

1. **Select "Online" → "Running Tools" from the menu bar.**

   The dialog box for tools running displays.

2. **Select "Position Control" from the "Tools Running" dialog box.**

   The dialog box for tools running-position control displays.

3. **Press the [Change] button below the field of the start data sheet No.**

   The dialog box for setting start data sheet No. appears.

4. **Input the Start Data sheet No.**

5. **Press the [RUN] button.**

   Execute start position control from the specified data sheet No.

6. **Press the [Finish] button upon completion of position control.**

■ Dialog box items

Item	Contents	Related Page
Synchronization of the main station axis	When set as the main station axis, "Main Station" will be displayed. When set as the slave station axis, the main station axis based on such axis will be displayed. E.g.) When axis-2 is set to be a slave station following axis-1 as the main station, "axis-1" will be displayed in the line of axis-2". Axes not used for synchronized control will be displayed as [--------].	12.1 Synchronous Control
Synchronized output	Displays the synchronous running function set to the slave axis. Gear, clutch, cam gear＋clutch, gear＋cam, clutch＋cam gear＋clutch＋cam Axes not used for main station axis and synchronized control will be displayed as [--------].	
Synchronization status	Displays the set status (synchronous/non-synchronous) of each axis.	
Current value	Monitors the feedback values of the axes after unit conversion. Click the [Update Current Value] button to display the value input dialog box, which allows to update the current value.	17.5 Current value update
Unit	Displays the position units of different axes set in parameter settings.	
Deviation (Pulse)	The deviation value is displayed when the movement auto check is enabled. "0" is displayed for virtual axis or when the function is disabled.	17.6 Pulse input
No. of data sheet in execution	Displays No. of data sheets being executed or executed	9.4 Creating the position control data sheet
Start data sheet No.	Start data　sheet No. of position control Click the [Change] button to change the start data　sheet No. .	
RUN/Stop	Executes RUN/Stop operation of position control • Click the [RUN] button to execute position control, and the button name is changed to [Stop]. • Press the [Stop] button to execute deceleration stop, and the button name is changed to [RUN].	
Axis status	Displays running or stopping. "Error" is displayed in case of an error.	
Error code	The latest error code is displayed in case of an error. Click [Clear Error] to remove the error.	19.3 Error Code List
Warning code	The latest warning code is displayed in case of a warning. Click [Clear Warning] to clear the warning.	19.4 Warning Codes List
Speed Multiplier	It allows setting the target speed of JOG operation of different axes set in parameter settings as 100% to specify the speed multiplier operation. Click the [Speed Multiplier] button to display the value input dialog box.	

Emphasis

- Position control operation needs to download the set data to the control unit in advance. Operations behind the start data sheet No. vary according to the running modes.
- Click [Clear Error] to clear the error upon recoverable error of the control unit.
- Click [Clear Warning] to clear the warning upon warning of the control unit.
- Position control operation of interpolation operation groups is to start to stop the axis with the minimum number in the program group. During tools running, click the [RUN] button of any axis to start position control, except that when the [RUN] button of an axis beyond the axis with the minimum number is clicked, warning message will appear.
- This dialog box cannot be closed during the operation.
- Changes in the conditions during tools running will temporarily update the position controller for running, but will not be reflected in the configuration data written in the control unit. Therefore, when switch to the RUN mode again, it will be started according to the configuration data downloaded to the control unit.

10.4.6 Demonstration with tools running

It is allowed to manually operate the axes with tools running and take the position address where the axis is stopped as point data for login.

Steps

1. **Select "Online" → "Running Tools" from the menu bar.**

   The dialog box for tools running displays.

2. **Select "Demo" from the Tools Running dialog box.**

   The dialog box for tools running - demonstration displays.

3. **Stop at the position control point via JOG operation.**

4. **Press the [Demo] button.**

5. **Input the No. of data sheet to input the login position information, and click the [OK] button.**

   Register the current value to the movement of the specified data sheet No.. In addition, when the axis of demonstration is used as the interpolation axis, register the current value to the movement of the corresponding coordinates in the interpolation group.

6. **Upon completion of demonstration, click the [Finish] button.**

Emphasis

- Click [Clear Error] to clear the error upon recoverable error of the control unit.
- Click [Clear Warning] to clear the warning upon warning of the control unit.
- After the demonstration, the control mode of the data sheet after demonstration will be automatically changed to "absolute value".
- Upon completion of tools running and after the settings data are downloaded to the control unit, the demonstration result will take effect.
- This dialog box cannot be closed during the operation.

■ Dialog box items

Item	Contents	Related Page
Synchronization of the main station axis	When set as the main station axis, "Main Station" will be displayed. When set as the slave station axis, the main station axis based on such axis will be displayed. E.g.) When axis-2 is set to be a slave station following axis-1 as the main station, "axis-1" will be displayed in the line of axis-2". Axes not used for synchronized control will be displayed as [--------].	12.1 Synchronous Control
Synchronized output	Displays the synchronous running function set to the slave axis. Gear, clutch, cam gear+clutch, gear+cam, clutch+cam gear+clutch+cam Axes not used for main station axis and synchronized control will be displayed as [--------].	
Synchronization status	Displays the set status (synchronous/non-synchronous) of each axis.	
Current value	Monitors the feedback values of various axes after unit conversion. Press the [Update Current Value] button to display the value input dialog box, which allows change of the current value.	17.5 Current value update
Unit	Displays the position units of different axes set in parameter settings.	
Deviation (Pulse)	The deviation value is displayed when the movement auto check is enabled. "0" is displayed for virtual axis or when the function is disabled.	17.6 Pulse input
JOG target speed	Monitors and displays the target speed of JOG operation. Click the [Change] button to change the target speed of JOG operation.	13.1 Setting and action of the JOG operation
JOG [+]	Click the [+] button to execute JOG forward running.	
JOG [-]	Click the [–] button to execute JOG backward running.	
Data sheet No.	Displays the data sheet No. of demonstration an press the [Demo] button to change the data sheet No. of demonstration and register the current value.	9.4 Creating the position control data sheet
Axis status	Displays running or stopping. "Error" is displayed upon error.	
Error code	The latest error code is displayed in case of an error. Click [Clear Error] to remove the error.	19.3 Error Code List
Warning code	The latest warning code is displayed in case of a warning. Click [Clear Warning] to clear the warning.	19.4 Warning Codes List
Speed Multiplier	It allows setting the target speed of origin return of different axes set in parameter settings as 100% to specify the speed multiplier operation. Click the [Speed Multiplier] button to display the value input dialog box.	

10.5 Monitors the current value via program

10.5.1 Current value field

- Store it as 2-word 32-bit data in the axis information region of the position control storage.
- When the power turns to OFF, the process value area resets. Hold it when RUN is switched to the PROG. mode.

■ **Counting range of the process value (current value) region**

Division	Range
Independent axis control	-1,073,741,824-1,073,741,823
Interpolation axis control	-8,388,608-+8,388,607

10.5.2 Reading of the current value

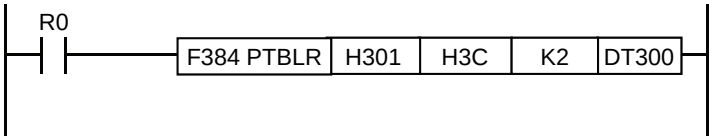
Perform reading according to the reading instruction for the [F384 PTBLR] position control parameters.

■ **Instruction Format**

Operation Number	Setting Contents	Specify reading of the process value region	
S1	Specify the axis number and position control storage region	H1 H101 H201 H301 H701	Specify the axis information region of axis-1 Specify the axis information region of axis-2 Specify the axis information region of axis-3 Specify the axis information region of axis-4 Specify the axis information region of the virtual axis
S2	Saves the starting address of the position control storage (offset address)	H3C H3E	Current value (Pulse) Unit converted into the current value (pulse/μm/inch/degree)
n	Read the number of words	K2	Specify the word 2
D	Save the operational storage of the read data	Specify any storage.	

■ Example program

It represents the situation when axis-4 process value (current value) is read into the data registers DT300-DT301. For details about the instructions, please refer to "Chapter 18 Instruction Word Reference".



■ Current value and unit converted into the current value

Offset Address	Description
H3C	Unit: Pulse The current value based on the mechanical origin and is saved in the unit of pulse. reset to "0" upon origin return. The value will not be updated even if the Update Current Value function is executed.
H3E	Unit: pulse/μm/inch/degree Saves the current value based on the electrical origin. Save the value converted to the selected unit system (pulse, μm, inch and degree) in the setting region of different axes. After origin return, the values set as the origin coordinates will be saved. It will be reset to "0" when the value saved in the origin coordinates is "0". This region will be updated when using the Update Current Value function.

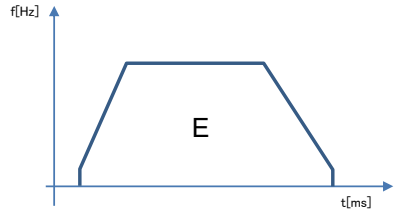
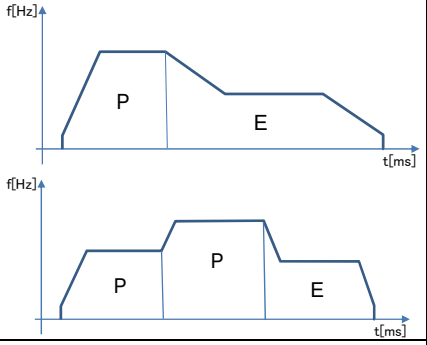
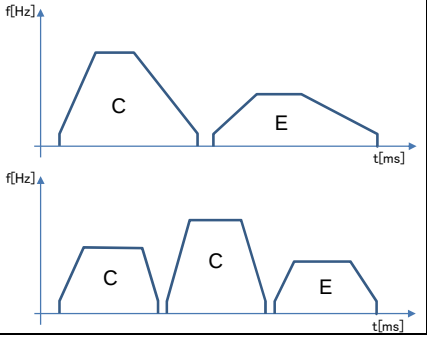
11

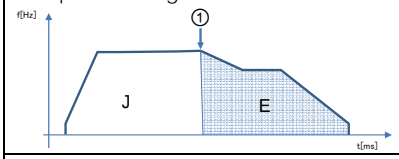
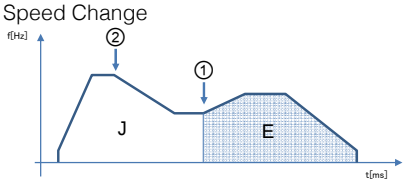
Free running (Position Control)

11.1 Basic Operations

11.1.1 Position Control Mode

■ Operation Mode

Name	Real-time Charts	Actions and Purposes	Repetition	Interpolation
E-point Control		● Moving to the end point is called "E-point Control". ● Use this method for the 1-speed acceleration and deceleration control.	●	●
P-point Control		● Controlling via the pass point is called "P-point Control". ● Use this method for the 2-speed acceleration and deceleration control. ● When the P-point control is started, it will be switched to the E-point control after the pulse output is performed based on the specified movement amount.	●	●
C-point Control		● Controlling via the continuance point is called "C-point Control". ● Use this method for two continuous 1-speed position controls corresponding to the target speed, acceleration and deceleration time. ● The time switching to the E-point control from the C-point control is specified as the dwell time.	●	●

Name	Real-time Charts	Actions and Purposes	Repetition	Interpolation
J-point Control	No Speed Change  Speed Change  	● Controlling via the speed point (JOG Operation Point) is called "J-point Control". ● Perform control at the set speed after startup. ● Start the position control when the J-point position control contact is in ON. ● Change speed when the J-point speed change mark is set ① Position control contact of Point J ② Speed change mark of Point J	—	—

■ Selection of the position control operation mode

Select the position control operation mode via the Configurator PM7.

- Input the mode in 1 line of the E-point control.
- During continuous input of data sheets with P point control, C point control and J point control, executes combined input to make the final data sheet adopt E-point control.

Emphasis

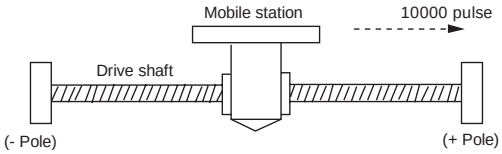
- **When using P: passing point, C: continuance point, J: the next line of the speed point is not selected and E: end point, detect the self-diagnostic error.**

■ Setting the J-point control

- Only select the "Increment" with the J-point control.
- Set the changed target speed in the dialog box of the position control parameters for the speed change with the J-point control.

11.1.2 Settings and operations of the J-point control

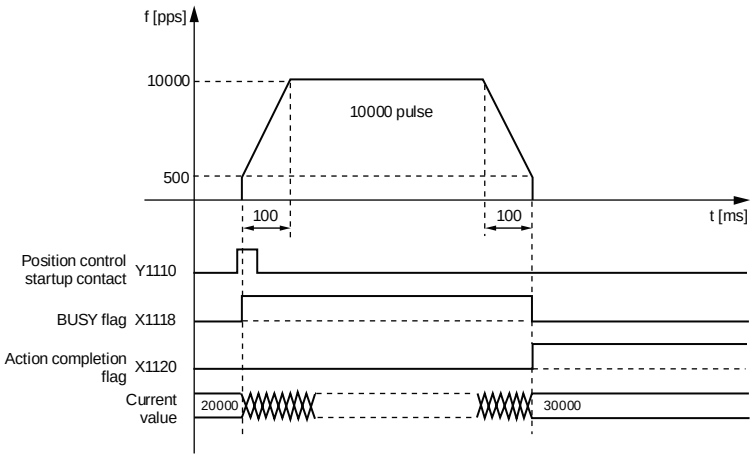
The following example is explained with the independent axis control of axis-1. Set the movement amount as the increment mode and the unit as pulse.



■ Setting Contents

Item	Setting Example
Operation Mode	E: end point
Control mode	I: increment
X-axis movement amount	10,000 pulse
Acceleration and deceleration mode	L: linear
Acceleration time (ms)	100 ms
Deceleration time (ms)	100 ms
Target speed	10000 pps

■ Action Chart

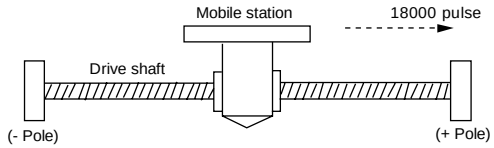


■ Action of each contact

- It indicates that the BUSY mark (X1118) of the motor under operation is in ON at the beginning and then OFF at the end of operation.
- It indicates that the action completion mark (X1120) is in ON at the end of operation, and has been holden to any action from the next position control, JOG operation, origin return and pulse generator operation for startup. The timing for turning ON is after the instruction for the unit to be send to the target position.

11.1.3 Settings and operations of the P-point control

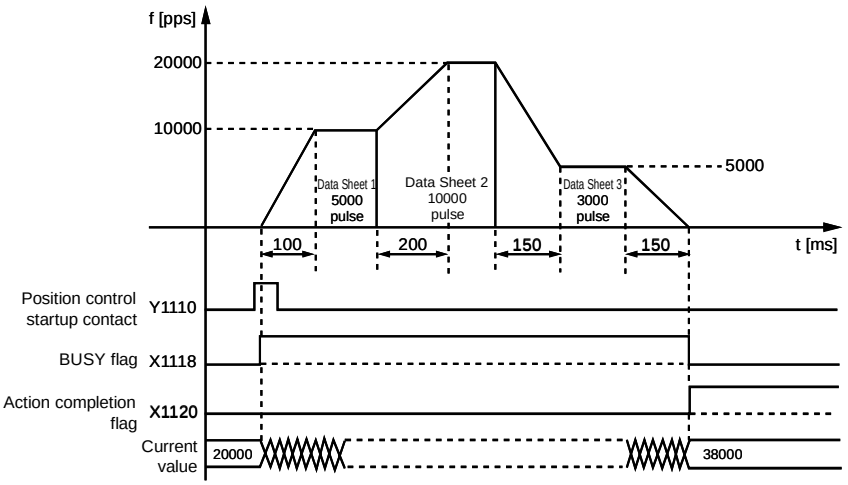
The following example is explained with the independent axis control of axis-1. Set the movement amount as the increment mode and the unit as pulse.



■ Setting Contents

Item	Setting Example		
	Data Sheet 1	Data Sheet 2	Data Sheet 3
Operation Mode	P: Passing Point	P: Passing Point	E: end point
Control mode	I: increment	I: increment	I: increment
X-axis movement amount	5,000 pulse	10,000 pulse	3,000 pulse
Acceleration and deceleration mode	L: linear	L: linear	L: linear
Acceleration time (ms)	100 ms	200 ms	30 ms
Deceleration time (ms)	10 ms	20 ms	150 ms
Target speed	10,000 pps	20,000 pps	5,000 pps

■ Action Chart

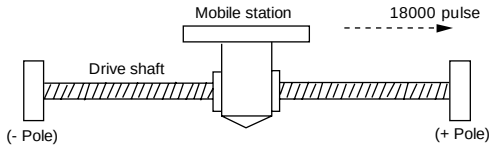


■ Action of each contact

- It indicates that the BUSY mark (X1118) of the motor under operation is in ON at the beginning and then OFF at the end of operation.
- It indicates that the action completion mark (X1120) is in ON at the end of operation, and has been holden to any action from the next position control, JOG operation, origin return and pulse generator operation for startup. The timing for turning ON is after the instruction for the unit to be send to the target position.

11.1.4 Settings and operations of the C-point control

The following example is explained with the independent axis control of axis-1. Set the movement amount as the increment mode and the unit as pulse.

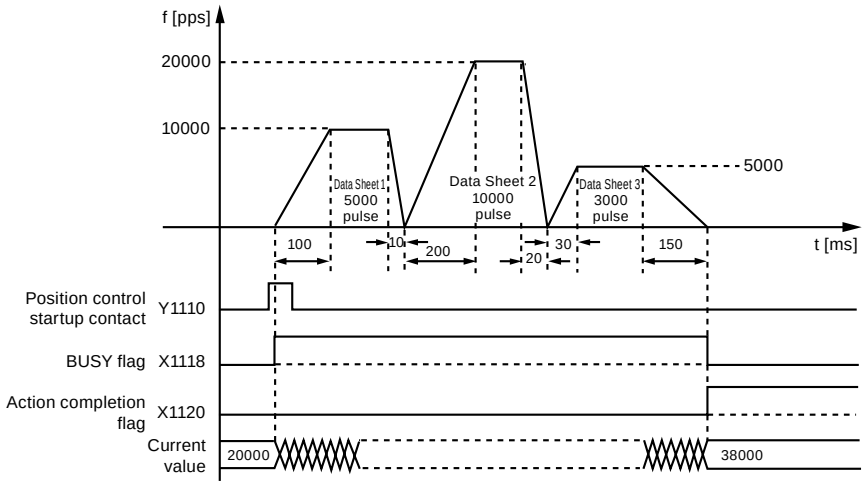


■ Setting Contents

Position control data and parameters are set via the tool software. Unit set to pulse

Item	Setting Example		
	Data Sheet 1	Data Sheet 2	Data Sheet 3
Operation Mode	C: Continuance Point	C: Continuance Point	E: end point
Control mode	I: increment	I: increment	I: increment
X-axis movement amount	5,000 pulse	10,000 pulse	3,000 pulse
Acceleration and deceleration mode	L: linear	L: linear	L: linear
Acceleration time (ms)	100 ms	200 ms	30 ms
Deceleration time (ms)	10 ms	20 ms	150 ms
Target speed	10,000 pps	20,000 pps	5,000 pps

■ Action Chart



■ Action of each contact

- It indicates that the BUSY mark (X1118) of the motor under operation is in ON at the beginning and then OFF at the end of operation.
- It indicates that the action completion mark (X1120) is in ON at the end of operation, and has been holden to any action from the next position control, JOG operation, origin return and pulse generator operation for startup. The timing for turning ON is after the instruction for the unit to be send to the target position.

11.1.5 Settings and operations of the J-point control

J-point control operates at the target speed from the operation start to the position control start contact of J-point control is ON, and start the next position control when the J-point control is ON.

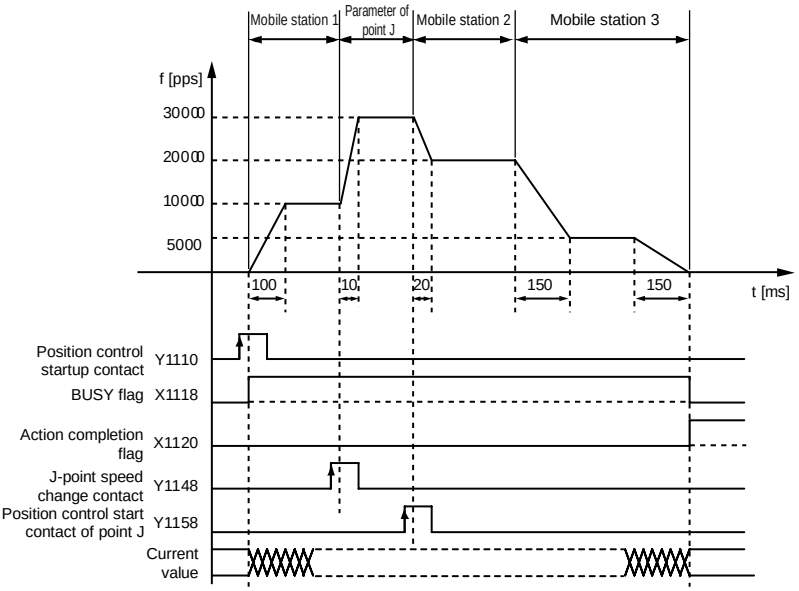
■ Setting Contents

Item	Setting Example			
	Data Sheet 1	J-point axis parameter settings	Data Sheet 2	Data Sheet 3
Operation Mode	J: Speed Point	—	P: Passing Point	E: end point
Control mode	I: increment	—	I: increment	I: increment
X-axis movement amount	5,000 pulse	—	10,000 pulse	3,000 pulse
Acceleration and deceleration mode	L: linear	—	L: linear	L: linear
Acceleration time (ms)	100 ms	—	200 ms	30 ms
Deceleration time (ms)	10 ms	—	20 ms	150 ms
Target speed	10,000 pps	—	20,000 pps	5,000 pps
J-point - running setting code	—	Linear acceleration/deceleration	—	—
J-point - acceleration time (ms)	—	10 ms	—	—
J-point - deceleration time (ms)	—	10 ms	—	—
J point target speed	—	30,000 pps	—	—

Emphasis

- **Specify parameters in the position control data sheet at the beginning of operation. Specify parameters upon speed change in the axis parameters settings menu.**
- **The J-point control can only be used for the independent axis control. It can not be used for the interpolation control.**
- **Please adopt the increment mode for the P-point control, C-point control and E-point control after the J-point control.**
- **Execute the speed control with the J-point control, but the constant value must be input at the target speed for the movement amount of the position control.**

■ Action Chart

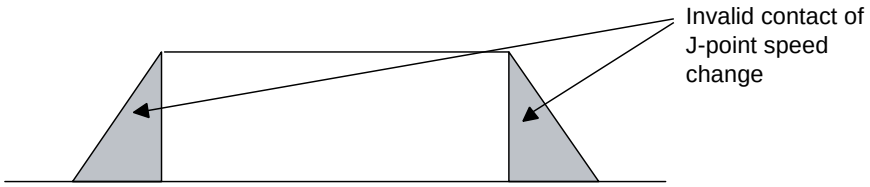


■ Action of each contact

- The BUSY mark (X1118) is in ON at startup and then OFF at the end of operation.
- It indicates that the action completion mark (X1120) is in ON at the end of operation, and has been holden to any action from the next position control, JOG operation, origin return and pulse generator operation for startup.
- The target speed is changed when the contact (Y1148) of the J-point speed change is in ON. The speed change contact is valid in the pulse edge of OFF→ON.
- Start the position control action when starting points (Y1158) of the J-point position control are in ON.

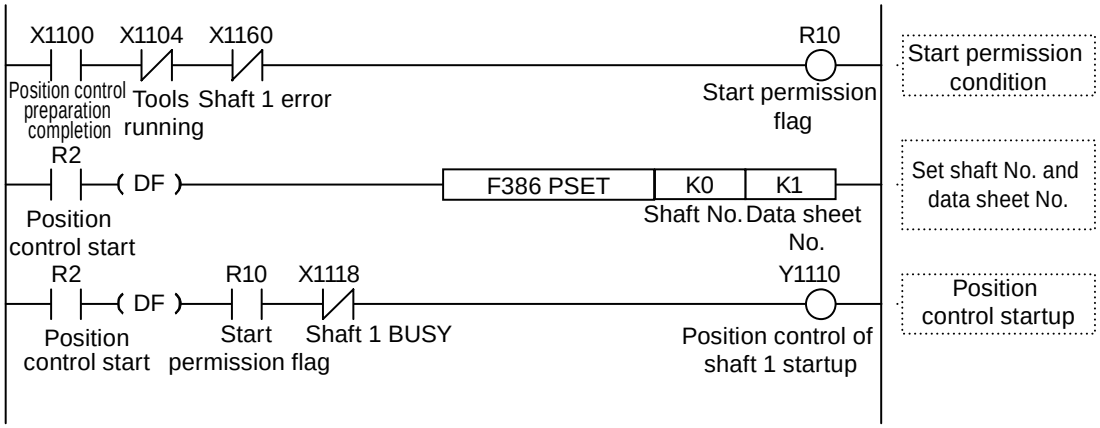
■ Actions with the speed change contact in ON during acceleration and deceleration

- Change speed during action of the J-point control, rather than during acceleration (deceleration).
- When the speed change signal is in ON during acceleration (deceleration), first convert to the constant speed status and then execute the speed change action.



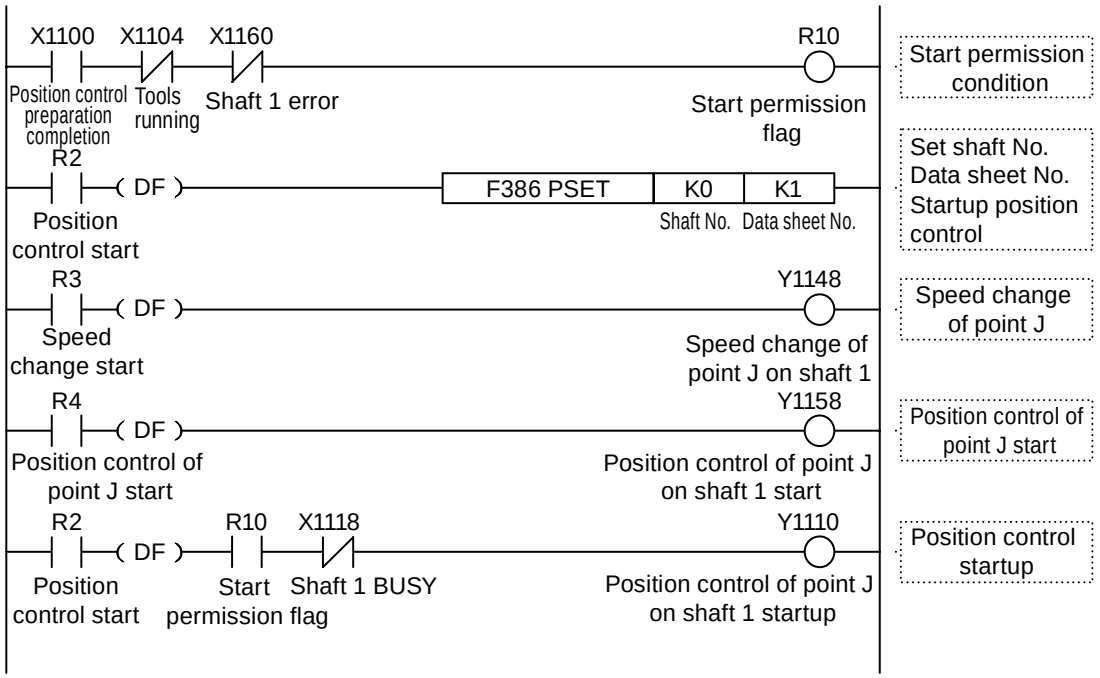
11.1.6 Example program (E point, P point and C point control)

■ Example program



11.1.7 Example program (J point control)

■ Example program



11.1.8 Points for attention of programs

■ Points for attention of programs

- Please set the final data sheet as E: end point.
- A set value error will occur during startup of the position control when values such as movement amount, acceleration time, deceleration time and target speed are beyond the set range.
- The starting point and mark number vary with the axis number.

■ Limit Input Operation

Conditions	Direction	Limit Status	Operation
Startup of each control	Forward run	Limit (+) input: ON	Can not start with errors
		Limit (−) input: ON	Can not start with errors
	Reverse run	Limit (+) input: ON	Can not start with errors
		Limit (−) input: ON	Can not start with errors
Operation of each control	Forward run	Limit (+) input: ON	Limit stop with errors
	Reverse run	Limit (−) input: ON	Limit stop with errors

11.2 Interpolation control

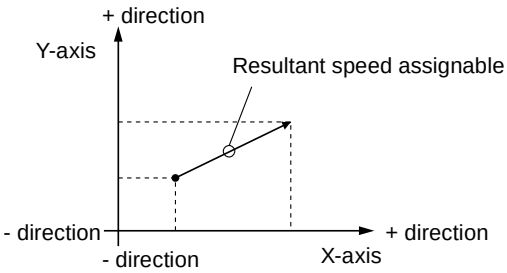
11.2.1 Interpolation control types

■ Operation types

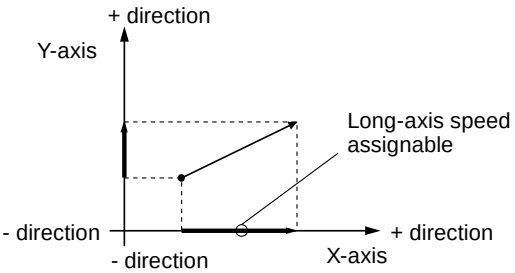
- Interpolation controls include 2-axis linear interpolation control, 2-axis arc interpolation control, 3-axis linear interpolation control and 3-axis spiral interpolation control. There are the following specified modes of the interpolation control operations for your selection according to the application. When there are 2 axes with interpolation relationship, they are called X-axis and Y-axis, and when they are in 3-axis symmetry, they are called X-axis, Y-axis and Z-axis. X-axis, Y-axis and Z-axis are automatically assigned according to the strength of axis-signal in rising order.
- The interpolation controls can freely combine E-point control using 1 data sheet and P-point and C-point controls using multiple data sheets for position control data.
- For instance, P-point control may be used to achieve continuous Interpolation control from 2-axis linear interpolation control to 2-axis arc interpolation control. Acceleration time and deceleration time may be set separately. Final data sheets of P-point control/C-point control should be set as E-point.

Type	Action designation mode	Necessary data
2 axis linear interpolation control	Resultant speed assignment	Resultant speed of the X-axis and Y-axis.
	Long-axis Speed Assignment	Speed of the long-axis (axis with longer moving distance)
2 axis arc interpolation control	Center point assignment/CW direction	X-axis and Y-axis coordinates of center point
	Center point assignment/CCW direction	X-axis and Y-axis coordinates of center point
	Passing point assignment	X-axis and Y-axis coordinates of passing point on the arc
3 axis linear interpolation control	Resultant speed assignment	Resultant speed of the X-axis, Y-axis and Z-axis.
	Long-axis Speed Assignment	Speed of the long-axis (axis with longer moving distance)
3 axis spiral interpolation control	Center point assignment/CW direction/X-axis feeding	Y-axis and Z-axis coordinates of center point
	Center point assignment/CCW direction/ X-axis feeding	Y-axis and Z-axis coordinates of center point
	Center point assignment/CW direction/Y-axis feeding	X-axis and Z-axis coordinates of center point
	Center point assignment/CCW direction/ Y-axis feeding	X-axis and Z-axis coordinates of center point
	Center point assignment/CW direction/Z-axis feeding	X-axis and Y-axis coordinates of center point
	Center point assignment/CCW direction/ Z-axis feeding	X-axis and Y-axis coordinates of center point
	Passing point assignment/X-axis feeding	Y-axis and Z-axis coordinates of passing point on the arc
	Passing point assignment/Y-axis feeding	X-axis and Z-axis coordinates of passing point on the arc
	Passing point assignment/Z-axis feeding	X-axis and Y-axis coordinates of passing point on the arc

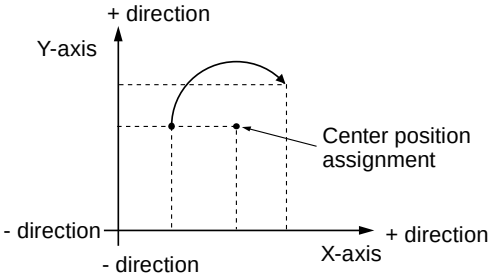
2 axis linear interpolation
(resultant speed assignment)



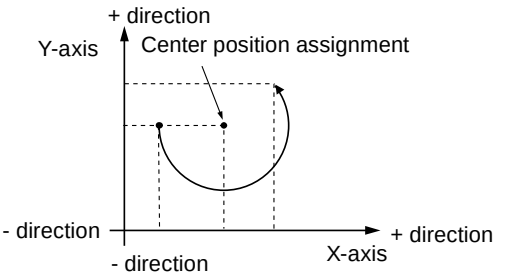
2 axis linear interpolation
(long-axis speed assignment)



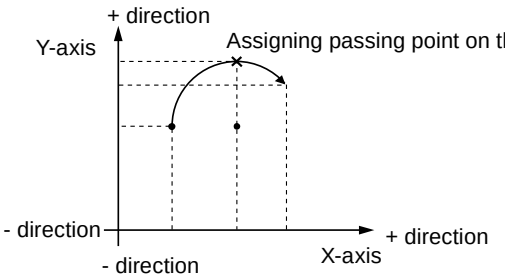
2 axis arc interpolation
(center point assignment/CW direction)



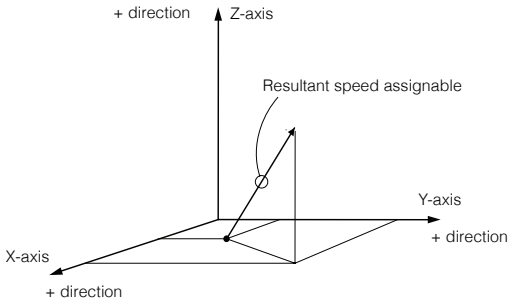
2 axis arc interpolation
(center point assignment/CCW direction)



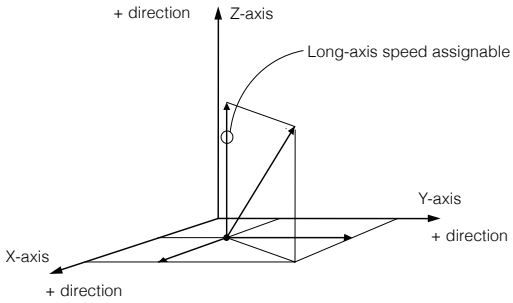
2 axis arc interpolation
(passing point assignment)



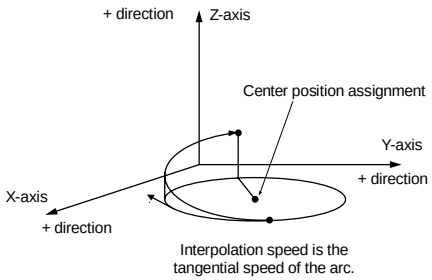
3 axis linear interpolation
(resultant speed assignment)



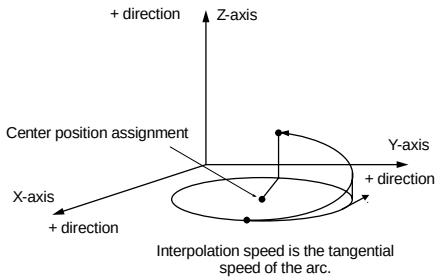
3 axis linear interpolation
(long-axis speed assignment)



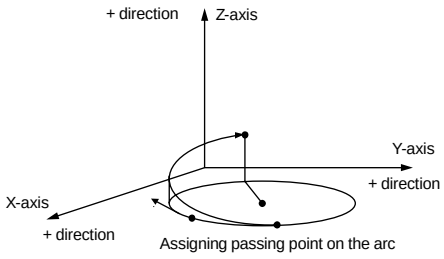
3 axis spiral interpolation (center point assignment/CW direction/Z-axis feeding)



3 axis spiral interpolation (center point assignment/CCW direction/Z-axis feeding)



3 axis spiral interpolation (passing point assignment/Z-axis feeding)

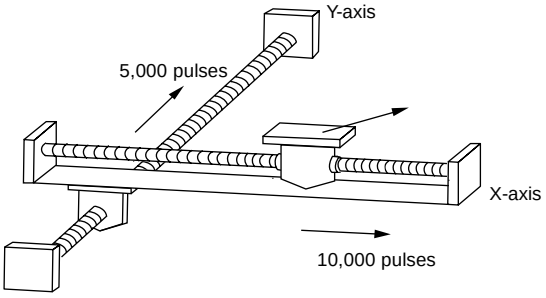


Interpolation speed is the tangential speed of the arc.

Upon 3-axis spiral interpolation, if the X-axis and Y-axis are feeding axes, actions after the axes are replaced mutually will be executed.

11.2.2 Setting and action of 2-axis linear interpolation

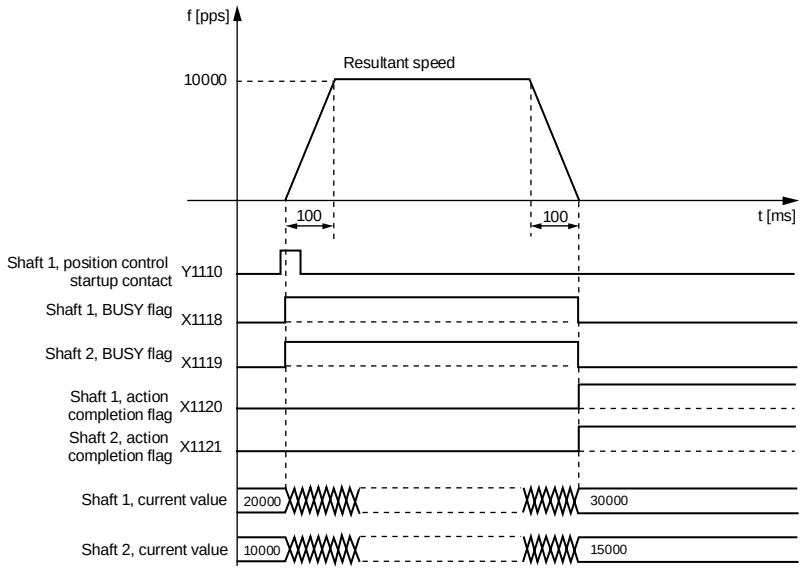
The following example is explained with the execution of the E-point control. Set the X-axis as axis-1, Y-axis as axis-2, movement amount as the increment mode and unit as pulse.



■ Setting Contents

Item	Setting Example
Operation Mode	E: end point
Interpolation operation	0: Linear (resultant speed)
Control mode	I: increment
X-axis movement amount	10,000 pulse
X-axis auxiliary point	0
Y-axis movement amount	5,000 pulse
Y-axis auxiliary point	0
Acceleration and deceleration mode	L: linear
Acceleration time (ms)	100 ms
Deceleration time (ms)	100 ms
Interpolation speed	10,000 pps

■ Action Chart



■ Action of each contact

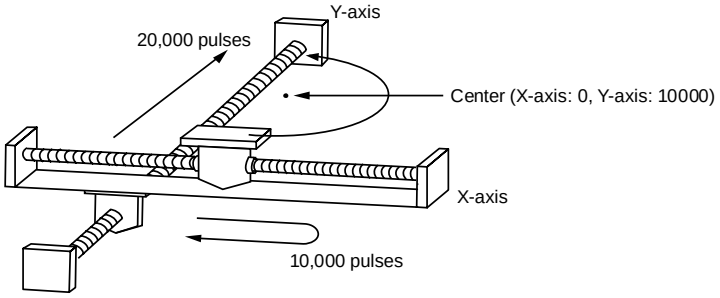
- It indicates that the BUSY mark (X1118, X1119) in axis-1 and axis-2 of the motor under operation is in ON at the beginning of the position control and then OFF at the end of operation.
- It indicates that axis-1 and axis-2 action completion mark (X1120, X1121) is in ON at the end of operation, and has been holden to any action from the next position control, JOG operation, origin return and pulse generator operation for startup.

■ Points for attention of programs

- To start interpolation control, please turn the position control startup contact of the axis with the smallest number in the same group.
- The X-axis and Y-axis auxiliary points are invalid during linear interpolation.
- During long-axis speed assignment, the resultant speed is faster than the long-axis speed.
- A set value error will occur during startup of the position control when values such as movement amount, acceleration time, deceleration time and target speed are beyond the set range.
- The starting point and mark number vary with the axis number.

11.2.3 Setting and action of axis-2 arc interpolation

The following example is explained with the execution of the E-point control. Set the X-axis as axis-1, Y-axis as axis-2, movement amount as the increment mode and unit as pulse.

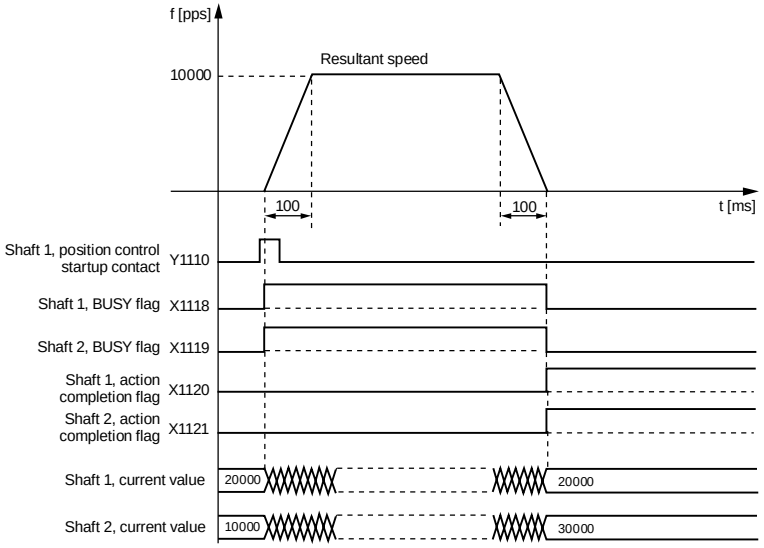


■ Setting Contents

Position control data and parameters are set via the tool software. Unit set to pulse

Item	Setting Example
Operation Mode	E: end point
Interpolation operation	S: arc (center point/CW direction)
Control mode	I: increment
X-axis movement amount	0 pulse
X-axis auxiliary point	0 pulse
Y-axis movement amount	20,000 pulse
Y-axis auxiliary point	10,000 pulse
Acceleration and deceleration mode	L: linear
Acceleration time (ms)	100 ms
Deceleration time (ms)	100 ms
Interpolation speed	10,000 pps

■ Action Chart



■ Action of each contact

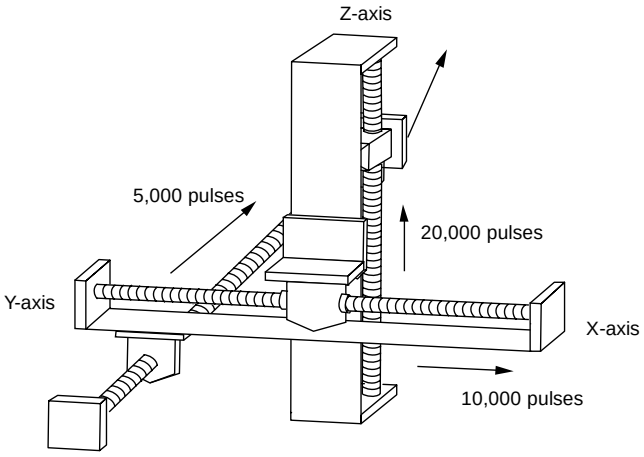
- It indicates that the BUSY mark (X1118, X1119) in axis-1 and axis-2 of the motor under operation is in ON at the beginning of the position control and then OFF at the end of operation.
- It indicates that axis-1 and axis-2 action completion mark (X1120, X1121) is in ON at the end of operation, and has been holden to any action from the next position control, JOG operation, origin return and pulse generator operation for startup.

■ Points for attention of programs

- To start interpolation control, please turn the position control startup contact of the axis with the smallest number in the same group.
- The X-axis auxiliary point is the center point of the X-axis and the Y-axis auxiliary point is the center point of the Y-axis during center point assignment. During passing point assignment, please set the passing points of the X-axis and the Y-axis respectively.
- In the increment mode of control, the center point and the passing point are both increment coordinates from the auto startup point.
- Where the startup point and the end of operation point are the same, 1-turn arc operation will be executed or alert will be given in the passing point mode.
- In the passing point mode, if the startup point, passing point and end of operation are on the same line, the arc cannot be established and the alert will be given for error.
- During long-axis speed assignment, the resultant speed is faster than the long-axis speed.
- A set value error will occur during startup of the position control when values such as movement amount, acceleration time, deceleration time and target speed are beyond the set range.
- The starting point and mark number vary with the axis number.

11.2.4 Setting and action of 3-axis linear interpolation

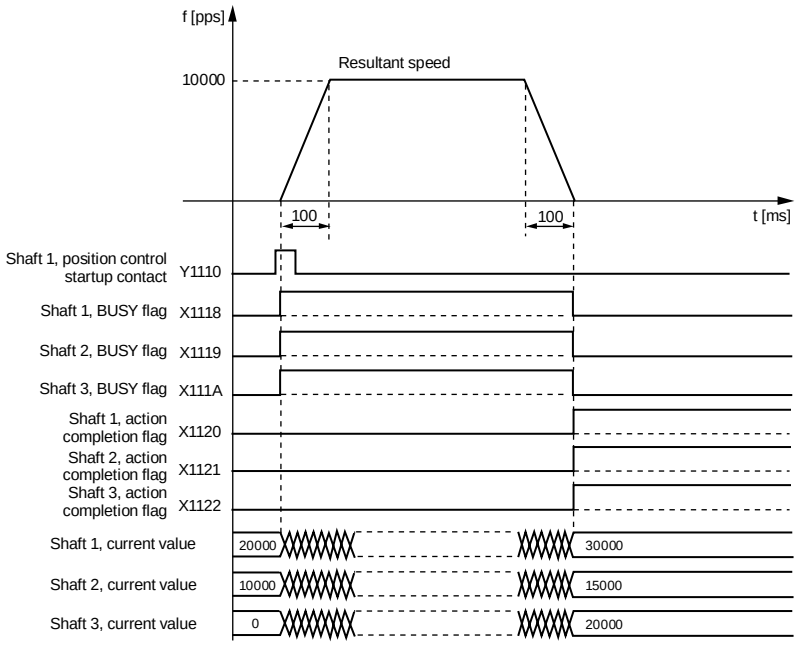
The following example is explained with the execution of the E-point control. Set the X-axis as axis-1, Y-axis as axis-2, Z-axis as axis-3, movement as the increment mode and unit as pulse.



■ Setting Contents

Item	Setting Example
Operation Mode	E: end point
Interpolation operation	0： Linear (resultant speed)
Control mode	I: increment
X-axis movement amount	10,000 pulse
X-axis auxiliary point	0
Y-axis movement amount	5,000 pulse
Y-axis auxiliary point	0
Z-axis movement amount	20,000 pulse
Z-axis auxiliary point	0
Acceleration and deceleration mode	L: linear
Acceleration time (ms)	100 ms
Deceleration time (ms)	100 ms
Interpolation speed	10,000 pps

■ Action Chart



■ Action of each contact

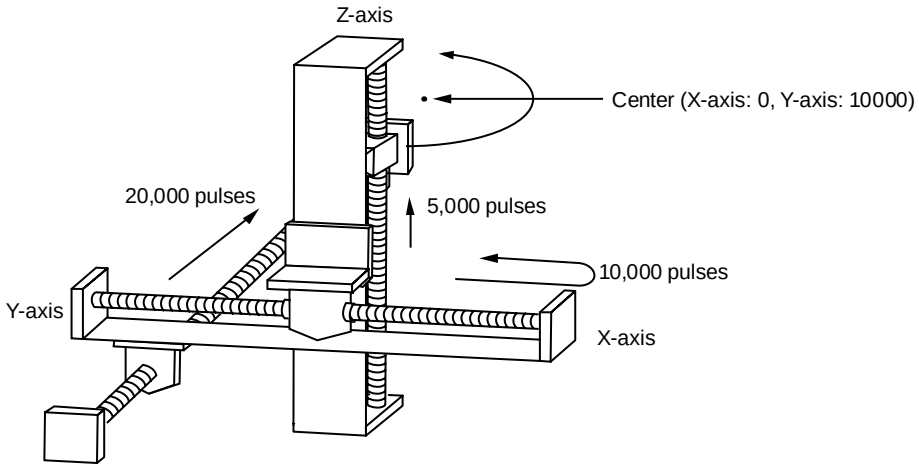
- It indicates that the BUSY mark (X1118, X1119, X111A) in axis-1, axis-2 and axis-3 of the motor under operation is in ON at the beginning of the position control and then OFF at the end of operation.
- It indicates that axis-1, axis-2 and axis-3 action completion mark (X1120, X1121, X1122) is in ON at the end of operation, and has been holden to any action from the next position control, JOG operation, origin return and pulse generator operation for startup.

■ Points for attention of programs

- To start interpolation control, please turn the position control startup contact of the axis with the smallest number in the same group.
- The X-axis and Y-axis auxiliary points are invalid during linear interpolation.
- During long-axis speed assignment, the resultant speed is faster than the long-axis speed.
- A set value error will occur during startup of the position control when values such as movement amount, acceleration time, deceleration time and target speed are beyond the set range.
- The starting point and mark number vary with the axis number.

11.2.5 Setting and action of 3-axis spiral interpolation

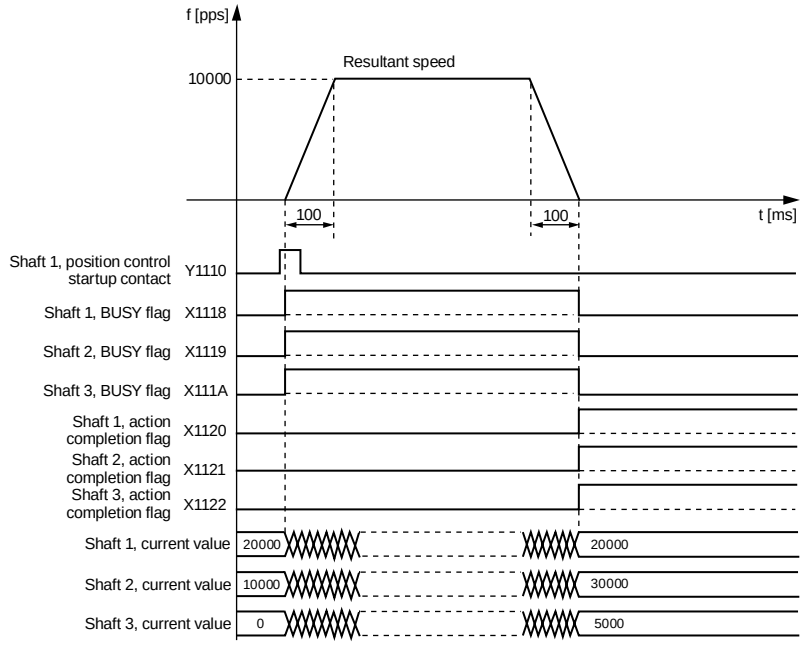
The following example is explained with the execution of the E-point control. Set the X-axis as axis-1, Y-axis as axis-2, Z-axis as axis-3, movement as the increment mode and unit as pulse.



■ Setting Contents

Item	Setting Example
Operation Mode	E: end point
Interpolation operation	E: spiral (center point/CCW direction/Z-axis feeding)
Control mode	I: increment
X-axis movement amount	0 pulse
X-axis auxiliary point	0 pulse
Y-axis movement amount	20,000 pulse
Y-axis auxiliary point	10,000 pulse
Z-axis movement amount	5,000 pulse
Z-axis auxiliary point	0
Acceleration and deceleration mode	L: linear
Acceleration time (ms)	100 ms
Deceleration time (ms)	100 ms
Interpolation speed	10,000 pps

■ Action Chart



■ Action of each contact

- It indicates that the BUSY mark (X1118, X1119, X111A) in axis-1, axis-2 and axis-3 of the motor under operation is in ON at the beginning of the position control and then OFF at the end of operation.
- It indicates that axis-1, axis-2 and axis-3 action completion mark (X1120, X1121, X1122) is in ON at the end of operation, and has been holden to any action from the next position control, JOG operation, origin return and pulse generator operation for startup.

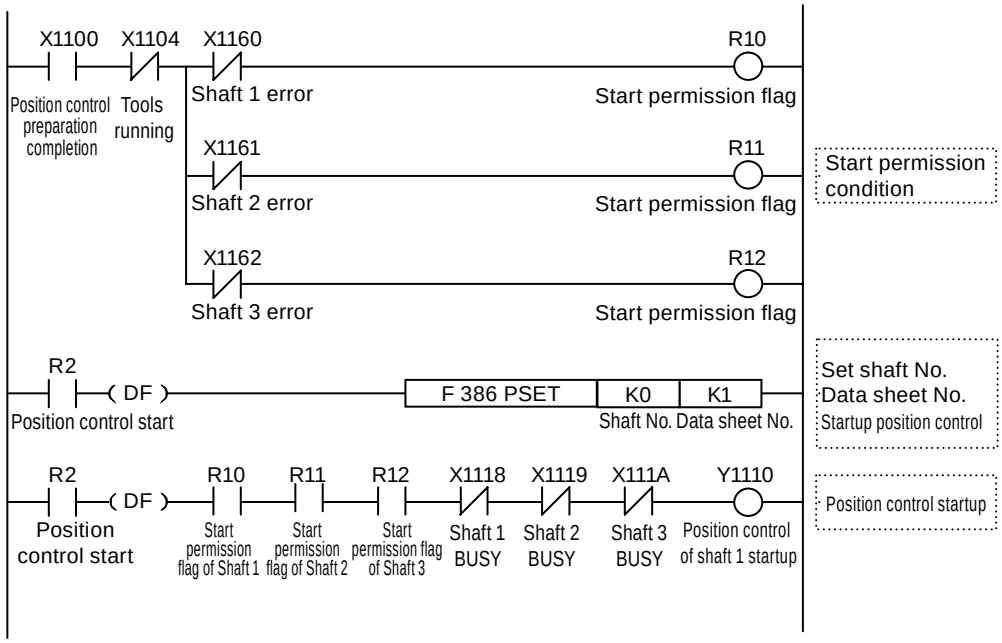
■ Points for attention of programs

- In the XY plane, the X-axis auxiliary point is the center point of the X-axis and the Y-axis auxiliary point is the center point of the Y-axis during center point assignment. During passing point assignment, please set the passing points of the X-axis and the Y-axis respectively. The same applies to the YZ plane and the XZ plane.
- In the increment mode of control, the center point and the passing point are both increment coordinates from the auto startup point.
- Where the startup point and the end of operation point are the same, 1-turn arc operation will be executed or alert will be given in the passing point mode.
- In the passing point mode, if the startup point, passing point and end of operation are on the same line, the arc cannot be established and the alert will be given for error.
- During long-axis speed assignment, the resultant speed is faster than the long-axis speed.
- A set value error will occur during startup of the position control when values such as movement amount, acceleration time, deceleration time and target speed are beyond the set range.
- The starting point and mark number vary with the axis number.

11.2.6 Example program (interpolation control)

3 axis interpolation control as the example.

■ Example program



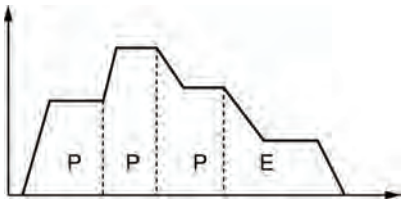
11.3 Setting and action of the position repetition function

Position control repetitions function means to specify the times of repetition for continuous position control at specified times.

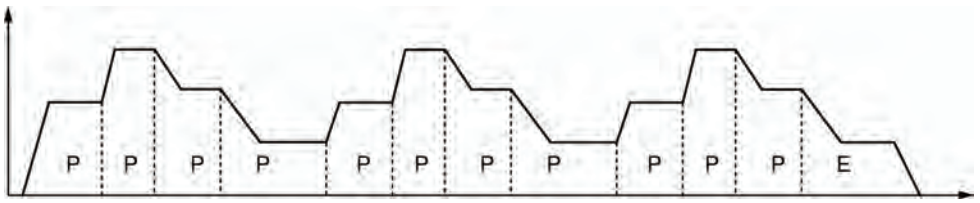
The times of repetition is set in the position control repetitions region of each axis. The repetitions can be specified within 2~254, or be set to 255 to indicate infinite repetitions.

■ Summary of position control repetitions

The following figure shows repetition of the position control for 3 times.

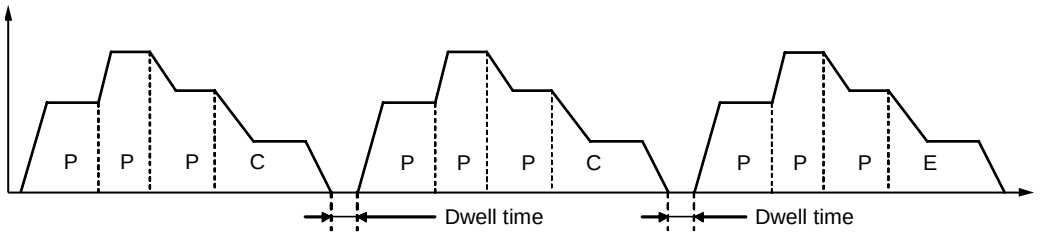


When the dwell is set to 0 with the E-point control of the end position control, the control unit processes E-point control as P-point control and repeats the position control for 3 times without stopping the operation before ending the operation.



When the pause is set to a value other than 0 with the E-point control of the end position control, the control unit processes E-point control as C-point control and pause according to the set dwell time of pause before executing position control again.

The operation is ended after repetitions of position control for 3 times.



■ Position control repetitions settings region (storage region No.0: universal region)

In this region, it is allowed to set the times of repetitions from the position control start by axis. The control unit will start repeating the position control that is started for the set times before ending the operation. The times of repetition will change to the initial value at the end of the operation.

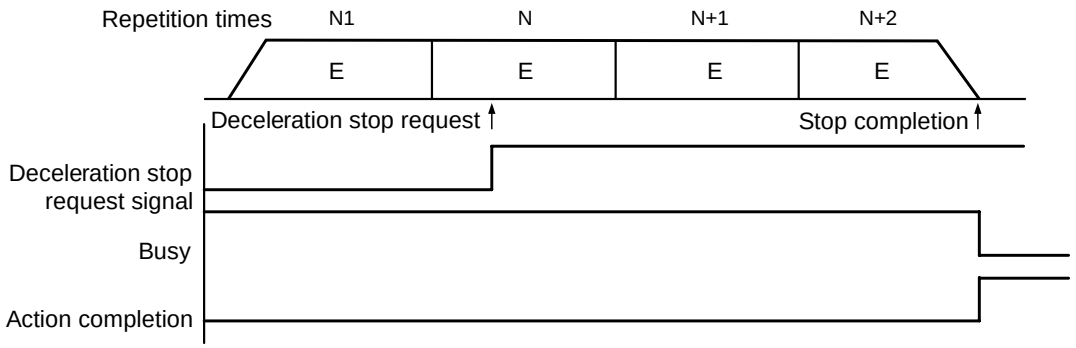
Position control storage offset address	Name	Contents	Initial value	Setting Range	Unit
H108	Axis-1 position control repetitions	Saves the times of repetition from the No. of the position control start data sheet to the E-point. If set to 255, the operation will be repeated infinitely before the operation is stopped.	0	0-255	Times
H109	Axis-2 position control repetitions				
H10A	Axis-3 position control repetitions				
H10B	Axis-4 position control repetitions				
H10F	Virtual axis position control repetitions				

■ Stop processing in the repetitive operation of position control

During repetitions of position control, if deceleration stop is executed, the following operations will occur.

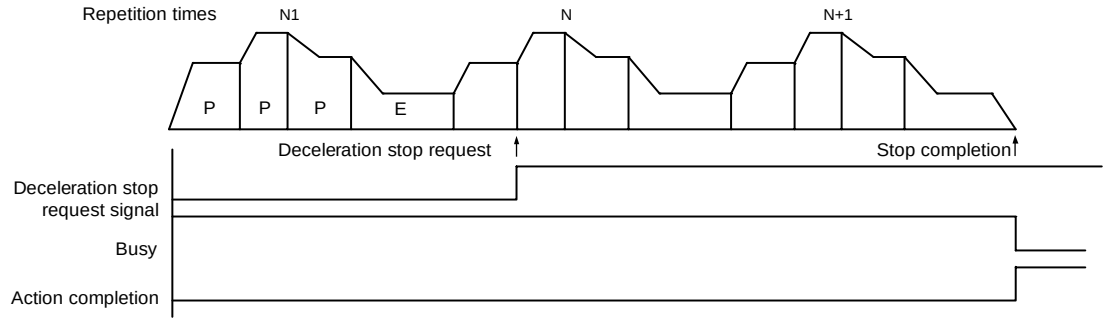
• When E-point control is repeated（Dwell time：0 ms）

When the control unit detects the deceleration stop, it will stop after performing the repetitive position control N+2 times.

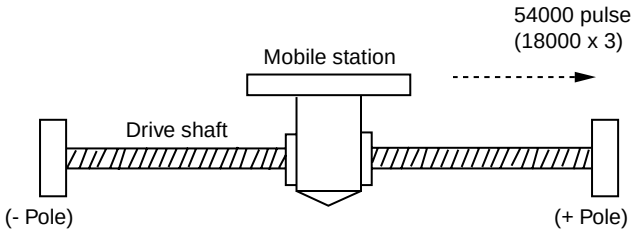


• **When continuously executing multiple position control data sheets**

When the control unit detects the deceleration stop, it will stop after performing the repetitive position control N+1 times.



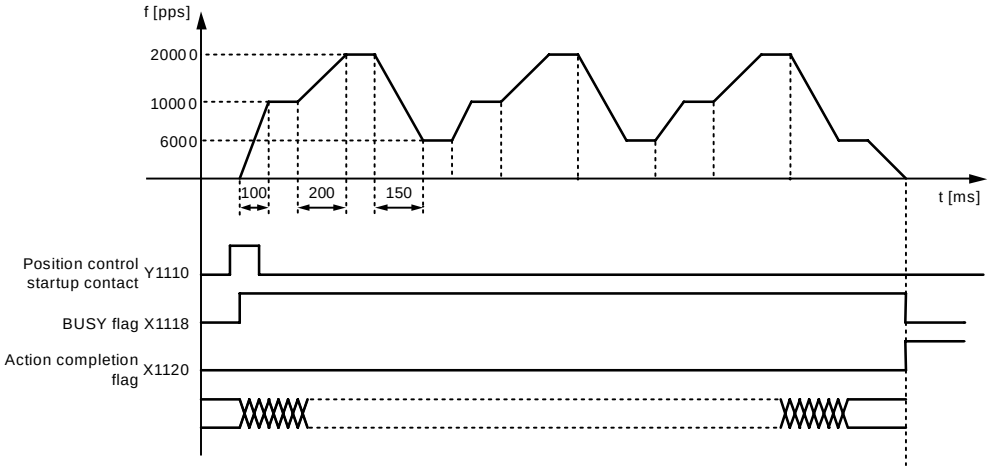
The following example is explained with the independent axis control. Set the movement amount as the increment mode and the unit as pulse.



■ **Setting Contents**

Item	Setting Example		
	Data Sheet 1	Data Sheet 2	Data Sheet 3
Operation Mode	P: Passing Point	P: Passing Point	E: end point
Control mode	I: increment	I: increment	I: increment
X-axis movement amount	5,000 pulse	10,000 pulse	3,000 pulse
Acceleration and deceleration mode	L: linear	L: linear	L: linear
Acceleration time (ms)	100 ms	200 ms	30 ms
Deceleration time (ms)	10 ms	20 ms	150 ms
Target speed	10,000 pps	20,000 pps	5,000 pps
Dwell time	0 ms	0 ms	0 ms
Repetitions of position control	3 (setting region for writing to the position control storage)		

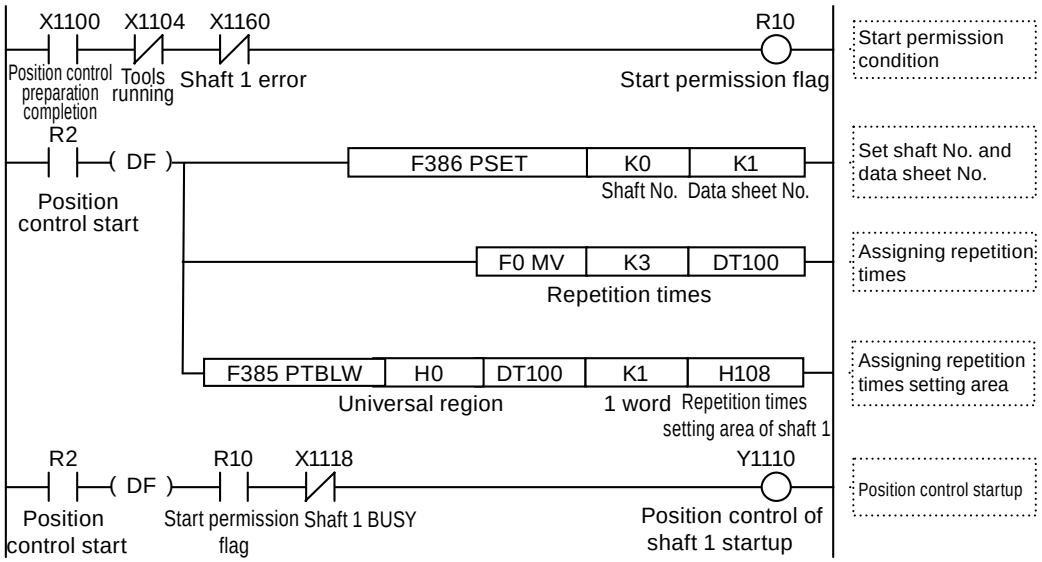
■ Action Chart



■ Action of each contact

- It indicates that the BUSY mark (X1118) of the motor under operation is in ON at the beginning and then OFF at the end of operation.
- It indicates that the action completion mark (X1120) is in ON at the end of operation, and has been holden to any action from the next position control, JOG operation, origin return and pulse generator operation for startup.

■ Example program



12

Free running (synchronous control)

12.1 Synchronous Control

12.1.1 Summary of Synchronous Control

■ What is synchronous control

Synchronous control is the function that makes the axis (slave axis) interlocked (synchronized) with the main station operate according to the operation of the benchmark axis (main station axis). Advantages of synchronous control are shown below.

1. Easy Setting

When the operations of multiple axes are interconnected, it is allowed to design operations of other axes based on the main station axis to simply realize settings of multiple inter-axis operations.

2. Ensuring operation safety

During synchronous control, if an axis stops due to certain causes, all related axes under synchronous control will be stopped. Therefore, it can easily improve the safety of the system.

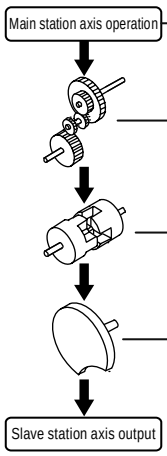
■ Functions of synchronous control

There are the following functions of synchronous control Such functions are executed in order, and the operation results of the functions are turned into operations of the slave station axis.

Function	Outline
Electronic gear	For the operations of the main station axis, it outputs the number of pulses obtained by multiplying by the set electronic gear ratio.
Electronic clutch	The electronic clutch can be used to separate the operation of the slave station axis from that of the main station axis by detachment of the clutch (OFF).
Electronic cam	Outputs pulses of the set cam shape. Calculates the phases of operations of the main station axis and outputs pulses of the cam corresponding to the phases. Cam shape (cam curves) are set via the setting tool.

■ Execution sequence and steps of synchronous control

The functions and setting steps for synchronous control are introduced briefly below.



Main station axis settings	Set the main station axis for various operation axes. Axes of main station axis are set to operate as slave station axes.
Electronic gear settings	Select to enable/disable electronic gear If enabled, perform various settings of the electronic gear.
Electronic clutch settings	Select to enable/disable electronic gear clutch. If enabled, perform various settings of the electronic clutch.
Electronic cam settings	Select to enable/disable electronic cam. If enabled, perform various settings of the electronic cam. Separate settings for electronic cam curves are required when using electronic cam

12.2 Settings of the main station axis and the slave station axis

12.2.1 Selection and setting of the main station axis

The main station axis is the axis as the benchmark for operations of synchronous control. Synchronous control execute operations by sending start/stop requests of various operations to the main station axis. The main station axis may be any of the following.

■ Types of main station axes

Types of main station axes	Outline
Actual axis	Axis that can be physically controlled by the control unit (1~4 axis). It is used when you hope that the main station axis is also used as a control object. When an actual axis is used as the main station axis, it is allowed to use axes other than the main station axis (3 axes) as the slave station axes.
Virtual axis	Virtual axis inside the control unit Using virtual axes can more effectively use the actual axes (1~4 axis). The virtual axis cannot output pulses to the outside. And it has no input signals from the outside.
Pulse input	The action to make the pulse input value of the input unit as the main station axis. It is used when connecting external devices on the bases of synchronous control such as external encoder. When pulse input is used as the main station axis, the slave station axis operates according to the pulse input. Therefore, special attention must be paid when stating or stopping operations via the control unit.

■ Types and restrictions of main station axes

		Types of main station axes		
		Actual axis	Virtual axis	Pulse input
Origin return		O	Only available in the "Data setting" mode	×
JOG operation		O	O	×
Position Control	Independent axis	O	O	×
	Interpolation	O	× Only available for independent axis	×
Stop function	System/Emergency/ Deceleration Stop	O	O	×
	Position limit stop	O	△ No limit signal input, only stopped by soft limit	×
	Error stop	O	O	×
Others			Settings for using virtual axes need to be done in the configuration menu	Synchronous with external pulse input, so main station axis control is not available. To stop synchronous control, please stop the slave station axis.

◆ Emphasis

- **If using the main station axis is set, the slave station axes can only operation synchronously under synchronous control and cannot operate independently.**
- **The virtual axes can only be used for the independent axes. To use virtual axes, please check the virtual axis check box in the axis settings dialog box of "Configurator PM7".**
- **Request for origin returning of virtual axis is available only in the "Data Settings" mode.**
- **When "pulse input" is set for the main station axis, it will be synchronized with pulse input of devices like the external encoder and cannot stop the main station axis freely.**

12.2.2 Selection and settings of the slave station axis

■ Selection of the slave station axis

- 1-4 axes may be selected as slave station axes. The virtual axis can only be used as the main station axis.
- In the "Synchronization Parameter Settings" dialog box of Configurator PM7, when the "main station axis of synchronization" of the axis to operate as the slave station axis is specified, it will operate as if the specified "main station axis of synchronization" is used as the slave station of the main station axis.
- Up to 4 slave station axes may be set for one main station axis.
- The axis set as the slave station operates synchronously with the main station axis when the synchronization takes effect. When the synchronization takes effect, the slave station axis cannot execute operations like position control independently.

■ Settings of the slave station axes

Operations of the slave station axes are interlocked with the main station axis, however, the following basic settings of axes must be set for every slave station axis.

- Unit setting
- Pulses per rotation
- Movement per rotation

12.3 Starting and cancellation of synchronous control

12.3.1 Starting and cancellation of synchronous control

■ Starting and cancellation operations

- The synchronous control can be temporarily canceled if the synchronization cancellation request signal is ON.
- After cancellation of synchronization, slave station axes can operate independently.
- The synchronous control can be resumed if the synchronization cancellation request signal is OFF.
- Synchronization can also be canceled during operation of the main station axis. (supported by control units above Motion CPU Ver.1.50.)

■ I/O signal assignment

Signal name	Axis 1	Axis 2	Axis 3	Axis 4	Operation
Request for synchronization clearing	Y1188	Y1189	Y118A	Y118B	ON: synchronization canceled, OFF: synchronization cancel executed
Synchronization canceling notice	X1188	X1189	X118A	X118B	ON: Canceling synchronization, OFF: Synchronizing

■ Operations during synchronizing/Canceling synchronization

<table>
<tr><th colspan="2" rowspan="2">Operation request axis</th><th colspan="2">Operations during synchronizing</th><th>Operations during Canceling synchronization</th></tr>
<tr><th>Main station axis setting axis</th><th>Slave station axis setting axis</th><th>Main/slave station setting axis</th></tr>
<tr><td colspan="2">Origin return</td><td>×
The main station axis executes origin return. The slave station axis does not executes origin return but operates as synchronized with the output of the main station. Please cancel synchronization to make it operate in order to execute origin return.</td><td rowspan="4">×
Operation request of the slave station axis is invalid.</td><td>○
Either for the main station axis or the slave station axis, only the origin return of the operation requesting axis is executed.</td></tr>
<tr><td colspan="2">JOG operation</td><td rowspan="2">○
Operation requests of the main and slave station axes are interlocked to execute the same operations.</td><td>○
Either for the main station axis or the slave station axis, only the JOG operation of the operation requesting axis is executed.</td></tr>
<tr><td rowspan="2">Position Control</td><td>Independent axis</td><td>○
When the main station axis is the starting axis of interpolation, the interpolation is executed through operation request. The main and slave station axes are interlocked to execute the same operations.</td></tr>
<tr><td>Interpolation</td><td>○
When the operation requesting axis is the starting axis of interpolation, the interpolation is executed through operation request.</td></tr>
<tr><td rowspan="5">Stop function</td><td>System stop</td><td colspan="3">Irrelevant to the synchronization settings, all axes are stopped.</td></tr>
<tr><td>Emergency stop</td><td rowspan="2">○
The main station axis is stopped via the stop request of the main station axis. The slave station axis, being interlocked with the main station axis, is also stopped.</td><td rowspan="2">○
Only the axes executing stop requests stop. The main station axis and other slave station axes set for the same main station axis keep operating.</td><td rowspan="2">○
Only the axes executing stop requests stop. (during interpolation, all object axes of interpolation stop.)</td></tr>
<tr><td>Ramp-to-stop</td></tr>
<tr><td>Position limit stop</td><td colspan="2" rowspan="2">Both the main station axis and the slave station axes stop.</td><td>Only axes with limit errors stop.</td></tr>
<tr><td>Error stop</td><td>Only axes with errors stop.</td></tr>
</table>

12.3.2 Precautions for canceling and stating synchronous control

■ Precautions for canceling synchronous control

- Synchronization can be canceled during operation of the main station axis, but the slave station axis is stopped immediately.
- It is recommended to use the clutch function to cancel synchronization after the slave station axis stops.
- When canceling synchronization, relays in relation to synchronous control (Notice on synchronization of slave station gear ratio change, Notice on synchronization of slave station clutch engagement) is set to OFF.

■ Conditions to start synchronization

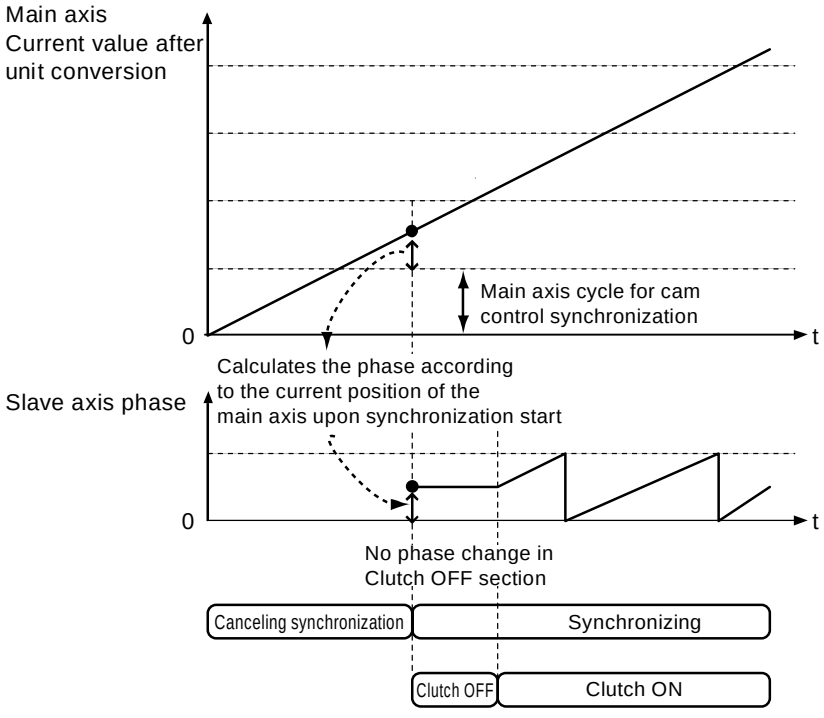
The synchronization can only be started when the following conditions are met.

- The slave station axis stops.
- No stop request for the slave station axis has happened.
- No error has occurred on the slave station axis.

If the conditions are met, it will not change to the synchronization status, and the canceling synchronization notice is not OFF. If the conditions are not met and the request for canceling synchronization is kept OFF, the synchronization will start from the stage when the conditions for synchronization are met.

■ Phase when the synchronization starts

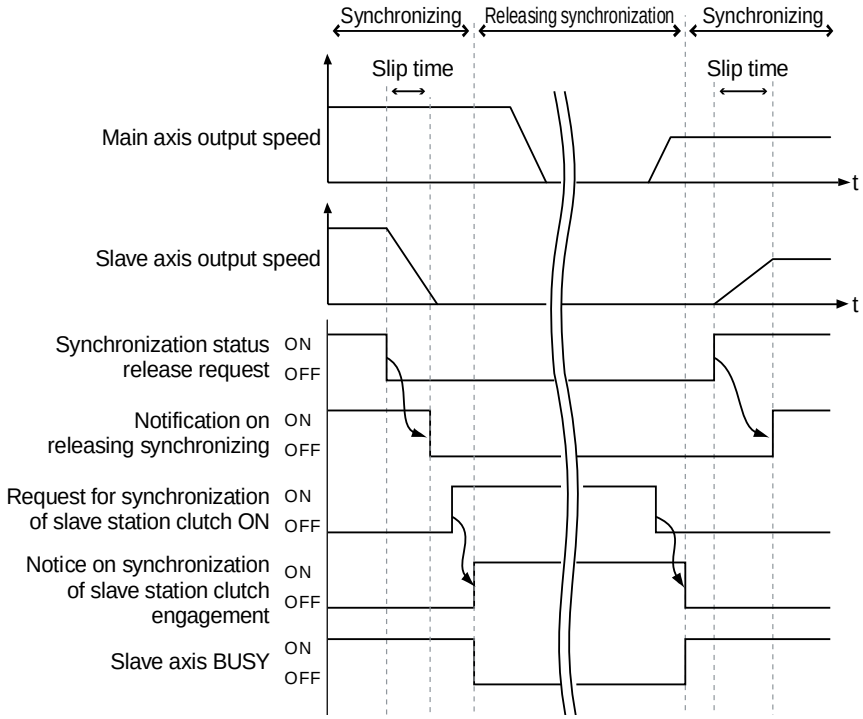
To be calculated according to the "Current Value after Unit Conversion" and the "Cam control synchronization period of cam control synchronization. After the "Current Value after Unit Conversion" is divided by the "Cam control synchronization period of cam control synchronization, the remainder is the phase.



■ Steps for canceling and starting synchronization

The following description is provided by taking the steps of the clutch trigger type set to "level" as an example.

Division	Steps	Operations and unit actions based on the user program
Synchronization clearing	①	Request for clutch ON of the synchronization of slave station clutch ON with the user program.
	②	The unit sets the notice on synchronization of slave station clutch engagement to OFF.
	③	Set the request for canceling synchronization of slave station clutch ON with the user program.
	④	After the unit sets the notice on canceling synchronization to ON, the cancel synchronous control.
Starting synchronization	⑤	Set the request for canceling synchronization of slave station clutch ON with the user program.
	⑥	The unit sets the notice on canceling synchronization to OFF.
	⑦	Request for clutch ON of the synchronization of slave station clutch ON with the user program.
	⑧	The unit sets the notice on synchronization of slave station clutch engagement to OFF, and then the synchronous control is started.

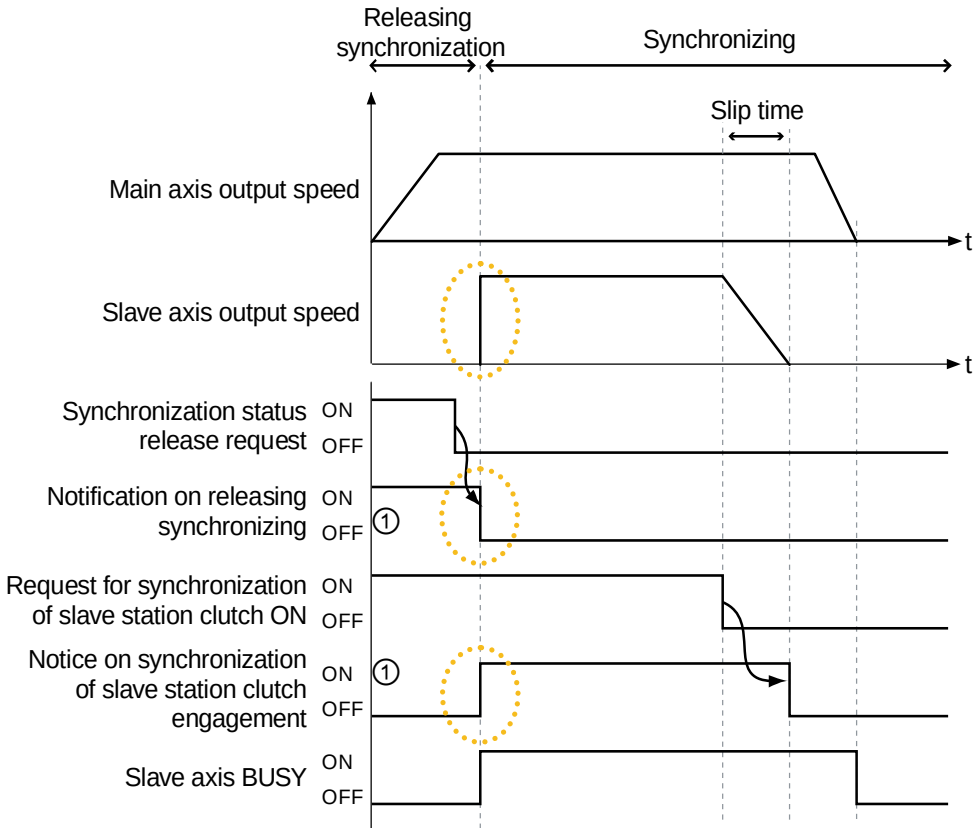


Signal name	Axis 1	Axis 2	Axis 3	Axis 4
Request for synchronization clearing	Y1188	Y1189	Y118A	Y118B
Synchronization canceling notice	X1188	X1189	X118A	X118B
Request for synchronization of slave station clutch ON	Y1198	Y1199	Y119A	Y119B
Notice on connection of request for synchronization of slave station clutch ON	X1198	X1199	X119A	X119B
Slave station axis BUSY	Y1118	Y1119	Y111A	Y111B

■ **Set the ON trigger type of clutch to "level".**

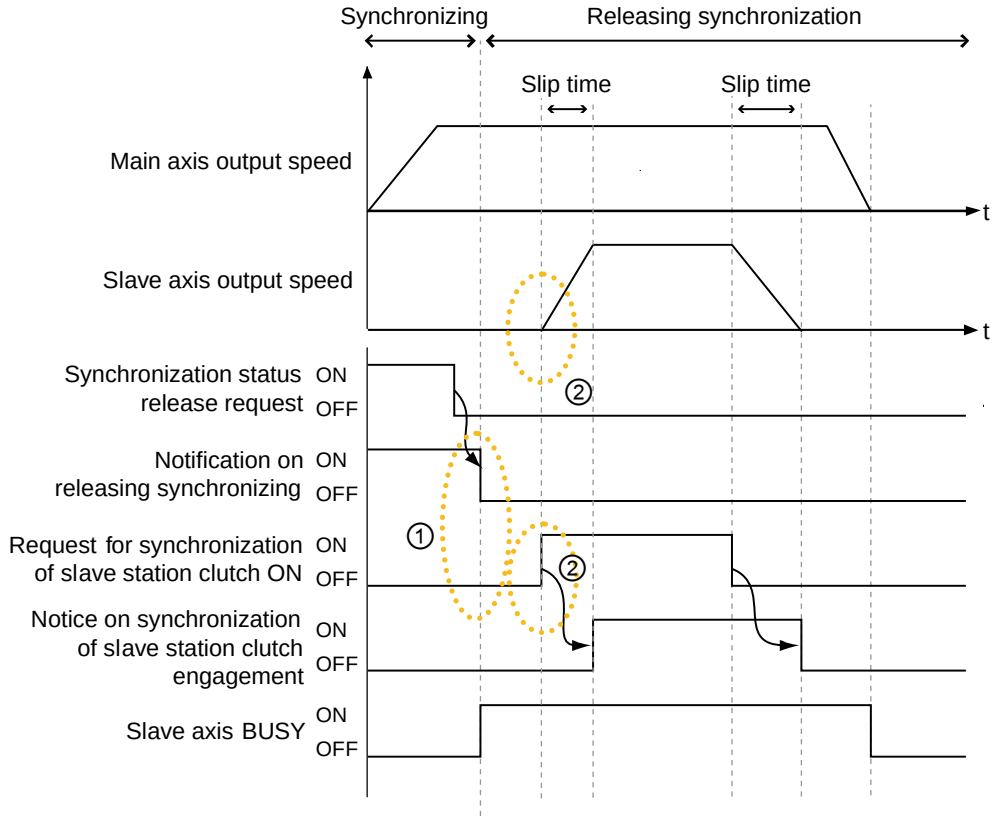
- When synchronization start is executed, if "Clutch ON of the synchronization of slave station" is set to ON, please directly connect the clutch without considering the settings of "slippage mode".
- However, when the synchronization start is executed, if "Clutch ON of the synchronization of slave station" is set to OFF, please connect the clutch according to the setting of "slippage mode".

When the synchronization start is executed and the Request for synchronization of slave station clutch is ON



①	Because the clutch is engaged (Clutch ON of the synchronization of slave station" is set to OFF) when the synchronization starts (notice on canceling synchronization is set to ON), the slave station axis starts operation immediately.

When the synchronization start is executed and the Request for synchronization of slave station clutch is OFF



①	Because the clutch is disengaged (Clutch ON of the synchronization of slave station" is set to OFF) when the synchronization starts (notice on canceling synchronization is set to OFF), the slave station axis will no start operation immediately.
②	The slave station axis starts operation according to the Request for synchronization of slave station clutch ON

■ I/O Allocation

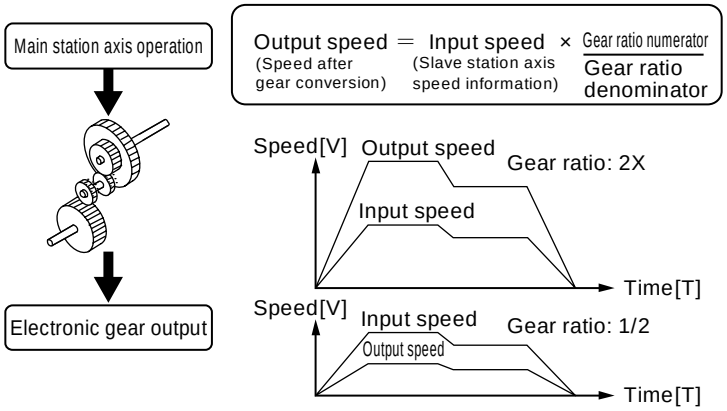
Signal name	Axis 1	Axis 2	Axis 3	Axis 4
Request for synchronization clearing	Y1188	Y1189	Y118A	Y118B
Synchronization canceling notice	X1188	X1189	X118A	X118B
Request for synchronization of slave station clutch ON	Y1198	Y1199	Y119A	Y119B
Notice on connection of request for synchronization of slave station clutch ON	X1198	X1199	X119A	X119B
Slave station axis BUSY	Y1118	Y1119	Y111A	Y111B

12.4 Electronic gear function

12.4.1 Summary of electronic gear function

■ Electronic gear function

The electronic gear function is the function that runs by multiplying the speed of the main station axis by the set gear ratio.



■ Precautions on using the electronic gear function

With the electronic gear function, it is possible to freely set the operation speed of the slave station axis corresponding to the main station axis, and the movement of the slave station axis is calculated according to the formula below, and the movements of the main station axis and that of the slave station axis are not consistent.

Movement of slave station axis = Movement of main station axis ×
(gear ratio numerator/ear ratio denominator)

※ During operations when the gear ratio is fixed

When the movements of the main station axis and the slave station axis must be consistent, please do not use the electronic gear function.

◆ CAUTION!

Please note that the slave station axis will stop suddenly upon execution of emergency stop and deceleration stop when changing the gear ration.

12.4.2 Types and contents of parameters to be set

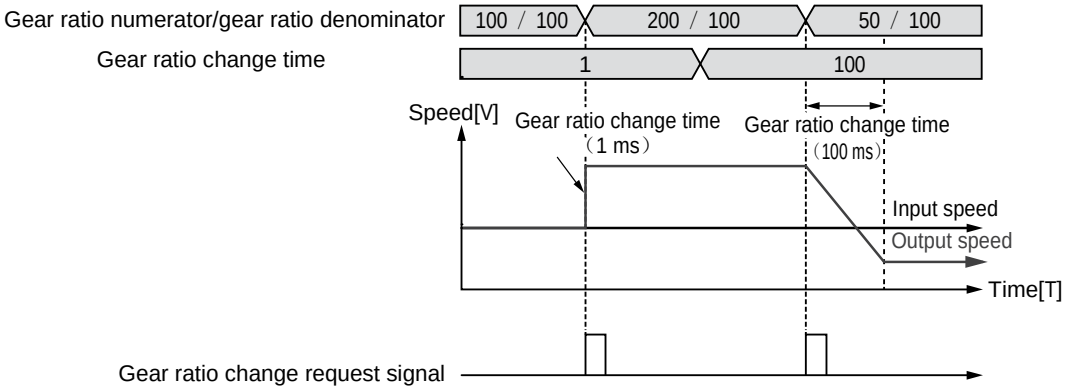
The parameters to be set when using the electronic gear are shown below.

Parameter Name	Outline
Setting electronic gear operation	enables/disables electronic gear function When the electronic gear function is disabled, the gear ratio of the electronic gear is fixed to 1:1, and the operations of the main station axis is directly inputted to the "electronic clutch" function.
gear ratio numerator	determines the gear ratio of the electronic gear The gear ratio of the electronic gear is determined according to the formula below. Output speed of electronic gear = operation speed of main station axis × (gear ratio numerator/ear ratio denominator)
gear ratio denominator	
Gear ratio change time	The time from the gear ratio speed before the change to the gear ratio speed after the change during the change of gear ratio of the electronic gear.

12.4.3 gear ratio change during operation

■ Precautions for changing gear ratio during operation

- To change the gear ratio during the operation, the speed will turn to the changed speed only after the "gear ration change time".
- When the gear ration change time is "1", the gear ratio will be changed at the acceleration/deceleration time of 0.
- The acceleration/deceleration during the change of gear ratio is linear. S acceleration/deceleration is not applicable.



■ Programming method

Please adopt the following steps to create the user program when changing the gear ratio during the operation.

1. Gear ratio change

Change the "gear ratio numerator of electronic gear/gear ratio denominator of electronic gear)".

The gear ratio set in this region is the gear ratio at the startup of the control unit, to restore it to the value at the startup, it is recommended to save the gear ration before change.

2. Set the gear ratio change request contact to ON

Please set the I/O signal "gear ratio change request of electronic gear" assigned to the object axis of the unit to ON.

This signal is valid for pulse edge type. Start changing the gear ratio by setting the gear ration change request signal to ON

■ I/O Allocation

Signal name	Axis 1	Axis 2	Axis 3	Axis 4
Request for gear ratio change of slave station shaft axis	Y1190	Y1191	Y1192	Y1193
Notice on synchronization of slave station gear ratio change	X1190	X1191	X1191	X1193

After the change, please set the gear ratio change request signal to OFF.

◆ Reference

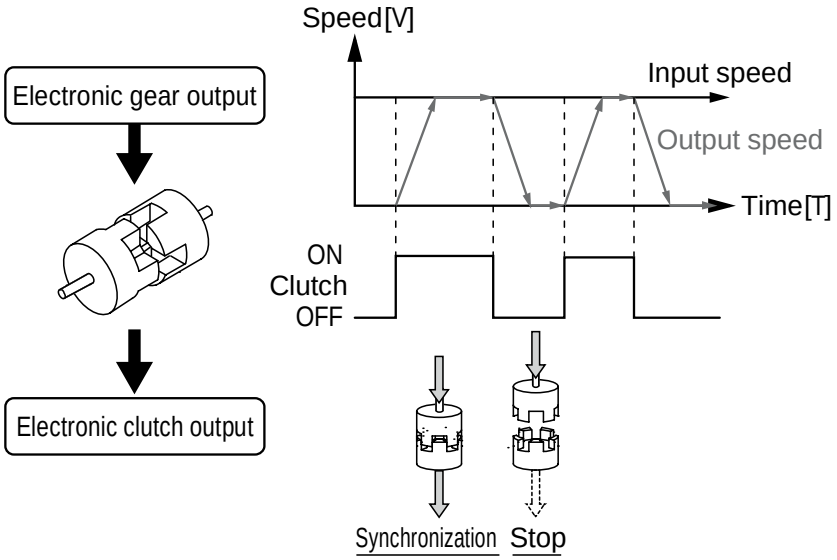
For details about the gear ration setting region, please refer to "Chapter 26.3 Position control storage".

MEMO

12.5 Electronic clutch function

12.5.1 What is the electronic clutch function?

The electronic clutch is the function that turns ON or OFF the clutch for the output of the electronic gear function. When the electronic clutch is OFF, operations of the main station axis and the slave station axis are separated, and the slave station axis will no longer follow the main station axis and turn to stop. When the electronic clutch is ON, operations of the main station axis and the slave station axis are interlocked.



◆ CAUTION!

Please note that the slave station axis may stop suddenly if the clutch is turned OFF during deceleration of the main station axis.

12.5.2 Types and contents of parameters to be set

The parameters to be set when using the electronic clutch are shown below.

Parameter Name		Outline
Electronic clutch Enabled/disabled		enables/disables electronic gear function When the electronic clutch is used, the electronic clutch OFF is the initial status. Always connect the electronic clutch according to the application. When the electronic clutch is not used, the electronic clutch OFF is in the constant connection status, when the output data of the electric gear are directly inputted to the electronic cam function. In this case, the main station axis and the slave station axis are interlocked constantly.
Clutch ON	Trigger type	Set "I/O Clutch On Request" to the detected trigger signal.
	Pulse edge selection	Trigger signal detection types can be selected from "level", "rising edge" and "falling edge".
	Method	Clutch connection modes can be selected from "direct" and "slippage".
	Slippage time	The slippage time must be set if "slippage" is selected.
Clutch OFF	Trigger type	Select "I/O Clutch OFF Request" or "I/O + Clutch Post Phase" as the detected trigger. (Note 1)
	Pulse edge selection	Trigger signal detection types can be selected from "level", "rising edge" and "falling edge".
	Method	Clutch connection modes can be selected from "direct" and "slippage".
	Slippage time	The slippage time must be set if "slippage" is selected.

(Note 1): support for "I/O + Clutch Post Phase" by control units above Motion CPU Ver.1.40. In addition, FPWIN GR7 of Ver.2.8 or later is required for setting.

◆ Emphasis

- **The mode to stop at any phase after adding the Clutch OFF ("I/O + Clutch Post Phase"). supported by control units above Motion CPU Ver.1.40. Please refer to "12.5.5Clutch OFF in Designated Phase " for details.**

12.5.3 Types of electronic clutch triggers

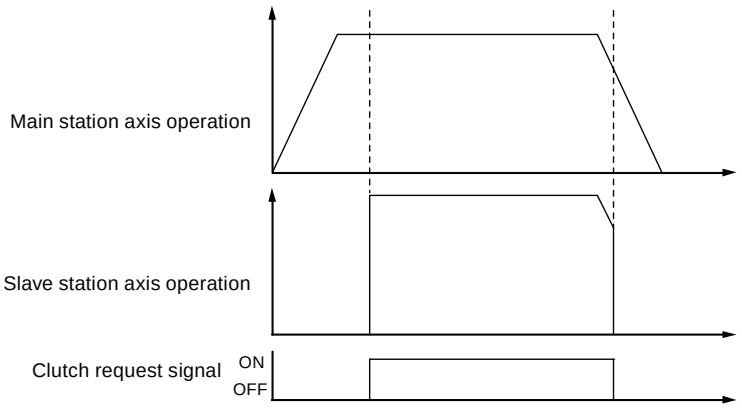
There are the following types for the ON/OFF of electronic clutch.

■ Clutch request signals (Y1198-Y119B, Y1200-Y1203)

controls the electronic clutch with the I/O signal "Clutch Request Signal" assigned to the unit.

■ I/O Allocation

Signal type	Axis 1	Axis 2	Axis 3	Axis 4	Operation
Request for slave station clutch ON	Y1198	Y1199	Y119A	Y119B	
Request for of slave station clutch OFF	Y1200	Y1201	Y1202	Y1203	
Slave station axis clutch operation notification	X1198	X1199	X119A	X119B	ON: connected, OFF: disconnected



(Note): the figure above shows the case when the clutch connection mode is set to "Direct".

■ Pulse edge selection

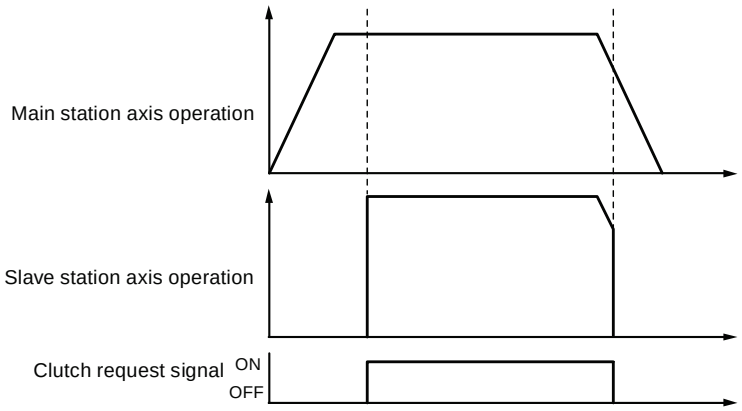
Pulse edge selection	Operation
Level	switches clutch operations by turning ON/OFF the Request for slave station clutch ON (Y1198-Y119B). The signal of request for slave station clutch OFF is not used. When the pulse edge is set to "Level", the request for of slave station clutch OFF (Y1120-Y1123) is invalid.
Rising edge	The clutch is ON on the rising edge of the request for slave station clutch ON (Y1198-Y119B). Or the clutch is OFF on the rising edge of the request for slave station clutch OFF (Y1120-Y1123)).
Falling edge	The clutch is ON on the falling edge of the request for slave station clutch ON (Y1198-Y119B). or the clutch is OFF on the falling edge of the request for slave station clutch OFF (Y1120-Y1123)).

12.5.4 Connection modes of electronic clutch

When using the electronic clutch function, turning the clutch is ON allows the the slave station axis to "Stop→Operate"; and turning it OFF allows the slave station axis to "Operate→Stop", when the operations during the acceleration and deceleration are be set as follows.

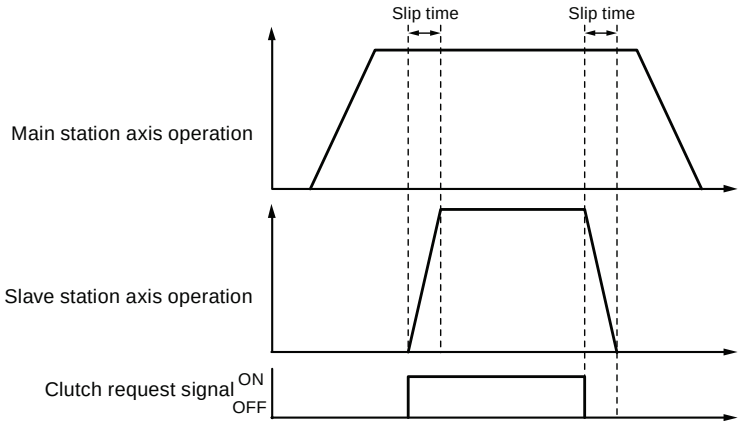
■ Direct mode

When the electronic clutch is detected to be ON (OFF), the operations of the main station axis and the slave station axis are made in consistence. When the direct mode is adopted, turning the clutch ON (OFF) makes the slave station axis operate along with the main station axis at the acceleration and deceleration speed of 0.



■ Slippage mode

When the electronic clutch is detected to be ON (OFF), the set "slippage time" is made the acceleration and deceleration time to make the operation of the slave station axis follow that of the main station axis. The acceleration and deceleration adopt the linear mode.

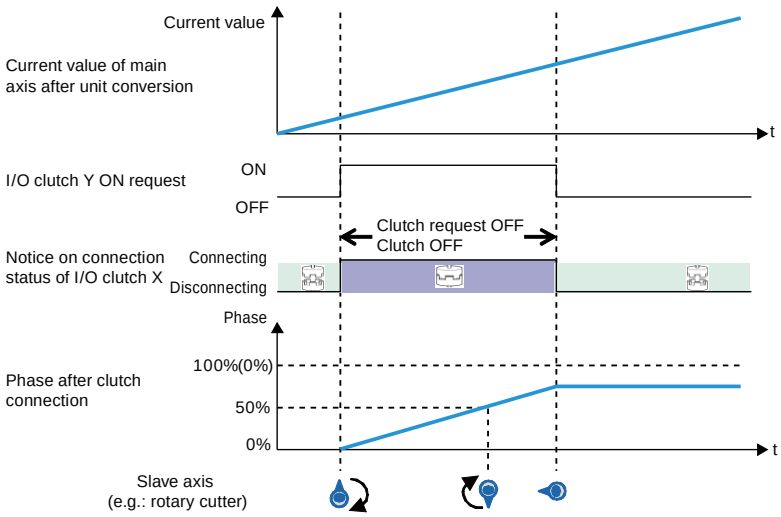


12.5.5 Clutch OFF in Designated Phase

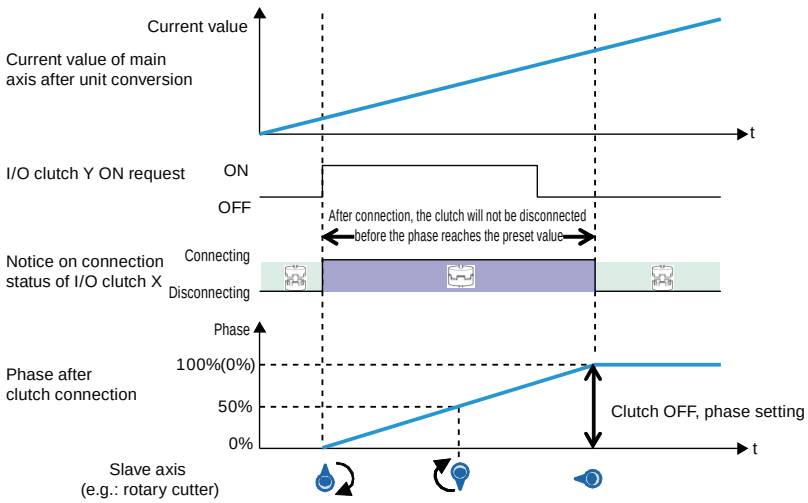
"Clutch OFF in Designated Phase" means to set the clutch OFF in any preset phase. It allows for control without deviation when repeating stop or start operations, etc. in the same phase. supported by control units above Motion CPU Ver.1.40.

■ Clutch OFF in Designated Phase

In case of OFF request via I/O signals, Clutch OFF operation will be executed independent from the phase.



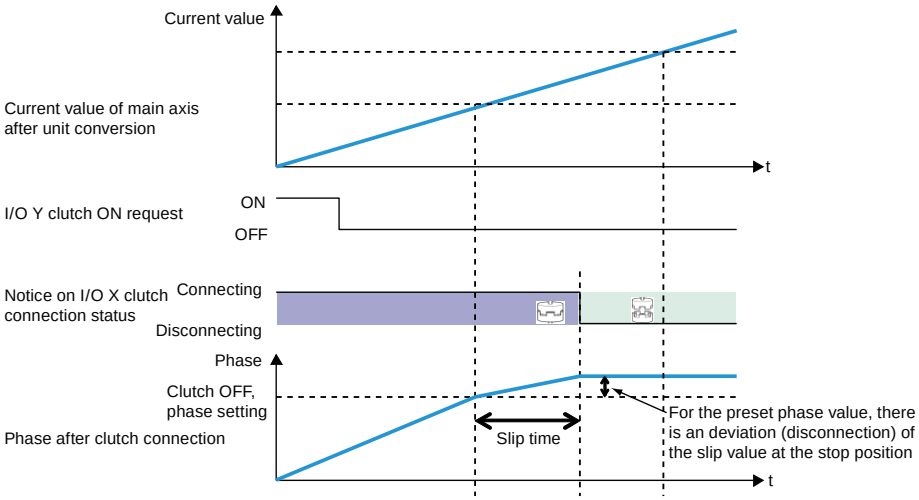
With the "Clutch OFF in Designated Phase" function, the clutch is set to OFF upon consistency with the preset phase after sending the OFF request according to the I/O signals.



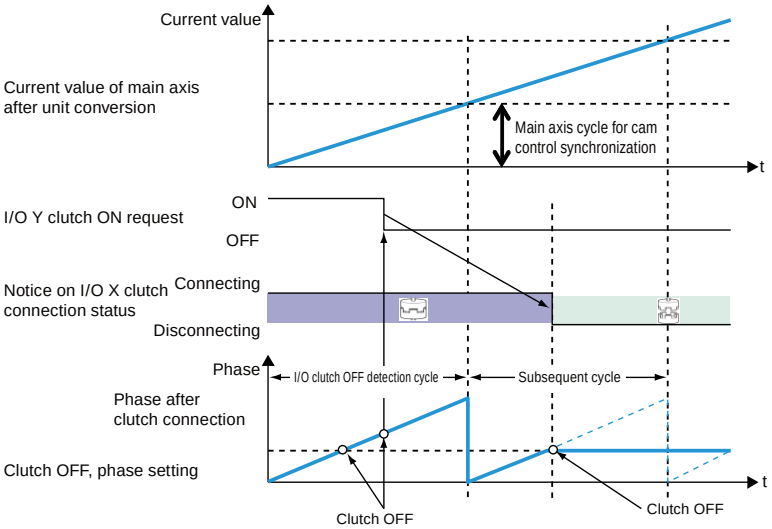
(Note 1): The figure above shows an example when the Clutch ON request and Clutch OFF request are both set to "Level". You can also select "rising edge" or "falling edge".

■ Precautions for operation features

- When the Clutch OFF method is set to "slippage", the phase will delay for the designated slippage time before deceleration stop after reaching the time of the set Clutch OFF ratio. To stop in the phase of the set ratio, please set the Clutch OFF mode to "Direct" first.



- When the Clutch OFF trigger signal is detected in a phase greater than the set ratio (0-99%), the clutch will be turned OFF upon the next arrival.

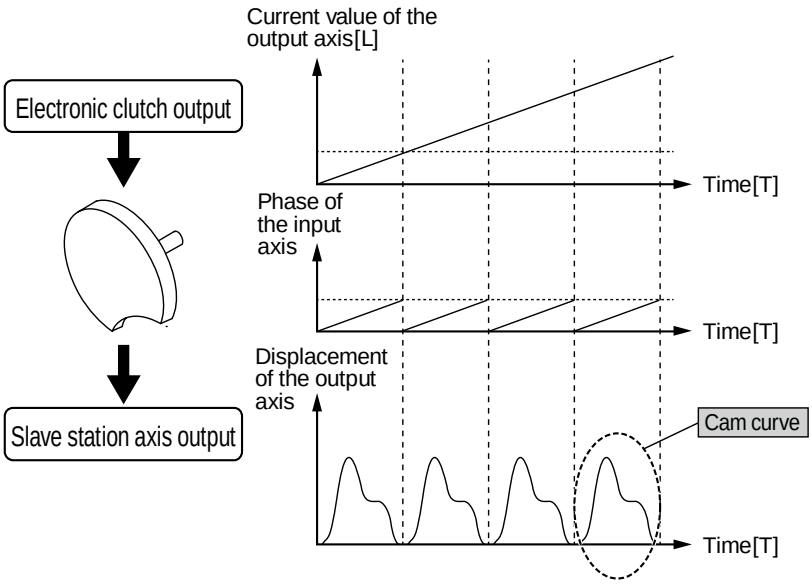


12.6 Electronic cam function

12.6.1 Summary of electronic cam function

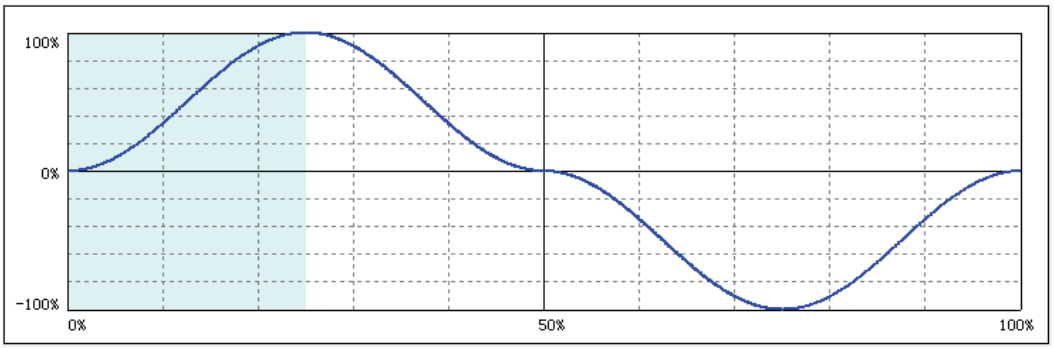
■ What is the electronic cam function

The electronic cam function determines and outputs the movement of the slave station axis according to the main station axis operation (phase information) and the cam curves with the preset cam curves. A cam curve means the movement of the slave station axis in each phase (rotation angle) based on the motion of the main station axis to rotate for one turn, which is set in the configuration menu.



■ Cam curves

A cam curve means the movement of the slave station axis in each phase (rotation angle) based on the motion of one revolution of the main station axis. The horizontal axis of a cam curve means the phase (rotation angle) of the main station axis on the basis of 1 revolution; and the vertical axis means the movement. The horizontal axis and the vertical axis are both expressed in %. Cam curves are set in the configuration menu of the Configurator PM7.



■ Cam curve specifications

Setting items	Specification
Resolution	1024, 2048, 4096, 8192, 16384, 32768
Number of cam curves	Resolution at 1024, 2048, 4096 and 8192: 16 Resolution 16384: 8 Resolution 32768: 4
Section setting	100%/period, up to 20 sections
Movement setting	100% setting
Cam curves	Selectable from the following modes Equal speed/equal acceleration/single string/involute/deformed ladder/deformed sine/deformed equal speed/ladder-shaped single stop involute m=1/single stop involute m=2/3/single stop deformed ladder m=2/3/single stop deformed ladder Ferguson curve/single stop deformed sine/single stop ladder/no stop deformed ladder/no stop deformed equal speed/NC2 curve/asymmetrical involute/asymmetrical deformed ladder
Adjusting function	Adjusting function for movement of any point data Up to 1,000 points (cam data unit)
Phase shifting function	Phase shifting of the created cam data 0 - 100 %
Display	Displacement/speed/acceleration/jerk display is freely available with the check box

Emphasis

- **Advance timing correction is added to correct the response delay of the cam output shaft. Supported by control units with Motion CPU Ver.1.50 or above. Please refer to "12.5.5 Clutch OFF in Designated Phase " for details.**

12.6.2 Types and contents of parameters to be set

The parameters to be set when using the electronic cam are shown below.

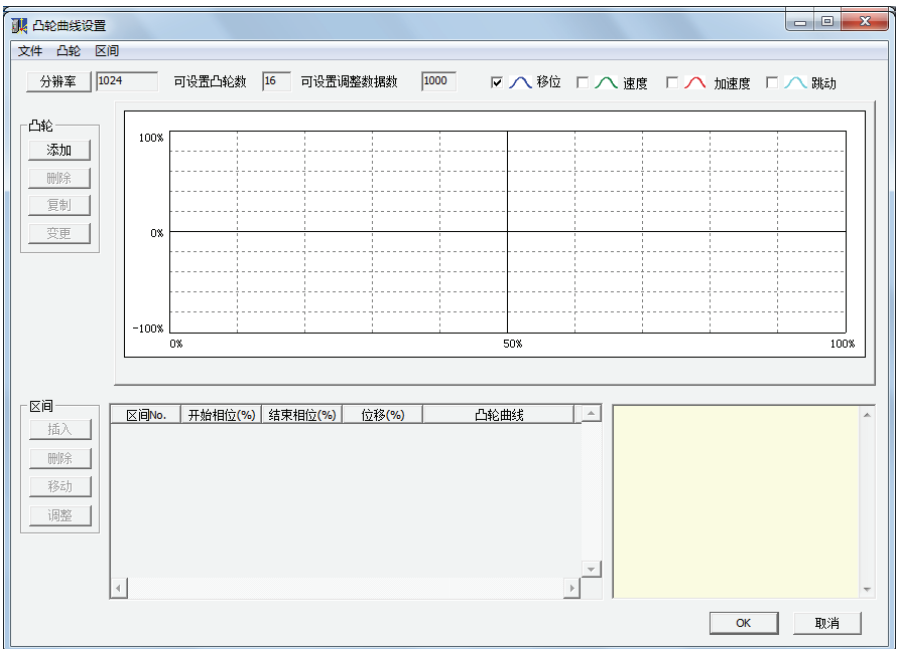
Parameter Name		Outline
Electronic cam enabled/disabled		enables/disables electronic cam function When the electronic cam is not used, the electronic cam function is not enabled, and the output of the electronic clutch is pulse output.
Cam curves		Most elementary settings for using the electronic cam function Cam curves are set in the "Cam Curve Settings' menu of the configuration menu. The control unit converts cam curves into point data for management according to the preset cam curves and resolution.
Cam control Main station axis cycle		sets the number of pulses equivalent to full phase (the data for the main station axis to rotate by 1 turn) of the cam curve used.
No. of cam curve used		Designate the number of cam curve to be used from multiple cam curves.
Cam stroke		sets the number of pulses equivalent to the full movement (100%) of the cam curve used.
Setting advance timing correction		enable/disable advance timing correction function.
	Benchmark amount	The unit depends on the unit system of the main station axis. Setting range: -1073741823 - 1073741823 (the decimal point position depends on the unit system)
	Benchmark speed	The unit depends on the unit system of the main station axis. Setting range: 1 - 32767000 (the decimal point position depends on the unit system)
	Parameter change time	Setting range: 1 - 10000 ms

(Note 1): advance timing correction is supported by control units with Motion CPU Ver.1.50 or above.

12.6.3 Cam curve settings

■ Startup of the cam curve settings menu

- Open the configuration menu from FPWIN GR7, select "Position Control Settings" to start the settings tool.
- In the toolbar of the unit settings tool, select "Axis Settings" - "Cam Curve Settings" from the following icons or from the menu, or click the  icon. The cam curve settings menu appears.
- Blank screen is displayed for creating a new file, and settings for cam curve 1 is displayed if data already exist.



■ Resolution setting

Click the [Resolution] button from the cam curve menu. After the resolution settings menu is displayed, select the resolution and click the [OK] button.

Emphasis

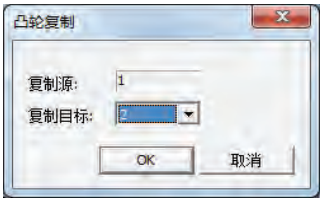
- **The resolution is valid for all cam curves. It is not allowed to set the resolution of each cam curve separately.**
- **Number of cam curves available for setting depends on the resolution. When changing the resolution, if the set number of cam curves exceeds the number of cam curves available for setting after the resolution is changed, the resolution will not be changed. Please delete the cam curves and change the resolution again.**

■ Creating/copying cam curves

Click the [Add] button in the "Cam" field to start the cam No. selection menu.

Select the cam No. and click the [OK] button.

Cam curves can also be copied. Click [Copy] to select the target and source cam curve No.



To change the cam No., click the [Change] button and select the changed cam No.

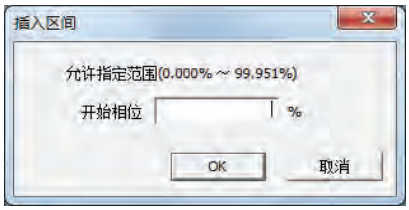
Note) A cam curve No. that has been set cannot be set.

■ Cam curve settings

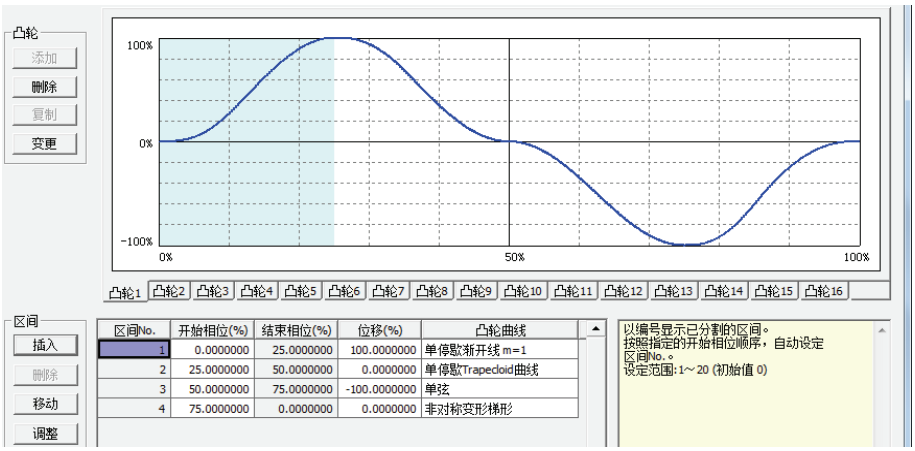
Click the [Insert] button in the "Section" field. Set the starting phase and click the [OK] button.

In the initial status, the cam curve is only set as a section of the 0~100 phase.

It is allowed to divide the above section into multiple sections by setting the starting phase.



Selected sections are on white background and unselected sections are on gray background.



◆ CAUTION!

- **The starting phase may fail to reach the designated phase due to resolution.**

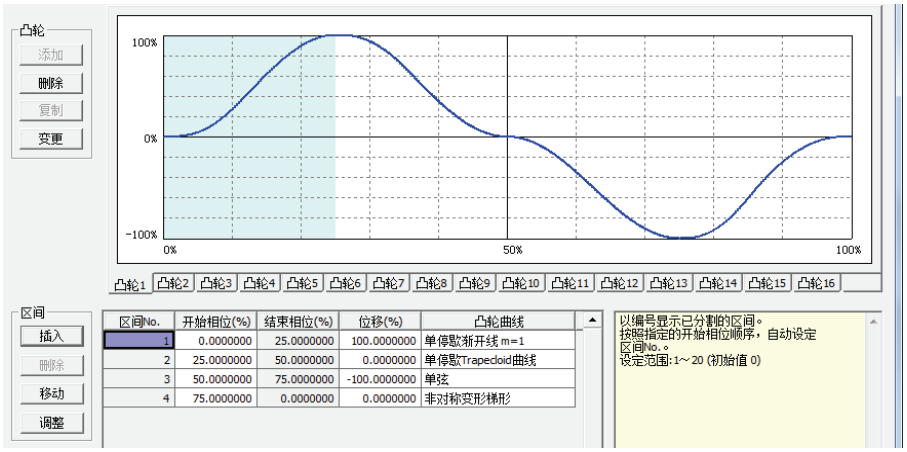
■ Cam chart edition

Edit the created cam chart data.

Please set the sections according to the following data:

- Starting phase (%)
- Displacement (%)
- Cam curves

The cam curve changes according to the settings.



Emphasis

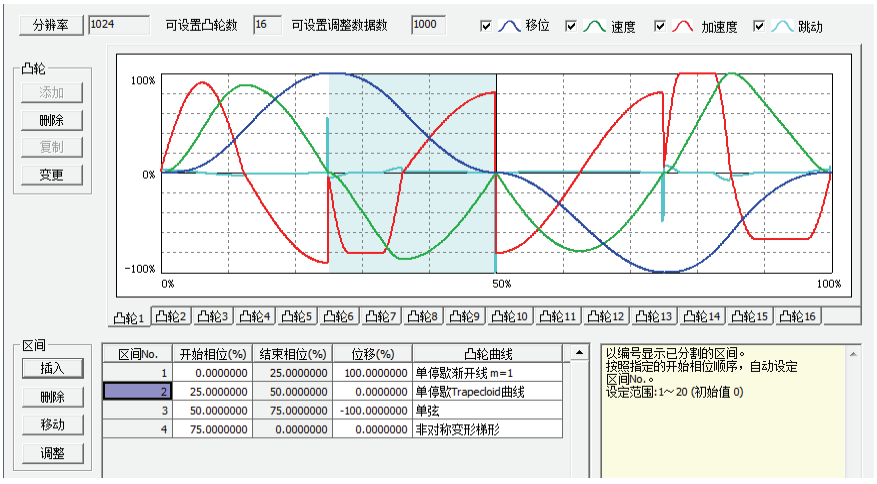
- **The end phase cannot be set. When the starting phase is changed, the end phase will be automatically changed.**
- **Please do not conduct sudden displacement of the cam curve which has been set.. Sharp displacement may prevent the motor from following the output.**
- **Similarly, please set the displacements of 0% phase and 100% phase to be the same.**

■ Cam chart confirmation

Confirm the set cam charts (cam curves) During synchronous control , the slave station axis follows the cam curve for operation. Therefore, sharp displacement of the cam curve may prevent the motor from following the output. In addition, as for the changes in cam curves, information like acceleration is also important besides displacement. The following information besides displacement can also be displayed in the cam chart settings menu.

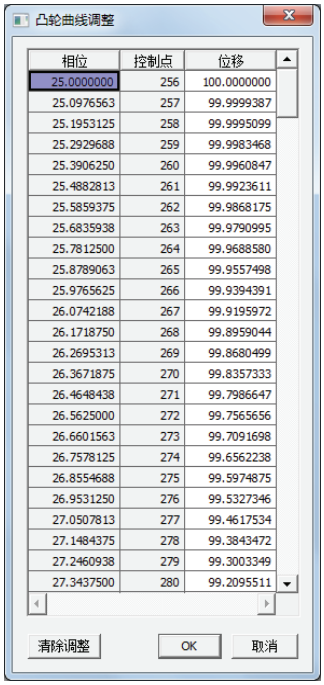
Display item	Outline
Displacement	Setting item in the cam chart.
Speed	Display the operation speed of the cam chart at the set displacement. It is displayed in the relative value.
Acceleration	Display the acceleration of each phase. Please note that dramatic speed change may occur at positions with major changes in acceleration.
Jerk	Jerk is the result of the acceleration derivative by time for expressing the change rate of acceleration.

In the cam chart settings menu, the display items can be set by checking the following check boxes. The cam chart settings are changed by referring to the display items.

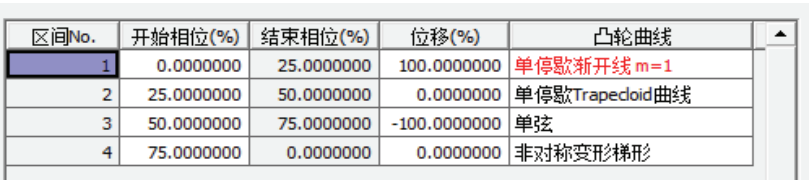


■ Cam chart adjustment

The tuning function for data of the set cam curves in the cam charts settings menu. Dramatic changes can be mitigated by tuning of set cam data with the adjustment function. Please select the section No. of the object and click the [Adjust] button for adjustment. The adjustment menu is displayed. Display the data sheets in designated section No. in the adjustment menu in the sections after division of the full section (0-100%) at the set resolution.



Select the data of the phase (control point) to be adjusted to change the displacement data. Select "OK" to accept the adjustment or "Clear Adjustment" to clear the set adjustment data. Cam curves in section Nos. with adjustment executed are displayed in red text, which allows you to judge whether the curves are subject to adjustment.

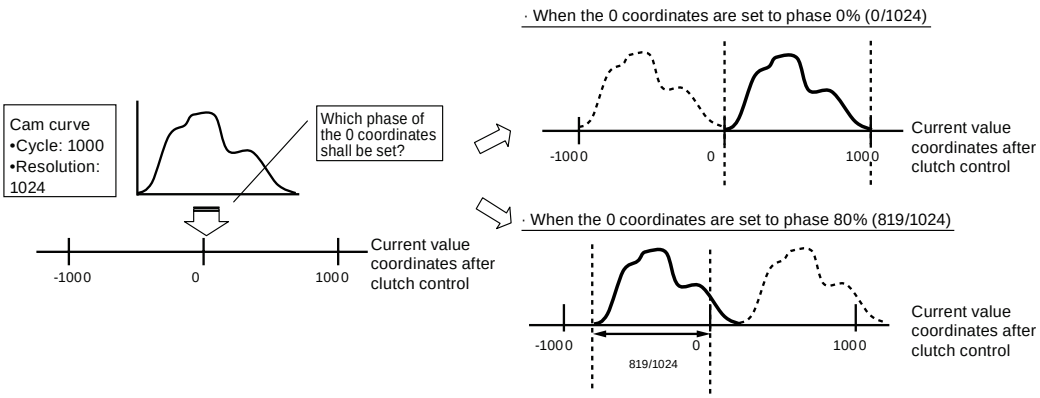


区间No.	开始相位(%)	结束相位(%)	位移(%)	凸轮曲线
1	0.0000000	25.0000000	100.0000000	单停歇渐开线 m=1
2	25.0000000	50.0000000	0.0000000	单停歇Trapecloid曲线
3	50.0000000	75.0000000	-100.0000000	单弦
4	75.0000000	0.0000000	0.0000000	非对称变形梯形

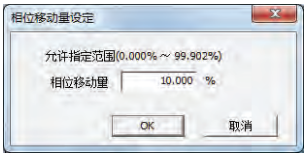
■ Cam chart movement

A created cam curve is defined with phase 0-100%, however, in practice, the benchmark phase of a created cam curve may be different. The cam chart movement function is used to set the percentage of the phase at the position where the coordinate system of the current value is 0 in the created cam curve.

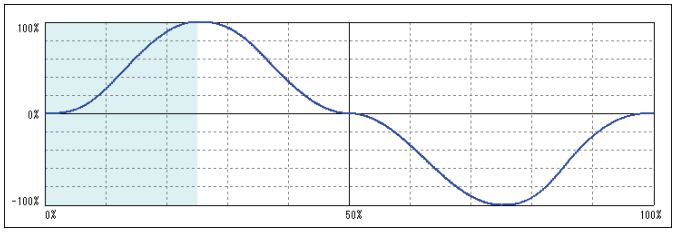
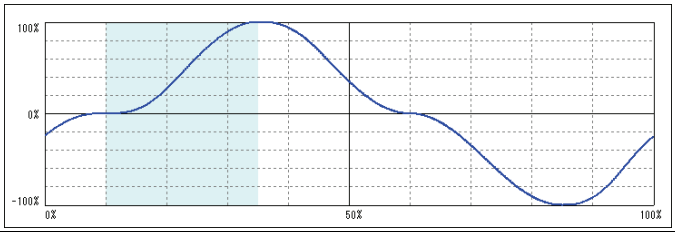
Diagram for the movement of electronic cam



Select movement from "Section" to set the movement.



The created cam curve moved by 10% with the display updated.

Before change	
After change	

■ Cam chart saving

Click the [OK] button in the cam chart settings menu to automatically save created cam charts. Saved cam charts are managed in FPWIN GR7 and downloaded by the same to the control unit for setting.

12.6.4 Advance timing correction

The "Advance timing correction" function means the correction for the response delay of the mechanical system connected to the electronic cam output or delay in the processing time of PLC operation. It is supported by control units of Motion CPU Ver.1.50 or above.

■ Advance timing correction designation

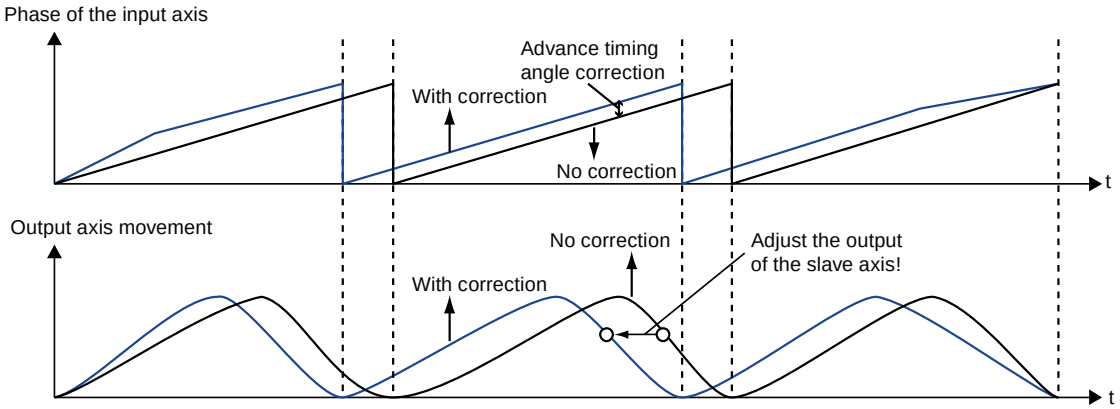
- Advance timing correction can be set via tool software or user program by slave station axis.
- After setting the "Advance timing benchmark speed" and "Advance timing benchmark amount", the "Main station axis input speed" in operation will be used for automatic calculation of the correction amount. Please calculate the advance timing correction with the following formula.

$$\text{Advance timing angle correction} = \text{Main axis input speed} \times \frac{\text{Advance timing angle reference}}{\text{Advance timing angle reference speed}}$$

Main axis input speed: speed after clutch control

■ Internal processing of advance timing correction

According to the set value of advance timing correction, we can work out the phase of the main station axis used as the correction benchmark of slave station axis as data for the operation. This value may be made the benchmark to work out the correction amount of the slave station axis.



☛To next page

■ Tool software setting

Set it via the Synchronization Control dialog box.

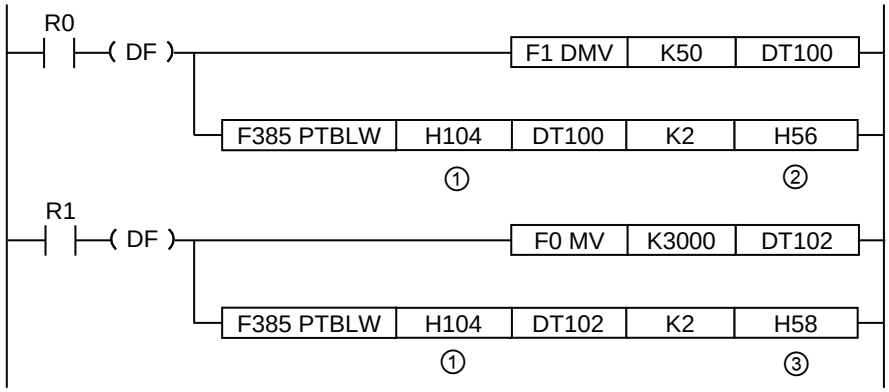
电子凸轮动作设定	使用
凸轮控制同步主轴周期	10000
使用凸轮曲线编号	1
凸轮行程量	10000
进角补偿动作设置	使用
基准量	0
基准速度	100
参数变更时间	100

Parameter Name		Outline
Setting advance timing correction		enable/disable advance timing correction function.
	Benchmark amount	The unit depends on the unit system of the main station axis. Setting range: -1073741823 - 1073741823 (the decimal point position depends on the unit system)
	Benchmark speed	The unit depends on the unit system of the main station axis. Setting range: 1 - 32767000 (the decimal point position depends on the unit system)
	Parameter change time	Setting range: 1 - 10000 ms

(Note 1): advance timing correction is supported by control units with Motion CPU Ver.1.50 or above.

■ Setting based on the user program

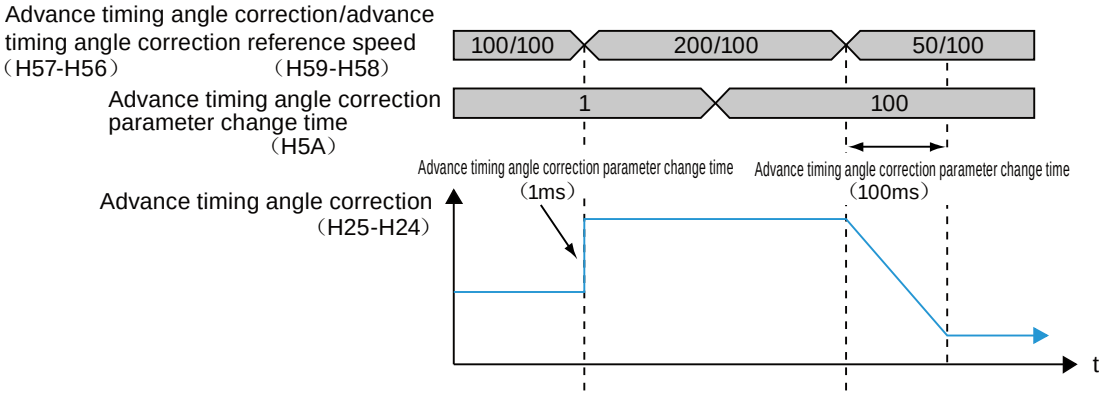
The case when the advance timing correction benchmark of axis-1 is changed to 50 and the benchmark speed of advance timing correction of the axis is changed to 3000 is shown below.



Symbols	Specified content of program	Specified value of program			
		Axis 1	Axis 2	Axis 3	Axis 4
①	Axis No. and synchronous control setting region	H1	H101	H201	H301
②	Setting region for benchmark amount of advanced timing correction	H56			
③	Setting region for advanced timing correction	H58			

■ Change of advance timing correction during operation

- Advance timing correction can be changed during operation.
- After detecting changes in the "Benchmark speed of advance timing correction" or "Benchmark amount of advanced timing correction", the unit will reflect the amount of advanced timing correction after the set "Change time of advanced timing correction".

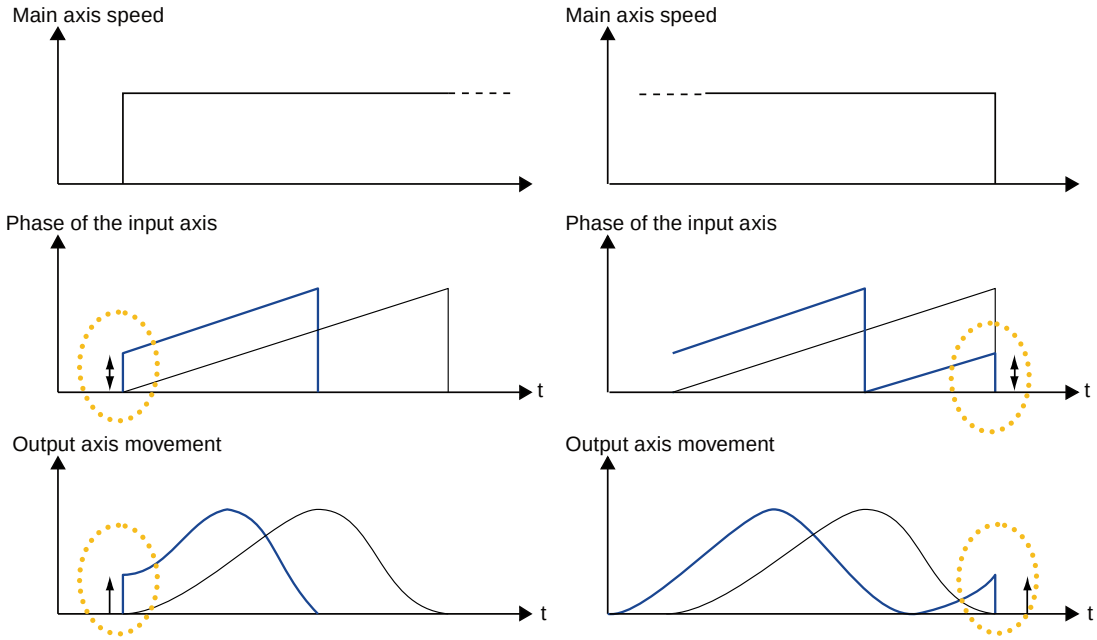


◆ CAUTION!

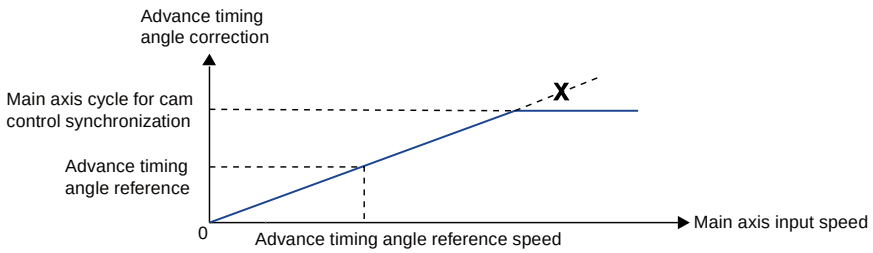
- **"Benchmark speed of advance timing correction" and "Benchmark amount of advanced timing correction" are 32-bit data with symbols. If the values are changed in 16-bit (1 byte), they may be changed to unexpected values. Please always change the values in 32-bit (2 byte).**
- **Upon any change during the operation, there may be deviation of the time for the unit to get the changed "Benchmark speed of advance timing correction" and "Benchmark amount of advanced timing correction". Please change either the "Benchmark speed of advance timing correction" or the "Benchmark amount of advanced timing correction" to prevent dramatic change in the "advanced timing correction".**

■ Precautions for settings

- When using the advanced timing correction, if the main station axis fails to set sufficient acceleration/deceleration time, or if sharp acceleration/deceleration is inputted for direct connection/disconnection of the clutch during the operation of the main station axis, overshoot or undershoot may occur due depending on the settings.
- When using the advanced timing correction, sufficient acceleration/deceleration time should be set for the main station axis, if the clutch function is used at the same time, slippage function should be set to prevent dramatic acceleration/deceleration.



- The advance timing correction" calculated according to the settings of "Benchmark speed of advance timing correction" and "Benchmark amount of advanced timing correction" may exceed the "Main axis cycle for cam control synchronization". If the advanced timing correction exceeds the "Main axis cycle for cam control synchronization", as shown in the figure below, the "Main axis cycle for cam control synchronization" should be the upper limit. Please set the advanced timing correction parameters according to the input speed.

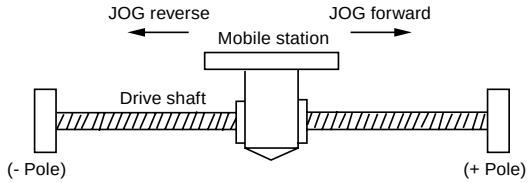


13

Manual operation (JOG operation)

13.1 Setting and action of the JOG operation

The following example is explained with the JOG operation of axis-1. The unit is set to pulse.

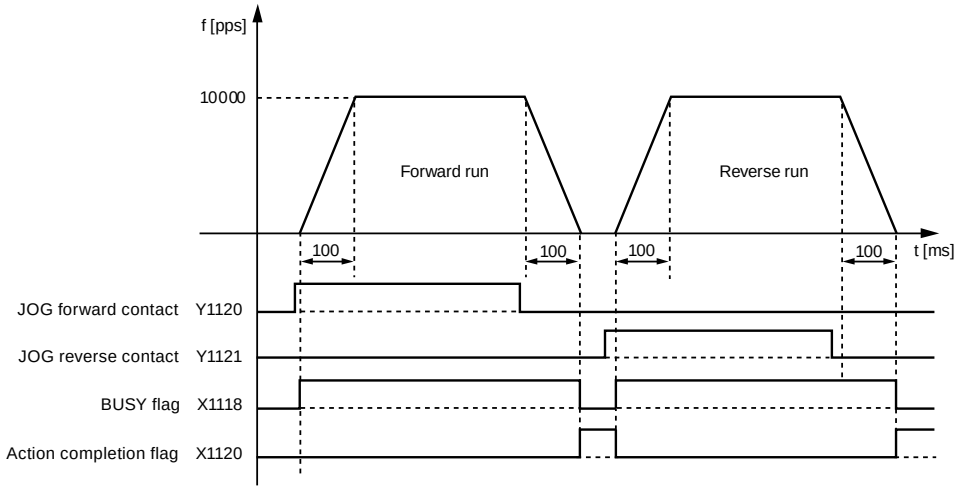


■ Setting Contents

Parameters to be set for JOG operation are set in the position control menu of the programming tool.

Item	Setting Example
Acceleration/deceleration curve	0: Linear acceleration/deceleration
Acceleration time (ms)	100 ms
Deceleration time (ms)	100 ms
Target speed	10000 pps

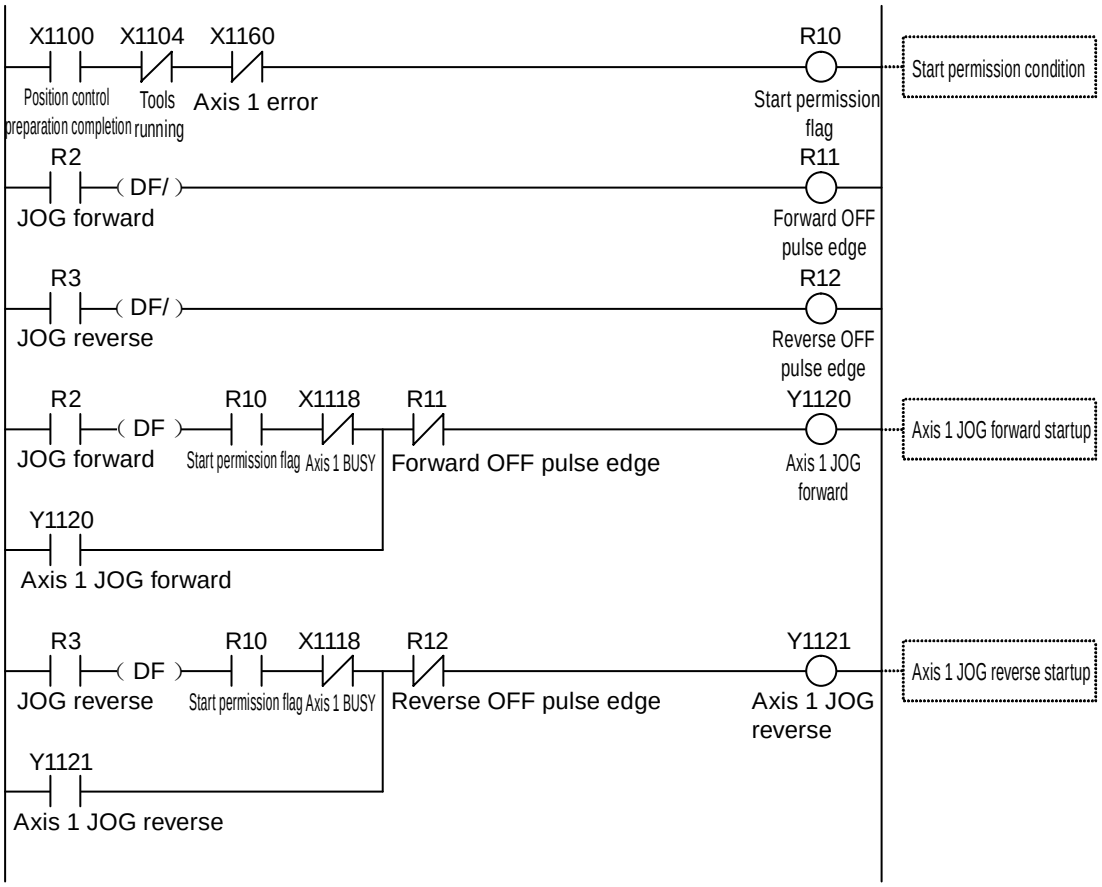
■ Action Chart



■ Action of each contact

- It indicates that the BUSY mark (X1118) of the motor under operation is in ON at the beginning of JOG operation and then OFF at the end of operation.
- It indicates that the action completion mark (X1120) is in ON at the end of operation, and has been holden to any action from the next position control, JOG operation, origin return and pulse generator operation for startup.

■ Example program



■ Points for attention of programs

The starting point and mark number vary with the axis number.

■ Limit Input Operation

Conditions	Direction	Limit Status	Operation
When JOG operation starts	Forward run	Limit (+) input: ON	Can not start with errors
		Limit (−) input: ON	Can be started
	Reverse run	Limit (+) input: ON	Can be started
		Limit (−) input: ON	Can not start with errors
When JOG operation is in action	Forward run	Limit (+) input: ON	Limit stop with errors
	Reverse run	Limit (−) input: ON	Limit stop with errors

13.2 Speed change during operation

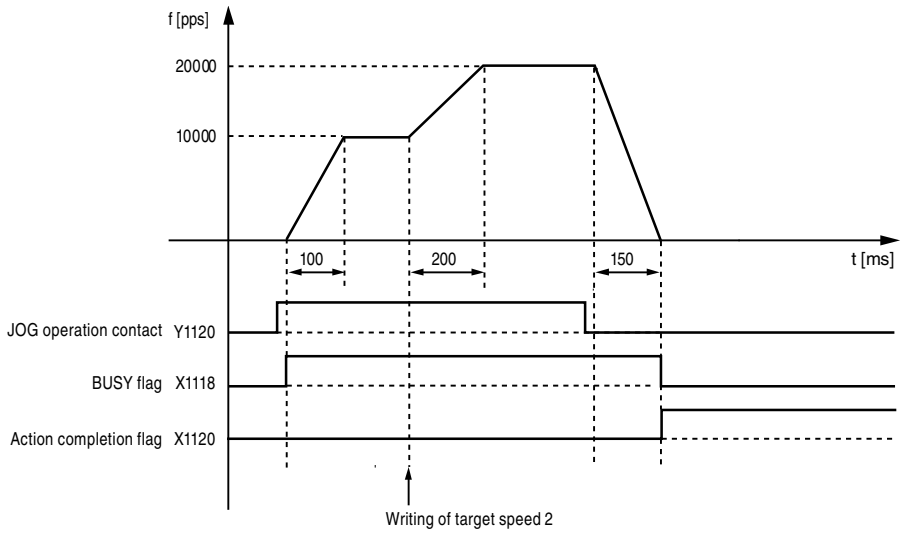
The target speed can be changed during the JOG operation.

■ Setting Contents

Parameters to be set for JOG operation are set in the position control menu of the programming tool.

Item	Setting Example	
Acceleration/deceleration curve	0: Linear acceleration/deceleration	
Acceleration time 1 (ms)	100 ms	
Deceleration time 1 (ms)	50 ms	
Target speed 1	10000 pps	
Acceleration time 2 (ms)	200 ms	The set values of acceleration time, deceleration time and target speed after speed change are written to the position control storage in the program are beyond the set range.
Deceleration time 2 (ms)	150 ms	
Target speed 2	20000 pps	

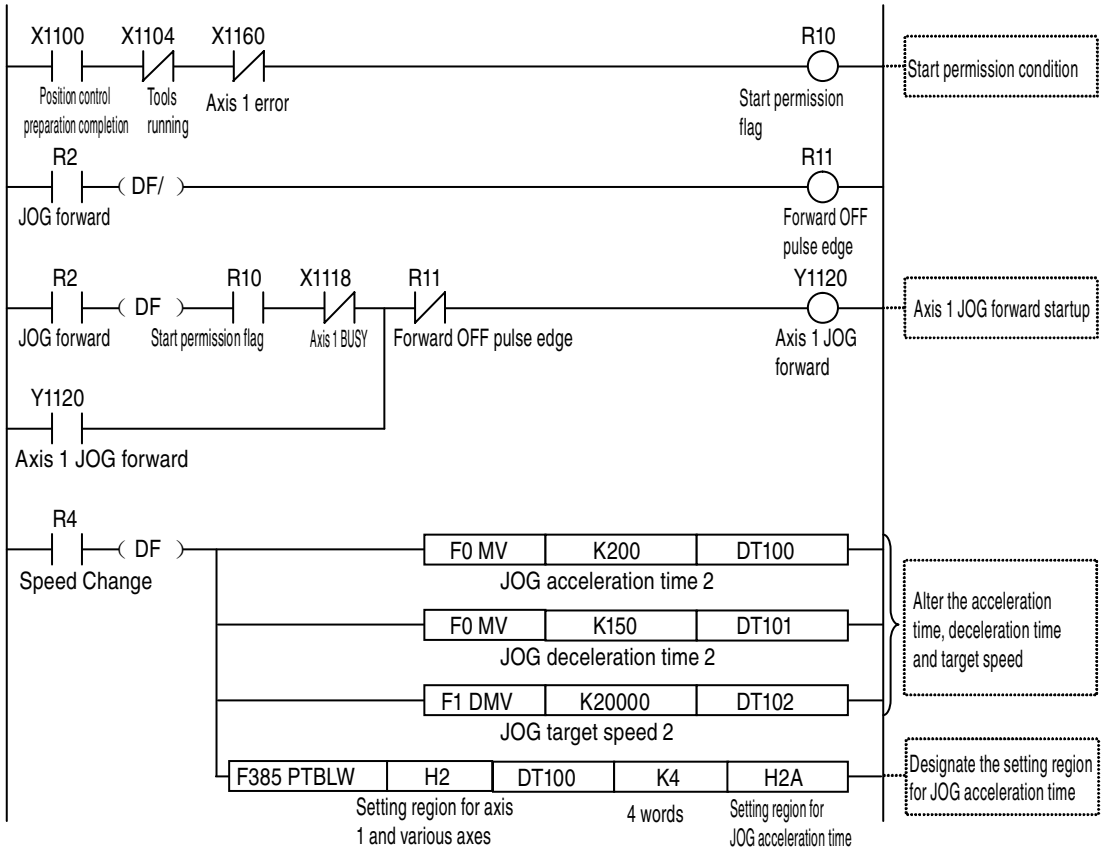
■ Action Chart



■ Action of each contact

- It indicates that the BUSY mark (X1118) of the motor under operation is in ON at the beginning of JOG operation and then OFF at the end of operation.
- The target speed can be freely changed during the JOG operation. The target speed is changed with program.
- It indicates that the action completion mark (X1120) is in ON at the end of operation, and has been holden to any action from the next position control, JOG operation, origin return and pulse generator operation for startup.

■ Example program



■ Points for attention of programs

- Rewrite the value of the position control storage (H2A-H2D) via the user program with speed change during the JOG operation. The following contents are set via the user program at the addresses of the position control storage. (H2A: JOG acceleration time, H2B: JOG deceleration time, H2C-H2D: target JOG speed)
- The starting point and mark number vary with the axis number.

14

Manual running (origin return)

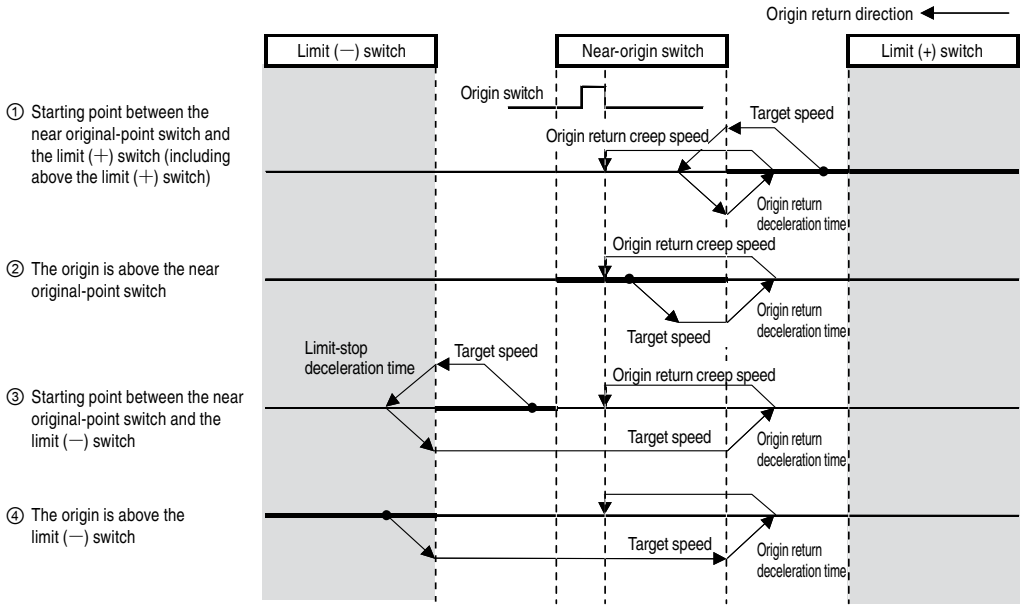
14.1 Type of the origin return

Origin return means the function to move to the preset benchmark position origin and set the coordinates there to 0.

There the following origin return modes for your selection.

■ **DOG mode 1 (pulse edge detection of the near origin switch + front-end benchmark of the origin switch)**

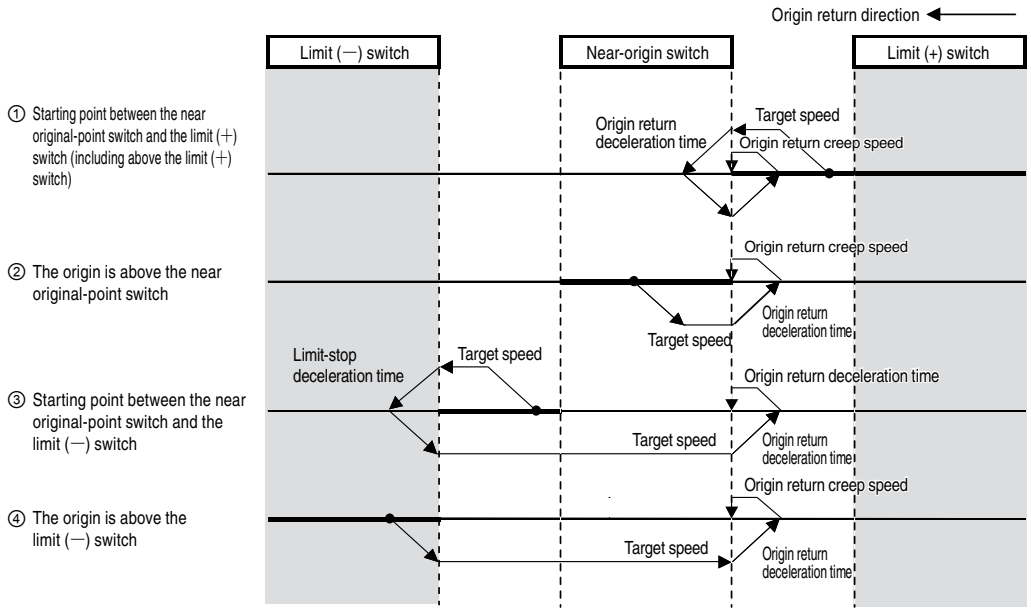
After the rising edge of the near origin switch is detected, the rising edge of the initial origin switch is used as the origin.



(Note) The operation is the same to when the origin sensor is turned ON upon startup.

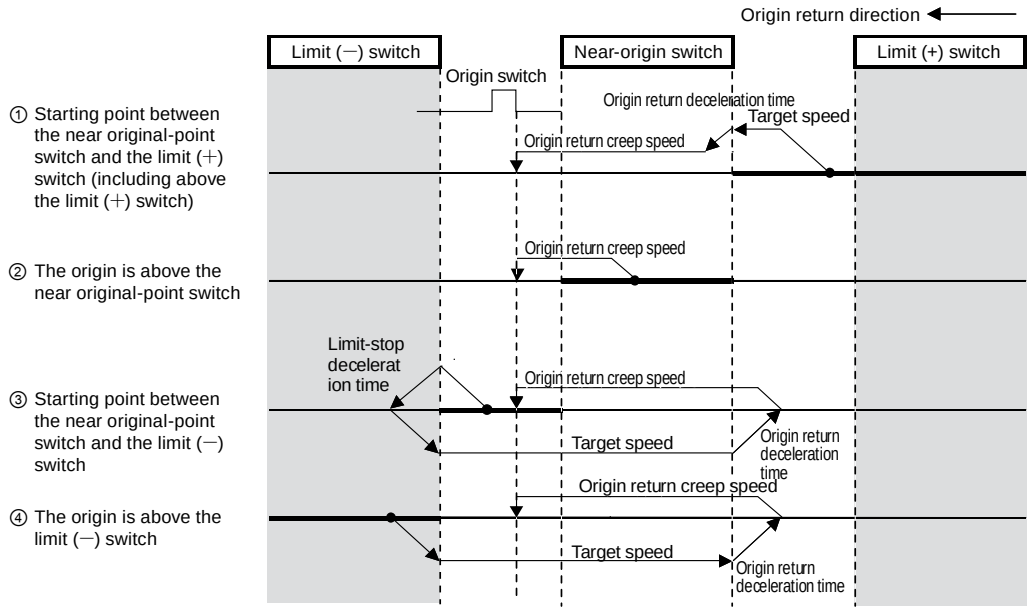
■ DOG mode 2 (pulse edge detection of the near origin switch)

After the rising edge of the near origin switch is detected, it is used as the origin.



■ DOG mode 3 (pulse edge detection of the near origin switch + back-end benchmark of the origin switch)

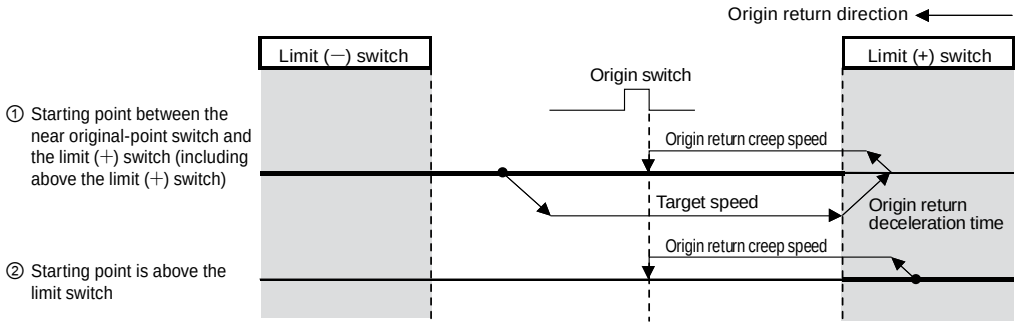
After the falling edge (back end) of the near origin switch is detected, the rising edge of the initial origin switch in the origin return direction is used as the origin.



(Note) The operation is the same to ③ when the origin sensor is turned ON upon startup.

■ Limit mode 1 (pulse edge detection of the limit switch + front-end benchmark of the origin switch)

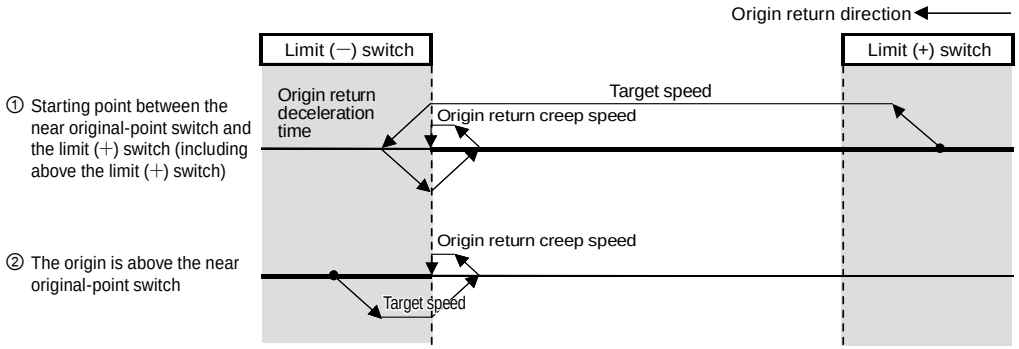
After the falling edge of the limit switch opposite to the origin return direction is detected, reverse running is started. And then stop on the rising edge of the original origin switch and make it the origin.



(Note) The operation is the same to ① when the origin sensor is turned ON upon startup.

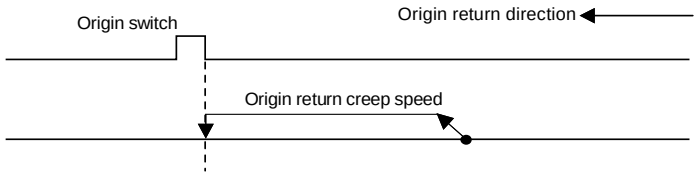
■ Limit mode 2 (pulse edge detection of the limit switch)

It stops after detecting the rising edge of the limit switch in the origin return direction and makes it the origin.



■ Origin mode (pulse edge detection of the origin switch)

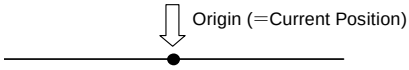
Move toward the origin return direction from the current value and stop moving after the rising edge of the initial origin switch is detected and used as the origin.



(Note) When the origin sensor is turned ON upon startup, the operation will be in the origin return direction without detecting the origin sensor.

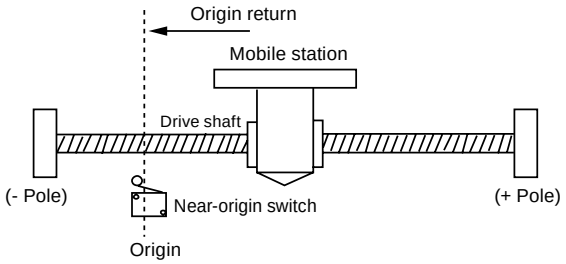
■ **Data setting mode**

Set the current value as the origin.



14.2 Setting and action of the origin return

The following example is explained with the origin return of axis-1. The unit is set to pulse.

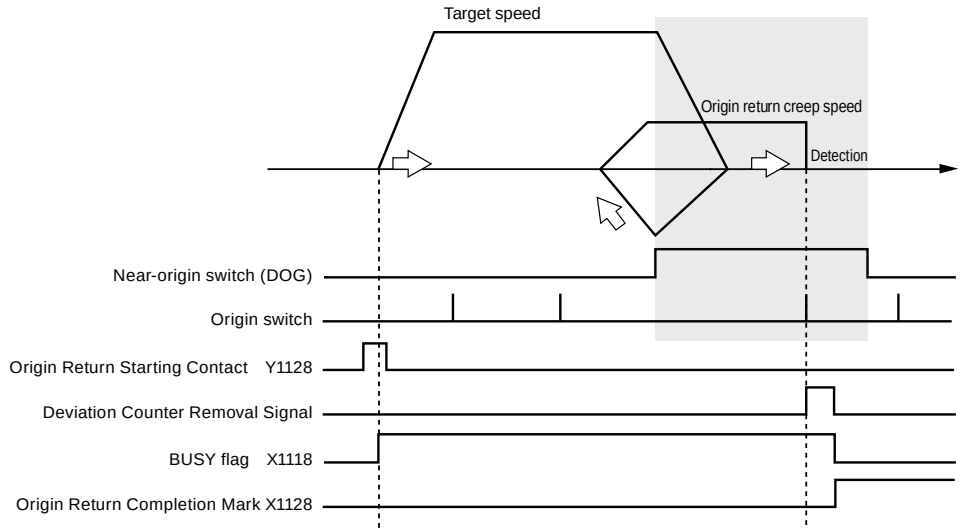


■ Setting Contents

Parameters required for setting origin return are set in the position control menu of the programming tool.

Item	Setting Example
Reset setting code	0: DOG mode 1
Reset direction	0: Reset (−) direction
Acceleration time (ms)	100 ms
Deceleration time (ms)	100 ms
Target speed	10,000 pps
Reset creep speed	1000 pps
ON time of the deviation counter removal signal	1 ms

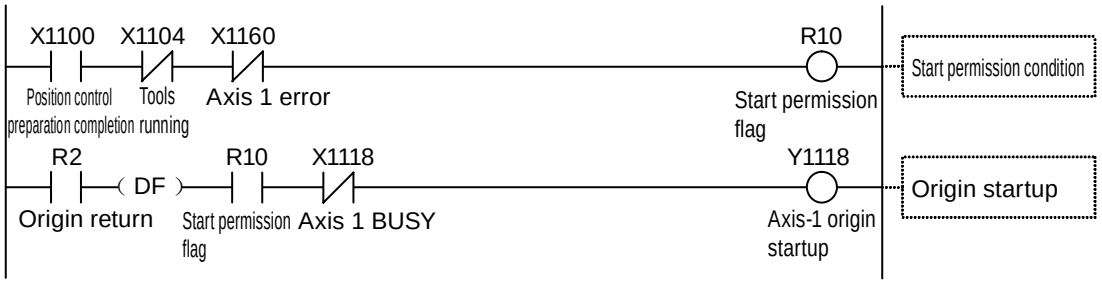
■ Action Chart



■ Action of each contact

- It indicates that the BUSY mark (X1118) of the motor under operation is in ON at the beginning of the origin return and then OFF at the end of operation.
- The deviation counter removal signal is in ON upon the completion of the origin return and is held at the ON status during the preset deviation counter removal signal On time.
- It indicates that the origin return completion mark (X1128) is in ON at the end of origin return, and has been holden to any action from the next position control, JOG operation, origin return and pulse generator operation for startup. Turn to ON when the origin return is completed.

■ Example program



■ Points for attention of programs

- The starting point and mark number vary with the axis number.

■ Limit Input Operation

Conditions	Direction	Limit Status	Operation
Origin return start	Forward run	Limit (+) input: ON	Can be started
		Limit (−) input: ON	Can be started
	Reverse run	Limit (+) input: ON	Can be started
		Limit (−) input: ON	Can be started
Action of the origin return	Forward run	Limit (+) input: ON	Automatic reverse operation
	Reverse run	Limit (−) input: ON	Automatic reverse operation

15

Manual running (pulse generator running)

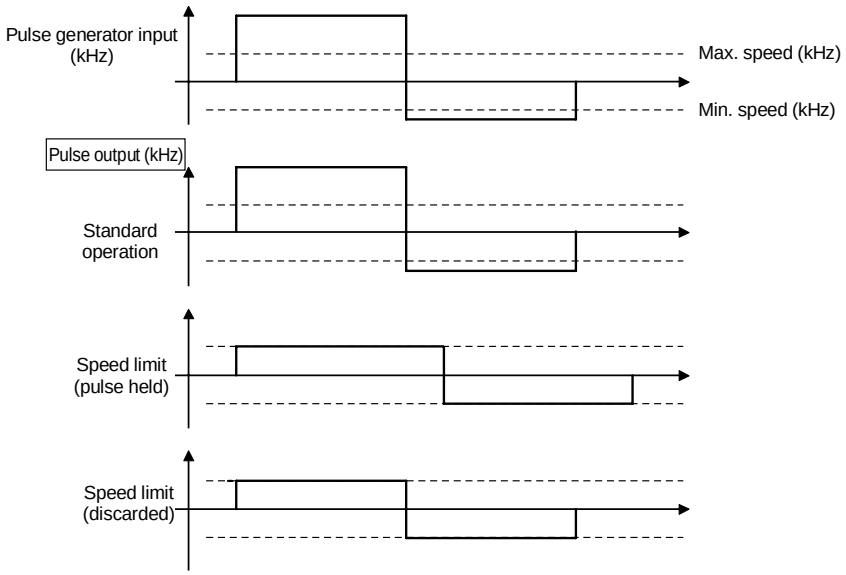
15.1 Settings and operations of pulse generator

■ Types of pulse generator operations

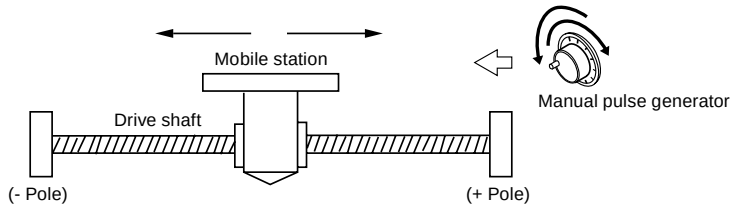
Pulse generator operation is the function to manually output pulses with the pulse generator connected on the control unit.

The following modes are available for selection for the operations of pulse generator.

Operation mode	Operation
Standard operation	The operation to obtain the number of pulses of the pulse generator in the unit of 1ms. The input content of the pulse generator is directly reflected to the actual operation.
Speed limit (pulse held)	The input speed of the pulse generator will be held at the preset max. speed if is to exceed the max. speed. Hold the number of pulses inputted by the pulse generator. Because pulses that cannot be outputted will also be maintained, the pulses will still be outputted even if there's no input of the pulse generator. The speed unit is "(the set unit X 1000)/s".
Speed limit (discarded)	The input speed of the pulse generator will be held at the preset max. speed if is to exceed the max. speed. Pulses that are cannot be outputted will be discarded, and the pulse output is interlocked with the operations of the pulse generator. The speed unit is "(the set unit X 1000)/s".



The following example is explained with the pulse generator operation of axis-1. The unit is set to pulse.

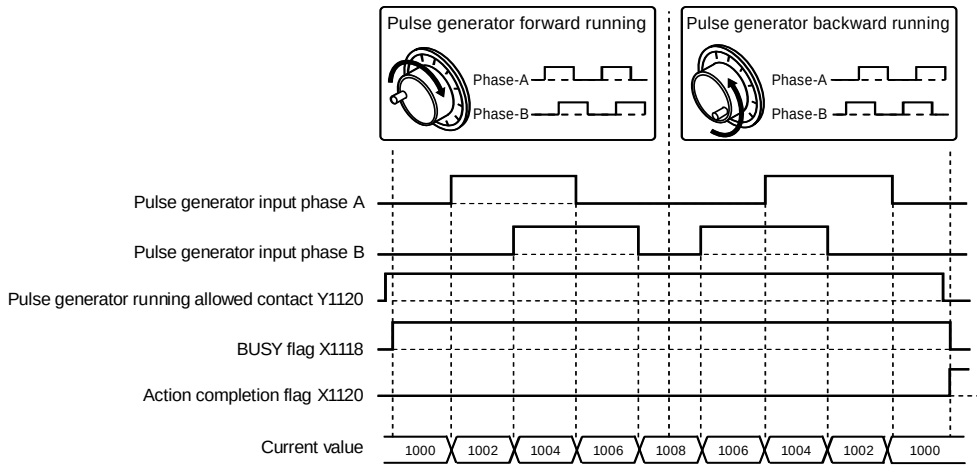


■ Setting Contents

Parameters to be set for pulse generator operation are set in the position control menu of the programming tool.

Item	Setting Example	Available setting range
Operation setting codes	0: Pulse generator 1	0: Pulse generator 1 1: Pulse generator 2 2: Pulse generator 3 3: Pulse generator 4
Numerator of pulse generator running ratio	2	1-32,767
Denominator of pulse generator running ratio	1	1-32,767
Input mode during operation of the pulse generator	2: Speed limit (discarded)	0: Standard operation 1: Speed limit (pulse held) 2: Speed limit (discarded)
Max. speed of pulse generator running	500	Pulse: 1-32,767,000 pps

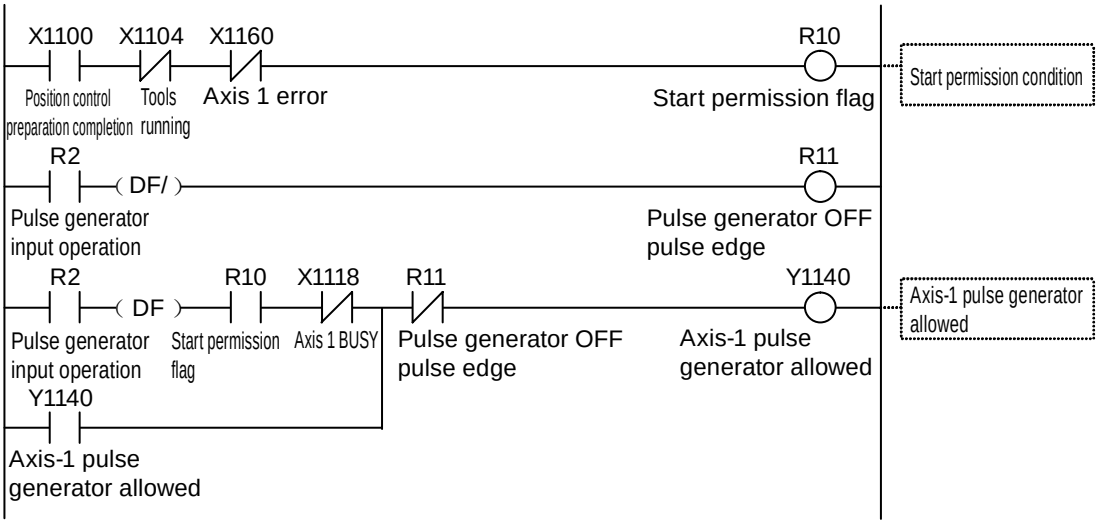
■ Action Chart



■ Action of each contact

- It indicates that the BUSY mark (X1118) of the motor under operation is turned ON when the pulse generator operation allowance contact is turned ON, and turned OFF when the pulse generator operation allowance contact is turned OFF.
- It indicates that the action completion mark (X1120) is in ON when the pulse generator operation allowance contact is OFF, and has been holden to any action from the next position control, JOG operation, origin return and pulse generator operation for startup.

■ Example program



■ Points for attention of programs

- For the numerator and denominator of the setting ratio of the input signals from the pulse generator, the movement of each pulse of the signals of the pulse generator.
- The starting point and mark number vary with the axis number.

■ Limit Input Operation

Conditions	Direction	Limit Status	Operation
Pulse generator running started	Forward run	Limit (+) input: ON	Can not start with errors
		Limit (−) input: ON	Can be started
	Reverse run	Limit (+) input: ON	Can be started
		Limit (−) input: ON	Can not start with errors
Pulse generator in operation	Forward run	Limit (+) input: ON	Limit stop with errors
	Reverse run	Limit (−) input: ON	Limit stop with errors

16

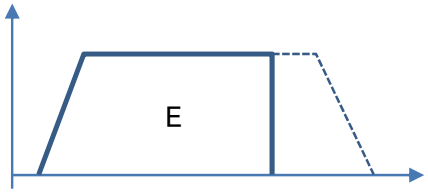
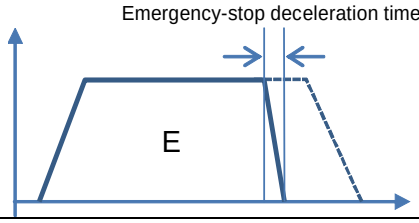
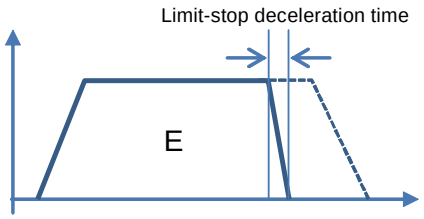
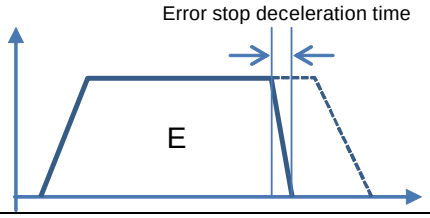
Stop function

16.1 Types and settings of the stop function

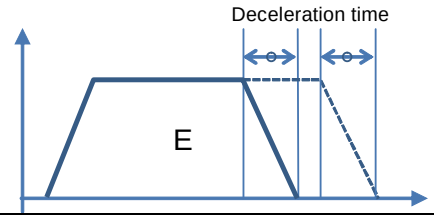
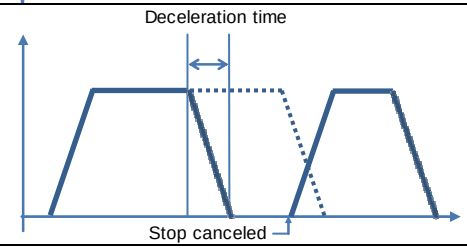
16.1.1 Stop Types

- There are 7 stops as follows.
- The output signals assigned to system stop, emergency stop, deceleration stop and pause take effect when turned ON with the user program.
- Limit stop, soft limit stop and error stop take effect under corresponding conditions.

■ Type of operation stop

Name	Real-time Charts	Occurrence Conditions and Operation
System stop		● When the system stop contact (Y1100) is set to ON, stop the started operation and the pulse output of all axes immediately. ● Stop at zero deceleration time. ● Perform the same action when the operation mode of the control unit is switched to PROG. from RUN.
Emergency stop		● When the system stop contacts (Y1130-Y1137) are set to ON, stop the started operation and the pulse output of the corresponding axis. ● Set the deceleration time of emergency stop in the settings of the position control parameters in the Configurator PM7.
Limit stop		● When the limit＋input and limit-input (Y1150-Y115B) are set to ON, stop the started operation and the pulse output of the corresponding axis. ● Set the deceleration time of limit stop to be set in the settings of the position control parameters for deceleration.
Soft limit stop		● When the soft limit function is enabled, if the soft limit range is exceeded, the operation that is already started will be stopped along with the pulse output of corresponding axis. ● Set the deceleration time of limit stop to be set in the settings of the position control parameters for deceleration.
Error stop		● In case of self-diagnosis error (error code 44: position control operation error), the pulse output of corresponding axes (all axes or various axes) are stopped. (Note 1) ● Set the deceleration time of error stop to be set in the settings of the position control parameters for deceleration.

(Note 1): Upon self-diagnosis error other than the position control operation error, the mode will change to PROG. and the system will be stopped.

Name	Real-time Charts	Occurrence Conditions and Operation
Deceleration stop (Note 1)		● When the deceleration stop (Y1138-Y113F) is set to ON, stop the started operation and the pulse output of the corresponding axis. ● Set the deceleration time to be set in the starting position control operation for deceleration.
Pause (Note 1)		● When the deceleration stop (Y1138-Y113F) is set to ON, stop the started operation and the pulse output of the corresponding axis. ● Set the deceleration time to be set in the starting position control operation for deceleration. ● When the deceleration stop signal if OFF, the stop control is executed again after cancellation of the deceleration stop.

(Note 1): The deceleration stop and pause function set the system operation setting region of the position control storage and switch the operations with the user program.

■ I/O signal assignment

Signal name	I/O Number				
	Axis 1	Axis 2	Axis 3	Axis 4	Virtual axis
System stop	Y1100				
Emergency stop (level-type operation)	Y1130	Y1131	Y1132	Y1133	Y1137
Ramp-to-stop (level-type operation)	Y1138	Y1139	Y113A	Y113B	Y113F

(Note 1): During interpolation control, please turn the contact corresponding to the min. axis number in the interpolation group.

16.1.2 Setting of the stop time

The stop time is designated by axis via the Configurator PM7.

■ Setting of the stop time

Item	Description
Emergency-stop deceleration time	Sets the the deceleration time upon emergency-stop. 0-10000ms (Initial value at 100 ms）
Limit-stop deceleration time	Sets the deceleration time for limit stop and soft limit stop. 0-10000ms (Initial value at 100 ms）
Deceleration time upon error stop	Sets the deceleration time upon error stop. 0-10000ms (Initial value at 100 ms）

16.2 Processing during stop

■ Operation during stop

- System stop, emergency stop, deceleration stop and pause are achieved when various request contacts in the I/O region are turned ON.
- The stop status is valid during the period when the contacts are ON and is held till the request signals are turned OFF. No operation is allowed during stop. The same applied to limit stop, soft limit stop and error stop.

■ Priority order of stop operation

- Execute stop processing in the following priority order when the stop control is required to repeat.

①System stop＞②Error stop＞③Soft limit stop＞④Limit stop＞⑤Emergency stop＞⑥Pause ＞⑦Deceleration stop

■ Setting of the dwell time

- During stop operation, setting the dwell time is invalid and irrelevant to the mode.
- The dwell time settings take effect during the position control operation after pause.

■ Mark processing

- For system stop, the BUSY signal turns to OFF and the operation end signal turns to ON.
- Upon emergency stop, limit stop, soft limit stop, error stop and deceleration stop, after the pulse output is completed upon deceleration and when the BUSY signal is turned OFF, the end signal turns to ON.

■ Current value coordinates

- Despite of stop operation, the current value coordinate region is still always updated.
- After emergency stop, limit stop, soft limit stop, error stop, deceleration stop and pause, perform deceleration as per the set deceleration time and save the value to stop the pulse output.
- For system stop, save the value to stop the pulse output.

16.3 Pause

16.3.1 Pause

- The Pause function is used to temporarily stop the control in operation. You can switch between the pause function and the deceleration stop function.
- The pause function means deceleration stop after the deceleration time controlled in the operation when the deceleration stop request is ON. After that, the stop status will be held while the deceleration stop request contacts (Y1138-Y113F) are ON, and the stop control resumes when the deceleration stop request contacts are OFF.

◆ Emphasis

- **Deceleration stop is not available during the pause. Please stop the emergency stop function to stop while using the pause function.**
- **The pause function is only available during auto running (Position Control). During manual running (JOG operation, origin return and pulse generator running), its operation is the same to that of deceleration stop.**
- **Like other stop functions, the pause function is held when the deceleration stop request signal is turned ON. The emergency stop or system stop is executed during stop, the pause status will be canceled to transfer to emergency stop or system stop.**

16.3.2 Pause settings

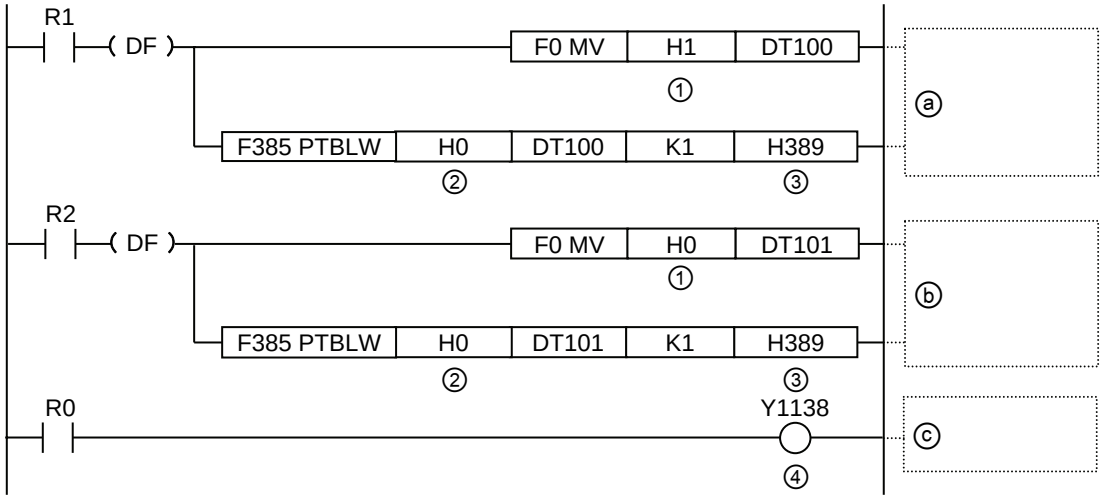
- Deceleration stop and pause set the system operation setting region of the position control storage (position control storage region No.1/Address H389) and switch the operations with the user program.

■ System operation setting region (position control storage region No.3)

Offset Address (Hex)	Name	Initial value	Contents
General region H0389	Ramp-to-stop operation	0	Operate when the deceleration stop request signal is Active (OFF⇒ON).
			0: Deceleration stop During repetition, the operation stops to the E-point of the object of repetition.
			1: Pause ● Perform deceleration stop, and resume position control when the "deceleration stop request signal" is canceled (ON⇒OFF). ● All operations are the same to that of deceleration stop for cases other than position control operation. ● During repetition, the operation stops till the E-point of the object of repetition, and resumes when the "deceleration stop request signal" is canceled (ON⇒OFF). ● If system stop or emergency stop is executed during pause, the pause will be canceled and the operation will not be resumed even if the "deceleration stop request signal" is canceled (ON⇒OFF).

■ Program sample

- Operation when the deceleration stop contact of axis-1 is turned ON.
- Set parameters corresponding to the operation in the system operation region (position control storage region No.0/Address H389).



Symbols	Description	Specified value of program				
		Axis 1	Axis 2	Axis 3	Axis 4	Virtual axis
①	Parameter values for switching	H0: Ramp-to-stop, H1: Pause				
②	Universal region	H0				
③	Setting region for system operation	H389				
④	Ramp-to-stop contact	Y1138	Y1139	Y113A	Y113B	Y113F
ⓐ	Turn the operation when the deceleration stop contact is turned ON to pause					
ⓑ	Turn the operation when the deceleration stop contact is turned ON to deceleration stop					
ⓒ	Perform deceleration stop or pause					

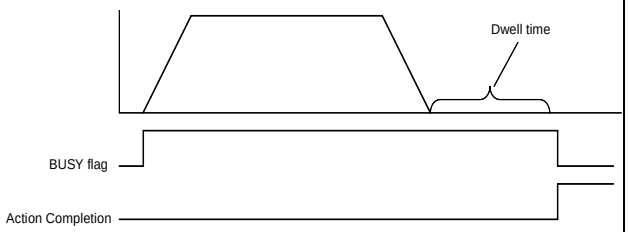
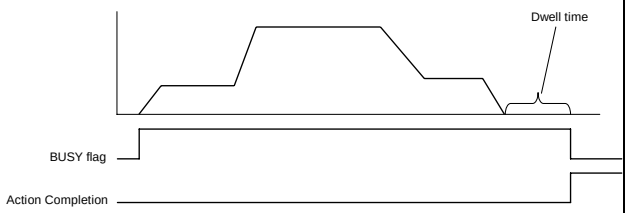
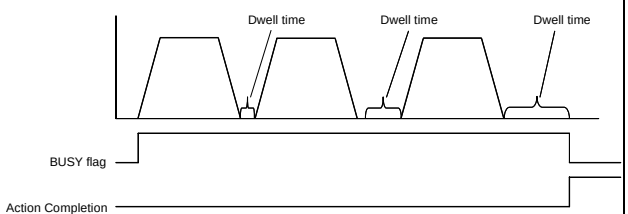
17

Auxiliary function

17.1 Dwell time

During auto operation, the time from completion of the execution of the position control data sheet to the beginning of the next operation is called as dwell time.

■ Operation mode and dwell time

Operation mode	Dwell time and operation	
E-point control		Dwell time means the time from completion of position instruction to completion of the operation.
P-point control		During P-point control, the dwell time is invalid because the position control data sheets operate continuously. Upon reaching the final data sheet (E-point), like E-point control, the dwell time means the time from completion of position instruction to completion of the operation.
C-point control		Dwell time means the wait time from completion of the execution of the position control data sheet (deceleration stop) to the beginning of the execution of the next data sheet. Upon reaching the final data sheet (E-point), like E-point control, the dwell time means the time from completion of position instruction to completion of the operation.

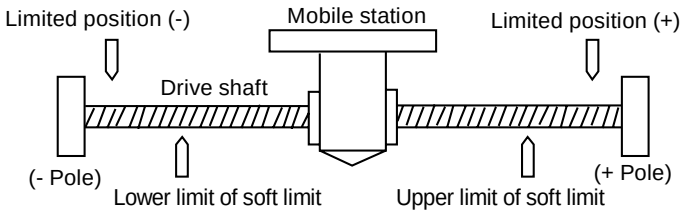
■ Setting of the dwell time

- The dwell time is designated in the position control data sheets via the Configurator PMX
- It is allowed to set each data sheet pf position control data within the range of 0-32767 (ms).

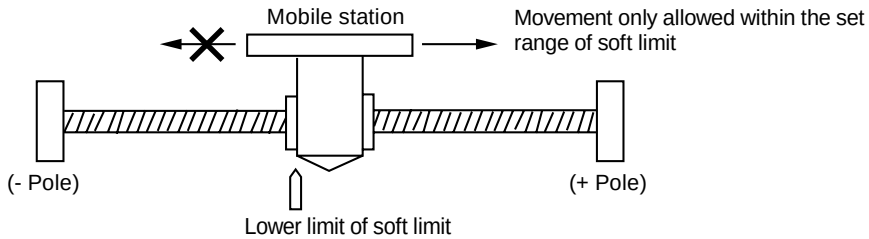
17.2 Soft limit

■ Soft limit functions

- To limit the movement range of the motor during system design, the mechanical limit (+) and limit (−) are set.
- The soft limit, unlike mechanical limits (+) and limit (−), is the function to add software limit for the absolute coordinates for internal management of the unit. Soft limit is the function to protect the motors, the servo amplifiers and motor drivers, and it is recommended to set it within the range of the mechanical limit (+) and limit (−) as shown in the figure below.



- Error will be reported if the soft limit setting range (upper and lower limits) are exceeded to trigger the deceleration stop. After stop, it is necessary to clear the errors and move the motor to the range within the soft limit via JOG operation and the like.



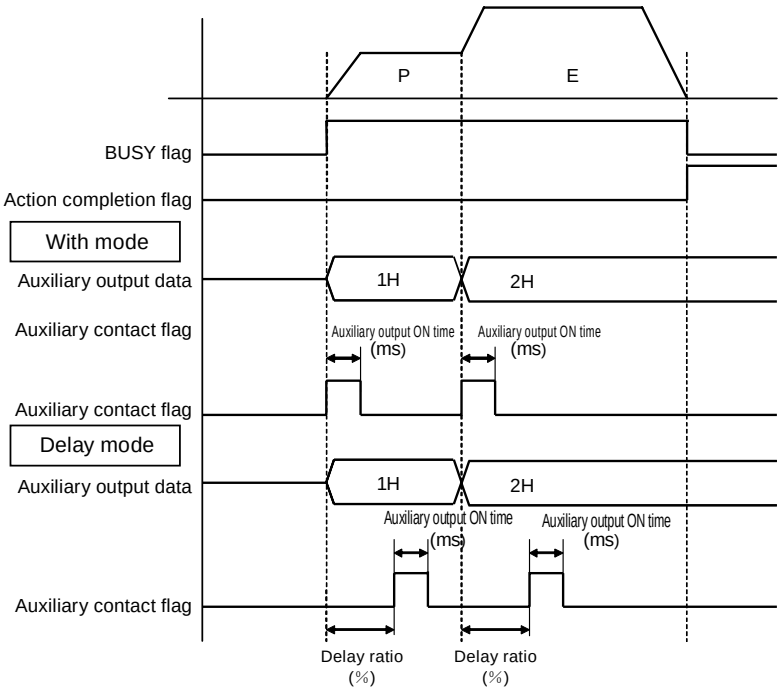
■ Soft limit settings

- Soft limit can be enabled/disabled in the Parameter Settings dialog box of Configurator PMX by axis.
- Soft limit can be enabled/disabled separately for position control, origin return and JOG operation. For example, you can enable soft limit during origin return and JOG operation

17.3 Auxiliary output

17.3.1 Auxiliary output function

- Auxiliary output is the function to notify the outside of which data is being executed during auto operation (E-point control, C-point control, P-point control and J-point control).
- Auxiliary output contacts and auxiliary output codes vary depending on data sheets in execution.
- Values of auxiliary output codes can be held to the next position control data sheet for execution. In addition, upon completion of auto operation, the auxiliary output codes just outputted will be held.



- Auxiliary output modes include the With mode and the Delay mode. Auxiliary output mode, auxiliary output ON time and delay ratio can be set via the Configurator PM7.
- Auxiliary output contacts can be monitored by input contacts (X1148-X114F) assigned to various axes.
- Auxiliary output codes can be set for various position control data sheets via the Configurator PMX Auxiliary output codes can read position control storage (information region of each axis) for monitoring.

17.3.2 Auxiliary output settings

Auxiliary output is designated via the Configurator PM7 by axis. The Auxiliary output function is valid when the auxiliary output mode is selected from the "Parameter Settings" dialog box.

■ **Settings of auxiliary output mode/auxiliary output contact operation**

Item	Description	
Auxiliary output mode	N: Unused	Selected when auxiliary output contacts and auxiliary output codes are not used.
	W: With mode	As the auto operation started, the auxiliary contact flag assigned to corresponding axis in the I/O region is turned ON.
	D: Delay mode	According to the position control movement ratio (%) of auto operation, the auxiliary contact flag assigned to corresponding axis in the I/O region is turned ON. However, when the auto operation is set to J-point control, the operation is the same to that in the With mode.
Auxiliary output ON time	Sets the auxiliary output contact ON time. 0-255 ms (Initial value at 10 ms）	
Auxiliary output Delay ratio	sets the ratio of the delay to the auxiliary output contact is turned ON when the auxiliary output mode is set to Delay mode. Setting range 0-100% (initial value: 0%)	

■ **Settings of auxiliary output codes**

Each data sheet of position control data can be assigned an output code (1 byte).

Emphasis

- **If only auxiliary output code is used, please select any auxiliary output mode from the With mode and the Delay mode.**
- **No matter in which auxiliary output mode (With mode or Delay mode), the auxiliary output codes will be saved at the beginning of position control.**

17.3.3 Monitoring of auxiliary output

Auxiliary output contacts in operation can be monitored by input contacts. In addition, auxiliary output codes can read position control storage region for monitoring.

■ Assignment of auxiliary output contacts

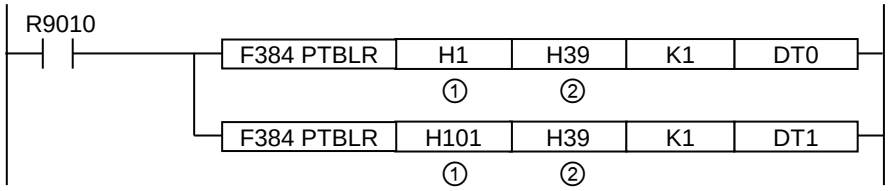
Item	Axis 1	Axis 2	Axis 3	Axis 4	Virtual axis
Auxiliary output contact	X1148	X1149	X114A	X114B	X114F

■ Auxiliary output code.monitoring

- Auxiliary output codes indicating the current status are saved at address H39 of the information region of each axis in the position control storage. Please read them with the user program.
- Auxiliary output codes can also be monitored with the data monitoring of the Configurator PMX

■ Program sample

An example of reading auxiliary output codes of axis-1 and axis-2 to DT0-DT1 is given below.



Symbols	Specified content of program	Specified value of program				
		Axis 1	Axis 2	Axis 3	Axis 4	Virtual axis
①	Axis No. and axis information region	H1	H101	H201	H301	H701
②	The region to save auxiliary output codes	H39				

17.3.4 Operation upon movement change during operation

■ Precautions for movement change during position control operation

When the Delay ratio is set to 1-99%, the operation of the auxiliary contacts during movement change in position control operation is shown as follows.

- When executing movement change request before the auxiliary contact is turned ON, please turn the auxiliary contact on according to the ratio before the movement change.
- The data sheet is turned ON upon completion of data sheet execution when the movement when the auxiliary contact is turned on is smaller than the target value after change.

17.4 Origin coordinates

The origin coordinates function is used to set the coordinates of the origin to any value after origin return.

- The coordinates of the origin after origin return can be set in the position control storage via the Parameter Setting dialog box of Configurator PMX or the user program.
- The set coordinates will be turned into the origin coordinates when executing origin return of the target axis.

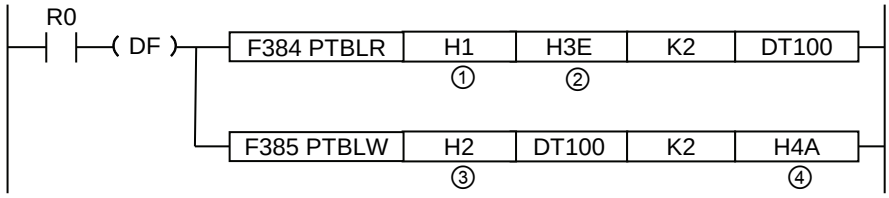
■ Settings of origin coordinates

The origin coordinates for each axis can be set in the Parameter Settings dialog box of Configurator PMX.

	1轴	2轴	3轴	4轴
原点返回 - 复位设定代码	0:DOG方式1	0:DOG方式1	0:DOG方式1	0:DOG方式1
原点返回 - 返回方向	0:限位(－)方向	0:限位(－)方向	0:限位(－)方向	0:限位(－)方向
原点返回 - 返回加速时间(ms)	100	100	100	100
原点返回 - 返回减速时间(ms)	100	100	100	100
原点返回 - 返回目标速度	1000	1000	1000	1000
原点返回 - 返回爬行速度	100	100	100	100
原点返回 - 原点坐标(pulse)	300000	0	0	0
原点返回 - 偏差计数器清零时间 (ms)	1	1	1	1
JOG运行 - 加减速方式	0:直线加减速	0:直线加减速	0:直线加减速	0:直线加减速

■ Program sample

An example of reading the current value of axis-1 after unit system conversion and setting it the origin coordinates is given below.



Symbols	Description	Specified value of program				
		Axis 1	Axis 2	Axis 3	Axis 4	Virtual axis
①	Axis No. and axis information region	H1	H101	H201	H301	H701
②	Storage region for unit converted into the current value	H3E				
③	Axis No. and axis settings region	H2	H102	H202	H302	H702
④	Settings region of origin coordinates	H4A				

◆ Emphasis

- **The origin coordinates will be set to be equal to the integral value after unit system conversion.**
  E.g.) when the unit is μm (0.1 μm), 1,000.0 μm is set as "10000".

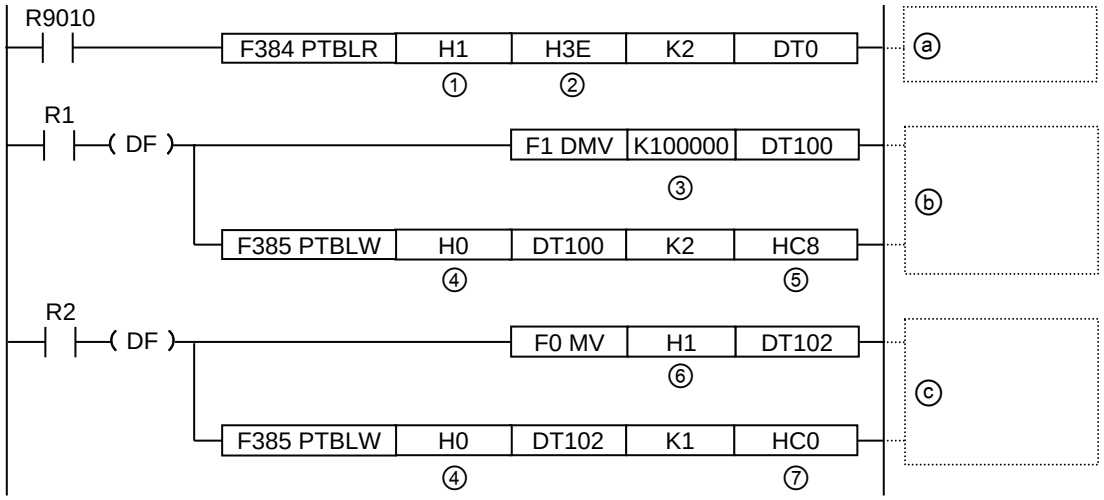
17.5 Current value update

The current value update function is used to set the "current value after conversion of unit system" saved in the position control storage to any value.

- Set the value as the current value via the user program in the current value update coordinates region (position control storage region No.0/Address HC8-HCF/HD6-HD7) of the position control storage.
- When the bit of the target axis of the current value update question flag region (position control storage region No.0/Address HC0) is set to ON, the "current value after conversion of unit system" of the information region of each axis (position control storage region No.1/Address H3E-H3F) will be changed to the designated current value.

■ Program sample

An example of presetting any value K100000 in the position control storage region to update the current value after conversion of unit system of axis-1 is given below. In the first line of the program, read the current value after conversion of unit system of axis-1 to the data registers DT0-DT1 for monitoring.

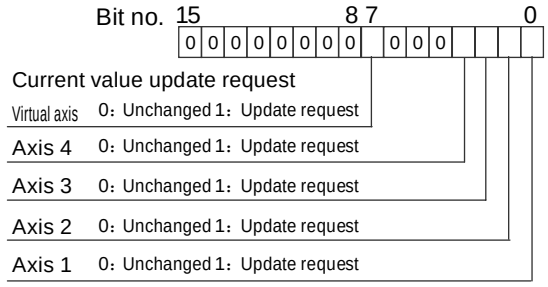


Symbols	Specified content of program	Specified value of program				
		Axis 1	Axis 2	Axis 3	Axis 4	Virtual axis
①	Axis No. and axis information region	H1	H101	H201	H301	H701
②	Storage region for unit system converted into the current value	H3E				
③	Updated value	Any value				
④	Universal region	H0				
⑤	Updated coordination region of the current value	HC8	HCA	HCC	HCE	HD7
⑥	Set value of current value update request flag region	H1	H2	H4	H8	H80
⑦	Current value update request flag region	HC0				

■ Current value update region (position control storage: universal region)

<table>
<tr><th>Storage address (Hex)</th><th>Name</th><th>Contents</th></tr>
<tr><td>HC0</td><td>Current value update request flag</td><td>Change the current value coordinates after conversion of unit system managed by the unit controller (offset addresses H3E-H3F of the axes) into the values set in the current value updated coordinates regions (HC8-HCF or HD6-HD7) only when the bit corresponding to the axes turns from 0 to 1.
Upon completion of the change, the unit controller will automatically clear the corresponding bit of the current value update request flag region (HC0).
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>0</td><td>Request for current value update of axis-1</td><td>0</td><td rowspan="4">0: unchanged
1: Origin coordinates of corresponding content changed
(Auto clearing by the unit controller after execution)</td></tr>
<tr><td>1</td><td>Request for current value update of axis-2</td><td>0</td></tr>
<tr><td>2</td><td>Request for current value update of axis-3</td><td>0</td></tr>
<tr><td>3</td><td>Request for current value update of axis-4</td><td>0</td></tr>
<tr><td>4-6</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>7</td><td>Request for current value update of the virtual axis</td><td>0</td><td></td></tr>
<tr><td>15-8</td><td>—</td><td>—</td><td>—</td></tr>
</table></td></tr>
<tr><td>HC8-HC9</td><td>Current value updated coordination of 1-axis</td><td rowspan="5">Saves the preset coordinates as the current value.</td></tr>
<tr><td>HCA-HCB</td><td>Current value updated coordination of 2-axis</td></tr>
<tr><td>HCC-HCD</td><td>Current value updated coordination of 3-axis</td></tr>
<tr><td>HCE-HCF</td><td>Current value updated coordination of 4-axis</td></tr>
<tr><td>HD6-HD7</td><td>Current value updated coordination of the virtual axis</td></tr>
</table>

(Note): The current value update request flag is designated via the H constant. For update request of axis-1 and axis-2, write H3.



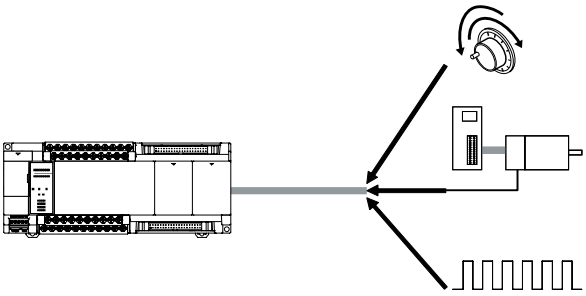
Emphasis

- **The current value changed via current value update is the current value after conversion of unit system.**

17.6 Pulse input

17.6.1 Pulse input application

Pulse input for each axis can be used in the three applications below. The applications are selected via the Parameter Setting dialog box of Configurator PM7



■ Pulse input application

Input object	Contents
Pulse generator	● Set when using manual pulse generator. ● The pulse generator of a specific axis can be designated with the pulse generator running setting codes.
Feedback pulse	● The setting is performed when connecting the encoder for monitoring the running of the motor. ● If the feedback pulse is selected, the unit will count the feedback pulses of the main axis, detect instruction values and differential of pulse input values with the pulse input values. (Auto check of movement)
High speed counter	● Set when used for input as universal counter. ● Various input modes (2-phase input, direction identification input and separate input) are supported. ● The unit saves the number of input pulses to the monitoring region.

■ Combination restrictions based on application

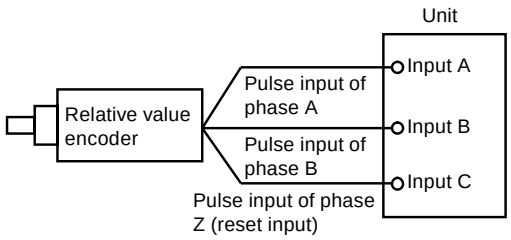
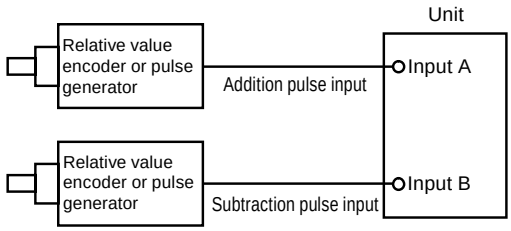
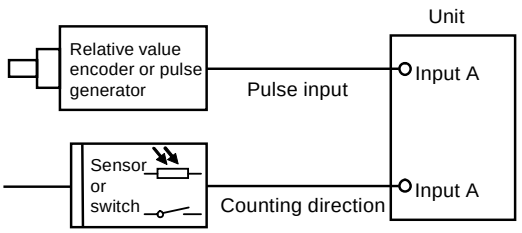
Pulse input mode		Pulse input application		
		Pulse generator	Feedback pulse	High speed counter
Input mode	2-phase input	○	○	○
	Direction identification input	×	×	○
	Separate input	×	×	○
Multiplier	1 X	×	○	○
	2 X	×	○	○
	4 X	○	○	○ (Note)

(Note): Only settable for 2-phase input.

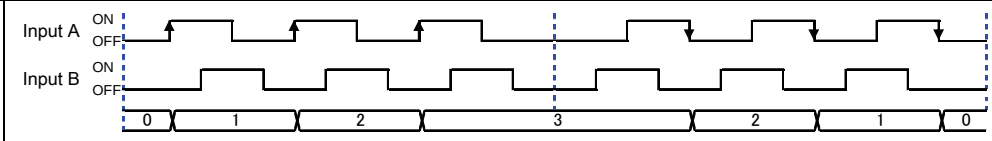
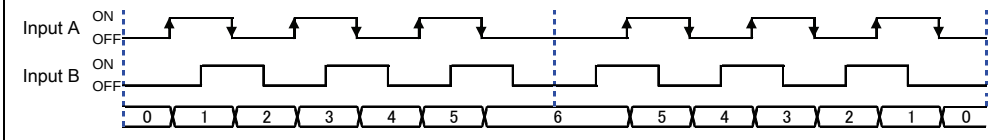
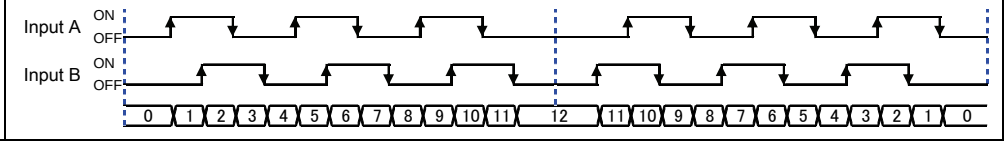
17.6.2 Input mode of pulse input

- You can select from the following 3 modes depending on the input device to be connected.
- The counting operation changes according to the settings of multiplier as shown in the following page.

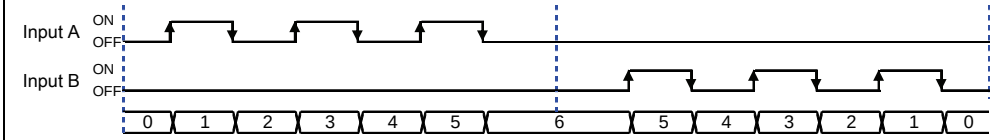
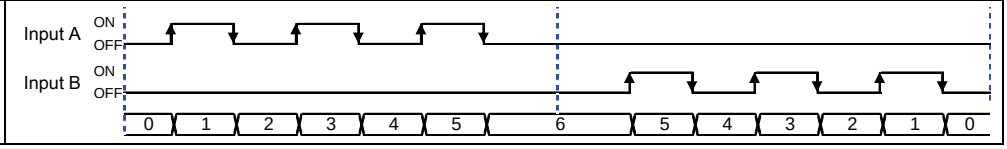
■ Input mode

Mode	Connection	Counting
2-phase (phase difference)		● The 2-phase input connects the input A signal and input B signal of each counter to the input A signal and input B signal of corresponding encoder. ● The counting direction depends on the phase difference between Phase A and Phase B. If Phase A leads over Phase B (electronic angle at 90°), add the counted value; and if Phase A lags behind Phase B (electronic angle at 90°), subtract the counted value.
Separate		● For separate input, the counter will perform addition operation when input A signal is on the rising edge or falling edge and subtraction operation when input B is on the rising edge or falling edge.
Direction judgment		● During direction judgment input, counting signal is connected with input A signal. The counting direction is controlled by the level of the direction signal of input B signal. ● If input B signal is turned OFF, the counter will perform addition operation when input A signal is on the rising edge or falling edge, and perform subtraction operation when input B is on the rising edge or falling edge.

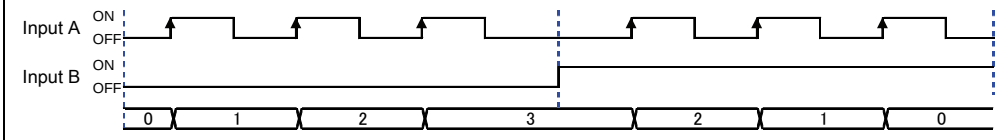
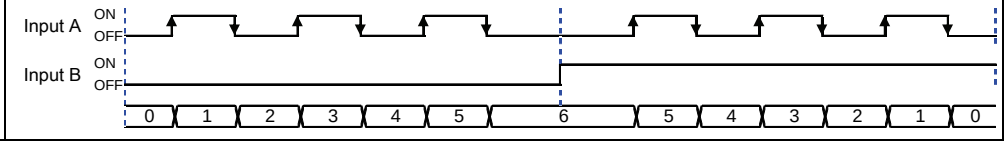
■ Counting operation of 2-phase input (phase difference input)

Multiplier	Real-time Charts	
	Addition	Subtraction
1 X		
2 X		
4 X		

■ Counting operation for separate input

Multiplier	Real-time Charts	
	Addition	Subtraction
1 X		
2 X		

■ Counting operation for direction judgment input

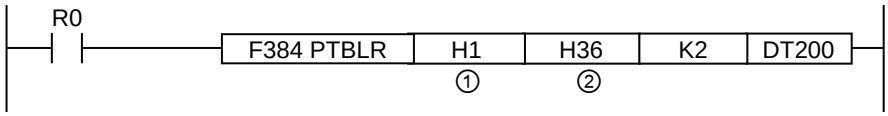
Multiplier	Real-time Charts	
	Addition	Subtraction
1 X		
2 X		

17.6.3 Monitoring of pulse input values

- Pulse input values are saved in the position control storage (Region No.1/Address H36-H37). Pulse input values can be read and monitored via user program.
- Save pulse input values corresponding to the purposes of pulse input (pulse generator, feedback pulse and high-speed counter). (Unit: pulse)
- Accumulated save pulse input values and clear the pulse input values after the pulse input purposes are changed or the pulse input values are cleared.

■ Program sample

An example for monitoring the pulse input value of Axis-1 is given below.



Symbols	Specified content of program	Specified value of program			
		Axis 1	Axis 2	Axis 3	Axis 4
①	Axis No. and axis information region	H1	H101	H201	H301
②	Pulse input value region	H36			

17.6.4 Pulse input value change function

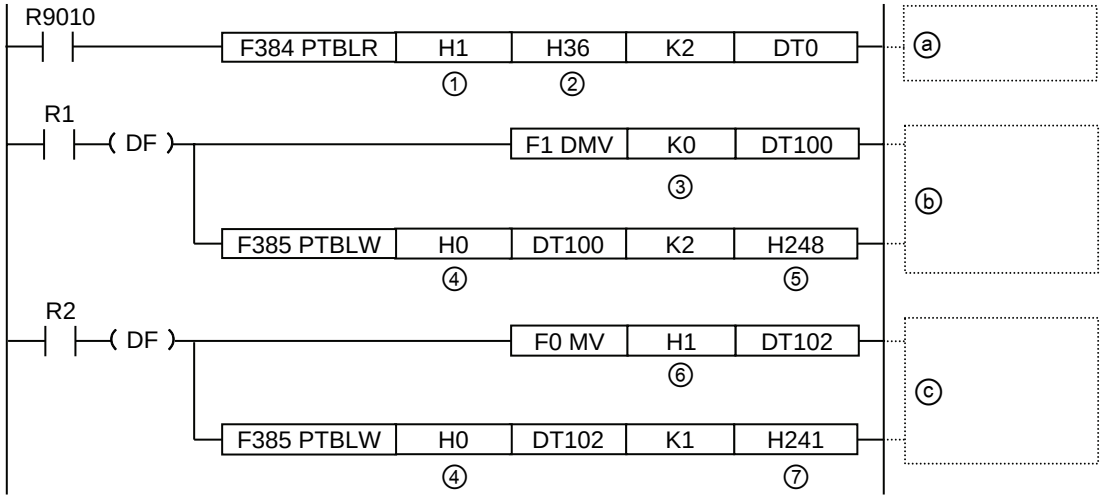
When the pulse input purpose is set to "feedback pulse" or "high-speed counter", it is allowed to change the pulse input values saved in the position control storage according to the user program.

■ Pulse counting control region (position control storage region No. 1)

<table>
<tr><th>Offset Address (Hex)</th><th>Name</th><th>Contents</th></tr>
<tr><td>H241</td><td>Request flag for pulse count change</td><td>
● When the bit corresponding to each axis turns from 0 to 1, change the pulse input value to the preset pulse count change value.
● This symbol is a pulse edge trigger. Please remember to turn 0 to 1 before the change.
● After the change, the unit controller will automatically clear the corresponding bit.
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>0</td><td>Axis-1 pulse count change</td><td>0</td><td rowspan="4">0: Pulse input value not changed
0→1: Pulse input value changed</td></tr>
<tr><td>1</td><td>Axis-2 pulse count change</td><td>0</td></tr>
<tr><td>2</td><td>Axis-3 pulse count change</td><td>0</td></tr>
<tr><td>3</td><td>Axis-4 pulse count change</td><td>0</td></tr>
<tr><td>15-4</td><td>—</td><td>—</td><td>—</td></tr>
</table>
</td></tr>
<tr><td>H248-H249</td><td>Pulse input change value of axis-1</td><td>Sets the pulse input value to be changed for axis-1</td></tr>
<tr><td>H24A-H24B</td><td>Pulse input change value of axis-2</td><td>Sets the pulse input value to be changed for axis-2</td></tr>
<tr><td>H24C-H24D</td><td>Pulse input change value of axis-3</td><td>Sets the pulse input value to be changed for axis-3</td></tr>
<tr><td>H24E-H24F</td><td>Pulse input change value of axis-4</td><td>Sets the pulse input value to be changed for axis-4</td></tr>
</table>

■ Program sample

- An example for presetting the pulse input value of axis-1 to any value KO is given below. Read the pulse input value from the 1st line of the program for monitoring.
- Preset the pulse input value in corresponding position control storage and set the change value request flag of corresponding axis. After the input value is changed, the change request flat region (position control storage region No.0/address H241) will be cleared.



Symbols	Specified content of program	Specified value of program			
		Axis 1	Axis 2	Axis 3	Axis 4
①	Axis No. and axis information region	H1	H101	H201	H301
②	Storage region for pulse input value	H36			
③	Change value	Any value			
④	Universal region	H0			
⑤	Region for pulse count change	H248	H24A	H24C	H24E
⑥	Set value for the request flag region of pulse count	H1	H2	H4	H8
⑦	Request flag region for pulse count change	H241			
ⓐ	Reading of pulse input value				
ⓑ	Write the preset values saved in the pulse input value region into the position control storage				
ⓒ	Write the values to the position control storage according to the request for pulse input change				

17.6.5 Pulse generator input function

- Select "Pulse Generator" from "Pulse Input Purpose" in the Parameter Settings dialog box of Configurator PM7 to use the manual pulse generator.
- The manual pulse generator function can use pulse generators connected to different axes. Therefore, using 1 pulse generator can make multiple axes to operate synchronously with the following restrictions for the settings of axes connected to the pulse generators and axes subject to pulse generator operation.

■ Combination Limitations

Pulse input purpose setting		Pulse generator operation	
Pulse generator connection axis	**Pulse generator operation axis**	**Operation**	**Outline**
Feedback pulse High speed counter	Feedback pulse High speed counter Pulse generator	×	The unit cannot identify the inputted pulse as manual pulse generator and will not execute pulse generator operation.
Pulse generator	Feedback pulse	○	Execute pulse generator operation. Feedback pulse can be used during pulse generator operation.
	High speed counter	○	Execute pulse generator operation. The high speed counter can be used during pulse generator operation.
	Pulse generator	○	Execute pulse generator operation.

■ Application and settings of running setting codes

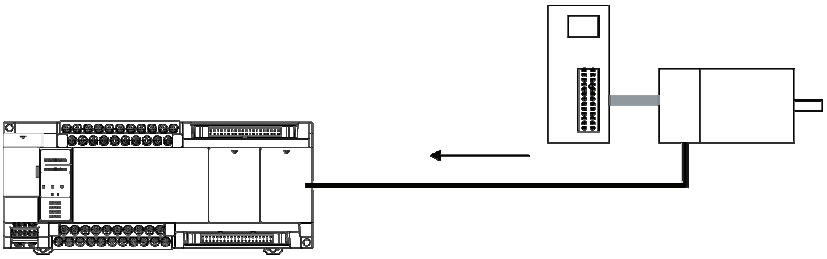
The following figure shows the case when the pulse generator connected to the connector of for pulse generator input of axis-1 and axis-2. Select "Pulse Generator" for the pulse input purpose of axis-1 and axis-2, and select "0: Pulse Input 1" for the pulse generator running setting code.

17.6.6 Feedback pulse function

Set the pulse input application to "feedback pulse" to use the encoder feedback pulse function.

■ Auto check of movement

- The movement auto check function is used to check whether the axes in operation operate according to the instructions and to compare the difference between the current value (absolute value) of internal management of the unit and the inputted feedback pulse input value (deviation) and the preset "threshold".
- Operations upon cases when the deviation exceeds the preset "threshold" is exceeded can be selected (among Error/Warning/No Execution).
- Auto check of movement can work in all operations. When the synchronous control function is used, the auto check of movement is invalid.
- Auto check of movement can also be used during synchronous control. (supported by control units above Motion CPU Ver.1.50.)



■ Processing inside the unit

When the auto check of movement is set, the following steps will be adopted for all operations.

①	Save the current value held by the unit to the inside of the unit upon operation start.
②	Stop the movement auto check function after operation starts till the preset interval for movement auto check has elapsed.
③	After the interval for movement auto check has elapsed, compare the deviation feedback value calculated according to the current pulse input value and the saved pulse input value to check whether the difference between the two (deviation) exceeds the preset movement auto check value.
④	Save the current value held by the unit to the inside of the unit.
⑤	Then repeat the operations of ②-④ above.

■ Clearing of pulse input value/operation upon origin return

- Pulses inputted as feedback pulse input are accumulated and saved as pulse input value.
- When the pulse input purpose is set to "feedback pulse", upon origin return, the pulse input value region of the position control storage will be cleared.

■ Settings for auto check of movement

The movement auto check is set via the Configurator PM7 or the user program in the origin coordinates setting region (position control storage region No.2/Address H8-HA/H18/H1A).

■ Setting region of the axes (position control storage region No.2)

Offset Address (Hex)	Name	Initial value	Contents	
H8	Movement auto check correction numerator	1	Sets the correction value for the pulse input during movement auto check. Calculates the deviation feedback value (pulse input value after correction) of inputted pulse input value according to the following formula and perform movement auto check. Offset feedback value = (correction numerator/correct denomination) x pulse input Setting range: 1-32767	
H9	Movement auto check correction denominator	1		
HA	Movement auto check operation	0	Sets the solution when the difference between the instruction value and the feedback value exceeds the movement check value.	
			0: error occurs	If the difference between the feedback value and the instruction movement exceeds the movement check value (threshold), error will occur with the operation stopped. After the error is cleared, the pulse input value will be cleared.
			1: warning occurs	If the difference between the feedback value and the instruction movement exceeds the movement check value (threshold), error will occur with the operation continued. After the warning is cleared, the pulse input value will be cleared.
			2: Non-execute	No movement check is executed.
H18	Value of movement auto check	10000	Sets the threshold value when executing movement auto check. Setting range: 0-65536 (pulse)	
H1A	Movement auto check interval	0	Sets the interval for executing movement auto check. (unit : ms) Setting range: 0 - 32767 (ms)	

Emphasis

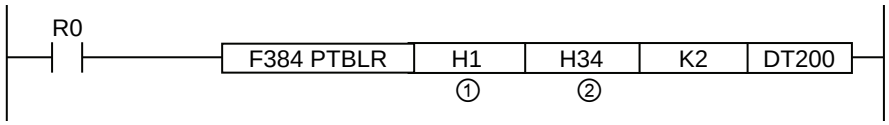
- **When setting the interval for executing movement auto check, the response time of the encoder used should be considered.**

■ Deviation monitoring

- The value calculated through movement auto check (deviation) is saved in the position control storage (Region No.1/Address H34-H35). It can be read by the user program for confirmation.
- The deviation can also be monitored via the data monitoring of the Configurator PMX and the tools running dialog box.
- The max. difference between the pulse input value and the instruction value is saved for the deviation.

■ Program sample

An example for reading the deviation of axis-1 for monitoring is given below.



Symbols	Specified content of program	Specified value of program			
		Axis 1	Axis 2	Axis 3	Axis 4
①	Axis No. and axis information region	H1	H101	H201	H301
②	Deviation region	H34			

17.6.7 High-speed Counter Function

Set the pulse input purpose to "High-speed counter" to allow the unit to use the pulse input as external counter.

■ Pulse input control

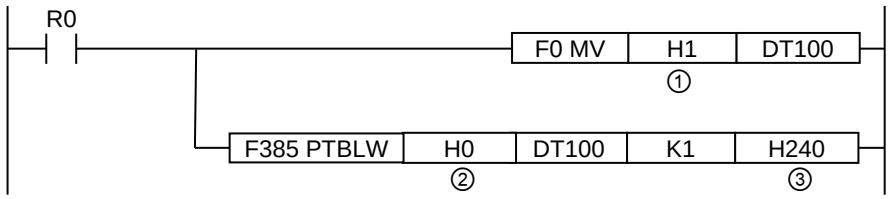
- When the pulse input purpose is set to "High-speed counter", the counting of pulse input values can be stopped freely. When the pulse input value counting stops, the current pulse input value will be held.
- Disabling/enabling of pulse input counting is written to the following regions via user program for settings.

■ Pulse counting control region (position control storage region No. 0)

<table>
<tr><th>Storage address (Hex)</th><th>Name</th><th>Contents</th></tr>
<tr><td>H240</td><td>Pulse counting permission flag</td><td>When the bit corresponding to each axis is 0, execute the counting of pulse input value.
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>0</td><td>Axis-1 pulse counting permission</td><td>0</td><td rowspan="4">0: pulse counting permitted
1: pulse counting not permitted</td></tr>
<tr><td>1</td><td>Axis-2 pulse counting permission</td><td>0</td></tr>
<tr><td>2</td><td>Axis-3 pulse counting permission</td><td>0</td></tr>
<tr><td>3</td><td>Axis-4 pulse counting permission</td><td>0</td></tr>
<tr><td>15-4</td><td>—</td><td>—</td><td>—</td></tr>
</table></td></tr>
</table>

■ Program sample

When the execution condition R0 is ON, axis-1 pulse input is disabled as shown in the example below.



Symbols	Description	Specified value of program			
		Axis 1	Axis 2	Axis 3	Axis 4
①	Value corresponding to the axis which is not allowed to count	H1	H2	H4	H8
②	Universal region	H0			
③	Pulse counting permission flag region	H240			

Reference

- **Please refer to "17.6.3Monitoring of pulse input values" for details about count value monitoring.**
- **Please refer to "17.6.4Pulse input value change function" for details about presetting of count value.**

17.7 Startup speed

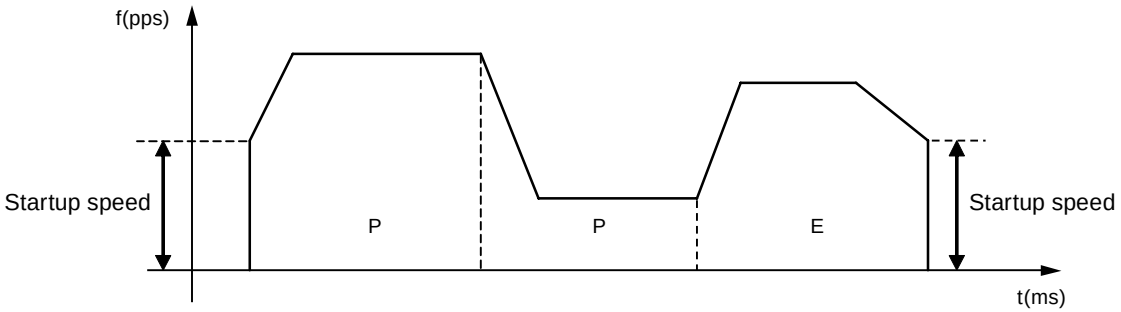
The unit can set the startup speed when each operation starts. The startup speed can be used for position control, JOG operation and origin return.

■ Startup speed setting

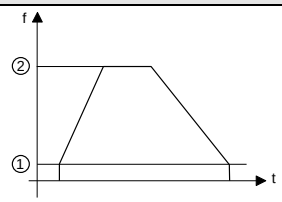
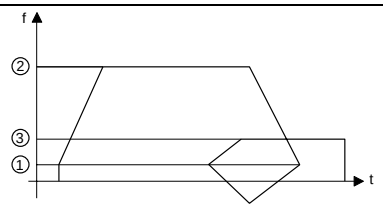
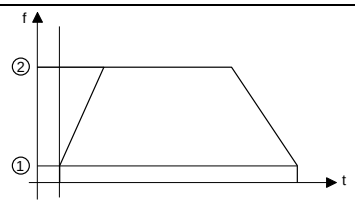
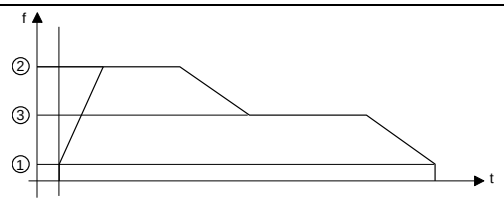
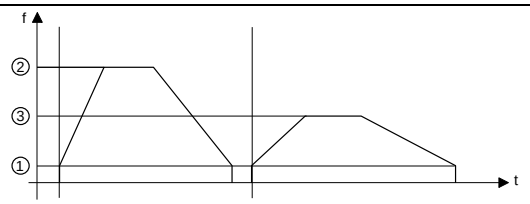
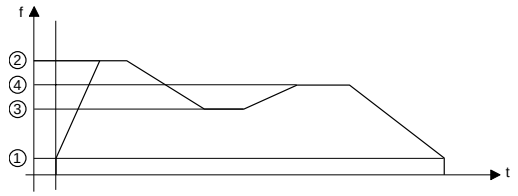
It can be set it via the "Parameter Settings of Axes" menu of Configurator PM7.

■ Precautions for startup speed setting

- The startup speed is also the end speed upon completion of the operation. The end speed cannot be changed.
- During origin return, the origin return creep speed is not affected by startup speed.
- The target speed of each operation is not affected by startup speed. The unit operates at the set target speed independent of the startup speed.



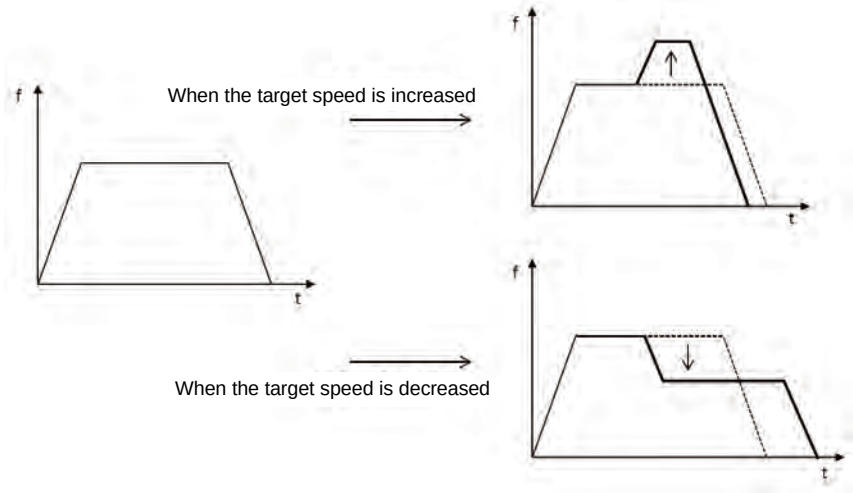
■ Operation mode and startup speed setting

Operation Mode	Startup speed setting		
JOG operation		①	Startup speed
		②	Target speed
Origin return		①	Startup speed
		②	Target speed
		③	Creep speed
E-point control		①	Startup speed
		②	Target speed
P-point control		①	Startup speed
		②	P point target speed
		③	E point target speed
C-point control		①	Startup speed
		②	C point target speed
		③	E point target speed
J-point control		①	Startup speed
		②	J point target speed
		③	J-point target speed (changed value)
		④	E point target speed

17.8 Target speed change

17.8.1 Function Description

The target speed change function is used to change the target speed to any speed according to the position control data sheets in operation. The operation amount in the data sheet will not be changed even if the speed is changed.



■ Use Conditions

Conditions for using the target speed change function are as follows

Control mode	Separate axis control	○	• During synchronous control, speed change is only allowed for the main station axis. (the slave station axis operates along with the main station axis).
	Interpolation control	×	
	Synchronous Control	○	
Operation mode	E-point	○	• Multiple times of speed change can be made in 1 data sheet. • Speed change is not allowed during the deceleration of the stop operation. • Speed change is not allowed during the deceleration of the C-point control. • Speed change is not allowed during the pause of the C-point control. • Please use the [J-Point Speed Change Contact] for speed change in J-point control. • Please directly change the [JOG Operation Target Speed] for speed change during JOG operation.
	P-point	○	
	C-point	○	
	J-point	×	
	JOG operation	×	
	Repetition control	○	

■ Speed change mode

Direct designation of speed	The changed speed is designated directly, and the change request mode is sent via I/O. The valid range of the function can be selected between the two modes of "Only Data Sheets in Operation" and "Data Sheets in Operation - Completion of Operation".
Ratio designation (Overwriting)	The function to change the speed at designated ratio (%). The set value (ratio) will be reflected upon change without the need for I/O to send the change request. The valid range of the function is the control operation at all positions upon completion of the settings. The ratio designation is still valid even if the speed is changed with direct designation speed.

17.8.2 Setting mode and operation (direct designation of speed)

■ Setting mode and operation for direct designation of speed

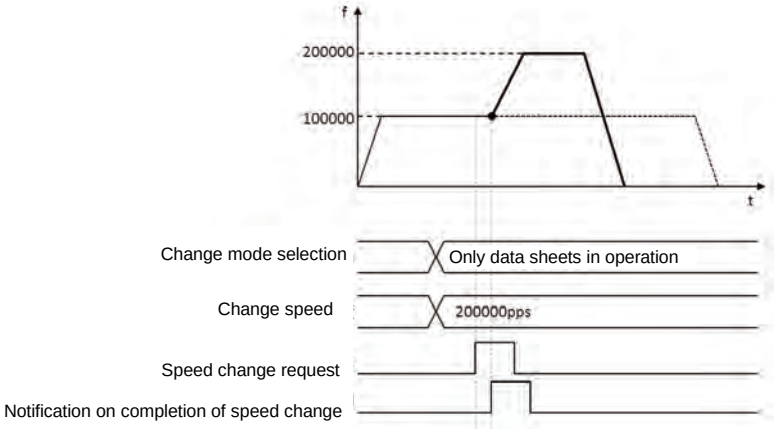
The target speed change function of the direct designation mode of speed operates in the following mode during the operation of position control.

1. Set the [Change Mode Selection] and [Change Speed] in the common storage.

2. Turn the [Speed Change Request] contact flag ON during position control operation.

※ Once the speed change starts, the [Speed Change Completion Notification] contact is marked ON.

※ When the [Speed Change Request] contact flag is OFF, the [Speed Change Completion Notification] contact will also be marked OFF.



(Note 1) Both the time from acceleration to speed change and the deceleration speed from speed change are determined by data sheet in operation.

(Note 2) The movement will not change even after speed change.

■ Setting parameters for direct designation of speed

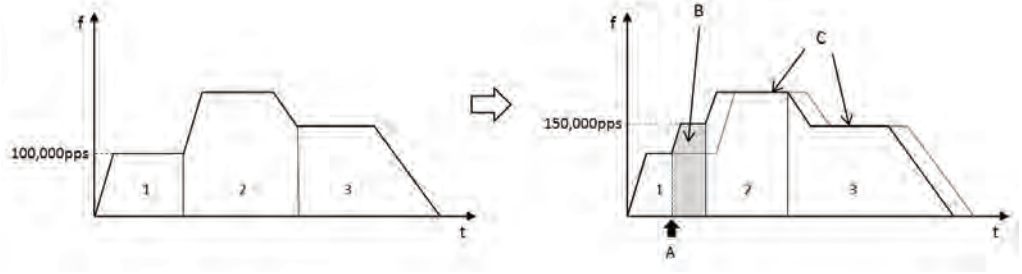
The following parameters should be used for target speed change of the direct designation of speed.

Setting region for position control operation change (position control storage region No. 5)

Offset address (Hex)	Name	Initial value	Contents
H1	Selection for position control speed change mode	H0	The change range setting section upon change in position control speed 0000H: only data sheets in operation 0001H: data sheets in operation-E-point data sheet (till the completion of operation) For values other than the values above, the operation follows the 0000H mode (only data sheets in operation).
H2-H3	Position control speed change Change speed	K100	The region to set the changed speed during position control speed change Set with the values converted into the unit system. 1-32,767,000 (designated unit system)

■ Operation sample ① Direct designation of speed • only data sheets in operation

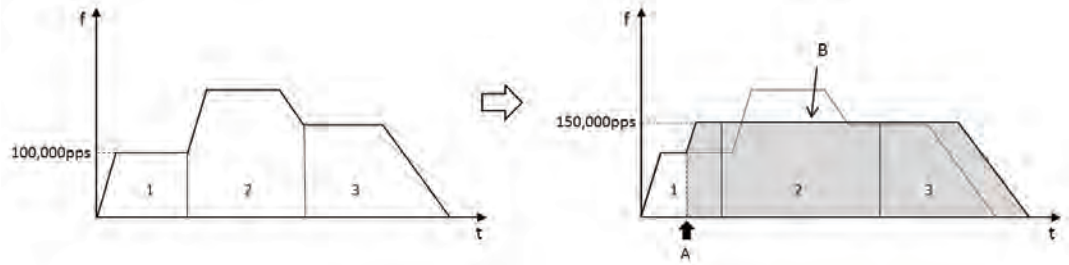
Parameter	Setting value
Change mode selection	0000H (only data sheets in operation)
Change speed	150,000 (pps)



A	Speed change request contact ON.
B	Only the speed of data sheet 1 is changed to 150,000 pps.
C	The speed values of data sheet 2 and 3 are not changed.

■ Operation sample ② Direct designation of speed data sheets in operation - E point data sheet (till the completion of operation)

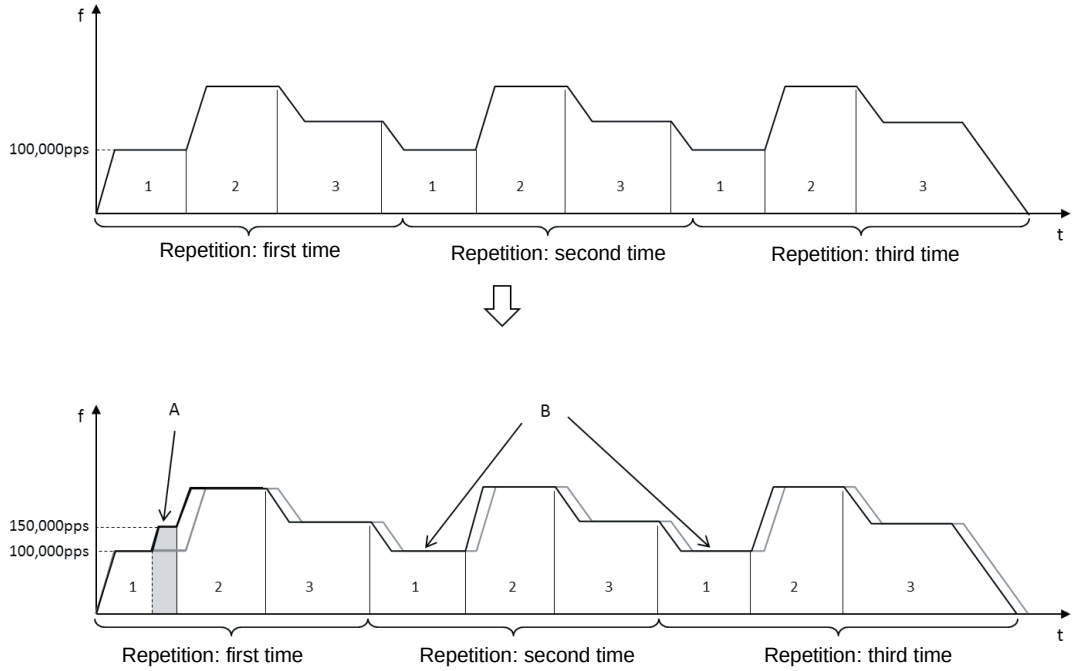
Parameter	Setting value
Change mode selection	0001H (data sheets in operation - E point data sheet)
Change speed	150,000 (pps)



A	Speed change request contact ON.
B	Continuous data sheets all operate at the speed of 150,000pps.

■ Operation sample (upon repetition)

During repetition of position control, when the speed change is performed (direction designation of speed; only data sheets in operation), only the speed in data sheets in operation during the repetition cycle being executed.

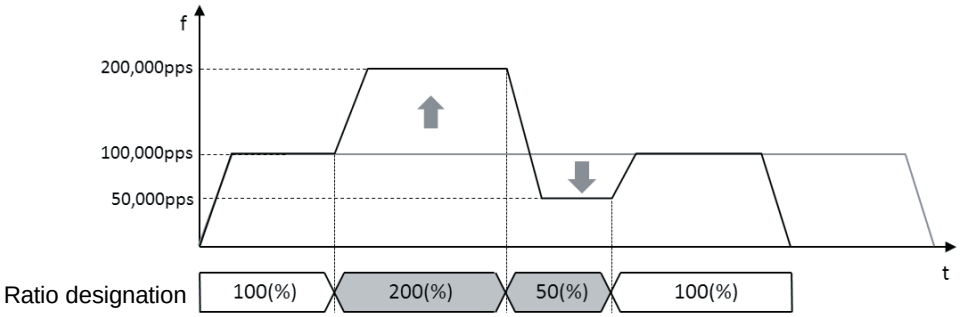


A	Only the speed of data sheet 1 which is repeated for the 1st time is changed to 150,000 pps.
B	Only the speed of data sheet 1 which is repeated for the 2nd and 3rd time will not be changed.

17.8.3 Setting method and operation (ratio designation mode)

■ Setting mode and operation for ratio designation mode overwriting

During ratio designation, when changing the [Ratio Designation] in the common storage, the instruction speed will immediately be reflected as the designated ratio.



(Note 1) Both the time from acceleration to speed change and the deceleration speed from speed change are determined by data sheet in operation.

(Note 2) The movement will not change even after speed change.

■ Setting parameters for ratio designation

The following parameters should be used for target speed change of the ratio designation.

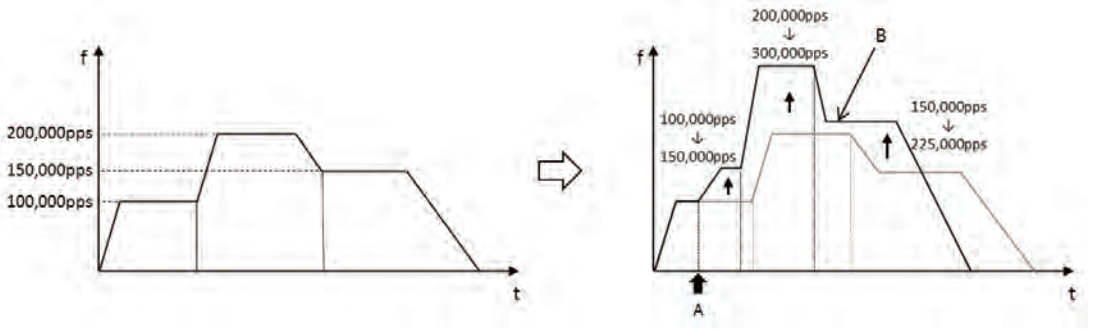
Setting region for position control operation change (position control storage region No. 5)

Offset address (Hex)	Name	Initial value	Contents
H0	Position control speed change Ratio designation (overwrite)	K100	The setting region for change ratio (overwriting) of designated speed upon position control speed change The set value (ratio) will take effect once set without the need for I/O to send the change request. 1-300 (%)

■ Operation sample

• Ratio designation ratio change from 100% → 150%

Parameter	Setting value
Ratio designation	100 (%) → 150 (%)

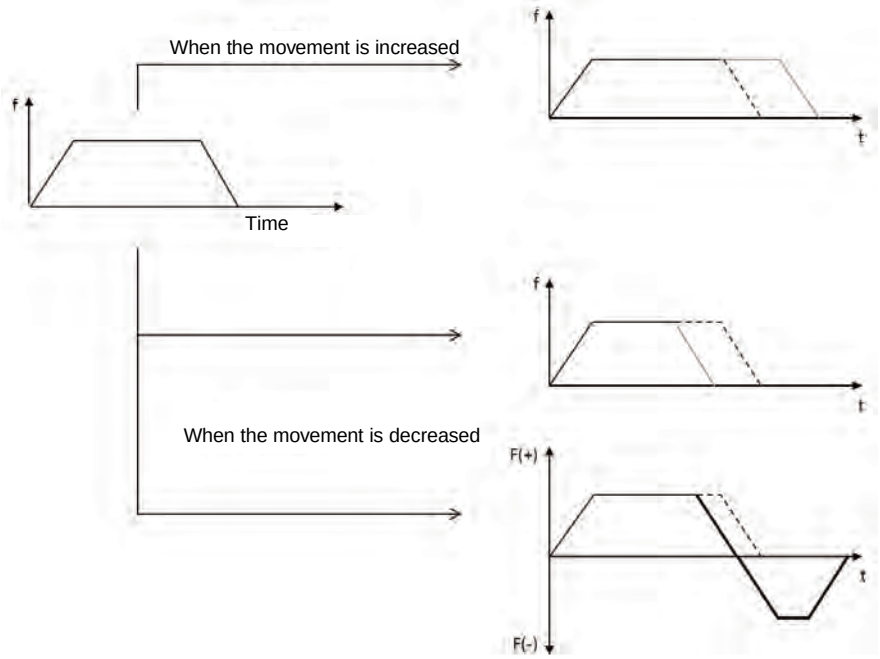


A	Ratio designation change 100→150 (%)
B	Continuous data sheets all operate at the set ratio.

17.9 Movement change function

17.9.1 Function Description

- Movement change function means to freely change the movement with the position control data sheet in execution.
- The target speed will not be changed even if the movement is changed.



■ Use Conditions

Conditions to use the movement change function are as follows

Control mode	Separate axis control	○	• During synchronous control, movement change is only allowed for the main station axis. (the slave station axis operates along with the main station axis).
	Interpolation control	×	
	Synchronous Control	○	
Operation mode	E-point	○	• Multiple times of movement change can be made in 1 data sheet. • Movement change is not allowed during the deceleration of the stop operation. • Movement change is not allowed during the deceleration of the C-point control. • Movement change is not allowed during the pause of the C-point control.
	P-point	○	
	C-point	○	
	J-point	×	
	JOG operation	×	
	Repetition control	○	

17.9.2 Setting method and operations

■ Setting method and operations for the movement change function

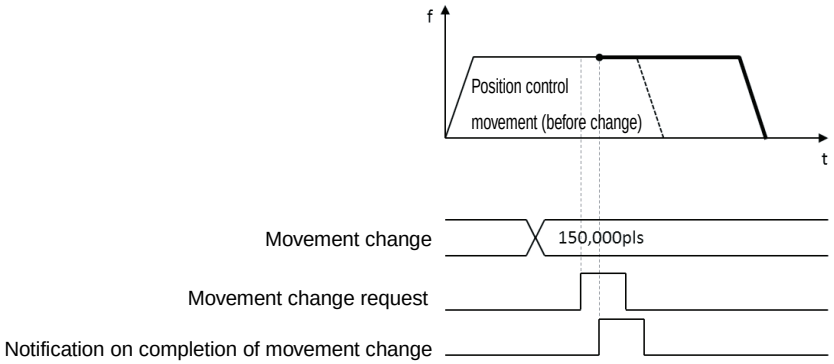
The movement change function operates during the position control in the following mode.

1. Set the [Change Movement] in the common storage.

2. Mark the [Request for Movement Change] contact ON during position control operation.

※ Once the movement change starts, the [Movement Change Completion Notification] contact is marked ON.

※ When the [Movement Change Request] contact is marked OFF, the [Movement Change Completion Notification] contact will also be marked OFF.



■ Setting parameters

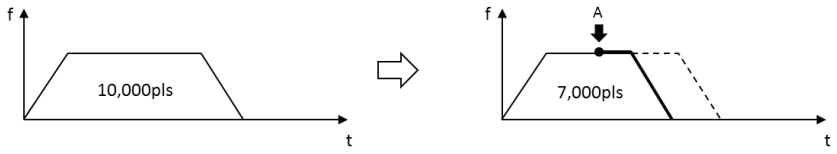
Movement change function uses the following parameters.

Setting region for position control operations (position control storage region No.3)

Offset address (Hex)	Name	Initial value	Contents
HA-HB	Position control movement change Movement change	H0	The setting region for changing movement when changing position control movement －1,073,741,823 - 1,073,741,823 (designated unit system)

■ Operation sample ① Reducing movement (changed movement ＞ current value)

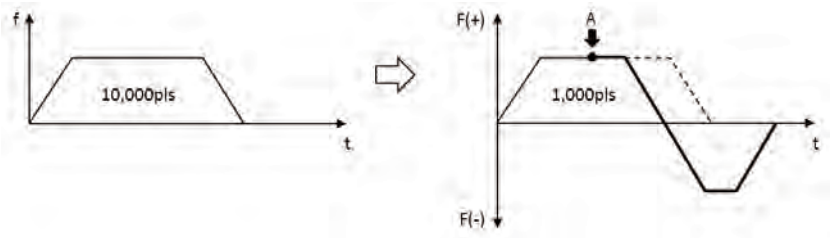
Parameter	Setting value
Control mode	Increment
Position control movement (before change)	10,000 (pls)
Position control movement (after change)	7,000 (pls)



A	Movement change request contact ON

■ Operation sample ② Reducing movement (changed movement ＜ current value)

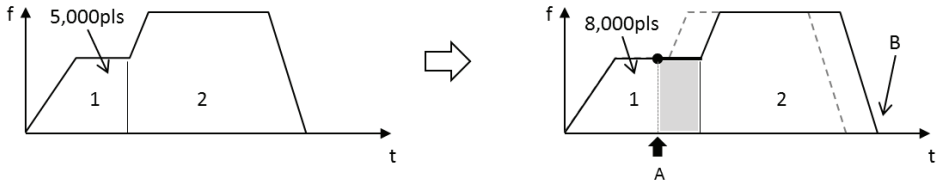
Parameter	Setting value
Control mode	Increment
Position control movement (before change)	10,000 (pls)
Position control movement (after change)	1,000 (pls)



A	Movement change request contact ON

■ Operation sample ③ Operating in continuous data sheets (increment)

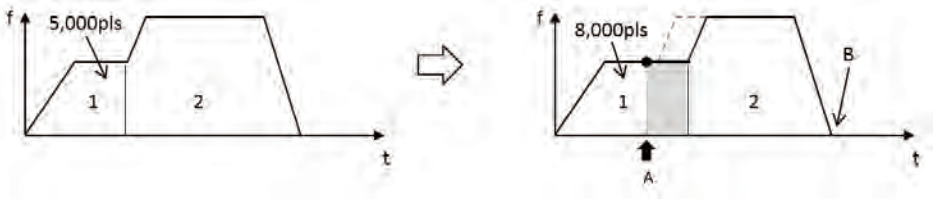
Parameter	Setting value
Control mode	Increment
Position control movement of data sheet 1 (before change)	5,000 (pls)
Position control movement of data sheet 1 (after change)	8,000 (pls)



A	Movement change request contact ON
B	Because it is setting increment, the stop position of data sheet 2 is also changed.

■ Operation sample④ Operating in continuous data sheets (absolute value)

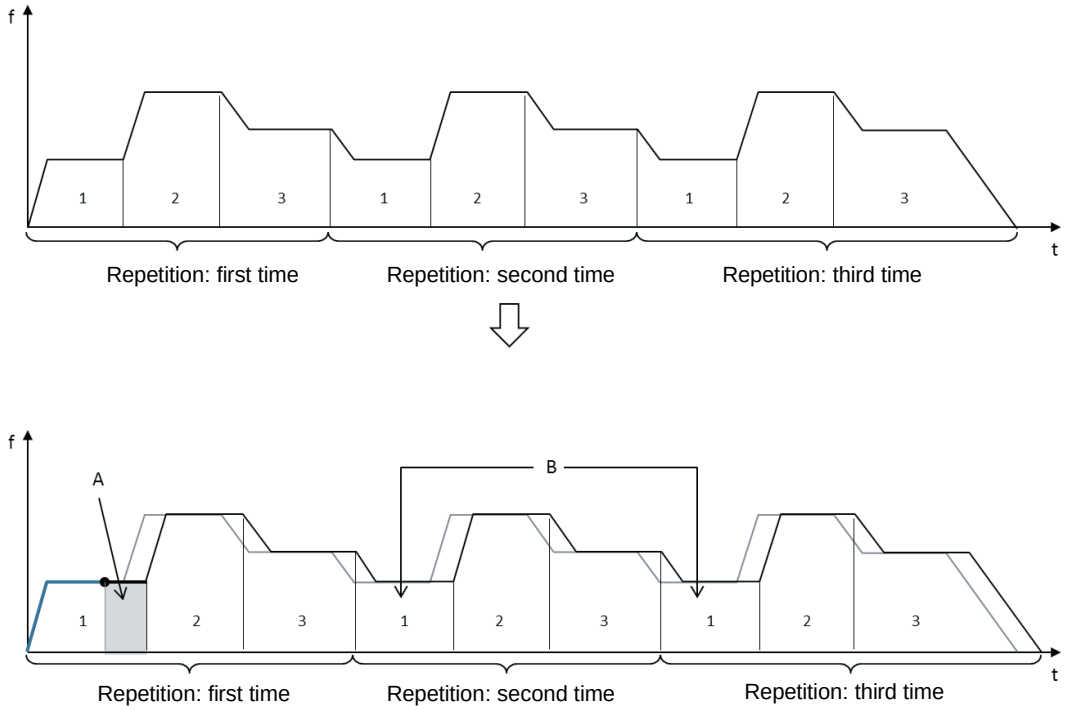
Parameter	Setting value
Control mode	Absolute value
Position control movement of data sheet 1 (before change)	5,000 (pls)
Position control movement of data sheet 1 (after change)	8,000 (pls)



A	Movement change request contact ON
B	Because it is setting absolute value, the stop position of data sheet 2 is not changed.

■ Operation sample (upon repetition)

During repetition of position control, when the movement is to be changed, only the movements in data sheets in operation during the repetition cycle being executed.



A	Only the movement of data sheet 1 which is repeated for the 1st time is changed to 8,000 pls.
B	The movement of data sheet 1 which is repeated for the 2nd and 3rd time will not be changed.

■ About the auxiliary output upon movement change

When auxiliary output is set in the Delay mode, even if the movement is changed, the auxiliary contact will be marked ON according to the position of the Delay ratio of the movement before the change. However, when the Delay ratio is set to 100%, the auxiliary contact upon operation completion will be marked ON.

17.10 Direct Input / Output

17.10.1 Direct Input / Output function

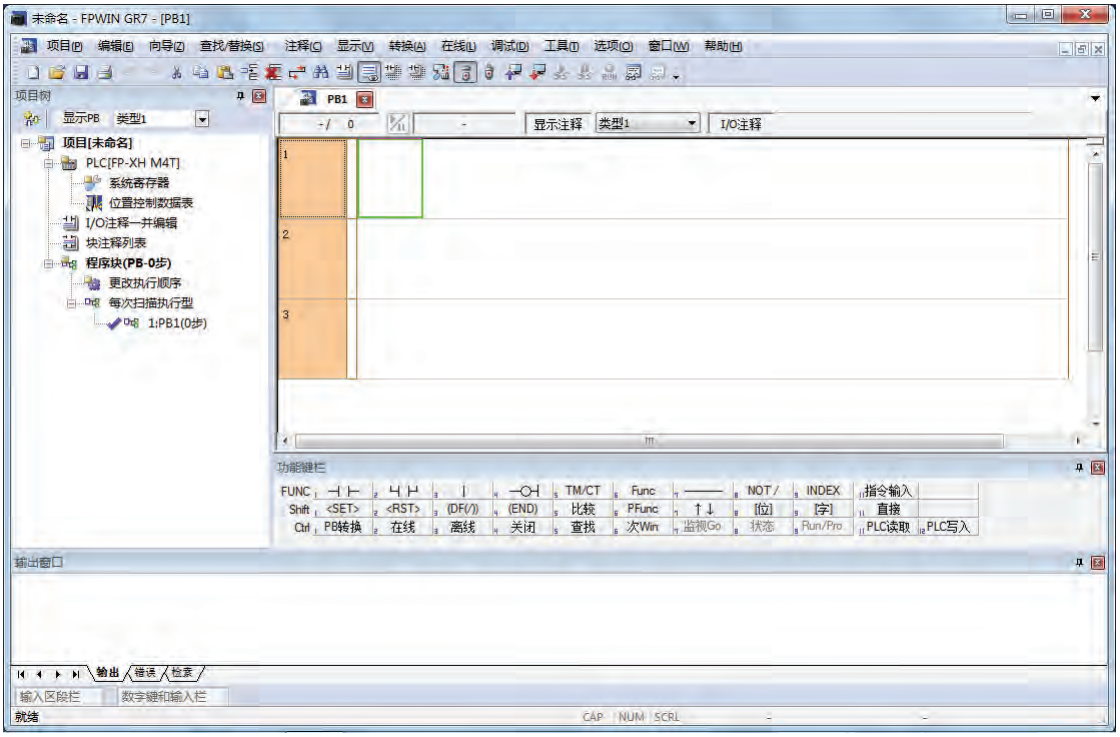
- The direct input / output function means to update external inputs/outputs during operation.
- In general, the inputs / outputs are updated as a whole during refreshing.
- When direct input instruction is used, read and update external inputs during operation.
- When direct input instruction is used, turn ON/OFF external inputs during operation.
- It is valid for controls with requirement for high-speed response.

■ Types of instructions

Direct input instruction	DST	Direct start
	DST/	Direct start NON
	DAN	Direct AND
	DAN/	Direct AND NON
	DOR	Direct OR
	DOR/	Direct OR NON
Direct output instruction	DOT	Direct output
	DSET	Direct set
	DRST	Direct reset
	DKP	Direct hold

■ Programming method based on FPWIN GR7

[Direct] selection via the options in the function bar.



- The function bar is used as direct instruction.

- Select the direct input/output instruction to be used. Select DKP instruction via [Instruction Input].
- Press [Esc] or [Shift] + [f11], the function key bar returns to the common input/output instruction keys.

17.10.2 Direct Input

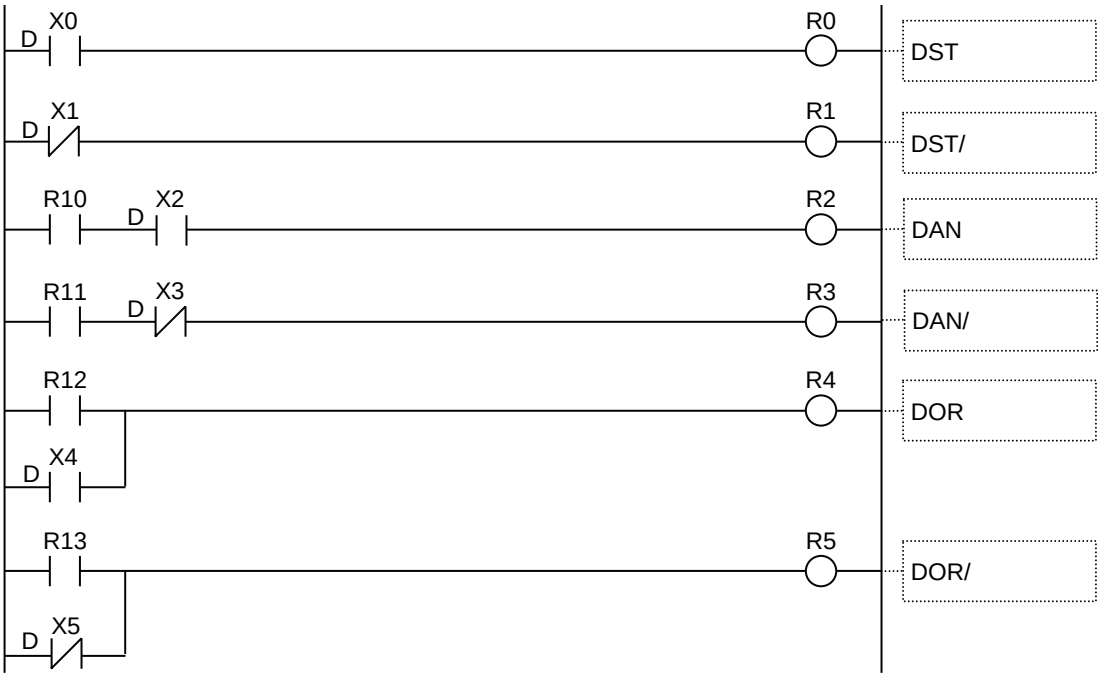
- Direct Input instructions include DST·DST/·DAN·DAN/·DOR·DOR/ instructions.
- Relay type available for designation includes only X contact.

■ Range that can be specified

Model	Device Range
FP-XH M4 control unit	X0-X7·X1100-X121F (Note)

(Note): When designating X1100-X121F, the input region of the motion control part is read and reflected.

■ Latter diagram flag



Reference

Please refer to the Instruction Word Reference to instructions for details about the instructions.

17.10.3 Direct output

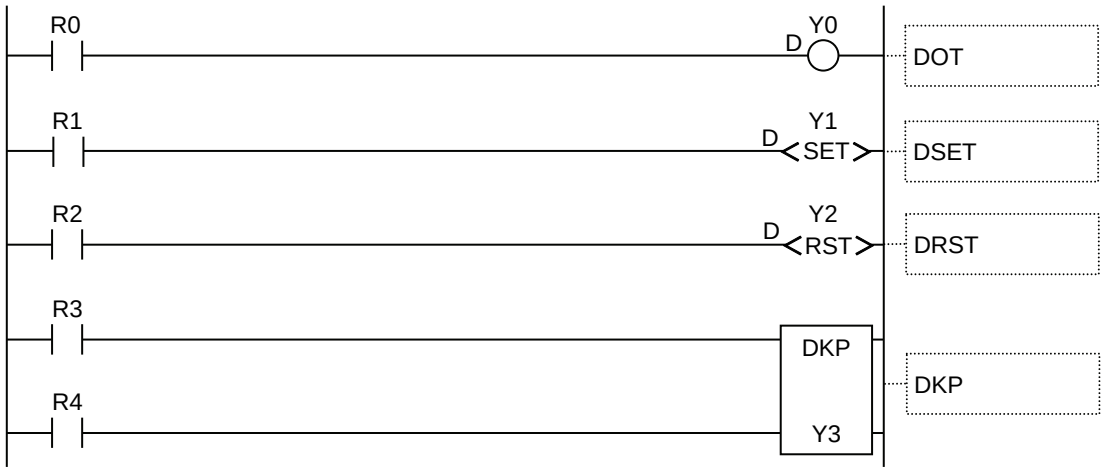
- Direct output instructions include DOT,·DSET,·DRST·and DKP.
- Relay type available for designation includes only Y contact.

■ Range that can be specified

Model	Device Range
FP-XH M4 control unit	Y0-Y7・Y1100-Y121F (Note)

(Note): When designating Y1100-Y121F, the input region of the motion control part is read and reflected.

■ Latter diagram flag



Reference

Please refer to the reference to instructions for details about the instructions.

18

Instruction Word Reference

18.1 Motion Control Instructions

18.1.1 [F384 PTBLR] Position control parameter read instruction

Read the position control parameter saved in the unit position control storage to the region of storage for operation.

■ Instruction Format

■ Operation Number

Operation Number	Setting Contents	
S1	Specify the axis number and position control storage region	
	(upper bit 8bit) axis number:	H0 (axis-1), H1 (axis-2), H2 (axis-3), H3 (axis-4) and H7 (virtual-axis)
	(lower bit 8bit) region number:	H0 (universal region), H01 (axis information region), H02 (axis setting region), H04 (synchronous control setting region) and H05 (position control operation change setting region)
S2	Initial address of the position control storage in which data to be read will be saved (offset address) or storage for computation in which initial address will be saved	
n	Read the number of words	
D	Save the operational storage of the read data	

(Note 1): The setting of axis number is invalid when reading universal region. Please specify H0 is S1.

(Note 2): Designate the operation number S1 via the hex combination. For the axis information region of axis number 3, it is designated to H201.

■ Designable storage region type

Operation Number	WX	WY	WR	WL	SV	EV	DT	LD	I	Constant		Indexing
										K	H	
S1	●	●	●	●	●	●	●	●	●	●	●	●
S2	●	●	●	●	●	●	●	●	●	●	●	●
n	●	●	●	●	●	●	●	●	●	●	●	●
D	—	●	●	●	●	●	●	●	●	—	—	●

■ Operation description

- Read the data saved in position control storage with [n] word starting with [S2], and save it to the storage region for computation starting with [D].
- Use [S1] to designate axis number and region number of position control storage.

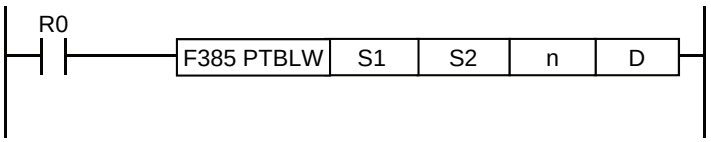
■ Precautions for programming

- When the number of operations exceeds the specified range, operating error will occur.

18.1.2 [F385 PTBLW] position control parameter write instruction

This is used when writing in position control parameter and data of position control data sheet through the user program.

■ Instruction Format



■ Operation Number

Operation Number	Setting Contents	
S1	Specify the axis number and position control storage region	
	(upper bit 8bit) axis number:	H0 (axis-1), H1 (axis-2), H2 (axis-3), H3 (axis-4) and H7 (virtual-axis)
	(lower bit 8bit) region number:	H0 (universal region), H01 (axis information region), H02 (axis setting region), H04 (synchronous control setting region) and H05 (position control operation change setting region)
S2	Save the storage region for operational to which data is written	
n	Number of words written	
D	Initial address of the position control storage to which data is saved (offset address) or storage for computation in which initial address will be saved	

(Note 1): The setting of axis number is invalid when being written to universal region. Please specify H0 is S1.

(Note 2): Designate the operation number S1 via the hex combination. For the axis setting region of axis number 3, it is designated to H202.

■ Designable storage region type

Operation Number	WX	WY	WR	WL	SV	EV	DT	LD	I	Constant		Indexing
										K	H	
S1	●	●	●	●	●	●	●	●	●	●	●	●
S2	●	●	●	●	●	●	●	●	●	–	–	●
n	●	●	●	●	●	●	●	●	●	●	●	●
D	●	●	●	●	●	●	●	●	●	●	●	●

■ Operation description

- Read the data saved in the region with [n] word starting with [S2], and save it to the position control storage starting with [D].
- Use [S1] to designate axis number and region number of position control storage.

■ Precautions for programming

- When the number of operations exceeds the specified range, operating error will occur.

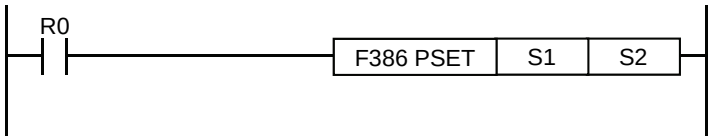
Reference

For details about the position control storage, see "26.3 Position control storage".

18.1.3 [F386 PSET] position control start data sheet setting

Written before the program starting the position control to set the position control data sheet to be started.

■ Instruction Format



■ Operation Number

Operation Number	Setting Contents
S1	Numbers of axes to start position control data sheets: H0 (axis-1), H1 (axis-2), H2 (axis-3), H3 (axis-4) and H7 (virtual axis)
S2	Numbers of data sheets to start position control data sheets: 1-600 (standard region), 10001-10100 (extended region) (note 1)

(Note 1): Data sheets No.10026-10100 are supported by control units of Motion CPU Ver.1.50 or above.

■ Designable storage region type

Operation Number	WX	WY	WR	WL	SV	EV	DT	LD	I	Constant		Indexing
										K	H	
S1	●	●	●	●	●	●	●	●	●	●	●	●
S2	●	●	●	●	●	●	●	●	●	●	●	●

■ Operation description

- Sets position control data sheet to start.
- When the startup contact of corresponding axis is ON, start position control operation according to the data set in the position control storage (position control data sheet region) in advance.

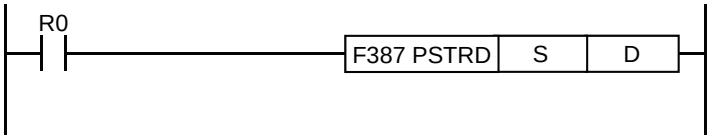
■ Precautions for programming

- When the number of operations exceeds the specified range, operating error will occur.
- When the conditions for system stop, emergency stop, position limit stop and deceleration stop are fulfilled, processing should be stopped with priority.
- When the value set or the position control storage (axis setting region) is abnormal, self-diagnose error (position control operation error) will occur.
- When the axis to be started is in operation, the operation will stop without starting position control.

18.1.4 [F387 PSTRD] axis status acquisition

Reads status information indicating position control operations to any device.

■ Instruction Format



■ Operation Number

Operation Number	Setting Contents
S	Numbers of axes to read status: H0 (axis-1), H1 (axis-2), H2 (axis-3), H3 (axis-4) and H7 (virtual axis)
D	Saves the address of device completing information reading

■ Designable storage region type

Operation Number	WX	WY	WR	WL	SV	EV	DT	LD	I	Constant		Indexing
										K	H	
S	●	●	●	●	●	●	●	●	●	●	●	●
D	–	●	●	●	●	●	●	●	●	–	–	●

■ Operation description

- Reads status of the axis designated by [S] to any device.

■ [D]: status information

bit	Status information	Contents	Axis 1	Axis 2	Axis 3	Axis 4	Virtual axis
0	Tools running	It will be turned ON during tools running with Configurator PM7, irrelevant to the designated axis	X1104	X1104	X1104	X1104	X1104
1	Error prompt	ON when the designated axis is in error	X1130	X1161	X1162	X1163	X1167
2	Warning	ON when the designated axis is in warning	X1168	X1169	X116A	X116B	X116F
3	BUSY	ON when the designated axis is operating	X1118	X1119	X111A	X111B	X111F
4	Action Completion	ON when the operation of the designated axis is completed	X1120	X1121	X1122	X1123	X1127
5	Origin return completion	ON when the designated axis is subject to origin return	X1128	X1129	X112A	X112B	X112F

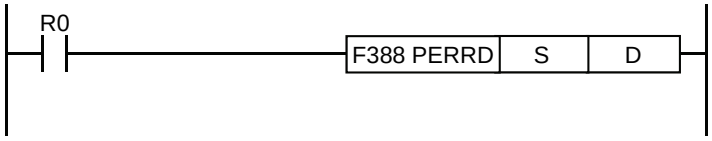
■ Precautions for programming

- When the number of operations exceeds the specified range, operating error will occur.

18.1.5 [F388 PERRD] position control error /warning acquisition

Reads codes saved in error notification buffer 1/warning buffer 1 to any device.

■ Instruction Format



■ Operation Number

Operation Number	Setting Contents
S	Numbers of axes to read error/warning codes: H0 (axis-1), H1 (axis-2), H2 (axis-3), H3 (axis-4) and H7 (virtual axis)
D	Saves the address of device completing information reading

■ Designable storage region type

Operation Number	WX	WY	WR	WL	SV	EV	DT	LD	I	Constant		Indexing
										K	H	
S	●	●	●	●	●	●	●	●	●	●	●	●
D	–	●	●	●	●	●	●	●	●	–	–	●

■ Operation description

- Reads codes saved in error notification buffer /warning buffer of the designated axis to any device.
- [D] saves error codes and [D+1] saves warning codes.

■ Precautions for programming

- When the number of operations exceeds the specified range, operating error will occur.

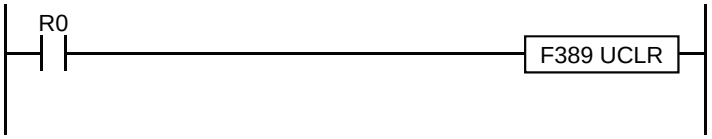
◆ Reference

- **Please refer to "19.1 Error/Warning" for overview about errors and warnings.**
- **Please refer to "19.3 Error Code List" for error codes.**
- **Please refer to "19.4 Warning Codes List" for warning codes.**

18.1.6 [F389 UCLR] position control error / warning clearing

Clears codes saved in error notification buffer/warning buffer.

■ Instruction Format



■ Operation description

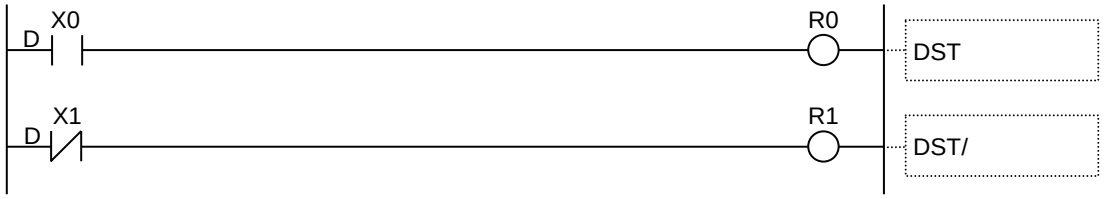
- Clears position control error notifications & region and warning notifications & region contents.

18.2 Direct Input Instruction

18.2.1 [DST·DST/] Direct start • Direct Start NON

DST, DST/: reads external inputs for logical operation. Due to the input refreshing of contact units, it is valid for controls with requirement for high-speed response.

■ **Instruction Format**



■ **Relay types available for designation (designation unit: bit) (●: designation available —: designation unavailable)**

		X	Y	R	T	C	L	P	E	Indexing
DST	Normal ON input contact for the start of logical operation	●	—	—	—	—	—	—	—	●
DST/	Normal OFF input contact for the start of logical operation	●	—	—	—	—	—	—	—	●

■ **Operation description**

- 「DST」Instruction, read specified external input, reflect it to the input contact, and then take this contact as normally open (NO) contact (a contact) and perform logic operation.
- 「DST/」Instruction, read specified external input, reflect it to the input contact, and then take this contact as normally closed (NC) contact (b contact) and perform logic operation.

<Example> During the above procedure

- When external input X0 flag is ON, R0 flag will be ON.
- When external input X1 flag is OFF, R1 flag will be OFF.

■ **Range that can be specified**

Model	Device Range
FP-XH M4 control unit	X0-X7·X1100-X121F (Note)

(Note): When designating X1100-X121F, the input region of the motion control part is read and reflected.

■ **Precautions for programs**

- When the contact is out of the specified possible range, operation error may occur.
- When setting the time through main unit input time constant setting function of system register, the time constant will be invalid.

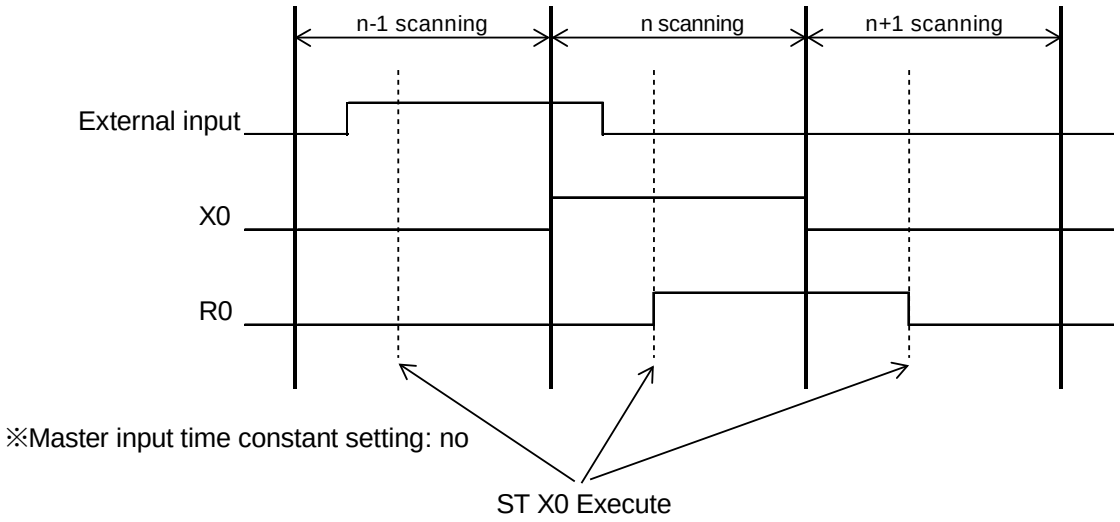
■ Comparison of ST instruction and DST instruction

- DST instruction is more suitable for requirement for high-speed response than ST instruction.

＜For ST instruction＞

●Latter diagram flag

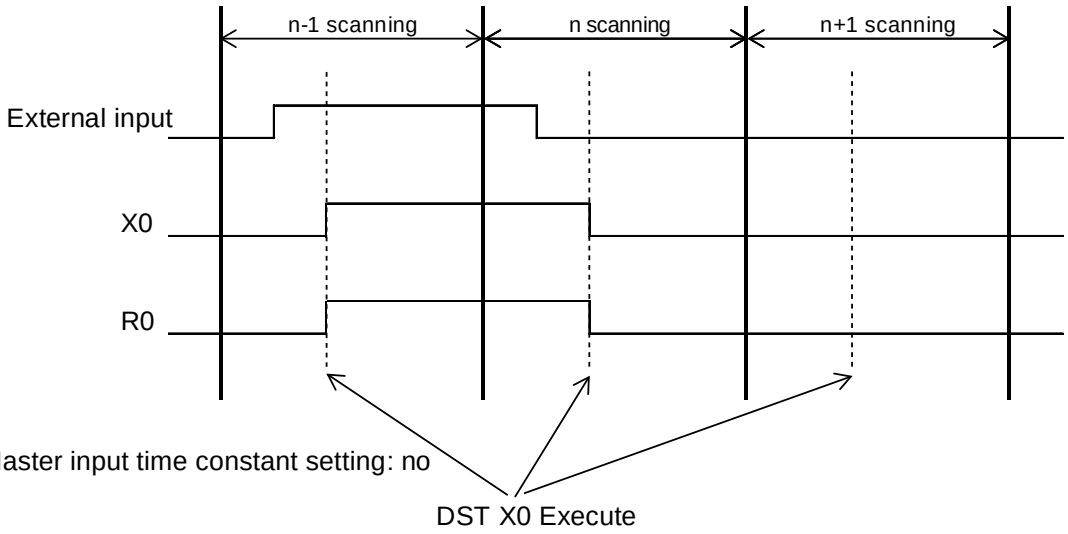
●Real-time Charts



＜For DST instruction＞

●Latter diagram flag

●Real-time Charts



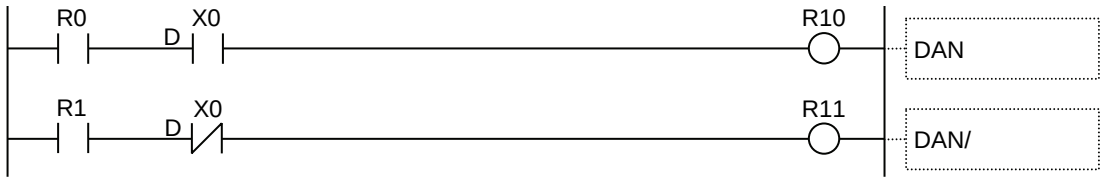
※Master input time constant setting: no

18.2.2 ［DAN·DAN/］ Direct AND • Direct AND NON

DAN: read external input and connect normally open (NO) contacts (a contact) in series. As input refreshing is performed by taking contact as a unit, it is valid for controls with requirement for high-speed response.

DAN: read external input and connect normally closed (NC) contacts (b contact) in series. As input refreshing is performed by taking contact as a unit, it is valid for controls with requirement for high-speed response.

■ Instruction Format



■ Type of designable relay (specified unit: bit) (●: designable -: non-designable)

		X	Y	R	T	C	L	P	E	Indexing
DAN	Normally open (NO) contacts connected in a line	●	–	–	–	–	–	–	–	●
DAN/	Normally closed (NC) contacts connected in series	●	–	–	–	–	–	–	–	●

■ Operation description

- Read specified external input and reflect it to output contact, and then perform logic multiply operation with the current result calculated with contacts connected in series.

<Example> During the above procedure

- When R0 flag is ON and external input X0 flag is ON, R11 flag will be ON.
- When R1 flag is ON and external input X0 flag is OFF, R11 flag will be OFF.

■ Range that can be specified

Model	Device Range
FP-XH M4 control unit	X0-X7·X1100-X121F (Note)

(Note): When designating X1100-X121F, the input region of the motion control part is read and reflected.

■ Precautions for programs

- When the contact is out of the specified possible range, operation error may occur.
- When setting the time through main unit input time constant setting function of system register, the time constant will be invalid.

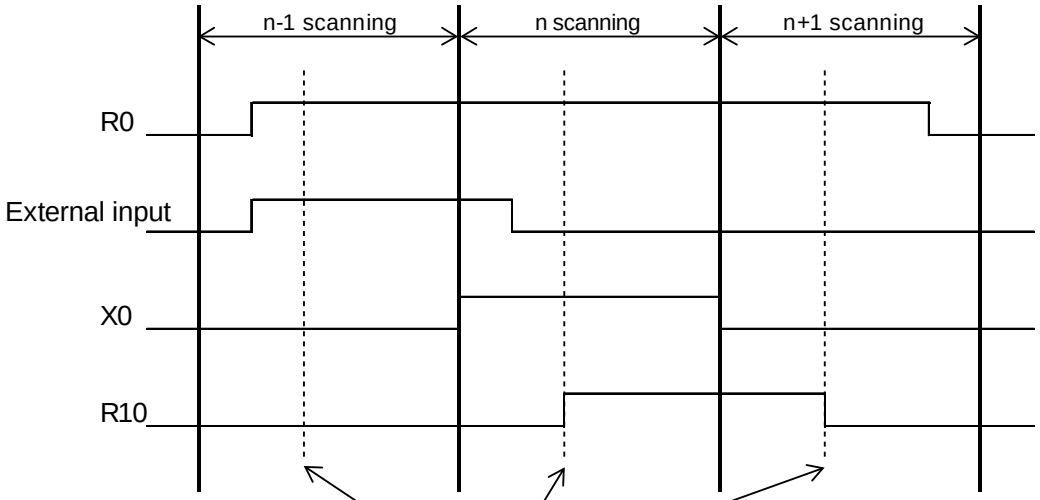
■ Comparison of AN instruction and DAN instruction

- DAN instruction is more suitable for requirement for high-speed response than AN instruction.

＜For AN instruction＞

●Latter diagram flag

●Real-time Charts



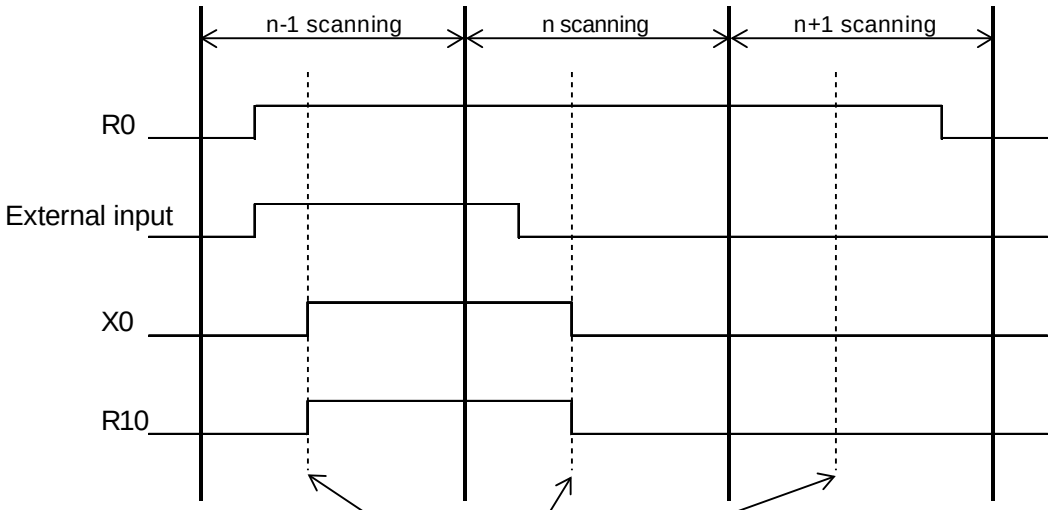
※Master input time constant setting: no

AN X0 Execute

<Upon DAN instruction>

●Latter diagram flag

●Real-time Charts



※Master input time constant setting: no

DAN X0 Execute

18.2.3 ［DOR·DOR/］ Direct OR • Direct OR NON

DOR: read external input and connect normally open (NO) contacts (a contact) in parallel. As input refreshing is performed by taking contact as a unit, it is valid for controls with requirement for high-speed response.

DOR/: read external input and connect normally closed (NC) contacts (b contact) in parallel. As input refreshing is performed by taking contact as a unit, it is valid for controls with requirement for high-speed response.

■ Instruction Format

■ Type of designable relay (specified unit: bit) (●: designable -: non-designable)

		X	Y	R	T	C	L	P	E	Indexing
DOR	Normally open (NO) contacts connected in parallel	●	–	–	–	–	–	–	–	●
DOR/	Normally closed (NC) contacts connected in parallel	●	–	–	–	–	–	–	–	●

■ Operation description

- Read specified external input and reflect it to output contact, and then perform logic add operation with the current result calculated with contacts connected in parallel.

<Example> During the above procedure

- When R0 flag is OFF and external input X0 flag is ON, R11 flag will be ON.
- When R1 flag is OFF and external input X0 flag is OFF, R11 flag will be OFF.

■ Range that can be specified

Model	Device Range
FP-XH M4 control unit	X0-X7·X1100-X121F (Note)

(Note): When designating X1100-X121F, the input region of the motion control part is read and reflected.

■ Precautions for programs

- When the contact is out of the specified possible range, operation error may occur.
- When setting the time through main unit input time constant setting function of system register, the time constant will be invalid.

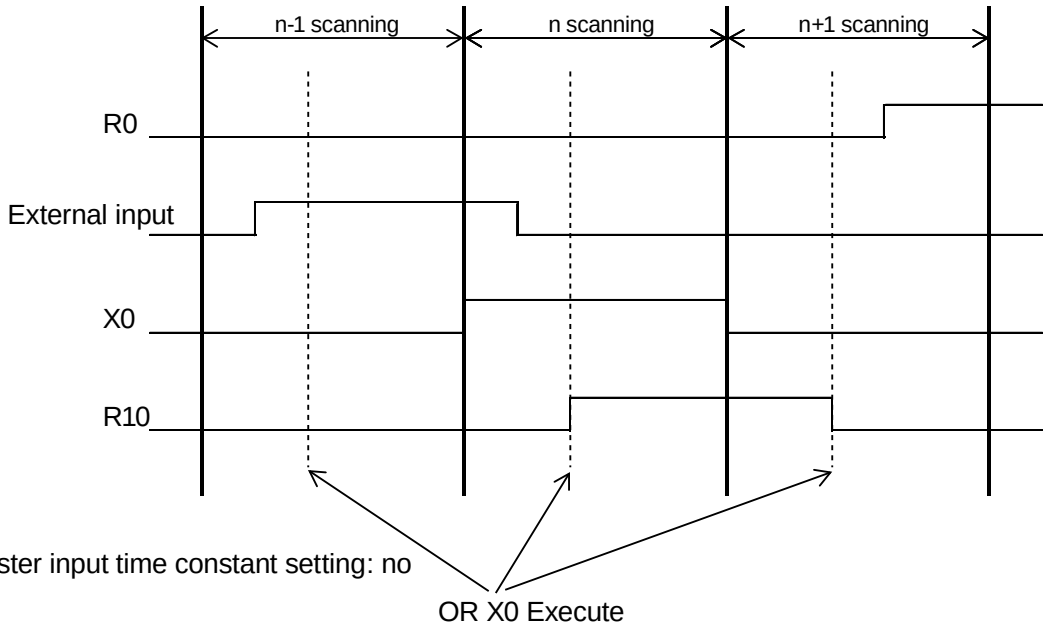
■ Comparison of OR instruction and DOR instruction

- DOR instruction is more suitable for requirement for high-speed response than OR instruction.

＜Upon OR instruction＞

●Latter diagram flag

●Real-time Charts

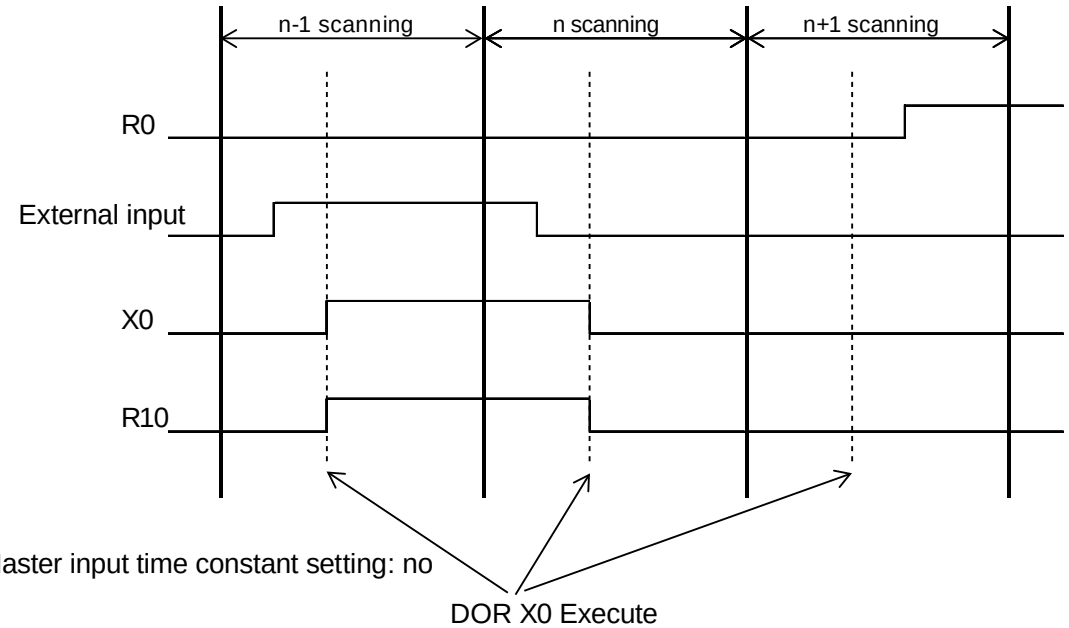


※Master input time constant setting: no

＜For DOR instruction＞

●Latter diagram flag

●Real-time Charts



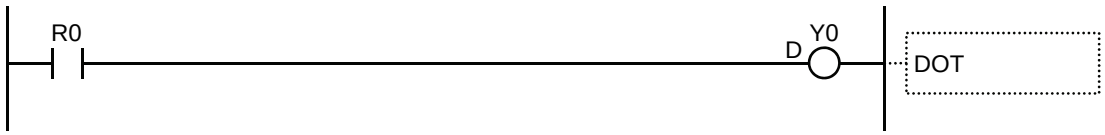
※Master input time constant setting: no

18.3 Direct Output Instruction

18.3.1 ［DOT］ Direct output

DOT: operate external output (ON/OFF). As input refreshing is performed by taking contact as a unit, it is valid for controls with requirement for high-speed response.

■ **Instruction Format**



■ **Type of designable relay (specified unit: bit) (●: designable -: non-designable)**

		X	Y	R	T	C	L	P	E	Indexing
DOT	Coil outputting logic operation result	—	●	—	—	—	—	—	—	●

■ **Operation description**

- 「DOT」 Instruction, reflect operation result to specified output contact, external input flag will be On/OFF.

<Example> During the above procedure

- When R0 flag is ON, external output Y0 flag will be ON.
- When R1 flag is ON, external output Y1 flag will be ON.

■ **Range that can be specified**

Model	Device Range
FP-XH M4 control unit	Y0 - Y7·Y1100 Y121F (Note)

(Note): When designating Y1100-Y121F, the input region of the motion control part is read and reflected.

■ **Precautions for programs**

- When the contact is out of the specified possible range, operation error may occur.
- A syntax error may occur if the same output coil is specified (dual output).

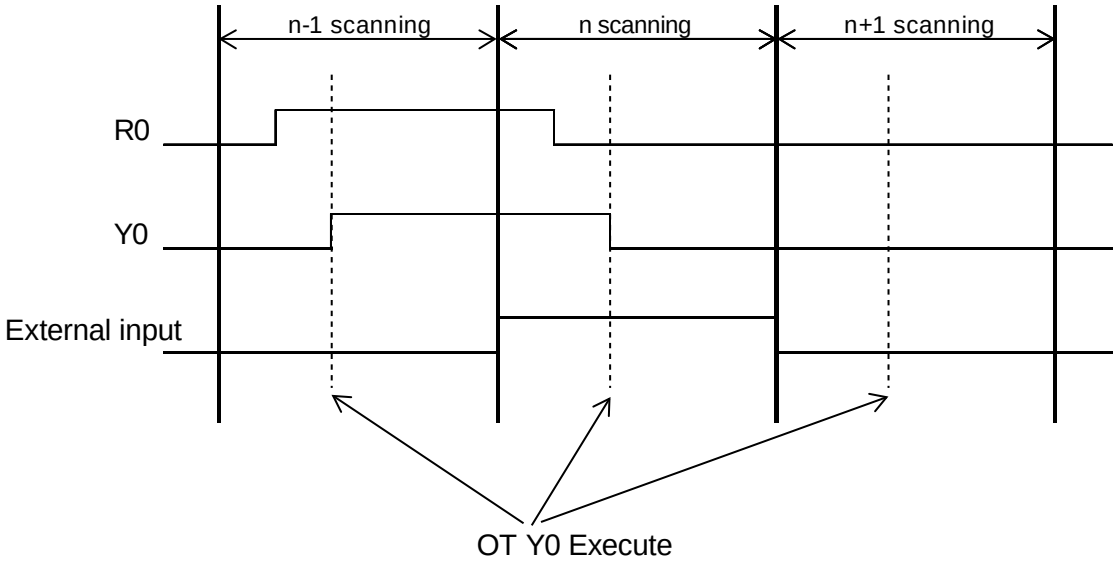
■ Comparison of OT instruction and DOT instruction

- DOT instruction is more suitable for requirement for high-speed response than OT instruction.

<For OT instruction>

●Latter diagram flag

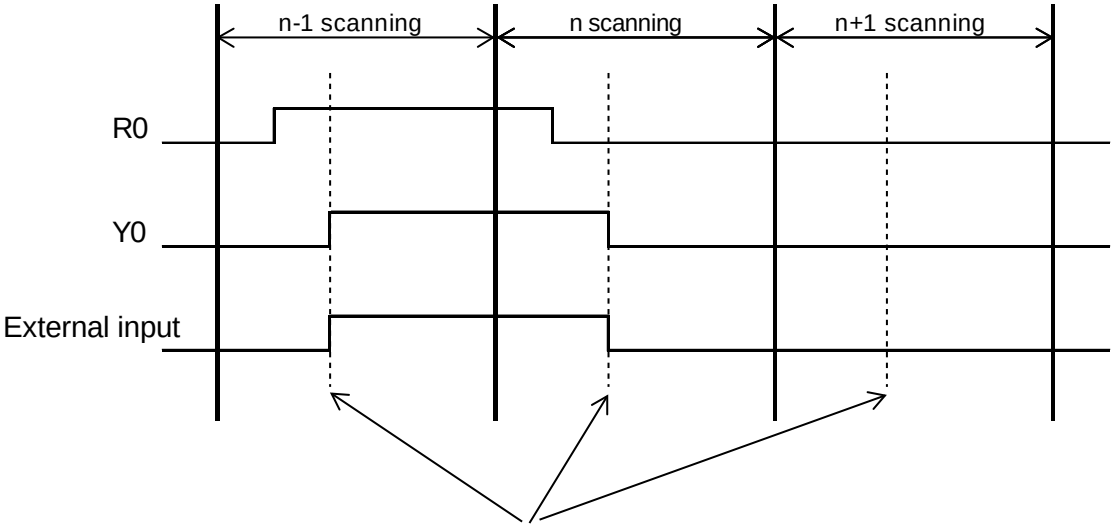
●Real-time Charts



<For DOT instruction>

●Latter diagram flag

●Real-time Charts

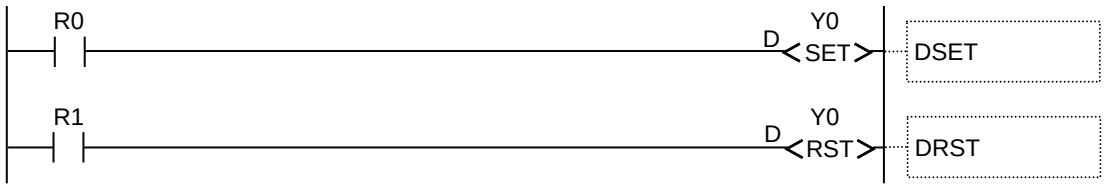


18.3.2 ［DSET·DRST］ Direct set · Direct reset

DSET: When execution condition is satisfied, external output flag will be ON. And the ON state will be held. As input refreshing is performed by taking contact as a unit, it is valid for controls with requirement for high-speed response.

DRST: When execution condition is satisfied, external output flag will be OFF. And the OFF state will be held. As input refreshing is performed by taking contact as a unit, it is valid for controls with requirement for high-speed response.

■ Instruction Format



■ Type of designable relay (specified unit: bit) (●: designable -: non-designable)

		X	Y	R	T	C	L	P	E	Indexing
DSET	Output coil	—	●	—	—	—	—	—	—	●
DRST	Output coil	—	●	—	—	—	—	—	—	●

■ Operation description

- 「DSET」 Instruction, when execution condition is ON, the specified output contact flag will be ON and external output flag will be ON. Hold the ON state, regardless of the change of state of execution condition.
- 「DRST」 Instruction, when execution condition is ON, the specified output contact flag will be OFF and external output flag will be OFF. Hold the OFF state, regardless of the change of state of execution condition.
- 「DSET」 「DRST」 Instruction can designate output on the same coil for many times. (No syntax error may occur even if total check is performed)

<Example> During the above procedure

- When R0 flag is ON, external output Y0 flag will be ON and the ON state will be held.
- When R1 flag is ON, external output Y0 flag will be OFF and the ON state will be held.

■ Range that can be specified

Model	Device Range
FP-XH M4 control unit	Y0 - Y7·Y1100 Y121F (Note)

(Note): When designating Y1100-Y121F, the input region of the motion control part is read and reflected.

■ Precautions for programs

- When the contact is out of the specified possible range, operation error may occur.
- The state of output end of DSET instruction will be held even if 「MC」 instruction is being executed.
- The output end of DSET instruction will be reset when switching from 「RUN mode」 to 「PROG mode」 or when the power is OFF, etc.

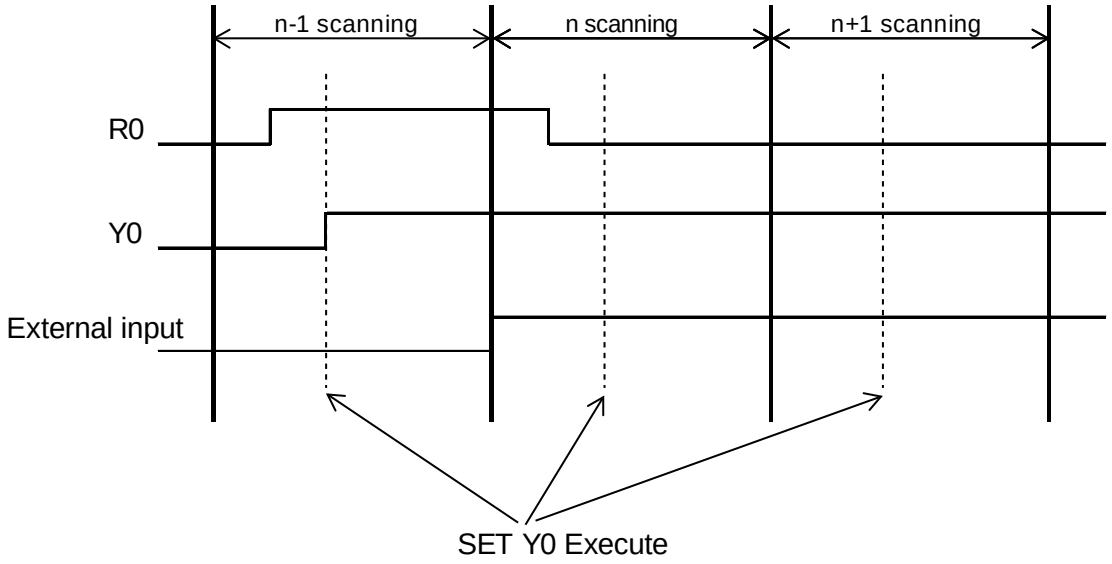
■ Comparison of SET instruction and DSET instruction

- DSET instruction is more suitable for requirement for high-speed response than SET instruction.

＜For SET instruction＞

●Latter diagram flag

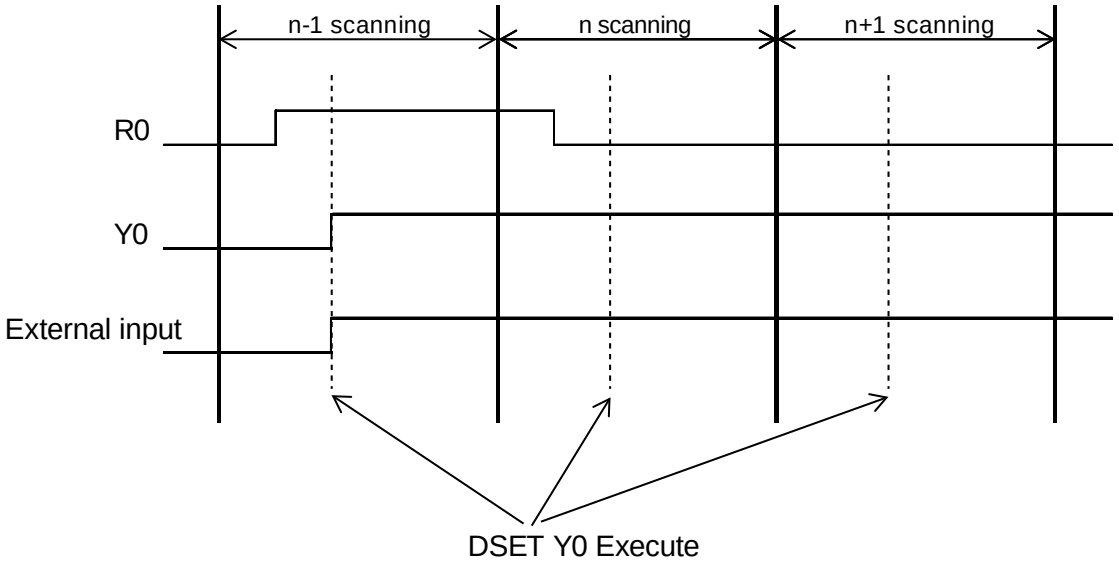
●Real-time Charts



<For DSET instruction>

●Latter diagram flag

●Real-time Charts



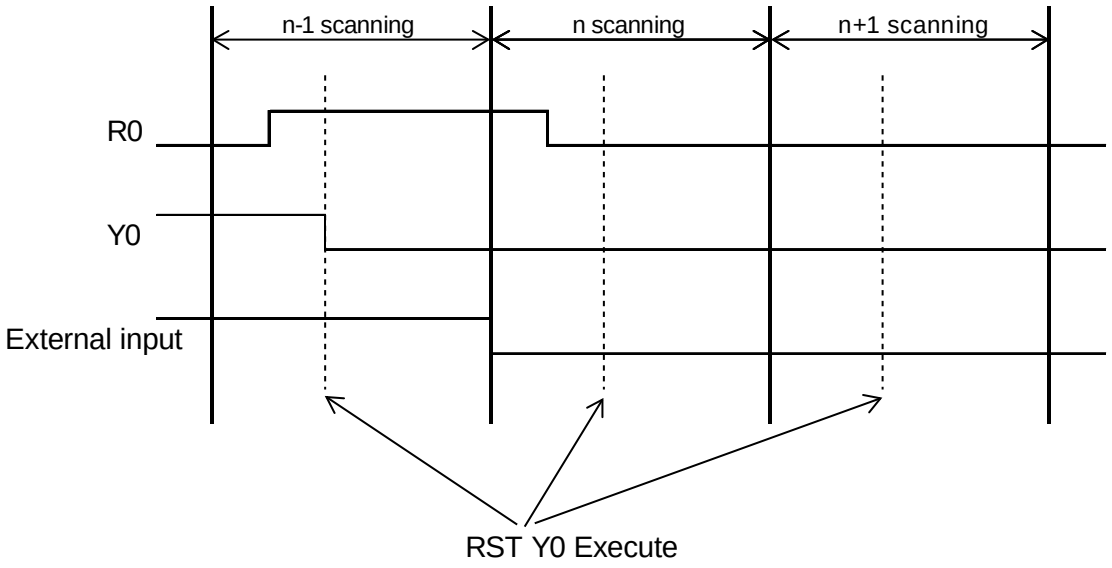
■ Comparison of RST instruction and DRST instruction

- DRST instruction is more suitable for requirement for high-speed response than RST instruction.

＜For RST instruction＞

●Latter diagram flag

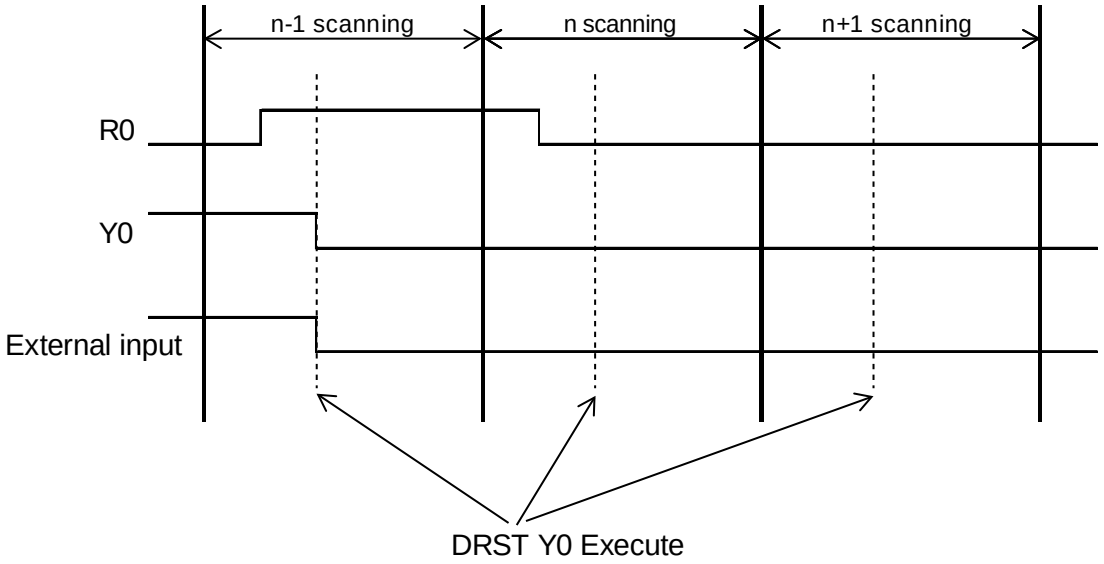
●Real-time Charts



<For DOT instruction>

●Latter diagram flag

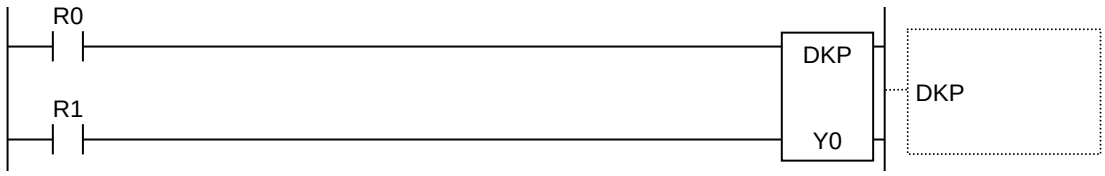
●Real-time Charts



18.3.3 ［DKP］ Direct hold

DKP: By outputting with set·reset, external input flag will be On/OFF and its state will be held.

■ **Instruction Format**



■ **Type of designable relay (specified unit: bit) (●: designable -: non-designable)**

		X	Y	R	T	C	L	P	E	Indexing
DKP	Output coil	–	●	–	–	–	–	–	–	–

■ **Operation description**

- When set input is ON, the specified coil output will be ON and external output flag will be ON. And its state will be held.
- When reset input is ON, the specified coil output will be OFF and external output flag will be OFF. And the holding state will be canceled.
- When the flag is held in the middle, this state will be held until the reset input flag is changed, regardless of ON/OFF state of set input.
- When set input and reset input is ON simultaneously, the reset input will be performed preferentially.

<Example> During the above procedure

- When R0 flag is ON, external output Y0 flag will be ON and the ON state will be held.
- When R1 flag is ON, external output Y0 flag will be OFF and the ON state will be held.

■ **Range that can be specified**

Model	Device Range
FP-XH M4 control unit	Y0 - Y7·Y1100 Y121F (Note)

(Note): When designating Y1100-Y121F, the input region of the motion control part is read and reflected.

■ **Precautions for programs**

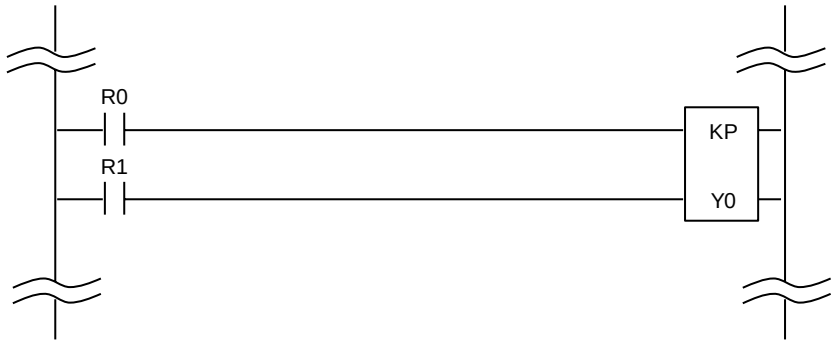
- When the contact is out of the specified possible range, operation error may occur.
- Syntax error may occur if the same output coil is specified (dual output).
- The state of output end will be held even if 「MC」 instruction is being executed.
- The output end will be reset when switching from 「RUN mode」 to 「PROG mode」 or when the power is OFF, etc.

■ Comparison of KP instruction and DKP instruction

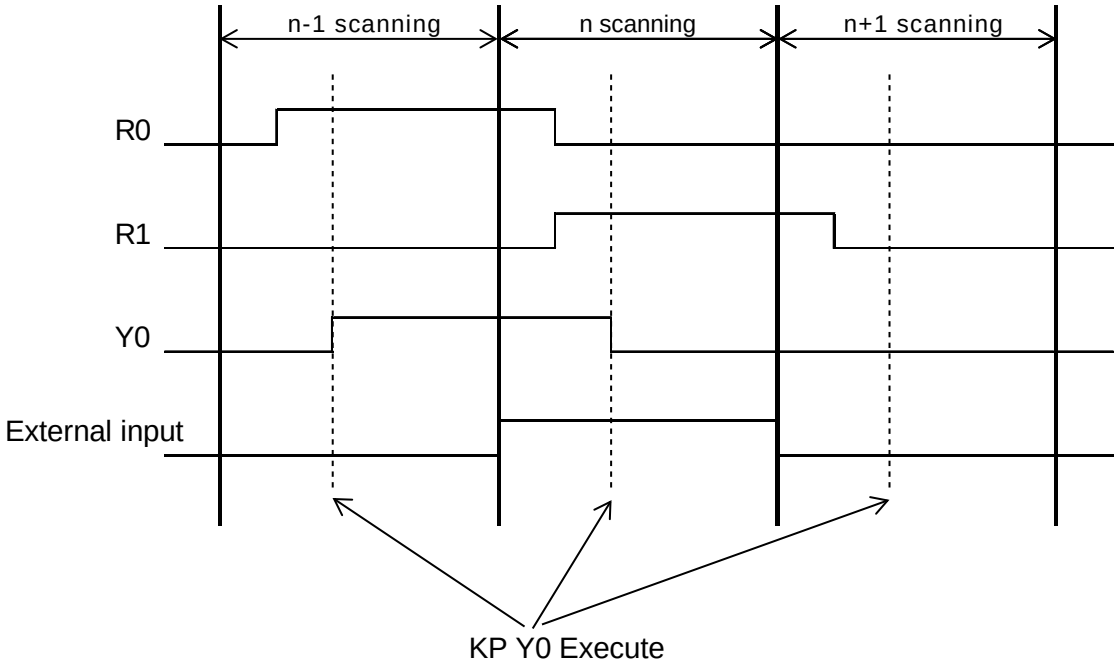
- DKP instruction is more suitable for requirement for high-speed response than KP instruction.

＜For KP instruction＞

●Latter diagram flag

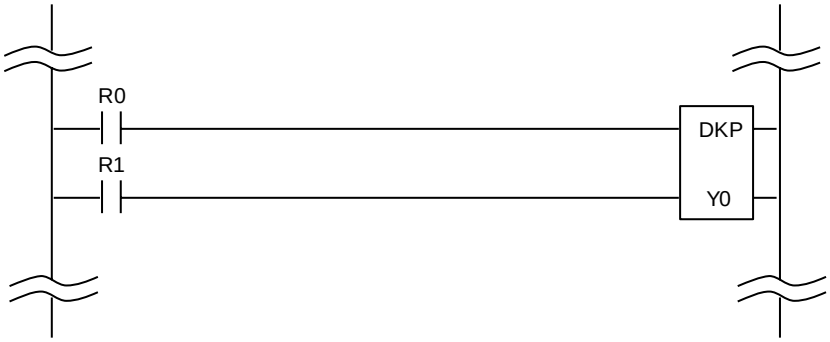


●Real-time Charts

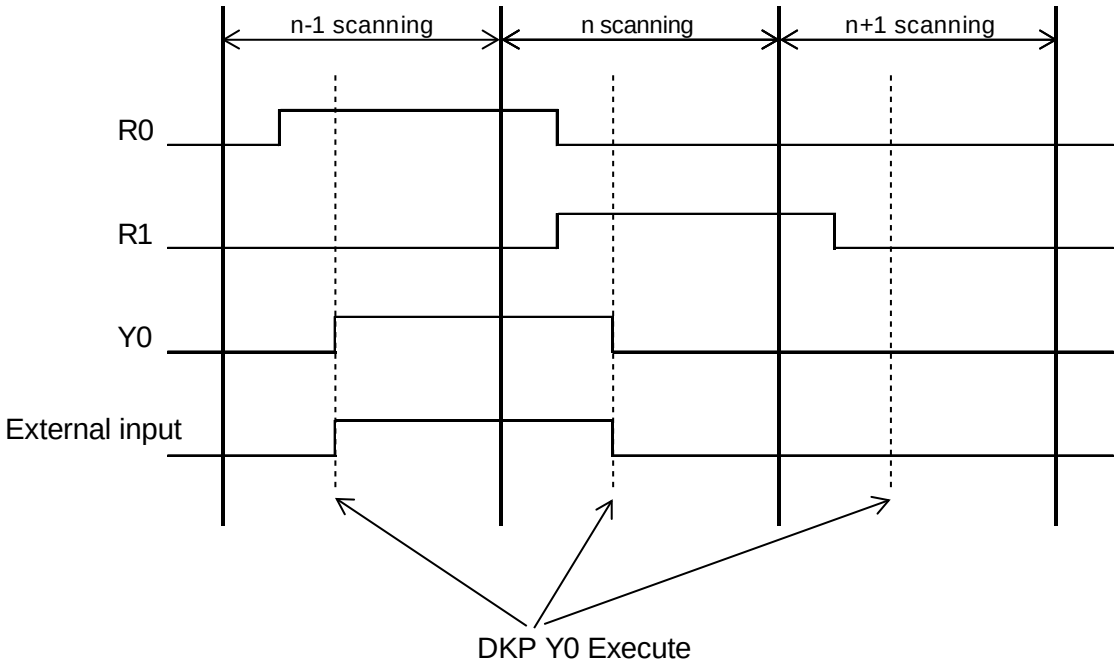


<For DKP instruction>

- Latter diagram flag



- Real-time Charts



19

Error/Warning Notification Function

19.1 Error/Warning

19.1.1 Error/Warning

■ Function of Error/Warning

- Notify that error occurs in the setting and operation of motion control part.
- The difference between error and warning is as follows.

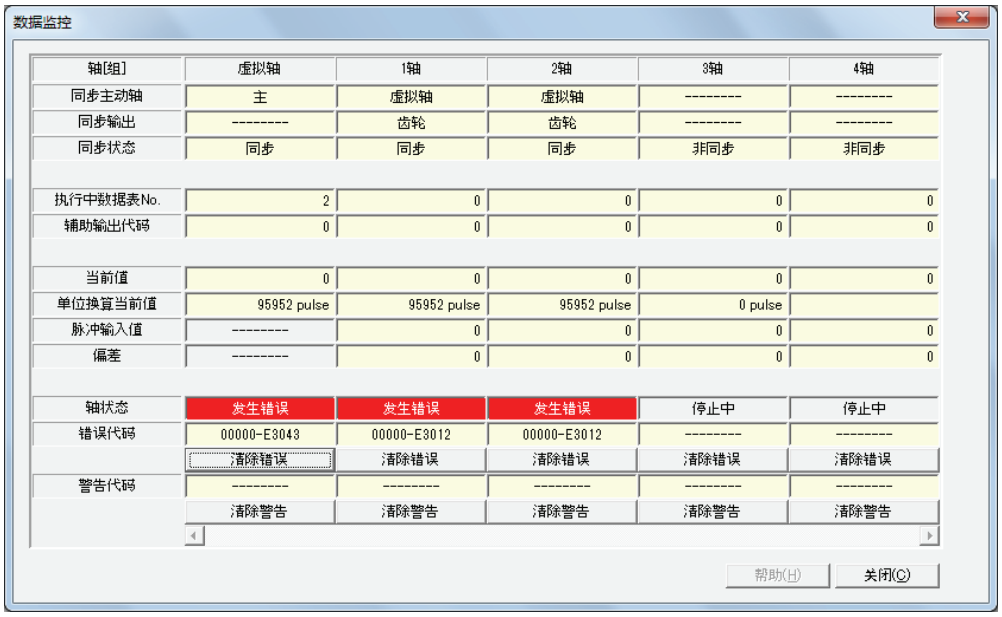
Error	When an error occurs, the running motor will stop. The motor stopped due to occurrence of error will not resume its operation before the error is cleared.
WARNING	Warning may occur when non-anomalous disorder of operation occurs. Operation can be executed after the warning, and the running motor will keep running.

■ Relationship with self-diagnosis error.

- when error or warning occurs, it will be detected as a self-diagnosis error (error code: position control operation error).
- Operation mode of control unit is set by using the system register No. 24 when position control operation error occurred. The default setting sets the operation to "continue", so the operation of motion control part is the one described in the table above. If "stop" is selected by system register No. 24, the motor will stop in case of error or warning.

19.1.2 Confirm and clear via Configurator PM7

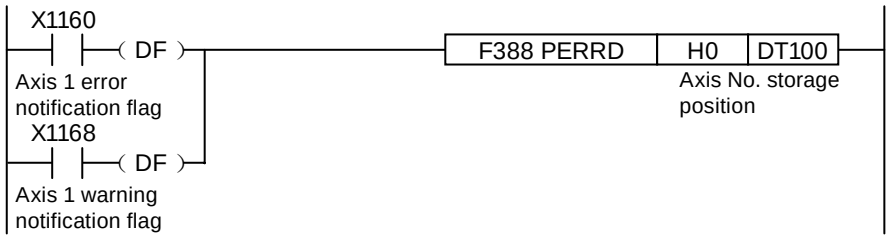
Confirm and clear each axis by choose "On-line"→"Status monitoring" on the Configurator PM7 of programming tool.



19.1.3 Confirm and clear via user program.

■ Confirmation of Error/Warning message

- The message is read via the special instruction PERED (Error/Warning obtained). When executing F388 PERRD instruction, in addition to error code and warning code, the code saved in buffer 1 will be read.

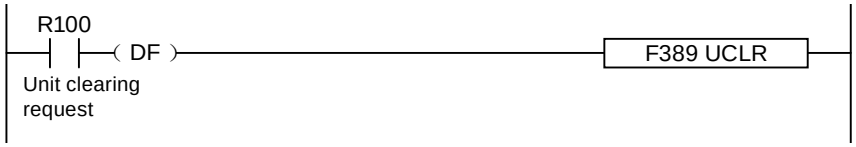


Error and warning codes are saved as follows.

DT100	Error code
DT101	Warning code

■ Clear of full axis is performed via UCLR instruction

- Error and warning occurred in the full axis of control unit can be cleared by executing the special instruction UCLR (Error/Warning cleared).



■ Clear for each axis via the I/O signal

- When the Error/Warning clear request flag assigned to I/O region is ON, the Error/Warning of each axis can be cleared individually. The following is the program for clearing the error.

■ I/O signal assignment

Signal name	Axis 1	Axis 2	Axis 3	Axis 4	Virtual axis
Error prompt	X1160	X1161	X1162	X1163	X1167
Warning	X1168	X1169	X116A	X116B	X116F
Clear error request	Y1160	Y1161	Y1162	Y1163	Y1167
Clear warning request	Y1168	Y1169	Y116A	Y116B	Y116F

19.1.4 Error/warning log

Log region for saving Error/Warning code when Error/Warning occurs is reserved in the unit.

Error log	Up to 7 error codes can be saved in each axis
Warning log	Up to 7 warning codes can be saved in each axis

- In case of Error/Warning, the Error/Warning code will be saved in the log region of the axis where the error occurs.
- Only the newest Error/Warning code of each axis can be confirmed in the position control setting menu of programming tool.
- Please read the Error/Warning log of each axis from the Error/Warning log region saved in the position control storage (universal region).

Error log

H128～H137	Axis 1 error log region
H138～H147	Axis 2 error log region
H148～H157	Axis 3 error log region
H158～H167	Axis 4 error log region
H198～H1A7	Axis 5 error log region

H128	–
H129	Error count
H12A～H12B	Error code notification buffer 1
H12C～H12D	Error code notification buffer 2
H12E～H12F	Error code notification buffer 3
H130～H131	Error code notification buffer 4
H132～H133	Error code notification buffer 5
H134～H135	Error code notification buffer 6
H136～H137	Error code notification buffer 7

Warning log region

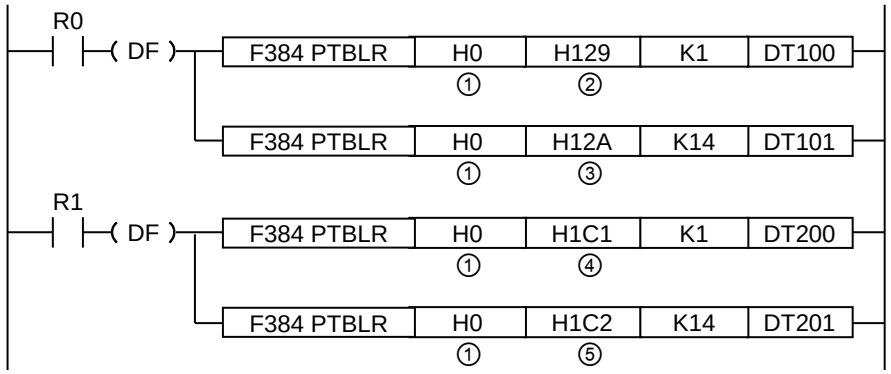
H1C0～H1CF	Axis 1 warning log region
H12D0～H1DF	Axis 2 warning log region
H13E0～H1EF	Axis 3 warning log region
H14F0～H1FF	Axis 4 warning log region
H230～H23F	Warning count

H1C0	–
H1C1	Warning count
H1C2～H1C3	Warning code notification buffer 1
H1C4～H1C5	Warning code notification buffer 2
H1C6～H1C7	Warning code notification buffer 3
H1C8～H1C9	Warning code notification buffer 4
H1CA～H1CB	Warning code notification buffer 5
H1CC～H1CD	Warning code notification buffer 6
H1CE～H1CF	Warning code notification buffer 7

Error/warning count	Save Error/Warning occurrence number.
Error/Warning notification buffer	Save Error/Warning code. The code saved in buffer 1 is always the newest one and the codes are saved in buffer 1⇒ buffer 2.....in the occurrence order of Error/Warning respectively.

■ Program sample

- Read Error count of axis-1 to DT100, and the example for reading Error code saved in Error code notification buffers 1 - 7 to 14 characters of DT101 - DT114 is as follows.
- Similarly, read Warning count of axis-1 to DT200, and the example for reading Warning code saved in Warning code notification buffers 1 - 7 to 14 characters of DT201 - DT214 is as follows.
- Read 2 characters for each Error code and Warning code.



Symbols	Specified content of program	Specified value of program				
		Axis 1	Axis 2	Axis 3	Axis 4	Virtual axis
①	Universal region	H0				
②	Error count	H129	H139	H149	H159	H199
③	Initial position of Error code notification buffer	H12A	H13A	H14A	H15A	H19A
④	Warning count	H1C1	H1D1	H1E1	H1F1	H231
⑤	Initial position of Warning code notification buffer	H1C2	H1D2	H1E2	H1F2	H322

19.2 Change of error recovery processing

19.2.1 Outline

Recovery methods after error occurred varies from state to state when the error occurs.

State when the error occurs	Contents
Recoverable state (○)	• The moving axis stops after the error occurs. • The control unit can recover the error at any time after the error occurs.
Unrecoverable state (×)	• Error when severe abnormalities appeared in the system of control unit. • Reconnect the power in case of unrecoverable error.

19.3 Error Code List

19.3.1 System error (1000H -)

The followings are errors occurred due to internal abnormalities of the unit. The system error is defined as the error that has a fatal effect on the system. Except for some items, reconnecting the power is necessary for the recovery of system error.

Code	Name	Contents	Object	Recovery	Measures
1000H	System crash	System crash	Full-axis	×	Reconnect the power. If this error continues, please contact our company.
1001H	Hardware error	Error occurred during the hardware test with the power ON	Full-axis	×	
1002H	Unit error	Some errors occurred during internal processing	Full-axis	×	
1003H	System processing error	System processing error caused by some reasons	Full-axis	○	Check the settings. If this error continues while there are no abnormal settings, please contact our company.
1020H	Tools running Abnormal completion	Error occurs in the communication with the computer when performing tools running via the position control setting menu of programming tool.	Full-axis	○	Confirm the cable connection between computer and PLC. Restart the computer.
1030H	Control unit error	ALARM occurs in control unit	Full-axis	×	Confirm the state of the control unit. Reconnect the power.
1031H	Control unit Abnormal operation mode	Switch the control unit to PROG mode and the operation stops	Full-axis	○	Confirm the state of the control unit. Set the control unit as RUN mode.

19.3.2 Axis operation error (3000H -)

The followings are errors occurred when executing various of operations

Code	Name	Contents	Object	Recovery	Measures
3010H	Position limit+ signal detection	Input of + side of position limit changed to ON	Each axis	○	Move the motor to the range within the position limit via JOG operation and the like. Verify if there is an exception in the position limit signal.
3011H	Position limit - signal detection	Input of - side of position limit changed to ON	Each axis	○	
3012H	Position limit signal abnormal	+ side and − side of position limit are changed to ON	Each axis	○	Confirm the state of position limit signal.
3020H	Soft limit (+ side) Detection	Movement of the motor exceeds the upper limit of soft limit.	Each axis	○	Move the motor to the range within the position limit via JOG operation and the like. Confirm the setting of soft limit.
3021H	Soft limit (- side) Detection	Movement of the motor exceeds the lower limit of soft limit.	Each axis	○	
3025H	Instruction speed operation exception 1	During internal operation of the instruction speed, operation fails due to overflow.	Each axis	○	Reduce the set speed. Check the setting of pulses per rotation and movement per rotation.
3026H	Instruction speed operation exception 2		Each axis	○	
3027H	Instruction speed operation exception 3		Each axis	○	
3030H	Abnormal axis operation	Errors occur to operation processing of the axes.	Each axis	○	Check the setting value and parameters of position control data. If this error continues while there are no abnormal settings, please contact our company.
3031H	Abnormal completion of operation	Errors occur to operation processing of the axes.	Each axis Full-axis	○	If this error continues, please contact our company.
3032H	Abnormal axis group operation	The axis group setting is changed during the operation and stop request process. The axis group setting is out of range.	Each axis	○	Please change the axis group during axis stop. And do not make any stop request. Check the axis group setting.
3033H	Abnormal interpolation operation	Errors occurred to other interpolation axes during interpolation operation lead to operation stop.	Each axis	○	Check the position control data setting value of interpolation operation. If this error continues while there are no abnormal settings, please contact our company.
3034H	The axis group setting is unavailable (during pulse generator running)	The axis group setting is changed during pulse generator running.	Each axis	○	Change the axis group when the pulse generator operation allowance signal is turned OFF.
3035H	Abnormal position control movement amount	The position control movement amount is beyond the upper or lower limit.	Each axis	○	Check the settings.

Code	Name	Contents	Object	Recovery	Measures
3040H	Abnormal synchronous operation group	During synchronous operation, the synchronous group is changed during the operation or stop request process. The synchronous group setting is out of range. Errors occur to origin return during synchronous operation.	Each axis	○	Change the synchronous group when the Busy signal of synchronous target axis is turned OFF. In addition, change when the stop request signals (system stop, emergency stop and deceleration stop) are turned OFF.
3042H	Abnormal origin return of synchronous operation	Origin return processing is executed during synchronization.	Each axis	○	Cancel synchronization during origin return processing.
3043H	Abnormal synchronous operation	Other axes stop due to exceptions during synchronous operation.	Each axis	○	Check unit setting of the stopped axes. If this error continues while there are no abnormal settings, please contact our company.
3044H	The synchronous operation setting is unavailable (during pulse generator operation)	The synchronous operation setting is changed during pulse generator operation.	Each axis	○	Change synchronous operation setting when the pulse generator operation allowance signal is turned OFF.
3045H	Abnormal synchronous axis difference check	Movement difference of the target axis of synchronous operation exceeds the specified difference value.	Each axis	○	Please check the operation of the target axis of synchronous operation.
3046H	Abnormal value of movement auto check	Uses the function when the difference between the instruction value and the feedback value exceeds the movement auto check value.	Each axis	○	Please check the operation of the target axis in operation. Check parameters of movement auto check function.

19.3.3 Setting value error (4000H ～)

Various setting value errors occurred via position control setting menu and ladder diagram program of programming tools are shown below.

Code	Name	Contents	Object	Recovery	Measures
4000H	Abnormal axis group setting	The axis group setting is abnormal.	Each axis	○	Check settings of the axis group and individual axis as follows. • The same axis No. is registered in multiple groups. • More than 4 axes are set in the same group. • The axis group comprises only 1 axis.
4002H	Abnormal unit setting	Axis designation unit system is out of range.	Each axis	○	Check whether the unit is any one listed below. pulse, μm, inch, degree
4004H	Abnormal pulses per rotation.	The number of pulses is beyond the specified scope.	Each axis	○	Check the settings. Reduce the following equation if the set value is beyond the specified scope. （Pulses per rotation）/（Movement per rotation）
4005H	Abnormal movement per rotation	The movement is beyond the specified scope.	Each axis	○	
4010H	Abnormal setting value of soft limit	The upper and lower limits of soft limit are beyond the specified scope.	Each axis	○	
4020H	Abnormal position limit deceleration time	The limit-stop deceleration time is beyond the specified scope.	Each axis	○	
4021H	Abnormal deceleration time upon error stop	The deceleration time upon error stop is beyond the specified scope.	Each axis	○	
4022H	Abnormal emergency stop deceleration time	The emergency stop deceleration time is beyond the specified scope.	Each axis	○	
4028H	Abnormal auxiliary output setting	The auxiliary output setting is incorrect. The auxiliary output mode is set to any mode other than the With mode and the Delay mode. The auxiliary output Delay ratio of Delay mode is not 0-100 (%).	Each axis	○	Check the settings. If this error continues while there are no abnormal settings, please contact our company.
4030H	Abnormal synchronous group setting	The same axis is set for synchronous groups 1 and 2. One master station axis or slave station axis is not set. More than one master station axes or slave station axes are set. The same axis is set as master station axis/slave station axis. The slave station axis is set as interpolation group.	Each axis	○	
4031H	Abnormal synchronous operation mode setting	The difference check function setting of synchronous operation is incorrect.	Each axis	○	

Code	Name	Contents	Object	Recovery	Measures
4042H	Pulse generator setting error	The pulse generator input mode is incorrect. The pulse generator operation mode is incorrect. The max. speed of pulse generator running is incorrect.	Each axis	○	Check the settings. If this error continues while there are no abnormal settings, please contact our company.
4043H	Abnormal pulse generator disabling	The pulse input application of pulse generator input allowance axis is not set as pulse generator.	Each axis	○	Check pulse input application. Set input application as "Pulse generator" when using the pulse generator.
4044H	Speed multiplier error	The speed multiplier setting is out of range.	Each axis	○	Check the settings. If this error continues while there are no abnormal settings, please contact our company.
4050H	Abnormal startup speed	The startup speed is beyond the specified scope.	Each axis	○	
4080H	Abnormal JOG position control acceleration and deceleration mode	The JOG position control acceleration and deceleration mode is beyond the specified scope.	Each axis	○	
4081H	Abnormal JOG position control acceleration time	The JOG position control deceleration time is beyond the specified scope.	Each axis	○	
4082H	Abnormal JOG position control deceleration time	The JOG position control deceleration time is beyond the specified scope.	Each axis	○	
4083H	Abnormal JOG position control target speed	The JOG position control target speed is beyond the specified scope.	Each axis	○	
4102H	Abnormal origin return target speed	The origin return target speed is out of range.	Each axis	○	
4105H	Abnormal origin return acceleration time	The origin return acceleration time is out of range.	Each axis	○	
4106H	Abnormal origin return deceleration time	The origin return deceleration time is out of range.	Each axis	○	
4107H	Abnormal origin return setting code	The origin return setting code is incorrect.	Each axis	○	
4110H	Abnormal origin return creep speed	The origin return reset creep speed is beyond the specified scope.	Each axis	○	
4111H	Abnormal origin return direction	The origin return direction is incorrect.	Each axis	○	
4112H	Abnormal origin return position limit	The limit switch is invalid (occurring only when origin return mode is position limit mode 1 or 2).	Each axis	○	
4113H	Abnormal origin return via synchronous setting	The pulse input application of target axis is feedback, and the pulse input is set as synchronous master station.	Each axis	○	
4120H	Abnormal origin coordinates	The setting value of origin coordinates is out of range.	Each axis	○	
4201H	Abnormal JOG operation target speed	The JOG operation target speed is beyond the specified scope.	Each axis	○	
4203H	Abnormal JOG operation acceleration and deceleration mode	The JOG operation acceleration and deceleration mode is incorrect.	Each axis	○	
4204H	Abnormal JOG operation acceleration time	The JOG operation acceleration time is beyond the specified scope.	Each axis	○	
4205H	Abnormal JOG operation deceleration time	The JOG operation deceleration time is beyond the specified scope.	Each axis	○	

Code	Name	Contents	Object	Recovery	Measures
4250H	Abnormal current value update	The setting value of current value update is out of range.	Each axis	○	Check the settings. If this error continues while there are no abnormal settings, please contact our company.
4301H	Abnormal absolute value/increment designation	The control mode is set as a value other than absolute value/increment.	Each axis	○	
4302H	Abnormal dwell time	The setting value of dwell time is out of range.	Each axis	○	
4303H	Abnormal position control start data sheet No.	The specified data sheet No. is 0 or exceeds the max. data sheet No.	Each axis	○	
4304H	Abnormal data sheet setting	In the position control data sheet, the final data sheet is not set as E point.	Each axis	○	
4400H	Abnormal position control movement setting	The position control movement is beyond the specified scope.	Each axis	○	
4401H	Abnormal position control acceleration and deceleration mode	The position control acceleration and deceleration mode is incorrect.	Each axis	○	
4402H	Abnormal position control acceleration time	The position control acceleration time is beyond the specified scope.	Each axis	○	
4403H	Abnormal position control deceleration time	The position control deceleration time is beyond the specified scope.	Each axis	○	
4404H	Abnormal position control target speed	The position control target speed is beyond the specified scope.	Each axis	○	
4500H	Abnormal interpolation type	The interpolation type setting is incorrect.	Each axis	○	
4504H	The arc interpolation execution is unavailable.	The parameters (center point, passing point, etc.) of arc interpolation are incorrect.	Each axis	○	
4505H	The spiral interpolation execution is unavailable.	The setting value is incorrect, and an error has occurred during spiral interpolation execution.	Each axis	○	
4510H	Abnormal position control speed change	The position control speed change is out of range.	Each axis	○	
4520H	Abnormal position control movement change	The position control movement change is out of range.	Each axis	○	
4600H	Pulse input setting error	The pulse input mode setting is incorrect.	Each axis	○	Check the settings. Check the combination of input mode, input frequency multiplication and input application.
4605H	Abnormal pulse count change value setting	The set pulse count change value is beyond the specified scope.	Each axis	○	Check the settings.
4609H	Abnormal movement auto check operation mode setting	The movement auto check function setting is incorrect.	Each axis	○	
4610H	Abnormal movement auto check correction numerator setting	The movement auto check correction numerator is beyond the specified scope.	Each axis	○	

Code	Name	Contents	Object	Recovery	Measures
4611H	Abnormal movement auto check correction denominator setting	The movement auto check correction denominator is beyond the specified scope.	Each axis	○	Check the settings.
4613H	Abnormal movement auto check interval setting	The movement auto check interval is beyond the specified scope.	Each axis	○	

19.3.4 Setting value error of synchronous parameters (5000H ～)

■ Common error of synchronous parameters (5000H ～)

Code	Name	Contents	Object	Recovery	Measures
5000H	Abnormal synchronous master station setting value	Setting of the synchronous master station is abnormal. ⇒Setting error (abnormal value) ⇒Main axis setting	Each axis	○	Check the settings. If this error continues while there are no abnormal settings, please contact our company.
5001H	Abnormal pulse input application of synchronous master station	Pulse input other than "high-speed counter" application is selected when setting the pulse input of synchronous master station axis.	Each axis	○	
5002H	Abnormal synchronous setting disabling	Synchronous setting request is executed in following axis states. • The main axis (slave station axis) is set as master station of other axes. • The master station axis is set as slave station axis of other axes. • The main axis (slave station axis) belongs to the interpolation group.	Each axis	○	
5006H	Abnormal deceleration time of separate deceleration stop of synchronous slave station	The separate deceleration stop time setting of synchronous slave station is abnormal.	Each axis	○	Check the settings. If this error continues while there are no abnormal settings, please contact our company.

■ Synchronization parameters Errors related to electronic gear (5100H ～)

Code	Name	Contents	Object	Recovery	Measures
5100H	Abnormal numerator setting of electronic gear ratio	The numerator setting of electronic gear ratio is abnormal.	Each axis	○	Check the settings. If this error continues while there are no abnormal settings, please contact our company.
5101H	Abnormal denominator setting of electronic gear ratio	The denominator setting of electronic gear ratio is abnormal.	Each axis	○	
5102H	Abnormal change time setting of electronic gear ratio	The change time setting of electronic gear ratio is abnormal.	Each axis	○	

■ Synchronization parameters Errors related to electronic clutch (5200H ～)

Code	Name	Contents	Object	Recovery	Measures
5200H	Electronic clutch Clutch ON trigger type setting error	Electronic clutch Clutch ON trigger type setting error	Each axis	○	Check the settings. If this error continues while there are no abnormal settings, please contact our company.
5201H	Electronic clutch Clutch ON pulse edge selection setting error	Electronic clutch Clutch ON pulse edge selection setting error	Each axis	○	
5203H	Electronic clutch Clutch OFF trigger type setting error	Electronic clutch Clutch OFF trigger type setting error	Each axis	○	
5204H	Electronic clutch Clutch OFF pulse edge selection setting error	Electronic clutch Clutch OFF pulse edge selection setting error	Each axis	○	
5207H	Electronic clutch Clutch ON mode setting error	Electronic clutch Clutch ON mode setting error	Each axis	○	
5208H	Electronic clutch Clutch ON slippage mode setting error	Electronic clutch Clutch ON slippage mode setting error	Each axis	○	
5209H	Electronic clutch Clutch ON slippage time setting error	Electronic clutch Clutch ON slippage time setting error	Each axis	○	
5210H	Electronic clutch Clutch ON slippage curve selection setting error	Electronic clutch Clutch ON slippage curve selection setting error	Each axis	○	
5211H	Electronic clutch Clutch OFF mode setting error	Electronic clutch Clutch OFF mode setting error	Each axis	○	
5212H	Electronic clutch Clutch OFF slippage mode setting error	Electronic clutch Clutch OFF slippage mode setting error	Each axis	○	
5213H	Electronic clutch Clutch OFF slippage time setting error	Electronic clutch Clutch OFF slippage time setting error	Each axis	○	
5214H	Electronic clutch Clutch OFF slippage curve selection setting error	Electronic clutch Clutch OFF slippage curve selection setting error	Each axis	○	

■ Synchronization parameters Errors related to electronic cam (5300H -)

Code	Name	Contents	Object	Recovery	Measures
5300H	Electronic cam Error in cycle setting of main station axis of synchronization for cam control	Electronic cam Error in cycle setting of main station axis of synchronization for cam control	Each axis	○	Check the settings. If this error continues while there are no abnormal settings, please contact our company.
5301H	Electronic cam Error in setting cam curve number	Electronic cam Cam curve number out of range Cam curve number used is not registered	Each axis	○	
5302H	Electronic cam Error in setting cam stroke	Electronic cam Error in setting cam stroke	Each axis	○	

■ Errors relating to cam curves

Code	Name	Contents	Object	Recovery	Measures
5400H	Error in setting cam curve resolution	Electronic cam Cam curve resolution out of range	Each axis	○	Check the settings. If this error continues while there are no abnormal settings, please contact our company.
5401H	Error in setting number of cam curves	Electronic cam Number of cam curves out of range	Each axis	○	
5402H	Error in setting functions of cam curve setting region	Electronic cam Functions of cam curve setting region out of range	Each axis	○	
5403H	Error in setting starting position of cam curve	Electronic cam Starting position (movement) for the control of cam curve out of range	Each axis	○	
5404H	Error in setting starting phase of cam curve	Electronic cam Starting phase of each section of cam curves out of range	Each axis	○	
5405H	Error in setting movement amount of cam curve	Electronic cam Movement of each section of cam curves out of range	Each axis	○	
5406H	Error in setting cam curve number	Electronic cam Number of each section of cam curve out of range	Each axis	○	
5410H	Error in setting total number of adjusted data	Electronic cam Total number of adjusted data of cam curve out of range	Each axis	○	
5411H	Error in setting number of adjusted data	Electronic cam Number of adjusted data of cam curve out of range (cam curve unit)	Each axis	○	
5413H	Error in setting control point of adjusted data	Electronic cam Control point of adjusted data of cam curve out of range	Each axis	○	
5414H	Adjusted data setting out of range	Electronic cam Adjustment for adjusted data of cam curve setting out of range	Each axis	○	

19.4 Warning Codes List

19.4.1 Unit warning (B000H -)

The warning codes upon warnings of the unit are listed below.

Code	Name	Contents	Object	Recovery	Measures
B000H	Tools running	The following request flag is turned ON from high-order PLC during tools running • Position control startup request flag (each axis) • Origin return request flag (each axis) • JOG forward/backward running request flag (each axis)	Each axis	○	During tools running, no request from PLC can be executed. However, the following request can still be executed from PLC even during tools running. • Deceleration stop request flag (each axis) • Emergency stop request flag (each axis) • System stop request flag (each axis) • Pulse generator running allowance flag (each axis)
B010H	Repeated startup	The operation of an axis is started when the operation of the same axis is not yet completed.	Each axis	○	Running request of an axis in operation cannot be executed. However, the following request can still be executed even during tools running. • Deceleration stop request flag (each axis) • Emergency stop request flag (each axis) • System stop request flag (each axis)
B030H	Warning on concurrent startup of J-point	Both thee "J-point speed change contact" and the "J-point position control start contact" are turned on during JOG position control operation Speed change contact of J-point turns ON during acceleration and deceleration	Each axis	○	When both contacts are ON at the same time, the "J-point position control start contact" is of higher priority, and the "J-point speed change contact" is ignored. Please turn the J-point speed change contact ON during constant speed operation.
B031H	Warning on speed change request J-point	J-point speed change contact turns ON when J-point is not running.	Each axis	○	Please confirm the ON time for the J-point speed change request contact.
B032H	Warning on J-point position control start request	J-point position control start contact turns ON when J-point is not running.	Each axis	○	Please confirm the ON time for position control start contact of J-point.
B045H	Warning for difference check of synchronous axes	Movement difference of the target axis of synchronous operation exceeds the specified difference threshold value. The warning occurs when "warning" is set for operation mode of synchronous operation and difference check of synchronization	Each axis	○	Please check the operation of the target axis of synchronous operation.
B046H	Movement auto check warning	When using the movement auto check function, the difference between the instruction value and the feedback value exceeds the movement auto check value. The warning occurs when "warning" is set for the movement auto check operation.	Each axis	○	Please check the operation of the target axis.

Code	Name	Contents	Object	Recovery	Measures
B048H	Movement auto check warning 2	When using the movement auto check function, the difference between the instruction value and the feedback value exceeds the movement auto check value. The warning occurs in the following conditions. ·When the instruction value and feedback (pulse input) exceed the checked value after pulse count value is changed ·When the instruction value and feedback exceed the checked value before the origin return is executed	Each axis	○	Please check the operation of the target axis.
B050H	Warning on output speed out of upper limit	The output speed exceeds the upper limit of the model by over 10%.	Each axis	○	Please check the operation speed setting of the target axis.
B060H	Warning on no change to position control speed (except for position control)	The speed change request contact turns ON before the position control operates	Each axis	○	Please check the time for speed change request ON.
B062H	Warning on no change to position control speed (during J-point operation)	The speed change request contact turns ON during J-point operation.	Each axis	○	
B063H	Warning on no change to position control speed (main station axis of synchronization)	The speed change request contact of the slave station axis of synchronization turns ON.	Each axis	○	
B064H	Warning on no change to position control speed (upon completion of position control output)	The speed change request contact turns ON upon completion of position control output.	Each axis	○	
B065H	Warning on no change to position control speed (during position control stop)	Speed change request contact turns ON during various stops of position control.	Each axis	○	
B066H	Warning on no change to position control speed (during dwell time)	Speed change request contact turns ON during dwell time of position control.	Each axis	○	

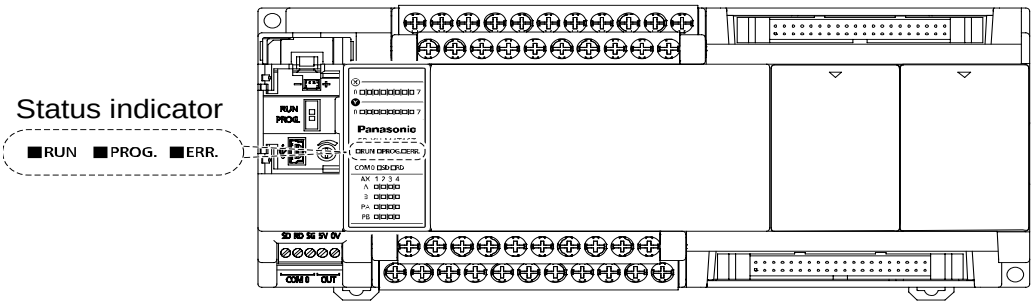
Code	Name	Contents	Object	Recovery	Measures
B070H	Warning on no change to position control movement (except for position control)	The speed change request contact turns ON before the position control operates	Each axis	○	Please check the time for movement change request ON.
B071H	Warning on no change to position control movement (dwell interpolation)	Movement change request contact ON during interpolation.	Each axis	○	
B072H	Warning on no change to position control movement (J-point operation)	Movement change request contact turns ON during J-point operation.	Each axis	○	
B073H	Warning on no change to position control movement (main station axis of synchronization)	The movement change request contact of the slave station axis of synchronization turns ON.	Each axis	○	
B074H	Warning on no change to position control movement (upon completion of position control output)	The movement change request contact turns ON upon completion of position control output.	Each axis	○	
B075H	Warning on no change to position control movement (during position control stop)	Movement change request contact turns ON during various stops of position control.	Each axis	○	
B076H	Warning on no change to position control movement (dwell time)	Movement change request contact turns ON during dwell time of position control.	Each axis	○	
B100H	Warning on no change to synchronization settings	Request for synchronization settings are made for axis in operation	Each axis	○	Change the synchronous settings when the Busy signal of synchronous target axis is turned OFF.
B304H	Recalculation exception warning	Error occurs during recalculation	Each axis	○	Please check the parameters of the axes and the settings of the interpolation group.

20

Troubleshooting

20.1 Self-diagnosis function

20.1.1 Status display LED of the control unit



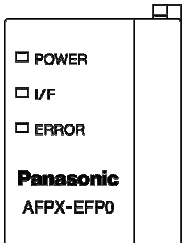
- When an error occurs in the embedded control unit, judge the current situation and stop the running self-diagnosis function as needed.
- When an error occurs, the status display LED of the control unit controller is as shown in below table.

■ **Self-diagnosis related LED display**

	LED display			Contents	Run
	RUN	PROG.	ERR.		
Normal	○	×	×	In normal operation	Run
	×	○	×	Prog mode In prog mode, even if forcible output is performed, LED does not blink.	Stop
	△	△	×	In RUN mode, during forcible input/output, RUN and PROG. LEDs will blink one by one.	Run
Exception	○	×	△	Self-diagnosis error (in operation)	Run
	×	○	△	Self-diagnosis error (being stopped)	Stop
	—	○	○	System monitoring timer stops working	Stop

○: ON, △: Blink, ×: off, —: on or off

20.1.2 Status Display LED of the FP-X Expansion FP0 Adapter



- When an error occurs in the FP0 adapter with embedded FP-X expansion, judge the current situation and stop the running self-diagnosis function as needed.
- When an error occurs, the status display LED of the control unit controller is as shown in below table.

■ Self-diagnosis related LED display

	LED display			Contents
	POWER	I / F	ERR.	
Normal	○	○	×	In normal operation
Abnormal	○	△	×	FP0 / FP0R expansion unit is not connected.
	○	○	△	When the power of the control unit is turned on, the connected FP0 expansion unit detached. The data access between the expansion FP0 adapter and the FP0 / FP0R expansion unit failed due to interference.
	○	×	×	The expansion FP0 adapter power is turned on after the control unit.

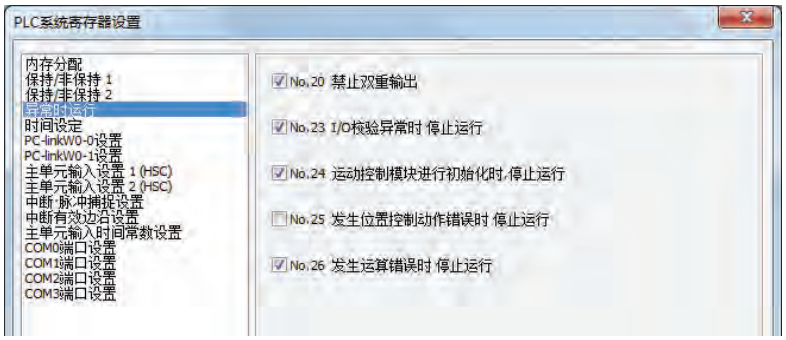
○: ON, △: Blink, ×: off, —: on or off

20.1.3 Operation mode in case of exception

- When an error occurs, the system usually stops running. Depending on various type of exception, you can set the system register to choose between keep running or stop.

■ FPWIN GR system register setting dialog box

If an error occurs when FPWIN GR7 is used to set PLC, select "Option (O)"→"PLC System Registrar Setting" in the menu bar, and click "Action on Error" tab. The following screen shows.



20.2 Troubleshooting Exceptions

20.2.1 ERR LED blinking

■ Situation

A syntax error or self-diagnosis error occurs.

■ Handling method

◆ Steps

1Use the programming tool to confirm the error code.

When a PLC error occurs during programming and commissioning, the Show Status dialog box will be displayed automatically. Please confirm the contents of self-diagnosis errors.

2. Confirm the error code and modify the error reason.

■ Error code and handling method

Error code	Situation	Handling method
1-9	A syntax error occurs.	● Switch PLC to PROG mode and clear error status. ● Use FPWIN GR7 for overall check and identify the address of syntax error and modify the program.
above 20	A self-diagnosis error occurs.	● Adjust settings and programs according to the error code list. ● Use the programming tool in PROG mode and resolve the error status.

Emphasis

- When an error with a code above 43 occurs, press the [Clear Error] button in the status display dialog box to clear the error status. In PROG mode, connecting to power supply again also can clear an error. However, contents of the computation storage except data for keeping will be cleared.
- When a computation error (code 45) occurs, the address in which an error occurred is saved to special data register DT90017 and DT90018. Before resolving the error status, click the [Computation Error] button in the dialog box and view the address in which an error occurs.

Reference

- For how to handle the position control error (error code 44), see "Chapter 19 Error/Warning ".

20.2.2 When Not Switched to RUN Mode

■ **Situation**

When a syntax error occurs or running stops, a self-diagnostic error occurs.

■ **Solution**

Confirm the situation according to the following steps.

◆ Steps

1. **Confirm whether the ERR LED is lit or not.**
2. **Use the tool software to perform "Overall Check" to confirm the syntax error.**

20.2.3 When ERR.LED Lights Up

■ **Situation**

The system monitoring timer is in operation, the controller stops running.

■ **Solution**

◆ Steps

1. **Switch to PROG. mode and turn on the power supply again.**

   If the ERR. LED lights again, it may be due to abnormal unit. If off, it may be caused by interference and other temporary reasons.

2. **Switch to RUN mode.**

   If the ERR. LED lights up after switching to RUN mode, it means that the program has timed out. Rerun the program.

3. **Check the surrounding environment to confirm if there is interference.**

   If the program itself is OK, it may be due to the surrounding environment. Check wirings (includes grounding wire).

◆ Emphasis

- **When rechecking the program, confirm the following items.**

  Example 1) Confirm whether the program is an infinite loop according to the instructions controlling JP instruction, LOOP instruction and other program processes.

  Example 2) The interrupt instruction is continuously executed?

20.2.4 If all LEDs are not lit

■ **Situation**

It may be due to insufficient power supply.

■ **Solution**

Confirm the situation according to the following steps.

◆ Steps

1. **Recheck the terminal and wiring for looseness after turning off the power.**
2. **Check that the voltage is applied within the allowable range.**
3. **Check whether the voltage fluctuation is too large.**
4. **When sharing power with other devices, disconnect the power from the other devices.**

   If the unit LED lights up during this operation, it may be due to insufficient power supply capacity. Redesign the power supply.

20.2.5 When Protection Error Message Shows

■ **Situation**

It may be due to the main memory card is used or a password is set.

■ **Handling method (when using the main memory card)**

In the case of using the main memory card, the program can not be edited. Turn the power off and remove the main memory card.

■ **Handling method (when using the password function)**

◆ Steps

1. **Select "Tools" → "PLC Password Setting" in FPWIN GR7.**

   The "PLC Password Setting" dialog box displays.
2. **Select "Allow Access" and click the [Set] button.**

   Remove the protection status.

◆ Emphasis

- **Pressing [Compulsory Removal] button will delete all programs saved to the PLC.**

20.2.6 When the Output is Not Normal

■ Situation

It may be due to the program, I/O assignment and other software problems combined with the wiring, power supply and other hardware problems.

■ Handling method (check of the output side)

Follow the check order of the output and input side to confirm the situation.

◆ Steps

1. **Verify if the output display LEDs of the input and output units are lit.**

   If lit, perform the next step; if not lit, perform step 4.

2. **Recheck the terminal for loose and the wiring status of the load.**

   If the unit LED lights up during this operation, it may be due to insufficient power supply capacity. Redesign the power supply.

3. **Verify if the voltage across the load is normal.**

   If the voltage is normal, it may be due to an abnormal load. If the voltage is not applied, it may be due to an abnormality in the unit's output.

4. **Use the tool software to monitor the output status.**

   If the monitor state is ON, it may be due to a dual output is used.

5. **Use the forcible input / output function of the tool software to force the corresponding outputs turn to ON / OFF.**

   When the unit output LED is lit, make further checks on the input side. If not lit, it may be due to abnormal unit output part.

■ Handling method (check of the input side)

Confirm the situation according to the following steps.

◆ Steps

1. **Verify if the input display LED of the unit is lit.**

   If not lit, perform the next step; if lit, perform step 3.

2. **Recheck the terminal for loose and the wiring status of the input device.**

   If the unit LED lights up during this operation, it may be due to insufficient power supply capacity. Redesign the power supply.

3. **Verify if the voltage across the input terminal is normal.**

   If the voltage is normal, it may be due to an abnormal unit input. If the voltage is not applied, it may be due to an abnormal power or input device.

4. **Use the tool software to monitor the input status.**

   If the monitor state is OFF, it may be due to an abnormal unit input.
   If the monitor state is ON, recheck the program. When the input device is two-wire sensor, it may be caused by a leakage current.

◆ Emphasis

- **When rechecking the program, note the following items.**

1. Check if the output has been rewrote, for example, a dual output is used.

2. Check if the program process has changed via control instructions such as MCR and JMP instruction.

3. Check if the allocation of the I/O mapping is consistent with the installation state.

20.2.7 When expansion units are not operated

■ **Situation**

The setting of the expansion unit may be incorrect.

◆ Steps

1. **Verify if the expansion unit terminal is set correctly.**

   Verify if the terminal setting of several units is made.

2. **Verify if the expansion FP0 adapter is attached to the end.**

   When the FP-X expansion FP0 adapter is attached to the end, the other expansion unit does not need to be set in the terminal.

3. **Verify if a momentary outage or other short time power on/off are occurred.**

   Sometimes, it is unable to identify the expansion unit due to momentary outage and other short time power on/off. Reconnect the power.

20.2.8 In case of a communication error (RS-232C)

■ Object

Order Number	Communication Interface	Communication Port No. Assigned				
		Master computer	Card installation part 1		Card installation part 2	
		COM0	COM1	COM2	COM3	COM4
Control unit standard configuration	RS-232C (3-wire) × 1 channel	●				
AFPX-COM1	RS-232C (5-wire) × 1 channel		●		●	
AFPX-COM2	RS-232C (3-wire) × 2 channel		●	●	●	●
AFPX-COM4	RS-232C (3-wire) × 1 channel			●		●
AFPX-COM5	RS-232C (3-wire) × 1 channel			●		●

■ Situation

Connections and settings may be incorrect.

◆ Steps

1. **Confirm the setting of the system register.**

   Verify if the setting corresponding to the communication port number assigned is correct. When selecting the inter-PLC link, verify if the connection region is repeated.

2. **Verify if the CS signal is ON.**
   When using 3-wire type, set the connection RS signal and CS signal to ON. When using 5-wire type, verify the RS signals of the communication card LED and the matched devices.

3. **Verify the connection with the matched devices.**
   Confirm that the SD terminal of the matched device is connected to the RD terminal at the PLC side, and the RD terminal of the matched device is connected to the SD terminal at the PLC side. Also, make sure the SG terminals from both devices are connected.

20.2.9 In case of a communication error (RS-422)

■ Object

Order Number	Communication Interface	Communication Port No. Assigned				
		Master computer	Card installation part 1		Card installation part 2	
		COM0	COM1	COM2	COM3	COM4
AFPX-COM3	RS-485 / RS-422 × 1 channel		●		●	

■ Situation

Connections and settings may be incorrect.

◆ Steps

1. **Confirm the setting of the system register.**

   Verify if the setting corresponding to the communication port number assigned is correct. When selecting the inter-PLC link, verify if the connection region is repeated.

2. **Verify if the terminal station is connected properly.**

3. **Verify if the transmission cable is securely connected to the data send terminal and data receive terminal.**

4. **Verify if the transmission cable is within the specifications.**

20.2.10 In case of a communication error (RS-484)

■ **Object**

Order Number	Communication Interface	Communication Port No. Assigned				
		Master computer	Card installation part 1		Card installation part 2	
		COM0	COM1	COM2	COM3	COM4
AFPX-COM3	RS-485 / RS-422 × 1 channel		●		●	
AFPX-COM4	RS-485 × 1 channel		●		●	
AFPX-COM6	RS-485 × 2 channel		●	●	●	●

■ **Situation**

Connections and settings may be incorrect.

◆ Steps

1. **Confirm the setting of the system register.**

   Verify if the setting corresponding to the communication port number assigned is correct. When selecting the inter-PLC link, verify if the connection region is repeated.

2. **Verify if the terminal station is connected properly.**

   Do not set the unit outside both sides of the network as the terminal exchange.

3. **Verify if the transmission cable is securely connected to the transmission terminals of the devices by (+) and (+), (-) and (-).**

4. **Verify if the transmission cable is within the specifications.**

   Do not use more than one type of cable.

20.2.11 In case of a communication error (Ethernet)

■ Object

Order Number	Communication Interface	Communication Port No. Assigned				
		Master computer	Card installation part 1		Card installation part 2	
		COM0	COM1	COM2	COM3	COM4
AFPX-COM5	Ethernet × 1 channel		●		●	

■ Situation

Connections and settings may be incorrect.

■ Verification steps (when the ERR.LED is not lit)

Connections and settings may be incorrect.

◆ Steps

1. **Confirm the setting of the system register.**

   Verify if the setting corresponding to the communication port number assigned is correct.

2. **Verify if the LAN cable is securely connected to the card or computer.**
3. **When using the HUB during connection, verify if the power of the HUB has been connected.**
4. **Verify if the LINK / ACT LED is lit.**

   If not lit, it indicates that the LAN cable is not connected properly.

5. **Verify the IP address and the IP address of the other end of the connection.**
6. **Verify if the transmission mode and speed of the COM1 port of the control unit controller are consistent with the communication environment setting of the FP-X communication card (AFPX-COM5).**

■ Verification steps (when the ERR.LED is lit)

Connections and settings may be incorrect.

◆ Steps

1. **Verify the status via the Configurator WD.**

   There is an IP address conflict on the network if the status is displayed "IP Conflict Error". Do not set conflicted IP address.

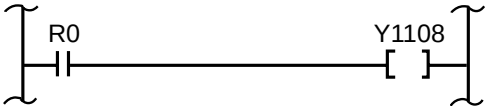
   It is unable to get IP from the DHCP server if the status is displayed "DHCP Error". Verify if there is an exception in the network system.

20.3 Troubleshooting Exceptions

20.3.1 Motor doesn't rotate and operate (when the LED for pulse output A or B blinks or is on)

■ **Handling method 1: for servo motor**

Confirm servo ON input is ON.



■ **Handling method 2**

Please confirm driver power is ON.

■ **Handling method 3**

Please confirm if unit and driver wirings are connected correctly.

■ **Handling method 4**

Please confirm the setting of pulse output mode (CW/CCW mode or Pulse/Sign mode) is in line with that of the driver.

20.3.2 Motor doesn't rotate and operate (when the LED for pulse output A or B is out)

■ **Solution**

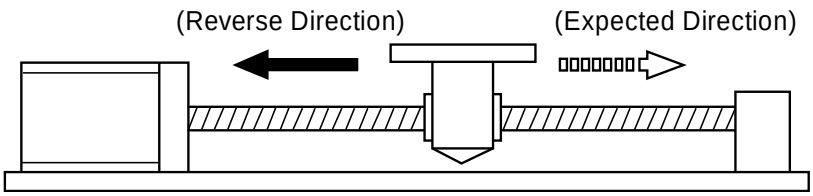
Please recheck the program.

Key check points

1. Confirm if I/O No. matches each other.
2. Please confirm if startup connection point is modified in program.
3. Confirm the logic of position limit switch input is valid. (When the ERR.LED lights up)

20.3.3 Rotate/move direction being opposite

[Example for rotate/move direction being opposite]



■ Solution 1

Please confirm if unit and driver wirings are connected correctly.

Key check points

Please confirm CW/CCW output or Pulse/Sign output are separately connected to corresponding inputs on the driver side.

■ Solution 2

Change each axis parameter's pulse output rotate direction, and set rotate direction to opposite.

21

Memory / Main Memory Card

21.1 Storage Backup

21.1.1 Program Memory Backup

The contents downloaded to the control unit controller can be saved even in case of power outage.

■ Program Memory Backup

Type	Remarks
Program	
Comments	Maximum 200KB I/O comments, description, comments between the lines
System register	
Position control data	Contains position control parameters and position control data sheet data set by the Configurator PM7.

21.1.2 Operational Memory Backup

- The operational memory includes outage hold and non-hold area.
- In the FP-XH M4 control unit, backup fixed region in case of a power outage or mode switching (RUN → PROG.).

■ Non-hold and hold area

Type	Description
Non-hold region	In case of a power outage or mode switching (RUN → PROG.), the data content is reset to 0.
Hold region	In case of a power outage or mode switching (RUN → PROG.), maintain the previous operational data.

■ Automatic backup in case of an outage

Type	Hold Area		
Counter	16 points	C1008 - C1023	
Counter elapsed value area	16 words	EV1008 - EV1023 (note 1)	
Internal relay	128 points	R5040-R511F	
Data register	315 words	(Note 2)	DT11970 - DT12284 (When 40k step program capacity is selected) DT32450 - DT32764 (When 32k step program capacity is selected) DT65218 - DT65532 (When 12k step program capacity is selected)

(Note 1): You can not hold counter target value area SV.

(Note 2): The data register range varies from the system register No.0 internal relay capacity setting.

■ Backup based on user program P13 (ICWT) instruction

Type	Description
How to use	The user program allows you to write P13 (ICWT) instruction and transfer the data register to the F-ROM area. Specifies the continuous range for using the 2K words as 1 storage block. Read from the F-ROM area to the data register by F12 (ICRD) instruction.
Write numbers	Less than 10 thousand times

21.1.3 Operational Memory Backup (When Battery Installed)

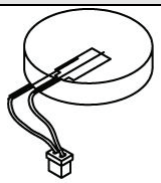
- Initially, install the backup battery sold separately when the hold region is insufficient or using the calendar clock function.
- After installing the battery, all the following areas also can be backuped in case of a power outage or mode switching (RUN→PROG.).

■ Backup using a backup battery

Type			Hold region
Operational memory	Timer		The tool software allows you to set the system register No. 6 - No.13 and specify any hold / non-hold area. (You can also keep the whole point)
	Timer elapsed value area		
	Internal relay		
	Data register		
	Step ladder diagram		
	Link relay		
	Link register		
Special data register	Calendar clock	Monitoring area	DT90053: hour/min (read only)
		Setting/motoring region	DT90054: min/sec, DT90055: day/hour, DT90056: year/month, DT90057: week

(Note 1): If detects that the battery is running out when the power is on, the operational memory of the hold area will be cleared to 0.

■ Backup battery type (sold separately)

Appearance	Product Name	Specification	Order Number
	Backup battery for FP-XH	With connector	AFPXHBATT

(Note): You can not use the old model FP-X series battery.

■ Number of installed batteries

For FP-XH M4, only one battery can be installed.

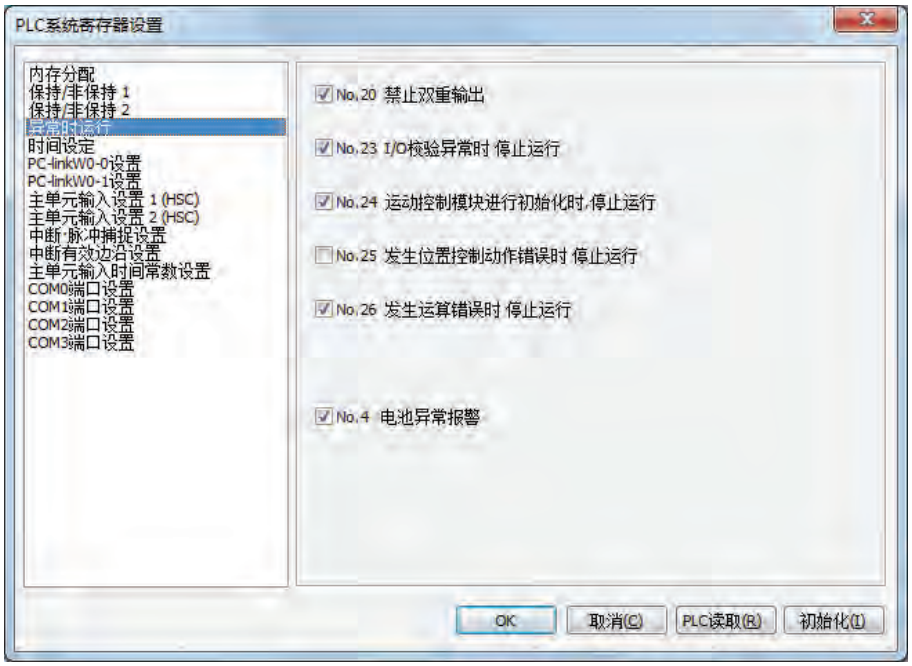
◆ Reference

- **For battery installation methods, refer to "4.2 Backup Battery Installation".**

21.1.4 Alarm Battery Error / Setting of the Hold region

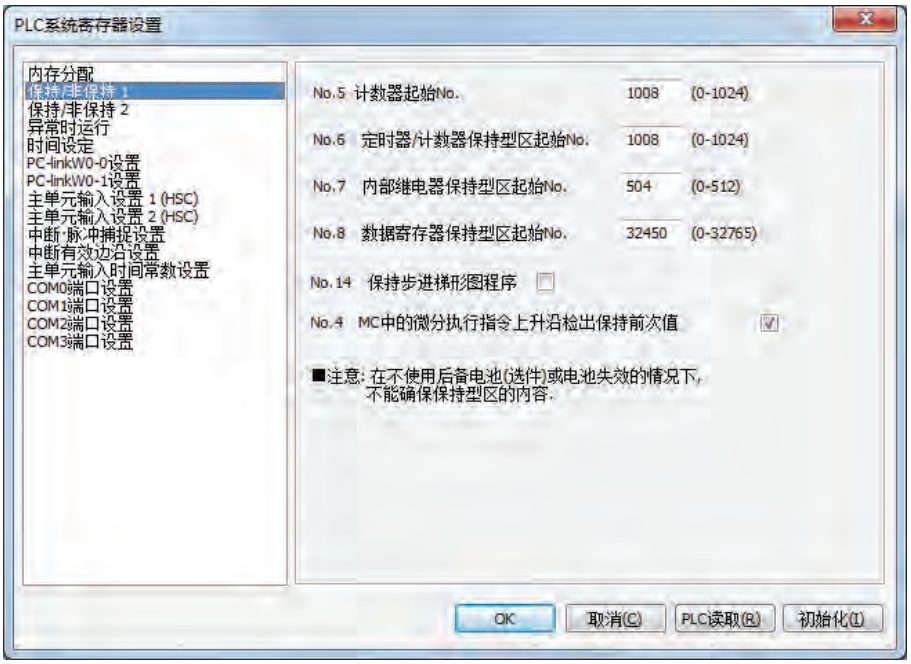
■ Setting of alarm battery error

- If a backup battery installed, select the "System Register No. 4 Alarm Battery Error" check box.
- When the battery capacity is low, the ERR.LED of the control unit controller flashes and an error alarm occurs.



■ Setting of the hold / non-hold area

When changing the range of the hold area of data registers and other operational memory areas, set the system register No. 6 - No. 14.



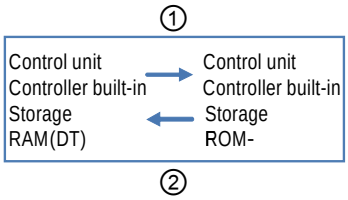
Emphasis

- **If the "Alarm Battery Error" is not set, the ERR.LED will not blink even if a battery error is detected.**
- **The setting of the system register No. 6 - No. 14 are only effective when the backup battery is installed. Use the initial valuesdirectly when the battery is not installed.**

21.2 RAM / ROM Transfer Function

21.2.1 Function Outline

Through an operation based on the tool software, all contents of the hold area of the data register DT can be backed up to the F-ROM area of the control unit built-in memory.



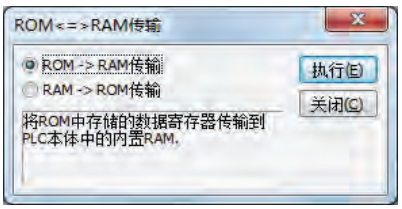
21.2.2 Operations Using the Tool Software

Explain it as belows assuming that the FPWIN GR7 has been started.

Steps

1. **Select "Online" → "Online Editing" from the menu bar.**
2. **Select "Tools" → "ROMRAM Transfer" from the menu bar.**

   The "ROM <=> RAM Transfer" dialog box displays.



3. **Select the transfer direction and click the [Run] Button.**

   For ROM-> RAM transfer, transfer from the F-ROM area to the data register area.

   For RAM-> ROM transfer, transfer from the data register area to the F-ROM area.

Emphasis

- **Only PROG. mode can be performed.**
- **Transfer data in all regions of the data register.**

21.3 Functions of the Main Memory Card

21.3.1 Function Outline

The main memory card includes functions such as storage backup, replication and real-time clock. Only one of the functions can be installed to the FP-XH M4 control unit.

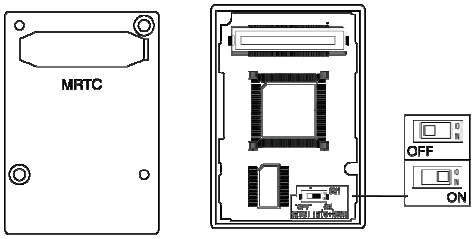
■ **Main memory function**

Item	Specification	
Calendar clock (real-time clock)	Setting items	Year (last 2 numbers in the Gregorian calendar), month, day, hour (24-hour) minute, second, week
	Accuracy	0 ℃: Month error in 104 seconds or less, 25 ℃: Month error in 51 seconds or less, 55 ℃: Month error in 155 seconds or less
Main memory function	Memory capacity	Flash-ROM (512kB)
	Storable data	System register, ladder diagram program, position control data and comment data (200kB) F-ROM data region, security function (password, upload prohibited)

21.3.2 Setting of the Main Memory Unit

■ **Setting of the Function Toggle Switch**

Confirm the switch position before installation.

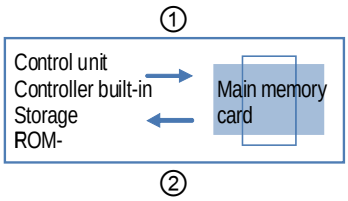


Switch position	Specification
OFF (RTC)	Position of factory setting. Only runs the real-time clock function.
ON (RTC + ROM)	The real-time clock function and main memory function are activated.

21.4 Main memory function

21.4.1 Function Outline

Use the main memory function when backing up and duplicating the program and data saved in the control unit controller.



■ Control unit ← → main memory transfer

Transfer direction	Transfer method	Transferred content
①	Operations Using the Tool Software	(Data must be transmitted) Ladder diagram program, system register, position control data, safety information (password)
		(Data selected via dialog boxes) Safety information (upload prohibited), comment data, F-ROM data region (note 1) (note 2)
②	Operations Using the Tool Software	(Data must be transmitted) Ladder diagram program, system register, position control data, safety information (password)
		(Data selected via dialog boxes) (note 3) comment data, F-ROM data region
	Switch to RUN mode Power ON in RUN mode	All contents written into the main memory unit are transferred to the internal memory of the control unit (F-ROM).

(Note 1): According to storage block No., specify the F-ROM data region in 2K words unit.

(Note 2): Delete the items unselected during built-in memory → main memory transferring from the main memory.

(Note 3): There is no comment data on the main memory. For the F-ROM data region, select via the menu is not available.

21.4.2 Before Turning on the Power

When the main memory card function toggle switch is ON (RTC + ROM) and the main memory function is active, depending on the different modes when the power is ON, the operation changes as follows.

■ When the power is turned on in PROG. mode

- When the power is turned on, change to the state indicating that data exists in all control units and main memory units (program, comments, system register data, data register and position register).
- Through the operation of the tool software, built-in memory → main memory transfer or main memory → built-in memory transfer can be performed.
- When you copy the data saved in the control unit controller to the main memory card, turn on the power in PROG. mode. When you switch to RUN mode, transfer the contents of the main memory card to the built-in memory.

■ When the power is turned on in the RUN mode

- When the power is turned on, transfer the data saved in the main memory unit (program, comments, system register data, data register) to the memory of the control unit controller.
- Data saved in the control unit controller before powering on will be overwritten.
- When the required data (program, comments, system register data, data register) has already saved to the main memory, turn on the power in RUN mode.

Emphasis

- **Perform the installation of the main memory card and the data transmission from the control unit controller to the main memory card after the setting and program editing are completed. Depending on the different operating conditions, the following errors will occur.**

Error message	Operating conditions
42FromPLC: Basic step error NOT support error	Upload prohibited status
63FromPLC: Application error mode error	When you want to perform the transfer operation of the main memory card in RUN mode.
65FromPLC: Application error protection error	When you want to edit the program with the main memory card installed.
The main memory is not installed in the PLC connected.	The function toggle switch in the main memory card can not switch to ON (RTC + ROM side). Or the main memory card is not installed.

- **When performing card assembly and disassembly with the power turned on, a I/O check exception error will occur.**

21.4.3 Transferring Data to the Main Memory Card

Comments and data register set through the program, system register, position register and options can be transferred to the main memory card.

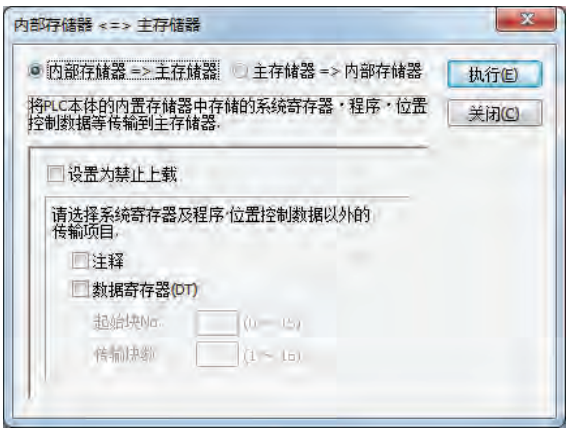
■ Operating steps

Please follow these steps to transfer data to the main memory card from the control unit. Operate via FPWIN GR7. Explain it as belows assuming that the FPWIN GR7 has been started.

◆ Steps

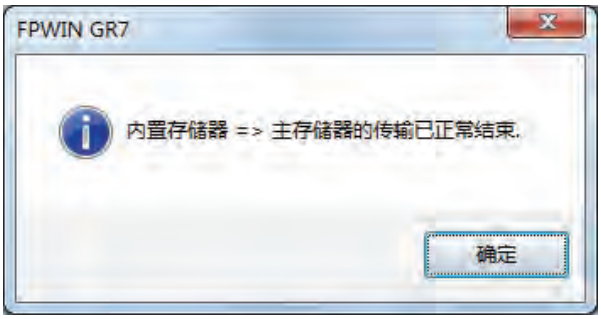
1. **Select "Online" → "Switch to Online Editing" from the menu bar.**
2. **Select "Tools" → "Built-in MemoryMain Storage" from the menu bar.**

   The "Built-in Memory <=> Main Memory" dialog box is displayed.



3. **Select the transfer direction and click the [Run] Button.**

   The message is displayed at the end of the transmission.



■ Option setting

Type	Description
Upload prohibited	Create the main memory card set in the upload prohibited status when the check box is selected. The control unit in which installed the main memory card and perform transferring changes to upload prohibited status.
Comments	Transfer the comments saved in the control unit controller built-in memory (F-ROM) (I/O comments, descriptions, comments between the lines) when the check box is selected.
F-ROM data region (for data register transfer)	Transfer the data for data register saved in the F-ROM data region of the control unit controller to the main memory card when the check box is selected. Specify the starting block No. and the number of the transfer blocks. The unit of the storage block is 2 words. The maximum number of the storage blocks can be transferred to the main memory is 20 (40,960 words).

■ Assigning of the F-ROM data region

Block No.	DT number conversion range		Block No.	DT number conversion range	
0	DT0	DT2047	16	DT30768	DT32815
1	DT2048	DT4095	17	DT32816	DT34863
2	DT4096	DT6143	18	DT34864	DT36911
3	DT6144	DT8191	19	DT36912	DT38959
4	DT8192	DT10239	20	DT38960	DT41007
5	DT10240	DT12287	21	DT41008	DT43055
6	DT12288	DT14335	22	DT43056	DT45103
7	DT14336	DT16383	23	DT45104	DT47151
8	DT16384	DT18431	24	DT47152	DT49199
9	DT18432	DT20479	25	DT49200	DT51247
10	DT20480	DT22527	26	DT51248	DT53295
11	DT22528	DT24575	27	DT53296	DT55343
12	DT24576	DT26623	28	DT55344	DT57391
13	DT26624	DT28671	29	DT57392	DT59439
14	DT28672	DT30719	30	DT59440	DT61487
15	DT30720	DT30767	31	DT61488	DT65535

Emphasis

- **Temporarily delete all data in the main memory card when the transmission begins. Comments and F-ROM data values that are not selected as the transmission range will not be saved in the main memory card.**
- **Transfer data from the control unit built-in RAM to the F-ROM area through the "RAM → Transfer Function" of the tool software or P13 (ICWT) instruction.**
- **Writing by P13 (ICWT) instruction and reading by F12 (ICRD) instruction can perform up to 32 blocks (up to 65536 words).**

21.4.4 Transfer from the Main Memory Card to the Unit Controller

The data saved in the main memory card can be transfered to the control unit controller by the following methods.

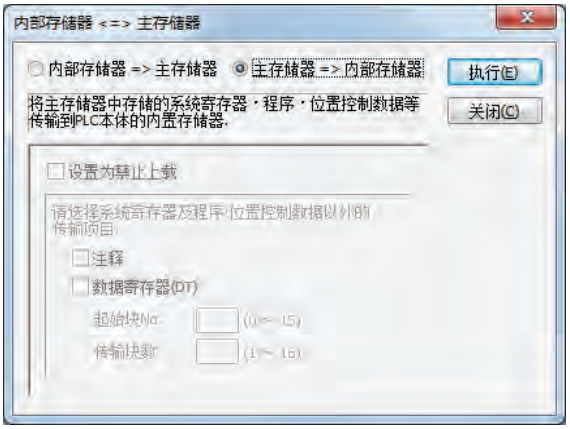
■ Operating steps

Use FPWIN GR and follow these steps to transfer data to the main memory card from the control unit. Explain it as belows assuming that the FPWIN GR7 has been started.

◆ Steps

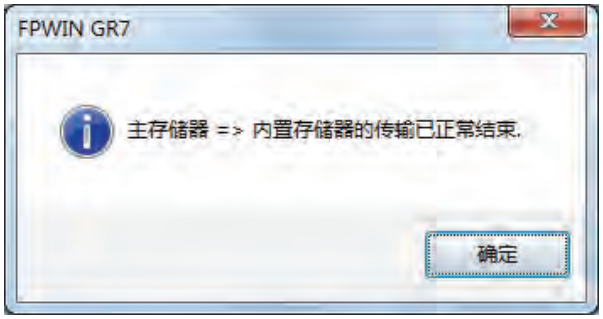
1. **Select "Online" → "Switch to Online Editing" from the menu bar.**
2. **Select "Tools" → "Built-in MemoryMain Storage" from the menu bar.**

   The "Built-in Memory <=> Main Memory" dialog box displays.



3. **Change the transfer direction to "Main Memory => Built-in Memory", click the "Run" button.**

   The message is displayed at the end of the transmission.



◆ Emphasis

- **After the transfer, and PROG is switched to RUN, the contents in the main memory card and the built-in memory are checked. The transfer process is not performed if consistent.**

■ Option setting

Type	Description
Comments	Comments saved in the main memory card (I/O comments, descriptions, comments between the lines) are transferred to the control unit controller built-in memory (F-ROM) when the check box is selected. The check box is not displayed when there is no comment data saved in the main memory unit.
F-ROM data area data register	The data saved in the main memory card is transfered to the F-ROM data area of the control unit controller when the check box is selected. The check box is not displayed when there is no data saved in the main memory unit.

21.4.5 Use between the Main Memory Card Models

Failure to install the main memory units created by model FP-XH M4 on other models (FP-X, FP-X0 and FP-XH).

21.5 Calendar clock

21.5.1 Function Outline

- The main memory card has calendar clock function.
- The time data is stored in the special data register for reading and using via the user program.

■ **Functions of the main memory unit**

Item	Specification	
Calendar clock (real-time clock)	Function	Year (last 2 numbers in the Gregorian calendar), month, day, hour (24-hour) minute, second, week Applicable until 2099. Applicable during leap years.
	Accuracy	0 ℃: Month error in 104 seconds or less, 25 ℃: Month error in 51 seconds or less, 55 ℃: Month error in 155 seconds or less

■ **Areas used via the calendar clock**

Special DT number	Data content				R	W
	High byte		Low byte			
DT90053	Time data	H00 - H23	Minute data	H00 - H59	○	×
DT90054	Minute data	H00 - H59	Second data	H00 - H59	○	○
DT90055	Day data	H00 - H31	Time data	H00 - H23	○	○
DT90056	Year data	H00 - H99	Month data	H00 - H12	○	○
DT90057	—		Week data	H00 - H06	○	○

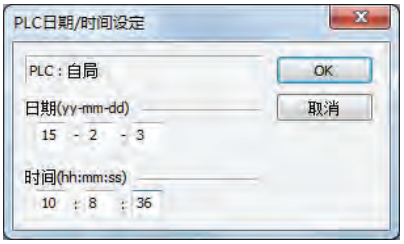
(Note 1): Specifies any week data within the range of H00 - H06.

21.5.2 Calendar Clock Setting

You can set the calendar clock through the tool software or the user program.

■ **Tool software setting**

Select the "PLC Date / Time Setting" menu. If the week data is required to set, please set through the user program.

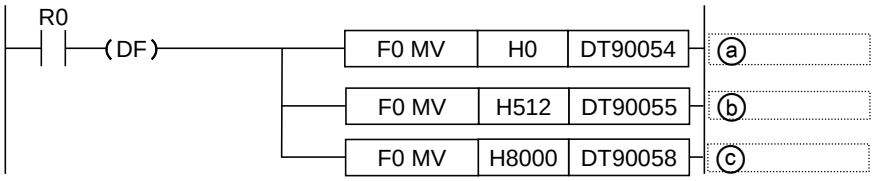


◆ Emphasis

- **Backup the calendar clock data through a battery. Install the battery before setting.**

■ **Setting based on the user program**

After the time data is written in the special data register DT90054 - DT90057, write H8000 in DT90058. Perform the transmission by following the order of H8000→H0000 or using the differential instruction. Always remember not to input H8000.

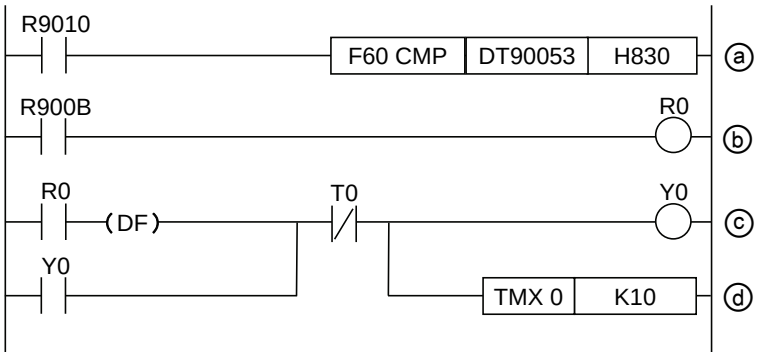


ⓐ	Set 0 minutes 0 seconds	ⓑ	Set 5 days 12 hours	ⓒ	Time alignment

21.5.3 Calendar Clock Application Examples

■ **Application example (regular automatic start)**

- Use the calendar clock (real-time clock) function to output 1 second (Y0) signal at 8:30 am every day. In this example, the "hour, minute data" stored in the special data register DT90053 are used to output signal regularly.
- In DT90053, the "hour data" and "minute data" are respectively stored in the high 8 bytes and low 8 bytes in the form of BCD. When compare this "hour, minute data" and the value of any time (BCD), use the special internal relay R900B (= flag) to check if the time is consistent.



ⓐ	Compare the value of special data register DT90053 (hour, minute data) and H830 (8:30).				
ⓑ	Output if consistent	ⓒ	Output pulse at a fixed time (1 second)	ⓓ	0.1 s timer setting K10, used as 1 s timer

22

Security Functions

22.1 Password Protection Function

22.1.1 Function Outline

■ Password protection function outline

The function that forbid the reading out and writing in of the program and system register by setting a password. The password setting method has the following two types.

1. Set by using the programming tool
2. Set by instructions (SYS1 instructions), but 32-digit password cannot be set for the instructions.

■ Characters can be used by the password

Password digits	Characters can be used
4-digit password	4 characters of the "0" to "9" and "A" to "F" (16 characters) can be used.
8-digit password	You can use 8 or less half-width alphanumeric characters (case sensitive) and symbols.
32-digit password	You can use 32 or less half-width alphanumeric characters (case sensitive) and symbols.

◆ CAUTION!

- **Never forget your password. You can not read the program if you forget your password. This is not possible even you ask for help from our company.**

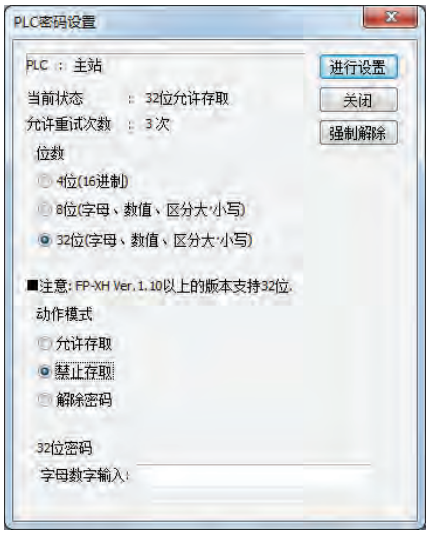
22.1.2 Tool software setting

■ Setting based on FPWIN GR7

1. Select [Online (L)] → [Online Editing (N)] from the menu bar, or press <CTRL> + <F2> keys simultaneously.
The screen switches to [Online Monitoring].

2. Select [Tools (T)] → [PLC Security Setting (S)] → [PLC Password Setting (P)] from the menu bar.
The "PLC Password Setting" dialog box displays.

■ PLC password setting dialog box



①	Display the current status of the password setting.
②	Specify the type of passwords used.
③	Specify password behavior. Allow Access: enter the password for program access operation. No Access: a password is set. Remove Password: remove the password setting.
④	Enter the password.

■ Confirmation of password setting contents

Item		Setting Contents
Current state	Password is not set	No password is set.
	xx bit no access (note)	A password is set, no access.
	xx bit allow access (note)	A password is set, allow access. (Password input is completed, the program can be accessed.)
Retry number		Namely the maximum number for consecutive password input. Each time the password is entered incorrectly, the retry number decreased (up to 3 times). If there has been three consecutive failed password attempts, you can not access the program. To reenter the password, set the PLC's power to OFF / ON and reboot.

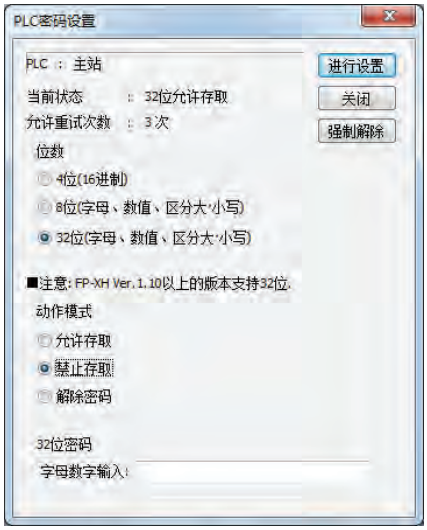
(Note): XX is one of 4, 8, 32 depending on the digits of the password set.

◆ CAUTION!

- **When the access is allowed, if the PLC power supply is set to OFF / ON, it will return to the password protection status again.**

■ Setting to prohibit access with a password

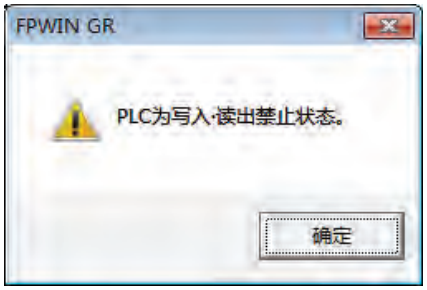
1. Select [Tools (T)] → [PLC Security Setting (S)] → [PLC Password Setting (P)] from the menu bar.
The "PLC Password Setting" dialog box displays.



2. Set the items in the table below, click [Set] button.

Item	Setting Contents
Digits	Please set the digits.
Operation mode	Select "No Access".
4, 8, 32-digit password	Enter any password to be set.

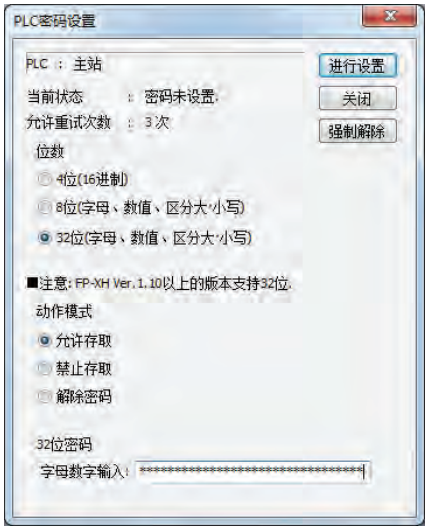
3. In order to confirm, enter the password again, click the [OK] button.
The following information is displayed when entering a state (protected state) that is forbidden to write / read.



4. Click the [OK] button.

■ Setting to allow access with a password

1. Select [Tools (T)] → [PLC Security Setting (S)] → [PLC Password Setting (P)] from the menu bar.
The "PLC Password Setting" dialog box displays.



2. Set the items in the table below, click [Set] button.

Item	Setting Contents
Digits	Please set the digits.
Operation mode	Select "Allow Access".
4, 8, 32-digit password	Enter a set password.

When allowing access, the following information displays.

3. Click the [OK] button.

◆ CAUTION!

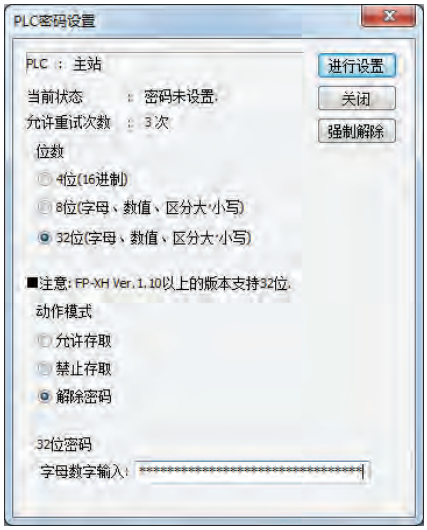
- **When the "Allow Access" status stays unchanged, if the PLC power supply is set to OFF / ON, it will become password protection status again.**

■ Password protection removal

The following 2 methods can be used to remove password setting.

	Contents	Program
Password removal	Specify and remove the logged password.	Hold all
Compulsory removal	Remove the password by deleting all programs and security information.	Delete all (also delete upload prohibited setting)

1. Select [Tools (T)] → [PLC Security Setting (S)] → [PLC Password Setting (P)] from the menu bar.
The "PLC Password Setting" dialog box displays.



2. Set the items in the table below, click [Set] button.

Item	Setting Contents
Digits	Please set the digits.
Operation mode	Select "Remove Password".
4, 8, 32-digit password	Enter a set password.

After the password removal is completed, the following message displays.

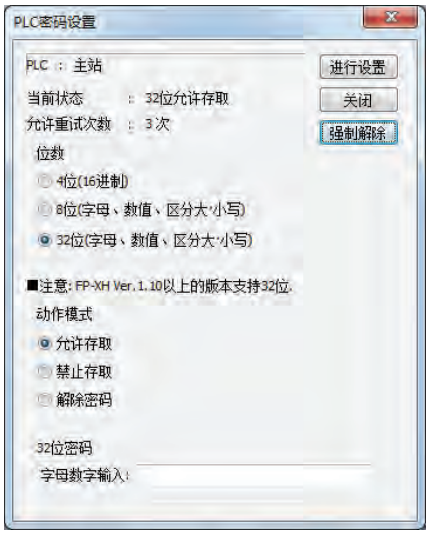
3. Click the [OK] button.

◆ CAUTION!

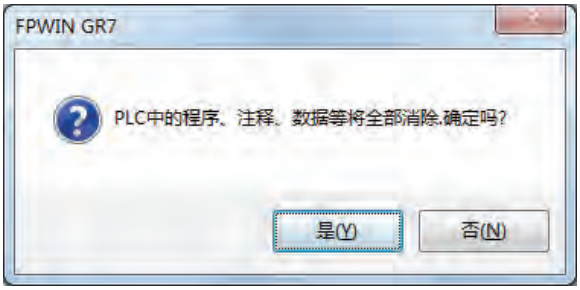
- **The password removal operation can only be performed in the "Allow Access" status.**

■ **Compulsory removal method (programs and security information all deleted)**

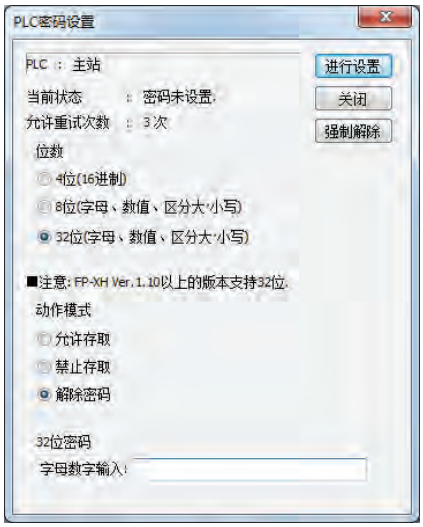
1. Select [Tools (T)] → [PLC Security Setting (S)] → [PLC Password Setting (P)] from the menu bar.
The "PLC Password Setting" dialog box displays.



2. Click the [Compulsory Removal] button.
The confirmation message displays.



3. Confirm the message and click the [Yes] button.
The current status is displayed as "No Password Set". All programs and security information have been deleted.



22.2 Program Upload Prohibited Function

22.2.1 Function Outline

■ Overview of the program upload prohibited function

- The function that prohibit access to program and system register through the setting of program upload prohibited.
- Please note that uploading the ladder diagram program and system register is not possible after setting as upload prohibited.
- Use the programming tool to remove the setting. However, all ladder diagram programs or system registers, password information, etc. will be deleted when removing.
- You can use the programming tool to read out the files managed by the computer for online editing. However, when the program is not consistent, it indicates that the program is damaged. In the case of using this function, please save the ladder diagram program in the form of file and conduct management.

■ Setting relation with the password protection function

- For PLC that has been set this function, the password setting is also available.
- For PLC that has been set a password, this function is also available.

◆ CAUTION!

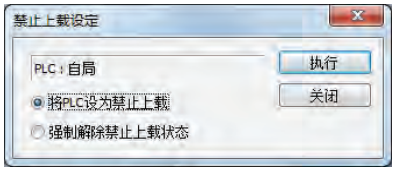
- **If compulsorily remove the upload prohibited setting, all programs and security information will be deleted. It is impossible to recover the deleted programs even you ask for help from our company.**

22.2.2 Tool software setting

■ Setting based on FPWIN GR7

1. Select [Online (L)] → [Online Editing (N)] from the menu bar, or press <CTRL> + <F2> keys simultaneously.
The screen switches to [Online Monitoring].

2. Select [Tools (T)] → [PLC Security Setting (S)] → [Upload Restriction Setting (R)] from the menu bar.
The dialog box of "Upload Restriction Setting" appears.



3. Select "Set PLC to Upload Restriction" and click the "Run" button.

■ Compulsory removal based on FPWIN GR7

In the "Upload Restriction Setting" dialog box, select "Remove upload protection compulsorily", and then press the [Execute (E)] key.

22.3 Security Function Applicability List

22.3.1 Control Unit Controller

The safe operating conditions of the control unit controller vary according to the presence or absence of the main memory card.

■ **No main memory card**

		Security status				
		Security function is not set	Upload prohibited	4-digit password	8-digit password	32-digit password
Settings/ removing operation	Upload prohibited	○		○	○	○
	4-digit password	○	○		×	×
	8-digit password	○	○	×		×
	32-digit password	○	○	×	×	

○: Available ×: Not available

■ **When a main memory card is installed**

		Security status				
		Security function is not set	Upload prohibited	4-digit password	8-digit password	32-digit password
Settings/ removing operation	Upload prohibited	×		×	×	×
	4-digit password	×	×		×	×
	8-digit password	×	×	×		×
	32-digit password	×	×	×	×	

○: Available ×: Not available

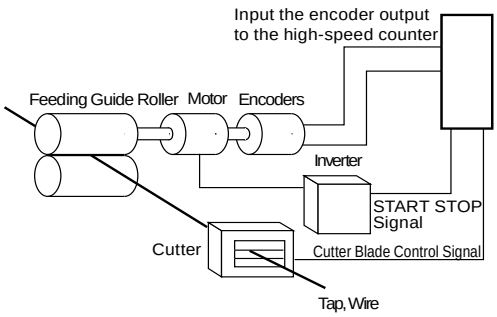
23

High-speed Counter Function

23.1 High Speed Counter Function Summary

23.1.1 High Speed Counter Function Summary

- It is the function which can perform high speed count for input signal from sensor and encoder.
- When process value is consistent with target value, the special instruction (F166/F167) which can change any output (Y0 - Y29F) to ON or OFF via interruption handling are provided. When the output changes to ON/OFF, you can use presets such as SET/RET instruction.
- Designate used channel and input via system register. Designate output in case of consistency via instruction word's operation number.

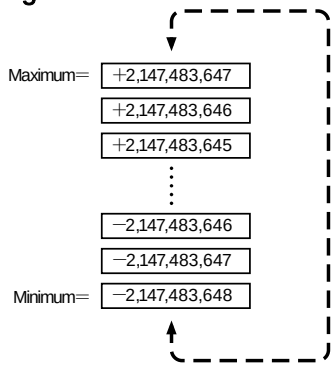


23.1.2 Count scope and process value (current value) region

- The high speed counter's process value is stored in register as special data of 2 word 32 bits.
- When the power turns to OFF, the process value area resets. Hold it when RUN is switched to the PROG. mode.
- The high speed counter is a ring type counter. When the count value exceeds the maximum value, it is restored to the minimum value. When the count value is lower than the minimum value, it is restored to the maximum value.

■ **Counting range of the process value (current value) region**

Division	Range
For high speed counter control	K–2,147, 483, 648-K2, 147, 483, 647



23.1.3 When using the high-speed counter function

■ Control unit

Channel number		Count input	HW reset input	Used storage region			Performance specification	
				In-control mark	Process value region	Target value region	Min. input pulse width	Max. count speed
[Single Phase] addition input subtraction input	CH0	X0	X6	R9110	DT90300 DT90301	DT90302 DT90303	Mid-speed input 50 μs	10kHz
	CH1	X1	No	R9111	DT90304 DT90305	DT90306 DT90307		
	CH2	X2	X7	R9112	DT90308 DT90309	DT90310 DT90311		
	CH3	X3	No	R9113	DT90312 DT90313	DT90314 DT90315		
	CH4	X4	No	R9114	DT90316 DT90317	DT90318 DT90319		
	CH5	X5	No	R9115	DT90320 DT90321	DT90322 DT90323		
	CH6	X6	No	R9116	DT90324 DT90325	DT90326 DT90327		
	CH7	X7	No	R9117	DT90328 DT90329	DT90330 DT90331		
[2-phase] Phase difference input Separate input Direction judgment	CH0	X0 X1	X6	R9110	DT90300 DT90301	DT90302 DT90303	Mid-speed input 100 μs	10kHz
	CH2	X2 X3	X7	R9112	DT90308 DT90309	DT90310 DT90311		
	CH4	X4 X5	No	R9114	DT90316 DT90317	DT90318 DT90319		
	CH6	X6 X7	No	R9116	DT90324 DT90325	DT90326 DT90327		

(Note 1): X6 can be used for either CH6 count input or CH0 reset input. X7 can be used for CH7 count input or CH2 reset input.

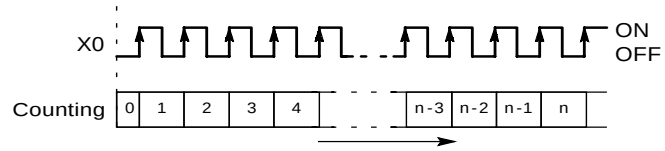
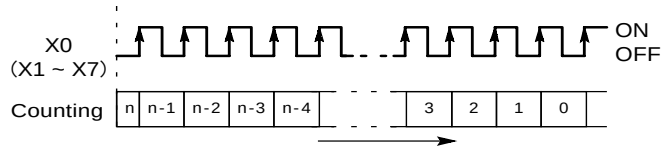
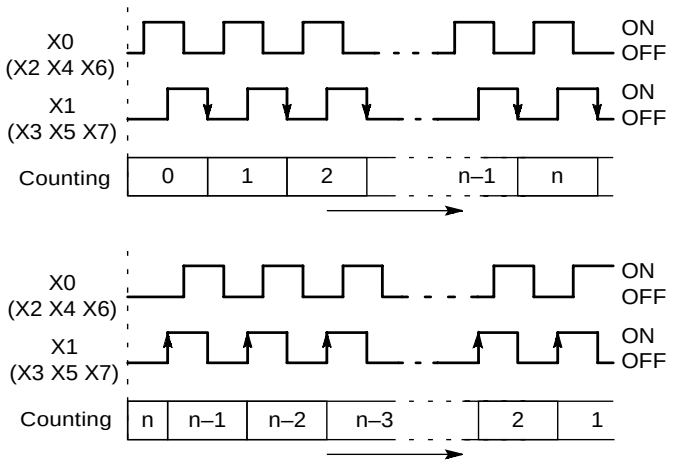
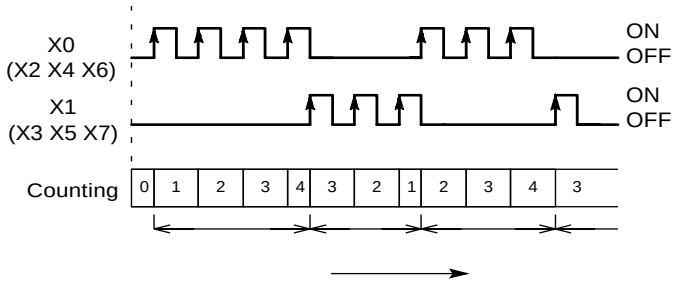
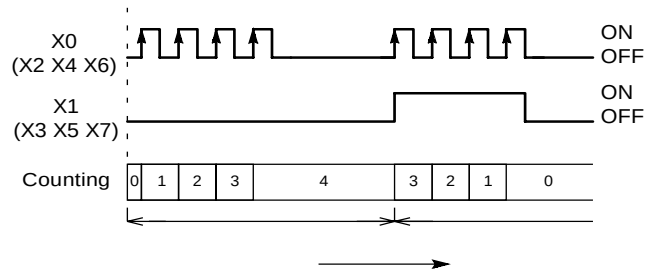
(Note 2): Only F1 (DMV) instruction can perform the reading and writing of process value region.

■ About max. count speed

The max. count speed indicates the situation when executing each item condition (output mode, channel) only. It indicates the value when not performing high speed counter consistent ON (F166) instruction, high speed counter consistent OFF (F167) instruction, pulse output function and other interruption handling control. For the performance when these functions are used concurrently, please contact us.

23.1.4 Type of input mode

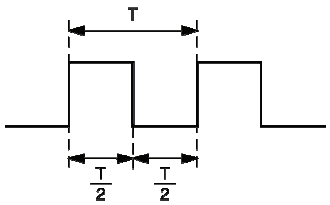
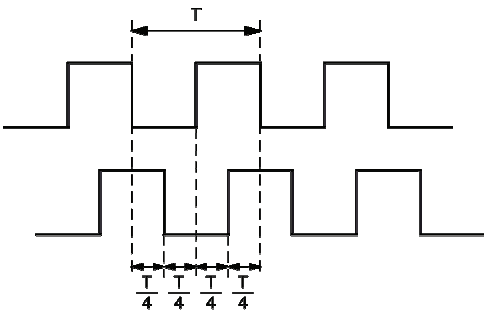
■ Input mode and count operation

Mode	Scope
Addition input	
Subtraction input	
2-phase input	
Separate input	
Direction identification input	

23.1.5 Min. input pulse width

For cycle T, below input pulse width is needed as a minimum.

■ Min. input pulse width

For single phase input	For 2-phase input
	

23.2 Settings of the System Register

23.2.1 Settings of the System Register

Functions are allocated in system register setting dialog box as below. Explain it as belows assuming that the FPWIN GR7 has been started.

◆ Steps

1. **In the menu bar, select "Option"→"System Register Setting".**

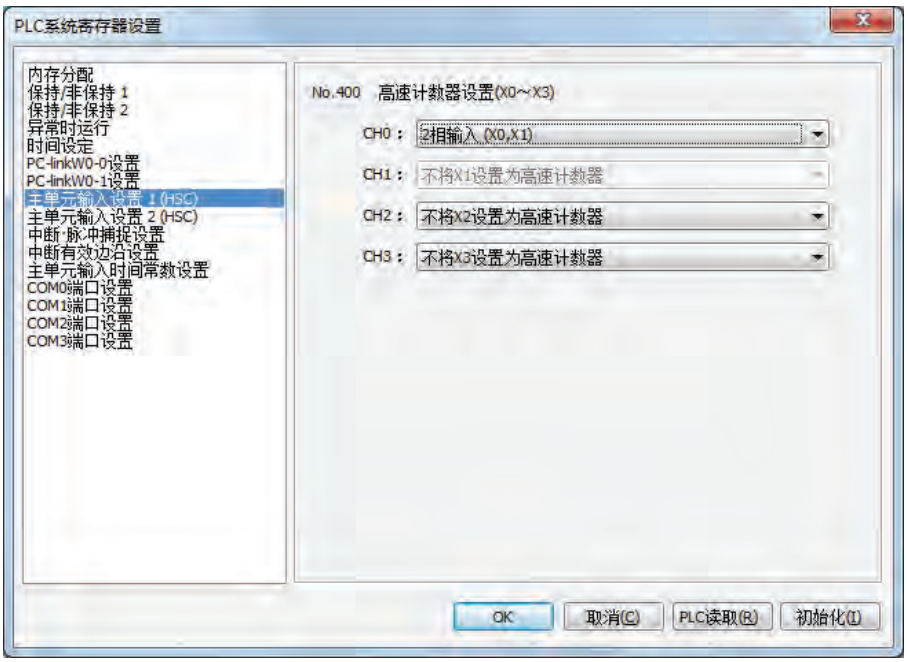
   The "PLC System Register Setting" dialog box displays.

2 **From the left window, select "Mainframe Input Setting 1 (HSC)" or "Mainframe Input** Setting 2 (HSC)".

   The setting menus of system register "No.400" or "No.401" display.

3 **Change the setting of the channel which uses high speed counter.**

   Below is the situation when 2-phase input (X0, X1) is allocated in CH0.



4. **Click the [OK] button.**

   Return to the Edit screen of the ladder diagram. You can download setting contents, program, and notes to PLC.

■ High speed counter output related system register

Type	No. and Setting Items		Setting Contents
Master input setting 1 (HSC)	400 High-speed counter settings (X0-X3)	CH0	Select any one of + count input input (X0), - count input input (X0), 2-phase input (X0, X1), separate input (X0, X1) and direction identification input (X0, X1).
		CH1	Select any one of + count input (X1) and - count input (X1).
		CH2	Select any one of + count input (X2), - count input (X2), 2-phase input (X2, X3), separate input (X2, X3) and direction identification input (X2, X3).
		CH3	Select any one of + count input (X3) and - count input (X3).
Master input setting 2 (HSC)	401 High speed counter settings (X4-X7)	CH4	Select any one of + count input (X4), - count input (X4), 2-phase input (X4,X5), separate input (X4, X5) and direction identification input (X4, X5).
		CH5	Select any one of + count input (X5) and - count input (X5).
		CH6	Select any one of + count input (X6), - count input (X6), 2-phase input (X6, X7), separate input (X6, X7), direction identification input (X6, X7).
		X6	When using external reset input, select the reset input of high speed counter CH0.
		CH7	Select any one of + count input (X7) and - count input (X7).
		X7	When using external reset input, select the reset input of high speed counter CH2.

(Note 1): The project name and range displayed vary with the model of control units.

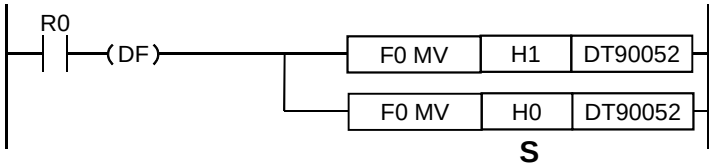
(Note 2): The input not used in high speed counter function selects "XX not act as high speed counter for setting".

23.3 High speed counter related instruction

23.3.1 [F0 MV] high speed counter control instruction

Perform controls such as soft reset, count disabling, high speed counter instruction clear.

■ Instruction Format



■ Operation Number

Operation Number	Setting Contents
S	The region or constant data in which high speed counter control code is saved.

■ Designable storage region type

Operation Number	WX	WY	WR	WL	SV	EV	DT	LD	I	Constant		Indexing
										K	H	
S	●	●	●	●	●	●	●	●	●	●	●	●

■ Operation description

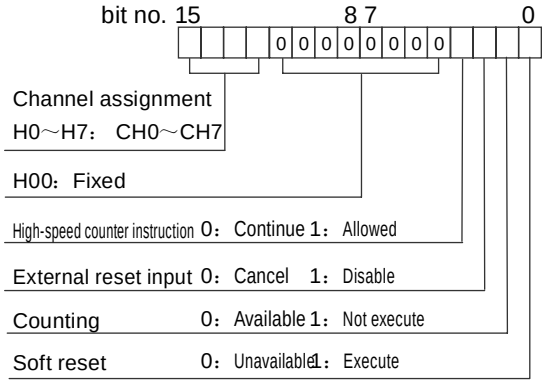
- Perform high speed counter control which corresponds to the control code designated by "S".
- This instruction is used when high speed counter performs below operation.
  ① Soft reset, ② count is disabled, ③ External input makes reset input invalid, ④ When the control executed by high speed counter instruction F166 - F167 is canceled, clear target value is interrupted.
- Once the control code is written, it will maintain till next writing.
- Control code written via F0 (MV) instruction is also saved to control code monitoring region when written in special register DT90052. Only lower 8 bits are written.

■ Precautions for programming

- The setting which is reset input invalid will become valid only when system register is used to allocate reset input.
- The external reset input setting can be used to switch the reset input (X6 or X7) allocated to mainframe input to valid or invalid.

■ Control code allocation

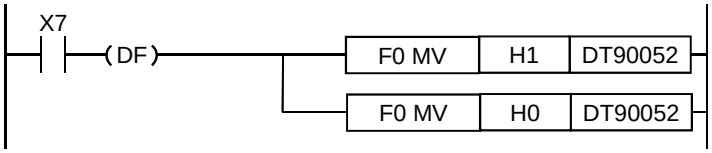
- Below bits are allocated according to designated channel and function.



- Assign any input by controlling the above functions via the external input.

■ Program sample

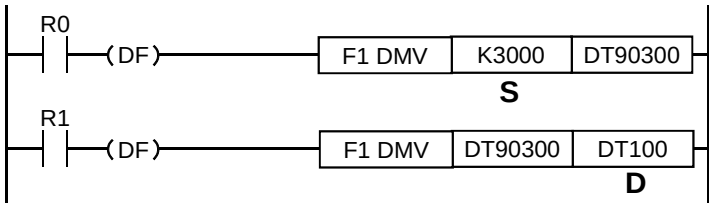
Below shows the situation in which input X7 is used to perform the soft reset of high speed counter CH0.



23.3.2 [F1 DMV] process value read and write instruction

Perform read and write of high speed counter process value.

■ Instruction Format



■ Operation Number

Operation Number	Setting Contents
S	During setting: save the region or constant data of process value (32 bit) which is set in high speed counter. K−2, 147, 483, 648-K2, 147, 483, 647
D	During reading: read the region of high speed counter process value.

■ Designable storage region type

Operation Number	WX	WY	WR	WL	SV	EV	DT	LD	I	Constant		Indexing
										K	H	
S	●	●	●	●	●	●	●	●	●	●	●	●
D	-	●	●	●	●	●	●	●	●	-	-	●

■ Operation description (process value reading)

- Save the contents of the special data register in which high speed counter process value is saved to the region which is designated by D.

■ Operation description (process value setting)

- When writing to process value region of high speed counter in which 32 bit data is designated by S, use high speed counter process value region to perform setting inside the system.

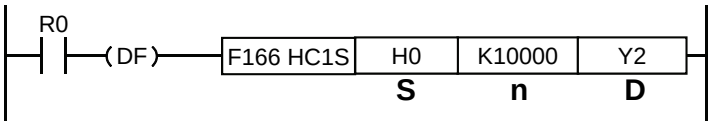
■ Precautions for programming

- Only F1 (DMV) instruction can be written. Transmit instruction F0 (MV) and other application instructions such as arithmetic cannot be written.
- Please use lower 16 bit storage region No. to designate the storage region of "S" or "D".

23.3.3 [F166 HC1S] high speed counter target value consistent ON instruction [F167 HC1R] high speed counter target value consistent OFF instruction

When the high speed counter process value is consistent with the target value of operation number setting, set the designated output to ON or OFF.

■ Instruction Format



■ Operation Number

Operation Number	Setting Contents
S	The high speed counter channel number which acts as consistent output object
n	Start number of the region in which high speed counter's target value data or data is saved
D	The output coil of ON or OFF in case of consistency (Y0 - Y29F)

■ Designable storage region type

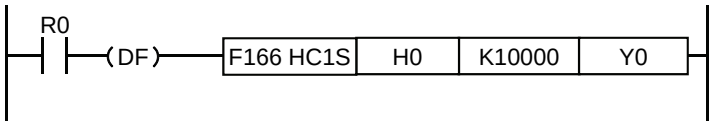
Operation Number	WX	WY	WR	WL	SV	EV	DT	LD	I	Constant		Indexing
										K	H	
S	-	-	-	-	-	-	-	-	-	●	●	-
n	●	●	●	●	●	●	●	●	●	●	●	●
D	-	-	-	-	-	-	-	-	-	-	-	-

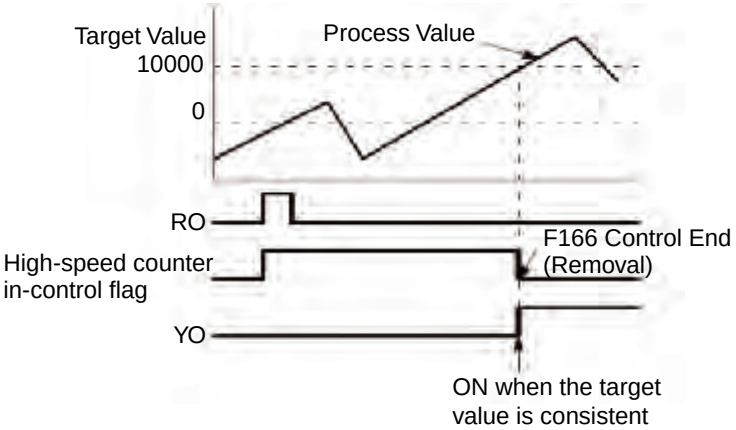
■ Operation description

- The value designated by [S] is set to high speed counter's target value, when process value is consistent to target value, control designates the output [Yn]. This will be executed by interruption handling.
- [F166 HC1S] During instruction, set output OFF->ON; during [F167 HC1R] instruction, set the output ON->OFF.
- When executing instruction, S value is saved to target value region.
- When the target value setting is consistent to target value, output control is cleared to zero when target value is consistent.
- When the target value is consistent, reset ON/OFF output, please use RST instruction, F0 (MV) instruction for resetting, or F166 (HC1R) instruction, F167 (HC1R) instruction to match the use.

■ Program sample

When the process value of high speed counter CH0 is consistent with K10000, below is the situation for setting output Y0.





■ Precautions for programming

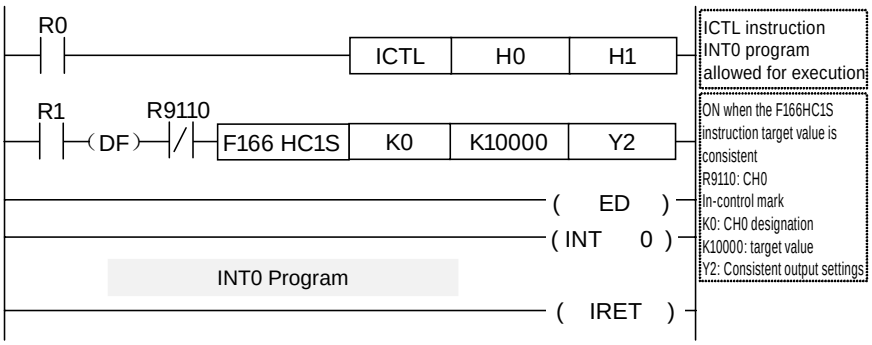
- After the instruction's execution condition turns to ON, high speed counter In-control mark (R9110 - R9117) will be ON until the target value is consistent. The high speed counter for the same channel cannot execute instruction (F166 - F167).
- Before being consistent with the target value, during hardware reset, process value is reset to 0, but the setting of the target value and target value being consistent will not reset to zero.
- For the output Y designated when target value has consistent output, do not perform dual-output check for OT instruction, KP instruction and other application instruction.
- When in common program and interruption program, the same channel is described, do not execute them at the same time.

23.3.4 Interruption program startup when target value has consistent control

After [F166 HC1S] instruction, [F167 HC1R] instruction combined with interruption program, when the target values are consistent, you can startup interruption program.

■ Execute method

- Use system register to set high speed counter. No need to set interruption input.
- Compile interruption program as secondary program.
- With the ICTL instruction in the main program, the corresponding interruption program is allowed to execute.
- Execute [F166 HC1S] instruction and [F167 HC1R] instruction. If high speed counter's process value is consistent with target value, the interruption program will startup.



■ Matching of channel number and interruption program number

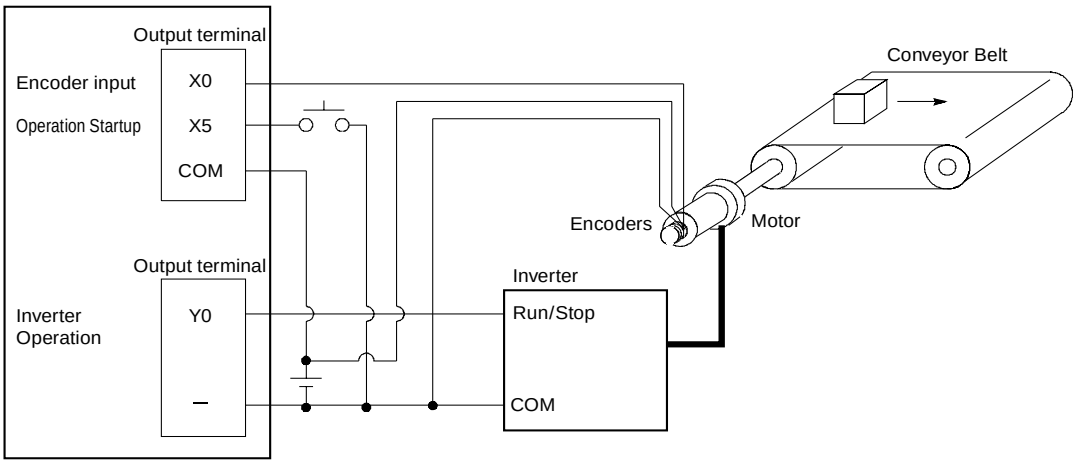
Channel number	INT No	Channel number	INT No
CH0	INT0	CH4	INT4
CH1	INT1	CH5	INT5
CH2	INT2	CH6	INT6
CH3	INT3	CH7	INT7

23.4 Example program

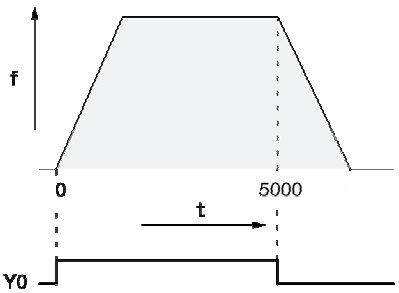
23.4.1 Running of the position control which has used inverter (1 speed)

Use the high speed counter to perform counting for feedback signal of the encoder. When the count value reaches 5000, stop the inverter.

■ Wiring example



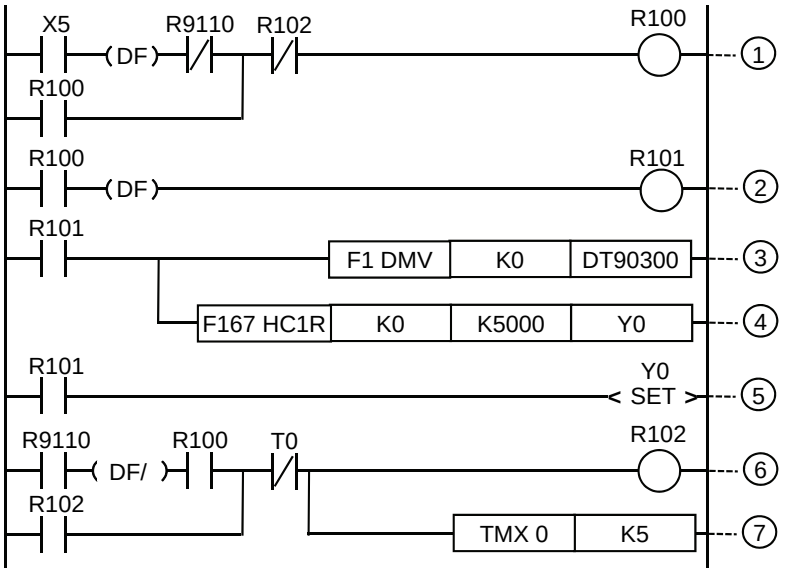
■ Action Chart



■ I/O allocation sheet

I/O Number	Contents	I/O Number	Contents
X0	Encoder input	R100	Position control operation
X5	operation startup signal	R101	Position control operation startup
Y0	Frequency converter operation signal	R102	Position control end pulse
		R9110	High speed counter CH0 in-control mark

■ Example program

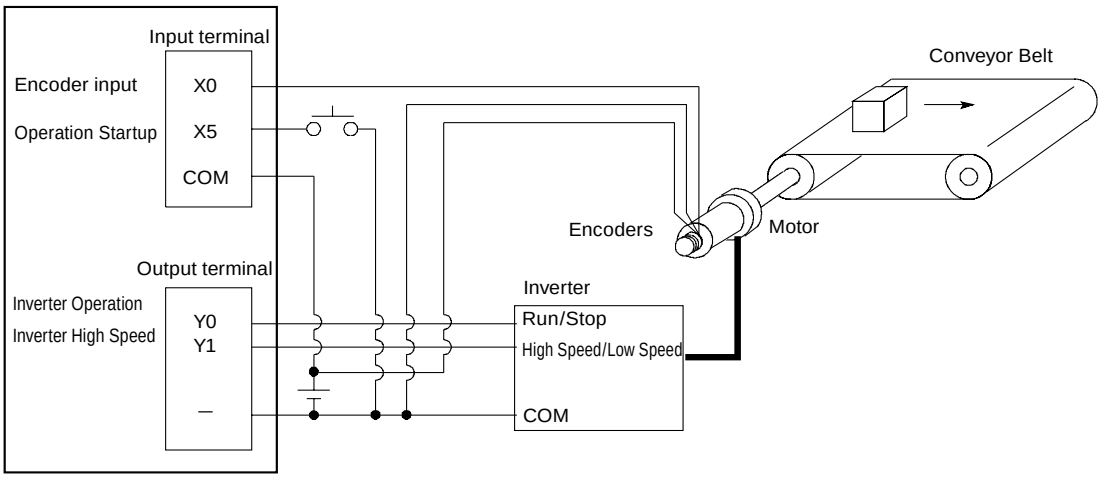


①	Position control operation
②	Position control operation startup
③	Value thorough which high speed counter CH0 passes being reset
④	Target value consistent OFF instruction: when high speed counter's process value reaches 5000 pulse, Y0 becomes OFF.
⑤	Setting inverter operation signal Y0
⑥	Position control end pulse (0.5 s)
⑦	Use 0.1 s timer, setting 0.5 s

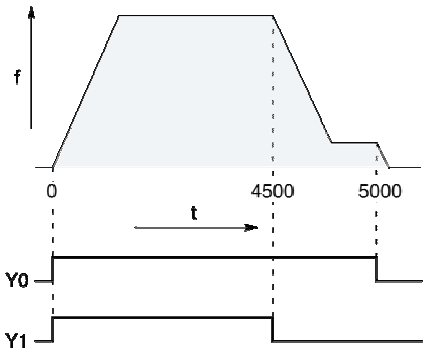
23.4.2 Running of the position control which has used inverter (2 speed)

Use the high speed counter to perform counting for feedback signal of the encoder. When the count value reaches 4500, switch inverter to low speed operation. When the count value reaches 5000, stop the inverter.

■ Wiring example



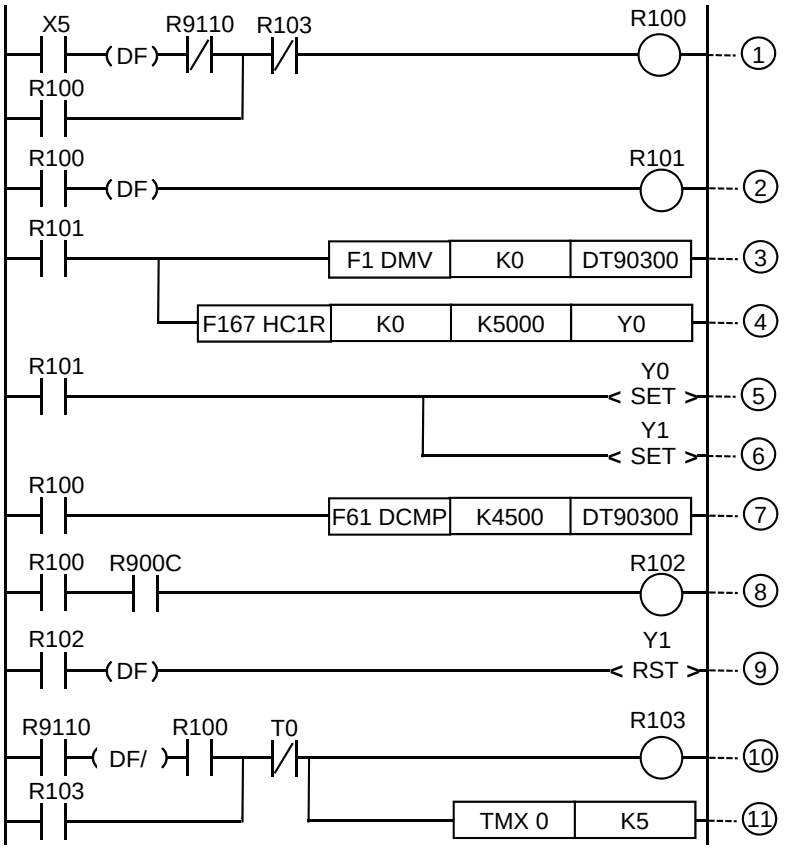
■ Action Chart



■ I/O allocation sheet

I/O Number	Contents	I/O Number	Contents
X0	Encoder input	R100	Position control operation
X5	operation startup signal	R101	Reach deceleration point
Y0	Frequency converter operation signal	R102	Position control operation startup
Y1	Frequency converter high speed signal	R103	Position control end pulse
		R900C	Compare instruction< mark
		R9110	High speed counter CH0 in-control mark

■ Example program



①	Position control operation
②	Position control operation startup
③	Value thorough which high speed counter CH0 passes being reset
④	Target value consistent OFF instruction: high speed counter CH0's process value reaches 5000 pulse, Y0 changes to OFF.
⑤	Setting Y0 (inverter operation signal)
⑥	Setting Y1 (inverter high speed signal)
⑦	32 bit data compare instruction: when high speed counter CH0's process value exceeds 4500 pulse, R900C becomes ON.
⑧	Reach deceleration point
⑨	Reset Y1 (inverter high speed signal)
⑩	Position control end pulse (0.5 s)
⑪	0.1 s timer: setting K5, used as 0.5 s timer

24

Other Functions

24.1 Analog potentiometer

24.1.1 Function Outline

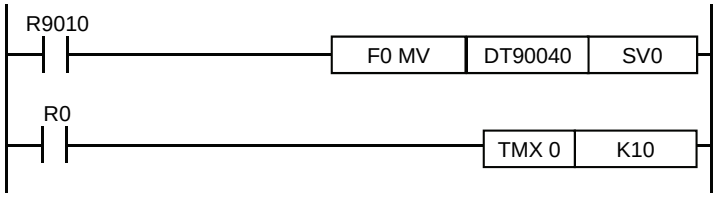
■ Function Outline

- The FP-XH M4 control unit equipped with an analog potentiometer.
- When rotating the potentiometer, the value of the special data register DT90040 changes between K0 - K4000. The set values inside the PLC can be changed without using a programming tool, therefore, it can be used to analog timers that change the set values by external rotary potentiometer.

24.1.2 Analog Potentiometer Application Examples

■ Timer application examples

The value of the special data register (DT90040) corresponding to the analog potentiometer V0 is transmitted to the set value area (SV0) of TMX0, and the timer time is set.



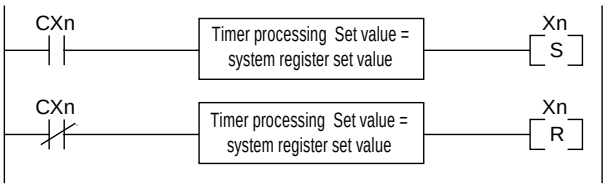
24.2 Input Time Constant Setting Function

24.2.1 Function Outline

■ **Actions when setting the input time constant processing**

It is easy to set the time constant of the control unit controller input after changing the value of the system register 430 - 431 with the programming tool.

If this setting is carried out, it will run in accordance with the following equivalent circuit. Once set, you can remove the input interference and vibration.



CXn=Xn contact input signal
Xn=input Xn image storage

◆ CAUTION!

- **Receiving an input signal of the X contact can be performed by the common I/O refresh time.**
- **For the input in the time constant processing, such as executing part of the refresh instructions, the time constant processing is invalid, and the input status at this time is read out for setting.**
- **If use the F182 (FILTR) instruction, the time constant processing can be set even for the input outside the control unit controller (expansion unit).**
- **Using the time processing in the equivalent circuit requires no time instruction.**
- **For the setting to interrupt the high-speed counter or pulse catch, the time constant processing is ineffective.**

■ **Input time constant setting function and applicable models**

System register number	Control unit controller I/O number	Applicable models
430	X0 - X3	○
431	X4 - X7	○

25

Maintenance and Inspection

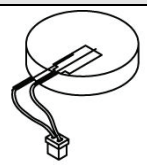
25.1 Precautions for Using Backup Battery

25.1.1 Backup Battery Replacement

You can replace the backup battery of the FP-XH M4 control unit when the power is on. Please replace the backup battery according to the following steps.

⚠WARNING	**Do not use batteries other than FPXHBATT. Failure to do so may result in an electric shock.**

■ **Backup battery type (sold separately)**

Appearance	Product Name	Specification	Order Number
	Backup battery for FP-XH	With connector	AFPXHBATT

■ **Number of installed batteries**

For FP-XH M4 control unit, only one battery can be installed.

Steps

1. **Power up the controller unit for more than five minutes.**

   When replacing the battery, charge up the built-in capacitor to maintain the memory contents.

2. **Turn the power off.**
3. **Open the cover.**
4. **Remove the used batteries.**
5. **Install the new battery within 2 minutes after cutting off the power supply.**
6. **Close the cover.**

Emphasis

- **You can replace the battery of the FP-XH M4 control unit when the power is on. If you perform the replacement after cutting off the power, in order to charge up the built-in capacitor, power up for more than 5 minutes, and complete the replacement in less than 2 minutes. If the charging is not sufficient, it may lead to unstable calendar clock data. When storing the battery connector cables, avoid them to be clapped into the card cover.**

25.1.2 Backup Battery Lifetime and Replacement Time

■ Backup Battery Lifetime

Main memory card	Type of Control Unit	Backup Battery Lifetime	Remarks
If installed If not installed	M4	More than 5 years	Run 8 hours per day

(Note): Please notice that the service life may be reduced due to use conditions.

■ Backup battery abnormality detection and battery replacement time

- If the battery voltage drops, special internal relays (R9005, R9006) will turn to ON. Develop an program to send an outside abnormal warning as needed.
- If the system register No. 4 "Alarm Battery Error" setting is effective, the ERR.LED of the controller unit controller will flash.
- After the backup battery error is detected, the data can be maintained for about one week without power. However, please replace the battery immediately.

◆ CAUTION!

- **When special internal relays (R9005, R9006) are ON or the ERR.LED of the control unit is flashed, if the power outage lasts a week, the data saved in the memory may be turned to 0.**
- **Special internal relays (R9005, R9006) are independent of the system register setting, if a backup battery error has been detected, it will turn to ON.**
- **Regardless of when the backup battery error was detected, power up the control unit for more than 2 minutes when replacing the backup battery.**

25.2 Inspection

Perform routine or periodic inspection to ensure the best use conditions.

■ Check Items

Check Items	Check Contents	Determination Criteria	Related Page
Power supply	Verify the lighting state of the control unit RUN / PROG LED.	Normal if "Lit"	P.2-2 - P.2-4 P.5-2 - P.5-7
Status display LED display	Verify RUN mode LED display Verify the ERR.LED	Lit when in RUN status Normal if "Unlit"	P.2-2 - P.2-4
Installation status	DIN rail installation, looseness Unit looseness and shaking	Required to be installed securely.	P.4-3, P.4-11 - P.4-12
Connection status	Terminal screw looseness near to crimp terminals connector looseness	No looseness Fastened in parallel Locked. The connector shall be tight.	P.4-5 - P.4-23
Unit supply voltage	Voltage between terminals	100-240 VAC or 24 VDC (all types)	P.2-6
Input and output circuit supply voltage	Supply voltage	100-240 VAC or 24 VDC (all types)	P.2-7 - P.2-12
Ambient environment	Ambient temperature, internal temperature ambient humidity, internal humidity environment	0-＋55℃ 10-95%RH There should be no dust and corrosive gas	P.4-2 - P.4-3
Backup battery	Control unit backup battery	Periodic replacement	P.4-4, P.25-2 - P.25-3

26

Specification

26.1 Control Unit Specifications

26.1.1 General Specification

■ General Specification

Item	Specification	
Ambient temperature	0-＋55℃	
Storage temperature	-40-+70℃	
Ambient humidity	10 - 95% RH (non-condensing at 25 ℃)	
Storage humidity	10 - 95% RH (non-condensing at 25 ℃)	
Voltage resistance (detection current 5 mA)	Power terminals - grounding terminals	1500 VAC 1 minute
	Power terminals - universal power supply terminals	1500 VAC 1 minute
	Universal input terminals - grounding terminals	1500 VAC 1 minute
	Universal output terminals - grounding terminals	500 VAC 1 minute
	Motion I/O terminals - grounding terminals	1500 VAC 1 minute
Insulation resistance (test voltage 500 VDC)	Power terminals - grounding terminals	100 MΩ or more
	Power terminals - universal power supply terminals	
	Universal input terminals - grounding terminals	
	Universal output terminals - grounding terminals	
	Motion I/O terminals - grounding terminals	
Vibration resistance	5-8.4 Hz, single amplitude of 3.5 mm 8.4-150 Hz, acceleration speed 9.8 m/s^2 10 min for X, Y and Z respectively (1X frequency interval/min.)	
Shock resistance	147 m/s^2, 4 times for X, Y, Z directions	
Anti-interference performance	1000 V [P-P] pulse width 50 ns, 1μs (based on noise simulation method) (power terminal)	
Operating environment	There should be no corrosive gas. There should be no heavy dust.	
Applicable standards of EU Directive	EMC directive: EN 61131-2, low voltage directive: EN 61131-2	
Overvoltage category	Category II	
Contamination level	Contamination level 2	
Quality	About 620g	

■ Current consumption list

For 100 VAC	For 200 VAC
320 mA or less	200 mA or less

26.1.2 Performance specification

Item			Specification
Control I/O points			Universal I/O part of the control unit: 16-point (DC input: 8 points / transistor output: 8 points) For E16 expansion I/O unit: up to 32 points For E30 expansion I/O unit: up to 256 points (up to 8 expansion units) For FP0R expansion I/O unit: up to 112 points (up to 3 expansion units)
Program mode / control mode			Relay symbol / cyclic operation mode
Program memory			Built-in Flash-ROM (requires no backup battery) Saved programs, system registers, position control data and position control data.
Comments storage			For I/O comments, descriptions, comments between the lines (requires no backup battery 1M byte)
Instructions number		Basic instructions	About 120 kinds
		Application instructions	About 230 kinds
Program capacity			24k / 32k / 40k step (switching) (note 1)
Operation processing speed (note 8)			Up to 7k steps: basic instruction 0.04 μs - / step, application instruction 0.22 μs - / step
			Above 7k steps: basic instruction 0.7 μs - / step, application instruction 1.73 μs - / step
IO refresh + basic time			Single control unit: below 75μs For expansion unit E16: 0.34ms × No. of units For expansion unit E30 时: 0.47ms × No. of units For expanded FP0 adapter: 1.4ms ＋ FP0 expansion unit refresh time (note 2)
Operational memory	Link relay	External input (X)	2080 points (X0 - X109F) (note 3)
		External output (Y)	2080 points (Y0 - Y109F) (note 3)
		Internal relay (R)	8192 points (R0-R511F)
		Timer, counter (T / C)	1024 points (note 4) (Initial setting Timer 1008 points: T0-T1007, counter 16 points: C1008-C1023） Timer measurable up to (1msec/10msec/100msec/1sec units) x 32767 Counter measures 1-32767
		Link relay (L)	2048 points (L0 - L127F)
	Storage region	Data register (DT)	64k, 32k, 12k words (note 1)
		Link data register (LD)	256 words (LD0 - LD255)
		Index register (I)	14 words (I0 - ID)
Differential points (DF, DF /, DFI)			Program capacity
Master control relay points			256 points
Label number (JMP + LOOP)			256 points
Step ladder diagram number			1000 stroke
Subprogram number			500 subprograms

(Note 1): When changing the system register No.0 (sequence program capacity setting), the data register (DT) capacity will also change.

(Note 2): FP0 expansion unit refresh timetable: 8-point unit: No. used × 0.8msec, 16-point unit: No. used × 1.0msec, 32-point unit: No. used × 1.3msec, 64-point unit: No. used × 1.9msec

(Note 3): The number of points in the above table is the point number of the operational storage. The actual number of points for input and output is determined by the combination of hardware.

(Note 4): The number of timer points can be changed by the setting of the system register No. 5. Points can be increased with the auxiliary timer.

Item		Specification
Interrupt program		Interruption via external input or interruption when the target value of the high-speed counter is consistent × 8 programs Timer interrupt (0.1 ms unit, 0.5 ms unit or 10 ms unit) × 1 program
Sampling and tracking		Instruction or regular sampling, +3 words per 16 bits / sampling × 1000 sampling
Inter-PLC link function		Up to 16 units, (link relay 1024 points, link register 128 words) × 2. (Communication speed: 115200 bps / 230400 bps)
Fixed scanning		Available (0msec-350msec)
Security Functions		Password (4-digit, 8-digit and 32-digit), program upload prohibited
Self-diagnosis function		Watchdog timer, program syntax checking
Program editing in RUN		Available (download in RUN, program rewrite in RUN, up to 512 steps)
High speed counter	Controller input	Single-phase 8ch or 2-phase 4-phase Max. 10 kHz
	Pulse input and output When the card installed	Can not be installed
Pulse output / PWM output	Controller output	No
	Pulse input and output When the card installed	Can not be installed
Pulse catch input interrupt input		8 points (master input 8 points)
Timer interrupt		0.1ms-0.3s (0.1ms unit), 0.5ms-1.5s (0.5ms unit), 10ms-30s (10ms unit)
Potentiometer input		1ch (K0 - K4000)
Input time constant processing		Available (set via system register or instructions)
Calendar clock (real-time clock) (note 5)		Year (last 2 numbers in the Gregorian calendar), month, day, hour (24h), minute, second, week. As of 2099. Applicable during leap years. Available only when the main memory card AFPX-MRTC and battery are installed
Flash-ROM backup		Guaranteed writing times: up to 10 thousand times
		Automatic backup in case of power outage Counter 16 points, internal relay 128 points, data register 315 words
		Can be operated through the tool software or F-ROM read and write instruction (F12 / P13) Backup in data register 2K words
Battery backup		When optional batteries are used, all storage regions for operation can be backed up The hold / non-hold region can be set with the system register.
Battery lifetime		More than 5 years depending on the actual use condition (run 8 hours per day) (note 7)

(Note 5): Calender clock (real-time clock) (0 ℃: Month error in 119 seconds or less, 25 ℃: Month error in 51 seconds or less, 55 ℃: Month error in 148 seconds or less)

(Note 6): It will be cleared upon connection of the power if no battery installed or the battery is empty.

(Note 7): The battery life is the value with the power supply not connected. The actual service life may be reduced due to use conditions.

(Note 8): The operation below 5k steps is accelerated for Main CPU version below Ver.1.09. (basic instruction 0.04 μs - / step, application instruction 0.22 μs - / step

26.1.3 Performance specifications of the motion control part

Item				Specification
Control axis number				Axis 4
Interpolation control				2-axis linear interpolation control, 2-axis arc interpolation control, 3-axis linear interpolation control and 3-axis spiral interpolation control.
Auto operation	Position Control	Position designate mode		Absolute value, increment
		Position designation unit		pulse μm (Min. unit of instruction selectable between 0.1 μm and 1 μm) inch (Min. unit of instruction selectable between 0.00001 inch and 0.0001 inch) degree (Min. unit of instruction selectable between 0.1 degree and 1degree)
		Position designate scope		pulse: -1,073,741,823-1,073,741,823 pulse μm (0.1 μm): -107,374,182.3-107,374,182.3 μm μm (1 μm): -1,073,741,823-1,073,741,823 μm inch (0.00001 inch): -10,737.41823-10,737.41823 inch inch (0.0001 inch): -107,374.1823-107,374.1823 inch degree (0.1 degree): -107,374,182.3-107,374,182.3 degree degree (1 degree): -1,073,741,823-1,073,741,823 degree
		Speed instruction scope		pulse: 1-32,767,000 pps μm: 1-32,767,000 μm/s inch: 0.001-32,767.000 inch/s degree: 0.001-32,767.000 rev/s
		Operation max. speed		4Mpps (Linear Driver Output Type) 500kpps (when NPN Open Collector Output Type 5 V DC is used) 200kpps (when NPN Open Collector Output Type 24 V DC is used)
		Acceleration and deceleration mode		Linear acceleration/deceleration, S shape acceleration/deceleration
		Acceleration time		0 - 10,000 ms (can use 1 ms unit setting)
		Deceleration time		0 - 10,000 ms (can use 1 ms unit setting)
		Position control data sheet number		All axes standard region 600 points, extension region 25 points
		Control mode	Single axis	PTP control (E point control, C point control), CP control (P point control), JOG position control (J-point control)
			Axis 2 linear interpolation	E point, P point, C point control, combination speed or long axis speed designation
			Axis 2 arc interpolation	E point, P point, C point control, center point or passing point designation
			Axis 3 linear interpolation	E point, P point, C point control, combination speed or long axis speed designation
			Axis 3 spiral interpolation	E point, P point, C point control, center point or passing point designation
		Startup speed		Standard region: below 3 points and the extension region: below 5 points
		Other functions	Dwell time	0 - 32,767 ms (can use 1 ms unit setting)

Item			Specification
Manual operation	JOG operation	Speed instruction scope	pulse: 1-32,767,000 pps μm: 1-32,767,000 μm/s inch: 0.001-32,767.000 inch/s degree: 0.001-32,767.000 rev/s
		Acceleration and deceleration mode	Linear acceleration/deceleration, S shape acceleration/deceleration
		Acceleration time	0 - 10,000 ms (can use 1 ms unit setting)
		Deceleration time	0 - 10,000 ms (can use 1 ms unit setting)
	Origin return	Speed instruction scope	pulse: 1-32,767,000 pps μm: 1-32,767,000 μm/s inch: 0.001-32,767.000 inch/s degree: 0.001-32,767.000 rev/s
		Acceleration and deceleration mode	Linear acceleration/deceleration
		Acceleration time	0 - 10,000 ms (can use 1 ms unit setting)
		Deceleration time	0 - 10,000 ms (can use 1 ms unit setting)
		Reset mode	DOG mode (3 types), limit modes (2 types) data setting mode, origin mode
	Pulse generator input operation	Speed instruction scope	Input synchronization with pulse generator (note 1)
Stop function	Ramp-to-stop	Deceleration time	Deceleration time for started operation
	Emergency stop		0 - 10,000 ms (can use 1 ms unit setting)
	Position limit stop		0 - 10,000 ms (can use 1 ms unit setting)
	Error stop		0 - 10,000 ms (can use 1 ms unit setting)
	System stop		Immediate stop (0ms) Full axis stop
Other specifications	Soft limit function	Setting Range	pulse: -1,073,741,823-1,073,741,823 pulse μm (0.1 μm): -107,374,182.3-107,374,182.3 μm μm (1 μm): -1,073,741,823-1,073,741,823 μm inch (0.00001 inch): -10,737.41823-10,737.41823 inch inch (0.0001 inch): -107,374.1823-107,374.1823 inch degree (0.1 degree): -107,374,182.3-107,374,182.3 degree degree (1 degree): -1,073,741,823-1,073,741,823 degree
	Backup		Parameters and position control data are saved via flash (without battery)
	High-speed Counter Function (Note 1)	Counting range	Counting range: -2,147,483,648-2,147,483,647 pulse
		Input mode	Phase difference input, direction identification input and separate input (frequency doubling function for different modes are supported)
	Target speed change		Possible
	Target position change		Possible
	Running tools		Possible
	Output pulse duty ratio		50%
Synchronization function	Corresponding function		Electronic gear, electronic clutch and electronic cam
	No. of axes	Main station axis	1
		Slave station axis	up to 4

(Note 1): the pulse generator input function and the high-speed counter function share the same pulse input terminal, so they cannot be used at the same time.

26.1.4 Communication Specifications

■ USB port (for tool software)

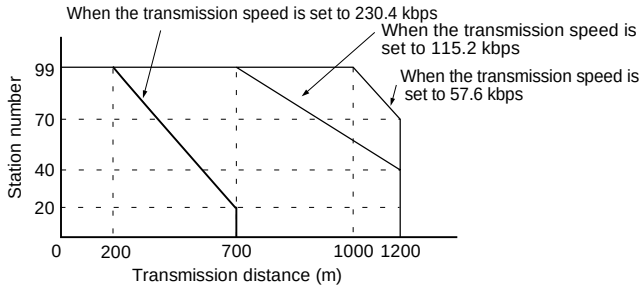
Item	Specification
Specification	USB2.0 Fullspeed
Communication Function	MEWTOCOL (slave)
Connector shape	USB miniB type

■ Communication port interface

Item		Specification		
Interface		RS-232C (non-insulated)	RS-422 (insulated)	RS-485 (insulated)
Communication type		1: 1 communication	1: 1 communication	1: N communication
Communication pattern		Half duplex	Half duplex	Two-wire half-duplex mode
Synchronous mode		Start-stop synchronous mode		
Transmission line		Multi-core shielded wire	Multi-core shielded wire	Shielded twisted pair wire or VCTF
Transmission distance		15 m	Up to 1200m	Up to 1200m
Rate		2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400 bit/s		
Transmission code	Computer link	ASCII		
	Universal serial communication	ASCII, binary		
	MODBUS-RTU	Binary		
Transmission format	Data length	7 bit / 8 bit		
	Parity check	No / Yes (odd / even)		
	Stop bit	1 bit / 2 bit		
	Start character	STX Yes / STX No		
	End character	CR / CR + LF / No / ETX / Time (0.01 - 100ms) (Note 4)		
Connected stations		2 stations	2 stations	Up to 99 stations (up to 32 stations when C-NET adapter connected)

(Note 1): When connecting a commercially available device, please confirm it according to the device actually used. The number of stations, transmission distance and speed can be changed with the connected device.

(Note 2): The transmission distance, speed and the number of stations are within the range given in the following table.



(Note 3): For functions used and combination limitations, refer to "1.3.4, limitations on Communication Function".

(Note 4): When the end character sets the time to 0, the transmission time is the time needed to transmit 4 bytes.

26.2 Operational Storage Area

■ List of Operational Storage Areas

Item		Specification
Relays	External input (X) (note 1)	2080 points (X0 - X109F)
	External output (Y) (note 1)	2080 points (Y0 - Y109F)
	Internal relay (R)	8192 points (R0-R511F)
	Link relay (L)	2048 points (L0 - L127F)
	Timer / counter (T/C) (note 3)	1024 points (timer 1008 points: T0-T1007, counter 16 points: C1008-C1023） Timer measures (1msec/10msec/100msec/1sec units) × 32767 Counter measures 1-32767
	Special internal relay (R)	256 points (R9000 - R915F)
Storage region	External input (WX)	130 words (WX0 - WX129)
	External output (WY)	130 words (WY0 - WY129)
	Internal relay (WR)	512 words (WR0 - WR511) (note 2)
	Link relay (WL)	128 words (WL0 - WL127)
	Data register (DT)	65533 words (DT0-DT12284)/32765 words (DT0-DT32764)/12285 words (DT0-DT65532) (note 3)
	Special data register (DT)	500 words (DT90000 - DT90499)
	Link data register (LD)	256 words (LD0 - LD255)
	Timer / counter set value region (SV)	1024 words (SV0 - SV1023)
	Timer / counter elapsed value region (EV)	1024 words (EV0 - EV1023)
	Index register (I)	14 words (I0 - ID)
Constant	Decimal constant (K)	K-32,768 - K32,767 (16-bit operation) K-2,147,483,648 - K2,147,483,647 (32-bit operation)
	Hexadecimal constant (H)	H0-HFFFF (16-bit operation) H0-HFFFFFFFF (32-bit operation)
	Floating-point type real numbers (f)	F-1.175494×10^{-38} - F-3.402823×10^{38} F 1.175494×10^{-38} - F 3.402823×10^{38}
Position control storage		1800 words in the position control data sheet area: 20 data sheets for each channel, 250 words

(Note 1): The number of points in the above table is the point number of the operational storage. The actual number of points for input and output is determined by the combination of hardware.

(Note 2): The number of timer points can be changed by the setting of the system register No. 5. Points can be increased with the auxiliary timer.

(Note 3): When changing the system register No.0 (sequence program capacity setting), the data register (DT) capacity will also change.

Program capacity	24K	32K	40K
Data register capacity	65533 words	32765 words	12285 words

(Note 4): For details on hold / non-hold region, refer to "21.1.2 Operational Memory Backup".

26.3 Position control storage

26.3.1 Composition of position control storage

Position control storage consists of 5 regions.

Region No.0	Region Name	Offset Address	Individual names of the regions	
0	Universal region	H85-H389	Setting parameter control region	
			Motion speed multiplier region	
			Axis group setting region	
			Updated data region of the current value	
			Position control data sheet designation region	
			Control region for position control	
			Error notification & clearing region	
			Warning notification & clearing region	
			Pulse counting control region	
			Synchronous control monitoring region	
			Setting region for system operation	
1	Axis information region (Note)	H0-H3F	Axis 1	Axis information & monitoring region
			Axis 2	Axis information & monitoring region
			Axis 3	Axis information & monitoring region
			Axis 4	Axis information & monitoring region
			Virtual axis	Axis information & monitoring region
2	Axis setting region	H0-H27FF	Axis 1	Parameter settings region
				Position control data setting region (standard 600 points, extension 100 points)
			Axis 2	Parameter settings region
				Position control data setting region (standard 600 points, extension 100 points)
			Axis 3	Parameter settings region
				Position control data setting region (standard 600 points, extension 100 points)
			Axis 4	Parameter settings region
				Position control data setting region (standard 600 points, extension 100 points)
			Virtual axis	Parameter settings region
				Position control data setting region (standard 600 points, extension 100 points)

Region No.0	Region Name	Offset Address	Individual names of the regions	
4	Synchronous control settings region	H0-HF	Axis 1	Universal setting region for synchronous control
				Electronic gear setting region
				Electronic clutch setting region
				Electronic cam setting region
			Axis 2	Universal setting region for synchronous control
				Electronic gear setting region
				Electronic clutch setting region
				Electronic cam setting region
			Axis 3	Universal setting region for synchronous control
				Electronic gear setting region
				Electronic clutch setting region
				Electronic cam setting region
			Axis 4	Universal setting region for synchronous control
				Electronic gear setting region
				Electronic clutch setting region
				Electronic cam setting region
5	Position control operation change region	H0-HF	Axis 1	Setting region
			Axis 2	Setting region
			Axis 3	Setting region
			Axis 4	Setting region
			Virtual axis	Setting region

◆ CAUTION!

- **Please do not execute writing in system reserved area.**
- **Before reading the information region of each axis, please firstly confirm that the position control ready flag (X1100) is ON.**

26.3.2 Universal region (storage region No.0)

■ Setting parameter control region

Offset Address	Name	Initial value	Contents
H85	Then calculate the data sheet number	K1	When the recalculation request signal (Y1107) =ON, the control unit will recalculate the position control data of the whole axis from the number at the end of this data sheet to No. 600. Setting Range: K1-K600

■ Operation speed setting region

Offset Address	Name	Initial value	Contents
H88	Operation speed multiplier	K100	The operation speed multiplier allows all operations (position control, JOG and origin return) to be performed at designated multiplier of the operation speed. Setting Range: K1-K100 Unit: %

■ Axis group setting region

<table>
<tr><th>Offset Address</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>HB0</td><td>Group-A axis setting</td><td rowspan="4">H0</td><td rowspan="4">Independent and interpolation settings of each axis are set in this region. During interpolation settings, the axes belong to any group of A-D, for instance, axis-1, axis-2 and axis-3 belong to group A, to perform 3-axis interpolation, please set the corresponding 3 into 1 in the interpolation settings of Group 1. When setting single axis separately, the axis belongs to no group, please set the corresponding bit of the independent axis to ON.
The max. number of interpolation in each group is 3, the same axis cannot be set repeatedly in different groups.
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>0</td><td>Group properties of axis-1</td><td>0</td><td rowspan="4">0: not belonging to any group
1: belonging to the interpolation group

If there are over 4 bits in the group set to 1, or the same axis being set to 1 repeatedly in other groups, an error will occur.</td></tr>
<tr><td>1</td><td>Group properties of axis-2</td><td>0</td></tr>
<tr><td>2</td><td>Group properties of axis-3</td><td>0</td></tr>
<tr><td>3</td><td>Group properties of axis-4</td><td>0</td></tr>
<tr><td>15-4</td><td>—</td><td>—</td><td>—</td></tr>
</table></td></tr>
<tr><td>HB1</td><td>Group-B axis setting</td></tr>
<tr><td>HB2</td><td>Group-C axis setting</td></tr>
<tr><td>HB3</td><td>Group-D axis setting</td></tr>
<tr><td>HB4</td><td>Independent axis setting</td><td>H0</td><td>Please set the object bit to 1 for independent axis not belonging to the interpolation group.
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>0</td><td>Properties of axis 1</td><td>0</td><td rowspan="4">0: belonging to the interpolation group. or not set in the axis used.
1: independent axis (not belonging to the interpolation group).
An error may occur when setting the interpolation group.</td></tr>
<tr><td>1</td><td>Properties of axis 2</td><td>0</td></tr>
<tr><td>2</td><td>Properties of axis 3</td><td>0</td></tr>
<tr><td>3</td><td>Properties of axis 4</td><td>0</td></tr>
<tr><td>15-4</td><td>—</td><td>—</td><td>—</td></tr>
</table></td></tr>
<tr><td>HB5-HBF</td><td>System reserved</td><td>—</td><td>—</td></tr>
</table>

■ Update region of the current value

<table>
<tr><th>Offset Address</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>HC0</td><td>Current value update request flag</td><td>H0</td><td>Only when the bit corresponding to each axis turns from 0 to 1 can the current value managed by the control unit be changed to the current value below.
After the change, the control unit will automatically clear the corresponding bit.
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>0</td><td>Request for current value update of axis-1</td><td>0</td><td rowspan="8">0: unchanged
1: update the current value of the object axis
(After execution, the control unit will automatically change the value to 0)</td></tr>
<tr><td>1</td><td>Request for current value update of axis-2</td><td>0</td></tr>
<tr><td>2</td><td>Request for current value update of axis-3</td><td>0</td></tr>
<tr><td>3</td><td>Request for current value update of axis-4</td><td>0</td></tr>
<tr><td>4</td><td>—</td><td>—</td></tr>
<tr><td>5</td><td>—</td><td>—</td></tr>
<tr><td>6</td><td>—</td><td>—</td></tr>
<tr><td>7</td><td>Request for current value update of the virtual axis</td><td>0</td></tr>
<tr><td>15-8</td><td>—</td><td>—</td><td>—</td></tr>
</table></td></tr>
<tr><td>HC1-HC7</td><td>System reserved</td><td>—</td><td>—</td></tr>
<tr><td>HC8-HC9</td><td>Current value updated coordination of 1-axis</td><td>K0</td><td>Saves the preset coordinates as the current value of 1-axis.</td></tr>
<tr><td>HCA-HCB</td><td>Current value updated coordination of 2-axis</td><td>K0</td><td>Saves the preset coordinates as the current value of 2-axis.</td></tr>
<tr><td>HCC-HCD</td><td>Current value updated coordination of 3-axis</td><td>K0</td><td>Saves the preset coordinates as the current value of 3-axis.</td></tr>
<tr><td>HCE-HCF</td><td>Current value updated coordination of 4-axis</td><td>K0</td><td>Saves the preset coordinates as the current value of 4-axis.</td></tr>
<tr><td>HD0-HD5</td><td>System reserved</td><td>—</td><td>—</td></tr>
<tr><td>HD6-HD7</td><td>Virtual axis, current value updated coordination</td><td>K0</td><td>Saves the preset coordinates as the current value of the virtual axis.</td></tr>
</table>

■ Position control starting data sheet designation region

Offset Address	Name	Initial value	Contents
H100	Position control starting data sheet number of axis-1	K1	Saves the position control starting data sheet number. Setting range: 1-600, 10001-10100
H101	Position control starting data sheet number of axis-2		
H102	Position control starting data sheet number of axis-3		
H103	Position control starting data sheet number of axis-4		
H104-H106	System reserved	—	—
H107	Position control starting data sheet number of the virtual axis	K1	Saves the position control starting data sheet number. Setting range: 1-600, 10001-10100

(Note 1): Data sheets No.10026-10100 are supported by control units of Motion CPU Ver.1.50 or above.

■ Control region for position control

Offset Address	Name	Initial value	Contents
H108	Axis-1 position control repetitions	K1	Saves the times of repetition from the No. of the position control start data sheet to the E-point. If set to 255, the operation will be repeated infinitely before the operation is stopped. Setting range: 0-255
H109	Axis-2 position control repetitions		
H10A	Axis-3 position control repetitions		
H10B	Axis-4 position control repetitions		
H10C-H10E	System reserved	—	—
H10F	Virtual axis position control repetitions	K1	Saves the times of repetition from the No. of the position control start data sheet to the E-point. If set to 255, the operation will be repeated infinitely before the operation is stopped. Setting range: 0-255

■ Error notification & clearing region

<table>
<tr><th>Offset Address</th><th>Name</th><th>Contents</th></tr>
<tr><td>H110</td><td>System reserved</td><td>—</td></tr>
<tr><td>H111</td><td>Error clearing of individual axis</td><td>performs error clearing for each individual axis.
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>0</td><td>Axis-1 error clearing</td><td>0</td><td rowspan="8">0: do not clear errors
0→1: clear errors
(After execution, the control unit will automatically change the value to 0)</td></tr>
<tr><td>1</td><td>Axis-2 error clearing</td><td>0</td></tr>
<tr><td>2</td><td>Axis-3 error clearing</td><td>0</td></tr>
<tr><td>3</td><td>Axis-4 error clearing</td><td>0</td></tr>
<tr><td>4</td><td>—</td><td>—</td></tr>
<tr><td>5</td><td>—</td><td>—</td></tr>
<tr><td>6</td><td>—</td><td>—</td></tr>
<tr><td>7</td><td>Virtual axis error clearing</td><td>0</td></tr>
<tr><td>15-8</td><td>—</td><td>—</td><td>—</td></tr>
</table></td></tr>
<tr><td>H112-H128</td><td>System reserved</td><td>—</td></tr>
<tr><td>H129</td><td>Error count of axis-1</td><td>Notifies the error count of axis-1.</td></tr>
<tr><td>H12A-H12B</td><td>Error code notification buffer 1 of axis-1</td><td rowspan="7">Saves the latest error codes in order from buffer 1.</td></tr>
<tr><td>H12C-H12D</td><td>Error code notification buffer 2 of axis-1</td></tr>
<tr><td>H12E-H12F</td><td>Error code notification buffer 3 of axis-1</td></tr>
<tr><td>H130-H131</td><td>Error code notification buffer 4 of axis-1</td></tr>
<tr><td>H132-H133</td><td>Error code notification buffer 5 of axis-1</td></tr>
<tr><td>H134-H135</td><td>Error code notification buffer 6 of axis-1</td></tr>
<tr><td>H136-H137</td><td>Error code notification buffer 7 of axis-1</td></tr>
<tr><td>H138</td><td>System reserved</td><td>—</td></tr>
<tr><td>H139</td><td>Error count of axis-2</td><td>Notifies the error count of axis-2.</td></tr>
<tr><td>H13A-H13B</td><td>Error code notification buffer 1 of axis-2</td><td rowspan="3">Saves the latest error codes in order from buffer 1.</td></tr>
<tr><td>H13C-H13D</td><td>Error code notification buffer 2 of axis-2</td></tr>
<tr><td>H13E-H13F</td><td>Error code notification buffer 3 of axis-2</td></tr>
<tr><td>H140-H141</td><td>Error code notification buffer 4 of axis-2</td><td rowspan="4">Saves the latest error codes in order from buffer 1.</td></tr>
<tr><td>H142-H143</td><td>Error code notification buffer 5 of axis-2</td></tr>
<tr><td>H144-H145</td><td>Error code notification buffer 6 of axis-2</td></tr>
<tr><td>H146-H147</td><td>Error code notification buffer 7 of axis-2</td></tr>
</table>

Offset Address	Name	Contents
H148	System reserved	—
H149	Error count of axis-3	Notifies the error count of axis-3.
H14A-H14B	Error code notification buffer 1 of axis-3	Saves the latest error codes in order from buffer 1.
H14C-H14D	Error code notification buffer 2 of axis-3	
H14E-H14F	Error code notification buffer 3 of axis-3	
H150-H151	Error code notification buffer 4 of axis-3	
H152-H153	Error code notification buffer 5 of axis-3	
H154-H155	Error code notification buffer 6 of axis-3	
H156-H157	Error code notification buffer 7 of axis-3	
H158	System reserved	—
H159	Error count of axis-4	Notifies the error count of axis-4.
H15A-H15B	Error code notification buffer 4 of axis-1	Saves the latest error codes in order from buffer 1.
H15C-H15D	Error code notification buffer 2 of axis-4	
H15E-H15F	Error code notification buffer 3 of axis-4	
H160-H161	Error code notification buffer 4 of axis-4	
H162-H163	Error code notification buffer 5 of axis-4	
H164-H165	Error code notification buffer 6 of axis-4	
H166-H167	Error code notification buffer 7 of axis-4	
H168-H198	System reserved	—
H199	Error count of virtual axis	Notifies the error count of the virtual axis.

Offset Address	Name	Contents
H19A-H19B	Error code notification buffer 1 of the virtual axis	Saves the latest error codes in order from buffer 1.
H19C-H19D	Error code notification buffer 2 of the virtual axis	
H19E-H19F	Error code notification buffer 3 of the virtual axis	
H1A0-H1A1	Error code notification buffer 4 of the virtual axis	
H1A2-H1A3	Error code notification buffer 5 of the virtual axis	
H1A4-H1A5	Error code notification buffer 6 of the virtual axis	
H1A6-H1A7	Error code notification buffer 7 of the virtual axis	

■ Warning notification & clearing region

<table>
<tr><th>Offset Address</th><th>Name</th><th>Contents</th></tr>
<tr><td>H1A8</td><td>System reserved</td><td>—</td></tr>
<tr><td>H1A9</td><td>Warning clearing designation of individual axis</td><td>Performs warning clearing for each axis.
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>0</td><td>Warning clearing of axis-1</td><td>0</td><td rowspan="8">0: do not clear warnings
0→1: clear warnings (After execution, the control unit will automatically change the value to 0)</td></tr>
<tr><td>1</td><td>Warning clearing of axis-2</td><td>0</td></tr>
<tr><td>2</td><td>Warning clearing of axis-3</td><td>0</td></tr>
<tr><td>3</td><td>Warning clearing of axis-4</td><td>0</td></tr>
<tr><td>4</td><td>—</td><td>—</td></tr>
<tr><td>5</td><td>—</td><td>—</td></tr>
<tr><td>6</td><td>—</td><td>—</td></tr>
<tr><td>7</td><td>Warning clearing of virtual axis</td><td></td></tr>
<tr><td>15-8</td><td>—</td><td>—</td><td>—</td></tr>
</table></td></tr>
<tr><td>H1AA-H1C0</td><td>System reserved</td><td>—</td></tr>
<tr><td>H1C1</td><td>Warning count of axis-1</td><td>Notifies the warning count of axis-1</td></tr>
<tr><td>H1C2-H1C3</td><td>Warning code notification buffer 1 of axis-1</td><td rowspan="7">Saves the latest warning codes in order from buffer 1.</td></tr>
<tr><td>H1C4-H1C5</td><td>Warning code notification buffer 2 of axis-1</td></tr>
<tr><td>H1C6-H1C7</td><td>Warning code notification buffer 3 of axis-1</td></tr>
<tr><td>H1C8-H1C9</td><td>Warning code notification buffer 4 of axis-1</td></tr>
<tr><td>H1CA-H1CB</td><td>Warning code notification buffer 5 of axis-1</td></tr>
<tr><td>H1CC-H1CD</td><td>Warning code notification buffer 6 of axis-1</td></tr>
<tr><td>H1CE-H1CF</td><td>Warning code notification buffer 7 of axis-1</td></tr>
<tr><td>H1D0</td><td>System reserved</td><td>—</td></tr>
<tr><td>H1D1</td><td>Warning count of axis-2</td><td>Notifies the warning count of axis-2</td></tr>
<tr><td>H1D2-H1D3</td><td>Warning code notification buffer 2 of axis-1</td><td rowspan="7">Saves the latest warning codes in order from buffer 1.</td></tr>
<tr><td>H1D4-H1D5</td><td>Warning code notification buffer 2 of axis-2</td></tr>
<tr><td>H1D6-H1D7</td><td>Warning code notification buffer 3 of axis-2</td></tr>
<tr><td>H1D8-H1D9</td><td>Warning code notification buffer 4 of axis-2</td></tr>
<tr><td>H1DA-H1DB</td><td>Warning code notification buffer 5 of axis-2</td></tr>
<tr><td>H1DC-H1DD</td><td>Warning code notification buffer 6 of axis-2</td></tr>
<tr><td>H1DE-H1DF</td><td>Warning code notification buffer 7 of axis-2</td></tr>
</table>

Offset Address	Name	Contents
H1E0	System reserved	—
H1E1	Warning count of axis-3	Notifies the warning count of axis-3.
H1E2-H1E3	Warning code notification buffer 3 of axis-1	Saves the latest warning codes in order from buffer 1.
H1E4-H1E5	Warning code notification buffer 3 of axis-2	
H1E6-H1E7	Warning code notification buffer 3 of axis-3	
H1E8-H1E9	Warning code notification buffer 4 of axis-3	
H1EA-H1EB	Warning code notification buffer 5 of axis-3	
H1EC-H1ED	Warning code notification buffer 6 of axis-3	
H1EE-H1EF	Warning code notification buffer 7 of axis-3	
H1F0	System reserved	—
H1F1	Warning count of axis-4	Notifies the warning count of axis-4.
H1F2-H1F3	Warning code notification buffer 1 of axis-4	Saves the latest warning codes in order from buffer 1.
H1F4-H1F5	Warning code notification buffer 2 of axis-4	
H1F6-H1F7	Warning code notification buffer 3 of axis-4	
H1F8-H1F9	Warning code notification buffer 4 of axis-4	
H1FA-H1FB	Warning code notification buffer 5 of axis-4	
H1FC-H1FD	Warning code notification buffer 6 of axis-4	
H1FE-H1FF	Warning code notification buffer 7 of axis-4	
H200-H230	System reserved	—
H231	Warning count of the virtual axis	Notifies the warning count of the virtual axis.

Offset Address	Name	Contents
H232-H233	Warning code notification buffer 1 of the virtual axis	Saves the latest warning codes in order from buffer 1.
H234-H235	Warning code notification buffer 2 of the virtual axis	
H236-H237	Warning code notification buffer 3 of the virtual axis	
H238-H239	Warning code notification buffer 4 of the virtual axis	
H23A-H23B	Warning code notification buffer 5 of the virtual axis	
H23C-H23D	Warning code notification buffer 6 of the virtual axis	
H23E-H23F	Warning code notification buffer 7 of the virtual axis	

■ Pulse counting control region

<table>
<tr><th>Offset Address</th><th>Name</th><th>Contents</th></tr>
<tr><td>H240</td><td>Pulse counting permission flag</td><td>When the bit corresponding to each axis is 0, execute the counting of pulse input.
This flag is only valid when the pulse input purpose is set to high-speed counting.
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>0</td><td>Axis-1 pulse counting permission</td><td>0</td><td rowspan="4">0: execute pulse input counting
1: do not execute pulse input counting</td></tr>
<tr><td>1</td><td>Axis-2 pulse counting permission</td><td>0</td></tr>
<tr><td>2</td><td>Axis-3 pulse counting permission</td><td>0</td></tr>
<tr><td>3</td><td>Axis-4 pulse counting permission</td><td>0</td></tr>
<tr><td>4</td><td>—</td><td>—</td><td rowspan="5">—</td></tr>
<tr><td>5</td><td>—</td><td>—</td></tr>
<tr><td>6</td><td>—</td><td>—</td></tr>
<tr><td>7</td><td>—</td><td>—</td></tr>
<tr><td>15-8</td><td>—</td><td>—</td></tr>
</table></td></tr>
<tr><td>H241</td><td>Request flag for pulse count change</td><td>When the bit corresponding to each axis turns from 0 to 1, change the pulse input count value to the preset pulse count change value.
This symbol is a pulse edge trigger. Please remember to turn 0 to 1 before the change.
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>0</td><td>Axis-1 pulse count change</td><td>0</td><td rowspan="4">0: Pulse count value not changed
0→1: Pulse count value changed</td></tr>
<tr><td>1</td><td>Axis-2 pulse count change</td><td>0</td></tr>
<tr><td>2</td><td>Axis-3 pulse count change</td><td>0</td></tr>
<tr><td>3</td><td>Axis-4 pulse count change</td><td>0</td></tr>
<tr><td>4</td><td>—</td><td>—</td><td rowspan="5">—</td></tr>
<tr><td>5</td><td>—</td><td>—</td></tr>
<tr><td>6</td><td>—</td><td>—</td></tr>
<tr><td>7</td><td>—</td><td>—</td></tr>
<tr><td>15-8</td><td>—</td><td>—</td></tr>
</table></td></tr>
<tr><td>H242-H247</td><td>System reserved</td><td>—</td></tr>
<tr><td>H248-H249</td><td>Pulse input change value of axis-1</td><td rowspan="4">Sets the pulse input value to be changed into for each axis.</td></tr>
<tr><td>H24A-H24B</td><td>Pulse input change value of axis-2</td></tr>
<tr><td>H24C-H24D</td><td>Pulse input change value of axis-3</td></tr>
<tr><td>H24E-H24F</td><td>Pulse input change value of axis-4</td></tr>
</table>

■ Synchronous control monitoring region

<table>
<tr><th>Offset Address</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>H250-
H2AF</td><td>System reserved</td><td>—</td><td>—</td></tr>
<tr><td>H2B0</td><td>Axis-1 synchronized main station axis information monitoring</td><td>HF</td><td>Saves the setting status of the main station axis under synchronized control.
<table>
<tr><td colspan="2">Saved value</td><td rowspan="2">Main station axis</td></tr>
<tr><td>Synchronizing</td><td>Canceling synchronization</td></tr>
<tr><td>FFFFH</td><td>FFFFH</td><td>No synchronizing settings</td></tr>
<tr><td>0000H</td><td>8000H</td><td>The monitored axis is the main station axis</td></tr>
<tr><td>0001H</td><td>8001H</td><td>Axis 1</td></tr>
<tr><td>0002H</td><td>8002H</td><td>Axis 2</td></tr>
<tr><td>0003H</td><td>8003H</td><td>Axis 3</td></tr>
<tr><td>0004H</td><td>8004H</td><td>Axis 4</td></tr>
<tr><td>0010H</td><td>8010H</td><td>Virtual axis</td></tr>
<tr><td>0021H</td><td>8021H</td><td>Pulse input 1</td></tr>
<tr><td>0022H</td><td>8022H</td><td>Pulse input 2</td></tr>
<tr><td>0023H</td><td>8023H</td><td>Pulse input 3</td></tr>
<tr><td>0024H</td><td>8024H</td><td>Pulse input 4</td></tr>
</table></td></tr>
<tr><td>H2B1</td><td>Monitoring the selection of synchronization output function of axis-1</td><td>H0</td><td>Saves the status of the synchronous operation function set for the axes.
<table>
<tr><td>bit</td><td>Function</td><td>Setting</td></tr>
<tr><td>0</td><td>Setting electronic gear operation</td><td rowspan="5">0: used
1: not used</td></tr>
<tr><td>1</td><td>Setting clutch operation</td></tr>
<tr><td>2</td><td>Electronic cam operation settings</td></tr>
<tr><td>3</td><td>Advance timing correction synchronization settings</td></tr>
<tr><td>15-4</td><td></td></tr>
</table></td></tr>
<tr><td rowspan="2">H2B2-
H2B3</td><td>Axis-2 synchronized main station axis information monitoring</td><td>HF</td><td>Please refer to axis-1.</td></tr>
<tr><td>Axis-2 synchronized output function selection condition monitoring</td><td>H0</td><td>Please refer to axis-1.</td></tr>
<tr><td rowspan="2">H2B4-
H2B5</td><td>Axis-3 synchronized main station axis information monitoring</td><td>HF</td><td>Please refer to axis-1.</td></tr>
<tr><td>Axis-3 synchronized output function selection condition monitoring</td><td>H0</td><td>Please refer to axis-1.</td></tr>
<tr><td rowspan="2">H2B6-
H2B7</td><td>Axis-4 synchronized main station axis information monitoring</td><td>HF</td><td>Please refer to axis-1.</td></tr>
<tr><td>Axis-4 synchronized output function selection condition monitoring</td><td>H0</td><td>Please refer to axis-1.</td></tr>
<tr><td>H2B8-
H2BD</td><td>System reserved</td><td>—</td><td>—</td></tr>
<tr><td rowspan="2">H2BE-
H2BF</td><td>Virtual axis synchronized main station axis information monitoring</td><td>HF</td><td>Please refer to axis-1.</td></tr>
<tr><td>Virtual axis synchronized output function selection condition monitoring</td><td>H0</td><td>H0 (fixed)</td></tr>
</table>

■ Setting region for system operation

Offset Address	Name	Initial value	Contents
H2C0-H388	System reserved	—	—
H389	Ramp-to-stop operation	K0	Operate when the deceleration stop request signal is Active (OFF ⇒ON). 0: Deceleration stop During repetition, the operation stops to the E-point of the object of repetition. 1: Pause • Perform deceleration stop, and resume position control when the "deceleration stop request signal" is canceled (ON⇒OFF). • All operations are the same to that of deceleration stop for cases other than position control operation. • During repetition, the operation stops till the E-point of the object of repetition, and resumes when the "deceleration stop request signal" is canceled (ON⇒OFF). • If system stop or emergency stop is executed during pause, the pause will be canceled and the operation will not be resumed even if the "deceleration stop request signal" is canceled (ON⇒ OFF).
H38A-H3FF	System reserved	—	—

26.3.3 Axis information region (storage region No.1)

<table>
<tr><th>Offset Address</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>H0-H23</td><td>System reserved</td><td>—</td><td>—</td></tr>
<tr><td>H24-H25</td><td>Advance timing angle correction</td><td>—</td><td>Saves advance timing angle correction amount. Saves the value converted to the selected unit system (pulse, μm, inch and degree) on the main station axis.</td></tr>
<tr><td>H25-H30</td><td>System reserved</td><td>—</td><td>—</td></tr>
<tr><td>H31</td><td>External terminal input monitoring</td><td>—</td><td>Saves the I/O information of all axes connected.
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>0</td><td>Limited position +</td><td>0</td><td rowspan="4">0: not activated
1: activated</td></tr>
<tr><td>1</td><td>Limited position -</td><td>0</td></tr>
<tr><td>2</td><td>Near original point</td><td>0</td></tr>
<tr><td>3</td><td>Origin</td><td>0</td></tr>
<tr><td>15-4</td><td>—</td><td>—</td><td>—</td></tr>
</table></td></tr>
<tr><td>H32-H33</td><td>System reserved</td><td>—</td><td>—</td></tr>
<tr><td>H34-H35</td><td>Deviation</td><td>—</td><td>Saves the maximum value of deviation (difference between the pulse input value and the instruction value).</td></tr>
<tr><td>H36-H37</td><td>Pulse input value</td><td>—</td><td>Saves pulse input values corresponding to the purposes of pulse input (pulse generator, feedback pulse and counter). Pulse input values will be saved accumulatively before changing the pulse input purposes or clearing the pulse input values.
Unit: Pulse</td></tr>
<tr><td>H38</td><td>Data sheet during or at end of execution</td><td>K1</td><td>Saves the numbers of position control data sheets during or at the end of each channel execution.
Setting Range: K1~K600</td></tr>
<tr><td>H39</td><td>Auxiliary output code</td><td>K0</td><td>Saves auxiliary output codes.</td></tr>
<tr><td>H3A</td><td>Set value of repetition times</td><td>K0</td><td>Saves the repetitions of the set position control. Set to 1 if no repetition of position control will be executed. Saved as 255 if the repetition times are infinite.
Setting Range: K0-K255
Unit: time</td></tr>
<tr><td>H3B</td><td>Repeat times current value</td><td>K0</td><td>Saves the repetition times of each operation. Saved as 1 when no repetitive is to be performed. When repeat times exceed upper limit, it restores to "0".
Setting Range: K0-K65535
Unit: time</td></tr>
<tr><td>H3C-H3D</td><td>Current value</td><td>K0</td><td>The current value based on the mechanical origin and is saved in the unit of pulse.
Reset to "0" upon origin return.
The value will not be updated even if the Update Current Value function is executed.
Unit: Pulse</td></tr>
<tr><td>H3E-H3F</td><td>Current value after conversion of unit system</td><td>K0</td><td>Saves the current value based on the electrical origin.
Save the value converted to the selected unit system (pulse, μm, inch and degree) in the setting region of different axes.
After origin return, the values set as the origin coordinates will be saved. It will be reset to "0" when the value saved in the origin coordinates is "0".
This region will be updated when using the Update Current Value function.</td></tr>
</table>

26.3.4 Axis setting region (storage region No.2)

■ Position control parameters of the axes

Save the data of the following formats from the starting address of position control parameters of each axis.

Offset Address	Name	Initial value	Setting range and description
H0	Unit setting	H0	Sets the unit system for the position control movement amount of each axis. The same unit system should be set for all interpolation axes. H0: Pulse H100: μm (Min. position instruction 0.1 μm) H101: μm (Min. position instruction 1 μm) H200: inch (Min. position instruction 0.1 inch) H201: inch (Min. position instruction 1 inch) H300: degree (Min. position instruction 0.1 degree) H301: degree (Min. position instruction 1 degree) An error will be reported in case of settings other than the above.
H1	System reserved	—	—
H2-H3	Pulses per rotation	K1	Sets the pulses per rotation of the motor. Conversion of the pulse number is required according to the setting of mm, inch or degree. Setting Range: K1-K32767 An error will be reported in case of settings other than the above.
H4-H5	Movement per rotation	K1	Sets the movement per rotation of the motor. Conversion of the pulse number is required according to the setting of mm, inch or degree. Setting Range: K1-K32767 An error will be reported in case of settings other than the above. The explanations will differ depending on different unit systems. μm: 1 μm inch: 1/10,000 inch degree: 1 degree
H6	System reserved	—	—

<table>
<tr><th>Offset Address</th><th>Name</th><th>Initial value</th><th>Setting range and description</th></tr>
<tr><td>H7</td><td>Pulse input mode</td><td>H20</td><td>Sets pulse input signals.
The settings should be made according to the pulse input purpose.
<table>
<tr><th>bit</th><th>Name</th><th>Contents</th></tr>
<tr><td>0</td><td>Rotation direction</td><td>Sets the pulse input rotation direction.
0. Forward Run
1. Reverse Run</td></tr>
<tr><td>1</td><td>—</td><td>—</td></tr>
<tr><td>3-2</td><td>Pulse input mode</td><td>Sets the input mode of pulse input.
Bit3 Bit2
0 0: 2-phase input
0 1: Direction identification input
1 0: Separate input
1 1: Reserve (at the initial value when setting)</td></tr>
<tr><td>5-4</td><td>Input multiplication</td><td>Used when the input mode (Bit2-3) of pulse input is set to "2-phase input" for setting the counting multiplier of pulses.
Bit5 Bit4
0 0: ×1 (1 multiplier)
0 1: ×2 (2 multipliers)
1 0: ×4 (4 multipliers)
1 1: Reserve (at the initial value when setting)</td></tr>
<tr><td>7-6</td><td>Pulse input application</td><td>Specifies the application of pulse input of each axis.
• Pulse generator: the pulse input is connected to the manual pulse generator.
• Feedback pulse: the pulse input is connected to the encoder feedback pulse.
• High speed counter
Bit7 Bit6
0 0: Pulse generator
0 1: Feedback pulse
1 0: High speed counter
1 1: Reserve (at the initial value when setting)</td></tr>
<tr><td>15-8</td><td>—</td><td>—</td></tr>
</table></td></tr>
<tr><td>H8</td><td>Movement auto check correction numerator</td><td>K1</td><td rowspan="2">Sets the correction value for the pulse input during movement auto check of operation of the mechanical system, etc.. Calculates the deviation feedback value (pulse input value after correction) of inputted pulse input values from pulse input terminals according to the following formula and perform movement auto check.
Offset feedback value = (correction numerator/correct denomination) x pulse input
Setting Range: K1-K32767</td></tr>
<tr><td>H9</td><td>Movement auto check correction denominator</td><td>K1</td></tr>
<tr><td>HA</td><td>Movement auto check operation</td><td>K0</td><td>Sets the solution when the difference between the instruction value and the feedback value exceeds the movement check value.
0: error occurs
Performs movement amount check, if the difference between the feedback value and the instruction movement exceeds the movement check value (threshold), error will occur with the operation stopped.
1: warning occurs
Performs movement amount check, if the difference between the feedback value and the instruction movement exceeds the movement check value (threshold), warning will occur with the operation continues.
2: Non-execute
No movement check is executed.</td></tr>
</table>

<table>
<tr><th>Offset Address</th><th>Name</th><th>Initial value</th><th>Setting range and description</th></tr>
<tr><td>HB</td><td>Soft limit valid/invalid</td><td>H0</td><td>Sets whether the soft limit is valid/invalid in each control.
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>0</td><td>Soft limit valid/invalid during position control</td><td>0</td><td>0: Soft limit invalid during position control
1: Soft limit valid during position control</td></tr>
<tr><td>1</td><td>Soft limit valid/invalid during origin return</td><td>0</td><td>0: Soft limit invalid during origin return
1: Soft limit valid during origin return</td></tr>
<tr><td>2</td><td>Soft limit valid/invalid during JOG operation</td><td>0</td><td>0: Soft limit invalid during JOG operation
1: Soft limit valid during JOG operation</td></tr>
<tr><td>15-3</td><td>—</td><td>—</td><td>—</td></tr>
</table></td></tr>
<tr><td>HC-HD</td><td>Upper limit of soft limit</td><td>K1073741823</td><td>Sets the upper limit of soft limit of the absolute coordinates.
The explanations will differ depending on different unit systems.
pulse: -1,073,741,823-1,073,741,823 pulse
μm (0.1 μm): -107,374,182.3-107,374,182.3 μm
μm (1 μm): -1,073,741,823-1,073,741,823 μm
inch (0.00001 inch): -10,737.41823-10,737.41823 inch
inch (0.0001 inch): -107,374.1823-107,374.1823 inch
degree (0.1 degree): -107,374,182.3-107,374,182.3 degree
degree (1 degree): -1,073,741,823-1,073,741,823 degree
An error will be reported in case of settings other than the above.</td></tr>
<tr><td>HE-HF</td><td>Lower limit of soft limit</td><td>K1073741823</td><td>Sets the lower limit of soft limit of the absolute coordinates.
The explanations will differ depending on different unit systems.
pulse: -1,073,741,823-1,073,741,823 pulse
μm (0.1 μm): -107,374,182.3-107,374,182.3 μm
μm (1 μm): -1,073,741,823-1,073,741,823 μm
inch (0.00001 inch): -10,737.41823-10,737.41823 inch
inch (0.0001 inch): -107,374.1823-107,374.1823 inch
degree (0.1 degree): 0.0-359.9 degree
degree (1 degree): 0-359 degree
An error will be reported in case of settings other than the above.</td></tr>
</table>

<table>
<tr><th>Offset Address</th><th>Name</th><th>Initial value</th><th>Setting range and description</th></tr>
<tr><td>H10-H11</td><td>System reserved</td><td>—</td><td>—</td></tr>
<tr><td>H12</td><td>Auxiliary output mode</td><td>HA00</td><td>Sets to enable/disable auxiliary output contacts and auxiliary output codes. The ON time of auxiliary output contacts is determined by the following auxiliary output ON time.
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>7-0</td><td>Auxiliary output mode</td><td>H0</td><td>0000H: disable auxiliary output function (auxiliary output contacts and auxiliary output codes).
0001H: use With mode
0002H: use Delay mode</td></tr>
<tr><td>15-8</td><td>Auxiliary output ON time</td><td>HA</td><td>Setting range: 00H (0 ms) - FFH (255 ms)</td></tr>
</table></td></tr>
<tr><td>H13</td><td>Auxiliary output Delay ratio</td><td>K0</td><td>Sets the ratio of output in the Delay mode during auxiliary output. The setting range is 0 (%) -100 (%), if set to 50%, the auxiliary output will be executed when the position control movement exceeds 50%.</td></tr>
<tr><td>H14</td><td>Limit switch</td><td>H1</td><td>Sets to enable / disable limit input.
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>1</td><td>Limited position valid/invalid</td><td>1</td><td>0: disable limit signal input
1: enable limit signal input</td></tr>
<tr><td>15-2</td><td>—</td><td>—</td><td>—</td></tr>
</table></td></tr>
<tr><td>H15</td><td>Pulse output control code</td><td>H30</td><td>Sets the pulse output of each channel and setting contents of the origin, near origin and position limit signal.
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>0</td><td>Output mode</td><td>0</td><td>0: Pulse/Sign
1: CW/CCW</td></tr>
<tr><td>1</td><td>Rotation direction</td><td>0</td><td>0: elapsed value + CW direction
1: elapsed value + CCW direction</td></tr>
<tr><td>2</td><td>Origin logic</td><td>0</td><td>0: Normal Open
1: Normal Close</td></tr>
<tr><td>3</td><td>Near origin logic</td><td>0</td><td>0: Normal Open
1: Normal Close</td></tr>
<tr><td>4</td><td>Limit + logic</td><td>1</td><td>0: Normal Open
1: Normal Close</td></tr>
<tr><td>5</td><td>Limit—logic</td><td>1</td><td>0: Normal Open
1: Normal Close</td></tr>
<tr><td>15-6</td><td>—</td><td>0</td><td>—</td></tr>
</table></td></tr>
<tr><td>H16-H17</td><td>Startup speed</td><td>K0</td><td>Sets the startup speed of each operation. The startup speed should be changed before the operation starts.
Setting Range: K0-K32767000
An error will be reported in case of settings other than the above.
The explanations will differ depending on different unit systems.
pulse: 1-32,767,000 pps
μm: 1-32,767,000 μm/s
inch: 0.001-32,767.000 inch/s
degree: 0.001-32,767.000 rev/s</td></tr>
</table>

Offset Address	Name	Initial value	Setting range and description
H18	Value of movement auto check	K10000	Sets the threshold value when executing movement auto check. Setting Range: K0-K65536
H19	System reserved	—	—
H1A	Movement auto check interval	K0	Sets the interval for executing movement auto check (unit: ms). Setting range: 0 - 32767 (ms)
H1B-H1F	System reserved	—	—

Offset Address	Name	Initial value	Setting range and description
H20	Origin return setting code	K0	Sets the origin return mode. 0: DOG mode 1 1: DOG mode 2 2: DOG mode 3 3: limit mode 1 4: limit mode 2 5: Z-phase mode 8: data setting An error will be reported in case of settings other than the above.
H21	Origin return direction	K0	Sets action direction of the origin return. 0: process value - direction (position limit − direction) 1: process value + direction (position limit + direction) An error will be reported in case of settings other than the above.
H22	Origin return acceleration time	K100	Sets origin return acceleration and deceleration time. Accelerate as per the acceleration time set once origin return starts, decelerate as per the deceleration time set after finishing near origin input, and then convert to creep speed. Setting range: 0 - 10,000 (ms) An error will be reported in case of settings other than the above.
H23	Origin return deceleration time		
H24-H25	Origin return target speed	K1000	Set origin return target speed. Accelerate to convert to the target speed if there is no near origin input once origin return starts. Setting range: K1-K32767000 An error will be reported in case of settings other than the above. The setting range of different units is as follows: pulse: 1-32,767,000 pps μm: 1-32,767,000 μm/s inch: 0.001-32,767.000 inch/s degree: 0.001-32,767.000 rev/s

<table>
<tr><th>Offset Address</th><th>Name</th><th>Initial value</th><th>Setting range and description</th></tr>
<tr><td>H26-H27</td><td>Origin return creep speed</td><td>K100</td><td>Sets the speed to search the origin after near origin input. The speed set should be less than the origin return target speed
Setting range: K1-K32767000
An error will be reported in case of settings other than the above.
The setting range of different units is as follows:
pulse: 1-32,767,000 pps
μm: 1-32,767,000 μm/s
inch: 0.001-32,767.000 inch/s
degree: 0.001-32,767.000 rev/s</td></tr>
<tr><td>H28</td><td>ON time of the deviation counter removal signal</td><td>K1</td><td>Sets ON time of the deviation counter removal signal after origin return.
Setting range: 1 - 100 ms
ON time of the deviation counter removal signal is 100 ms if the value set exceeds 100 ms.</td></tr>
<tr><td>H29</td><td>JOG running setting code</td><td>H0</td><td>Sets JOG operation mode.
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>0</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>1</td><td>Acceleration/deceleration mode setting</td><td>0</td><td>0: Linear acceleration/deceleration
1: S-shaped acceleration/deceleration</td></tr>
<tr><td>15-2</td><td>—</td><td>—</td><td>—</td></tr>
</table></td></tr>
<tr><td>H2A</td><td>JOG operation acceleration time</td><td rowspan="2">K100</td><td rowspan="2">Sets acceleration time during JOG operation. Accelerate as per the acceleration time set once JOG operation starts, decelerate as per the deceleration time set when JOG operation starting contact is turned OFF, and then stop.
Setting range: 0 - 10,000 (ms)
An error will be reported in case of settings other than the above.</td></tr>
<tr><td>H2B</td><td>JOG operation deceleration time</td></tr>
<tr><td>H2C-H2D</td><td>JOG operation target speed</td><td>K1000</td><td>Sets target speed of JOG operation Accelerate to convert to the target speed when JOG operation starting contact is turned ON once JOG operation starts. Operate at target speed after reaching the target speed.
Setting range: K0-K32767000
An error will be reported in case of settings other than the above.
The interpretation differs depending on different unit systems.
pulse: 1-32,767,000 pps
μm: 1-32,767,000 μm/s
inch: 0.001-32,767.000 inch/s
degree: 0.001-32,767.000 rev/s</td></tr>
</table>

Offset Address	Name	Initial value	Setting range and description
H2E-H32	System reserved	—	—
H33	Emergency-stop deceleration time	K100	It is valid when I/O requests emergency-stop. Decelerate as per the deceleration time. Setting range: 0 - 10,000 (ms) An error will be reported in case of settings other than the above.
H34	System reserved	—	—
H35	Limit-stop deceleration time	K100	It is valid when the operation includes position limit input. Decelerate as per the deceleration time. Setting range: 0 - 10,000 (ms) An error will be reported in case of settings other than the above.
H36	System reserved	—	—
H37	Deceleration time upon error stop	K100	It is valid when an error has occurred. Decelerate as per the deceleration time. Setting range: 0 - 10,000 (ms) An error will be reported in case of settings other than the above.
H38	Pulse generator running setting code	K0	Select from pulse generators of 1-4 when I/O requests pulse generator operation. 0: Pulse generator input 1 1: Pulse generator input 2 2: Pulse generator input 3 3: Pulse generator input 4 An error will be reported in case of settings other than the above.
H39	Numerator of pulse generator running ratio	K1	Sets multiplier of input pulse train during operation of the pulse generator. Multiply input pulse train of the pulse generator by (Numerator of pulse generator running ratio)/(Denominator of pulse generator running ratio), and take the product as instruction pulse number. Setting Range: K1-K32767 An error will be reported in case of settings other than the above.
H3A	Denominator of pulse generator running ratio	K1	Sets divisor of input pulse train during operation of the pulse generator. Multiply input pulse train of the pulse generator by (Numerator of pulse generator running ratio)/(Denominator of pulse generator running ratio), and take the product as instruction pulse number. Setting Range: K1-K32767 An error will be reported in case of settings other than the above.

<table>
<tr><th>Offset Address</th><th>Name</th><th>Initial value</th><th>Setting range and description</th></tr>
<tr><td>H3B</td><td>Input mode during operation of the pulse generator</td><td>K0</td><td>Sets regions of position control operation and interpolation operation mode.
0: Standard operation
1: Speed limit (pulse held)
2: Speed limit (discarded)
An error will be reported in case of settings other than the above.</td></tr>
<tr><td>H3C-H40</td><td>System reserved</td><td>—</td><td>—</td></tr>
<tr><td>H41</td><td>J-point control code</td><td>H0</td><td>Sets J-point control code.
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>0</td><td>—</td><td>—</td><td>—</td></tr>
<tr><td>1</td><td>Acceleration/deceleration mode setting</td><td>0</td><td>0: Linear acceleration/deceleration
1: S-shaped acceleration/deceleration</td></tr>
<tr><td>15-2</td><td>—</td><td>—</td><td>—</td></tr>
</table></td></tr>
<tr><td>H42</td><td>J-point acceleration time</td><td rowspan="2">K100</td><td rowspan="2">Sets J-point acceleration time.
Setting range: 0 - 10,000 (ms)
An error will be reported in case of settings other than the above.</td></tr>
<tr><td>H43</td><td>J-point deceleration time</td></tr>
<tr><td>H44</td><td rowspan="2">J point target speed</td><td rowspan="2">K1000</td><td rowspan="2">Sets J-point target speed.
Setting range: K0-K32767000
An error will be reported in case of settings other than the above.
The interpretation differs depending on different unit systems.
pulse: 1-32,767,000 pps
μm: 1-32,767,000 μm/s
inch: 0.001-32,767.000 inch/s
degree: 0.001-32,767.000 rev/s</td></tr>
<tr><td>H45</td></tr>
<tr><td>H46-H47</td><td>System reserved</td><td>—</td><td>—</td></tr>
<tr><td>H48-H49</td><td>Max. speed of pulse generator running</td><td>K0</td><td>Max. speed when selecting speed limit as pulse generator operation mode. Operate at the max. speed when the speed obtained by multiplying pulse generator input by (Numerator of pulse generator running/Denominator of pulse generator running) exceeds the specified max. speed.
Unit: setting unit X1000/s
Input range: 0-32767000 (pulse/s)
※When this region is set to 0, operate at the min. speed set.</td></tr>
<tr><td>H4A-H4B</td><td>Origin coordinates</td><td>—</td><td>Save origin coordinates after origin return.</td></tr>
<tr><td>H4C-H4F</td><td>System reserved</td><td>—</td><td>—</td></tr>
</table>

■ Position control data setting region

Please refer to the schedule after Page 26-37 for start bit address of each position control data sheet.

<table>
<tr><th>Offset Address</th><th>Name</th><th>Initial value</th><th>Setting range and description</th></tr>
<tr><td>H0</td><td>Control code</td><td>H0</td><td>Sets position designation mode of position control operation and acceleration/deceleration mode region.
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>0</td><td>Specify the increment and absolute value.</td><td>H0</td><td>0: Increment mode
1: Absolute value mode</td></tr>
<tr><td>1</td><td>Acceleration/decelerati on mode setting</td><td>H0</td><td>0: Linear acceleration/deceleration
1: S-shaped acceleration/deceleration</td></tr>
<tr><td>15-2</td><td>—</td><td>—</td><td>—</td></tr>
</table></td></tr>
<tr><td>H1</td><td>Operation Mode</td><td>H0</td><td>Sets regions of position control operation and interpolation operation mode. The interpolation relationship should be subject to settings of axis group setting region in general application region of position control memory. During interpolation operation, the setting of min. No. axis in axis group is valid.
<table>
<tr><th>bit</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>7-0</td><td>Control mode</td><td>H0</td><td>H0: E-point control (end-point control)
H1: P-point control (pass-point control)
H2: C-point control (continue-point control)
H3: J-point control (speed-point control)
An error will be reported in case of settings other than the above.</td></tr>
<tr><td>15-8</td><td>Interpolation content setting</td><td>H0</td><td>H0: Linear interpolation (resultant speed assignment)
H1: Linear interpolation (long-axis speed assignment)
H10: Arc interpolation (center point assignment/CW direction)
H11: Arc interpolation (center point assignment/CCW direction)
H20: Arc interpolation (passing point assignment)
H50: Spiral interpolation (center point assignment/CW direction/X-axis feeding)
H51: Spiral interpolation (center point assignment/CCW direction/X-axis feeding)
H52: Spiral interpolation (center point assignment/CW direction/Y-axis feeding)
H53: Spiral interpolation (center point assignment/CCW direction/Y-axis feeding)
H54: Spiral interpolation (center point assignment/CW direction/Z-axis feeding)
H55: Spiral interpolation (center point assignment/CCW direction/Z-axis feeding)
H60: Spiral interpolation (passing point assignment/X-axis feeding)
H61: Spiral interpolation (passing point assignment/Y-axis feeding)
H62: Spiral interpolation (passing point assignment/Z-axis feeding)
An error will be reported in case of settings other than the above.</td></tr>
</table></td></tr>
<tr><td>H2-H3</td><td>System reserved</td><td>—</td><td>—</td></tr>
</table>

Offset Address	Name	Initial value	Setting range and description
H4	Position control acceleration time	K100	Setting regions of acceleration/deceleration time during position control operation. Independent acceleration/ deceleration setting During interpolation operation, the setting of min. No. axis in axis group is valid. Setting range: 0 - 10,000 (ms) An error will be reported in case of settings other than the above.
H5	Position control deceleration time		
H6-H7	Position control target speed (Interpolation speed)	K1000	It is the target speed of target axis during independent axis operation, and target speed of interpolation during interpolation operation. During interpolation operation, the setting of min. No. axis in axis group is valid. Setting range: K1-K32767000 An error will be reported in case of settings other than the above. The interpretation differs depending on different unit systems. pulse: 1-32,767,000 pps μm: 1-32,767,000 μm/s inch: 0.001-32,767.000 inch/s degree: 0.001-32,767.000 rev/s

Offset Address	Name	Initial value	Setting range and description
H8-H9	Position control movement amount	K0	Movement setting region during position control operation It is interpreted as increment movement or absolute value coordinate in control mode setting. Setting range: K-1073741823-K1073741823 An error will be reported in case of settings other than the above. The interpretation differs depending on different unit systems. pulse: -1,073,741,823-1,073,741,823 pulse μm (0.1 μm): -107,374,182.3-107,374,182.3 μm μm (1 μm): -1,073,741,823-1,073,741,823 μm inch (0.00001 inch): -10,737.41823-10,737.41823 inch inch (0.0001 inch): -107,374.1823-107,374.1823 inch degree (0.1 degree): -107,374,182.3-107,374,182.3 degree degree (1 degree): -1,073,741,823-1,073,741,823 degree
HA-HB	Auxiliary point	K0	Auxiliary point (center point and passing point coordinates) setting region during arc interpolation and spiral interpolation control Setting range: K-1073741823-K1073741823 An error will be reported in case of settings other than the above. The interpretation differs depending on different unit systems. pulse: -1,073,741,823-1,073,741,823 pulse μm (0.1 μm): -107,374,182.3-107,374,182.3 μm μm (1 μm): -1,073,741,823-1,073,741,823 μm inch (0.00001 inch): -10,737.41823-10,737.41823 inch inch (0.0001 inch): -107,374.1823-107,374.1823 inch degree (0.1 degree): -107,374,182.3-107,374,182.3 degree degree (1 degree): -1,073,741,823-1,073,741,823 degree
HC	Dwell time	K0	At the end of position control operation of this data sheet, for C: continue-point, the motor stops as per dwell time to start operation of next data sheet; for P: pass-point, ignore this setting; for E: end-point, turn position control finishing contact to ON after standby as per the dwell time. Setting range: 0 - 32,767 (ms) An error will be reported in case of settings other than the above.
HD	Auxiliary output code	K0	Sets auxiliary output mode of the region via parameters, information of each axis and data output to auxiliary output code of the monitoring region. Without setting range
HE-HF	System reserved	—	—

◆ Emphasis

Position control memory address allocated to each item of the position control data sheet comprises address allocated to each axis and each data sheet and the offset address.

■ Starting address of position control data sheet (1-200)

Data sheet No.	Starting address	Data sheet No.	Starting address	Data sheet No.	Starting address	Data sheet No.	Starting address	Data sheet No.	Starting address
1	H50	41	H2D0	81	H550	121	H7D0	161	HA50
2	H60	42	H2E0	82	H560	122	H7E0	162	HA60
3	H70	43	H2F0	83	H570	123	H7F0	163	HA70
4	H80	44	H300	84	H580	124	H800	164	HA80
5	H90	45	H310	85	H590	125	H810	165	HA90
6	HA0	46	H320	86	H5A0	126	H820	166	HAA0
7	HB0	47	H330	87	H5B0	127	H830	167	HAB0
8	HC0	48	H340	88	H5C0	128	H840	168	HAC0
9	HD0	49	H350	89	H5D0	129	H850	169	HAD0
10	HE0	50	H360	90	H5E0	130	H860	170	HAE0
11	HF0	51	H370	91	H5F0	131	H870	171	HAF0
12	H100	52	H380	92	H600	132	H880	172	HB00
13	H110	53	H390	93	H610	133	H890	173	HB10
14	H120	54	H3A0	94	H620	134	H8A0	174	HB20
15	H130	55	H3B0	95	H630	135	H8B0	175	HB30
16	H140	56	H3C0	96	H640	136	H8C0	176	HB40
17	H150	57	H3D0	97	H650	137	H8D0	177	HB50
18	H160	58	H3E0	98	H660	138	H8E0	178	HB60
19	H170	59	H3F0	99	H670	139	H8F0	179	HB70
20	H180	60	H400	100	H680	140	H900	180	HB80
21	H190	61	H410	101	H690	141	H910	181	HB90
22	H1A0	62	H420	102	H6A0	142	H920	182	HBA0
23	H1B0	63	H430	103	H6B0	143	H930	183	HBB0
24	H1C0	64	H440	104	H6C0	144	H940	184	HBC0
25	H1D0	65	H450	105	H6D0	145	H950	185	HBD0
26	H1E0	66	H460	106	H6E0	146	H960	186	HBE0
27	H1F0	67	H470	107	H6F0	147	H970	187	HBF0
28	H200	68	H480	108	H700	148	H980	188	HC00
29	H210	69	H490	109	H710	149	H990	189	HC10
30	H220	70	H4A0	110	H720	150	H9A0	190	HC20
31	H230	71	H4B0	111	H730	151	H9B0	191	HC30
32	H240	72	H4C0	112	H740	152	H9C0	192	HC40
33	H250	73	H4D0	113	H750	153	H9D0	193	HC50
34	H260	74	H4E0	114	H760	154	H9E0	194	HC60
35	H270	75	H4F0	115	H770	155	H9F0	195	HC70
36	H280	76	H500	116	H780	156	HA00	196	HC80
37	H290	77	H510	117	H790	157	HA10	197	HC90
38	H2A0	78	H520	118	H7A0	158	HA20	198	HCA0
39	H2B0	79	H530	119	H7B0	159	HA30	199	HCB0
40	H2C0	80	H540	120	H7C0	160	HA40	200	HCC0

■ Starting address of position control data sheet (201 - 400)

Data sheet No.	Starting address	Data sheet No.	Starting address	Data sheet No.	Starting address	Data sheet No.	Starting address	Data sheet No.	Starting address
201	HCD0	241	HF50	281	H11D0	321	H1450	361	H16D0
202	HCE0	242	HF60	282	H11E0	322	H1460	362	H16E0
203	HCF0	243	HF70	283	H11F0	323	H1470	363	H16F0
204	HD00	244	HF80	284	H1200	324	H1480	364	H1700
205	HD10	245	HF90	285	H1210	325	H1490	365	H1710
206	HD20	246	HFA0	286	H1220	326	H14A0	366	H1720
207	HD30	247	HFB0	287	H1230	327	H14B0	367	H1730
208	HD40	248	HFC0	288	H1240	328	H14C0	368	H1740
209	HD50	249	HFD0	289	H1250	329	H14D0	369	H1750
210	HD60	250	HFE0	290	H1260	330	H14E0	370	H1760
211	HD70	251	HFF0	291	H1270	331	H14F0	371	H1770
212	HD80	252	H1000	292	H1280	332	H1500	372	H1780
213	HD90	253	H1010	293	H1290	333	H1510	373	H1790
214	HDA0	254	H1020	294	H12A0	334	H1520	374	H17A0
215	HDB0	255	H1030	295	H12B0	335	H1530	375	H17B0
216	HDC0	256	H1040	296	H12C0	336	H1540	376	H17C0
217	HDD0	257	H1050	297	H12D0	337	H1550	377	H17D0
218	HDE0	258	H1060	298	H12E0	338	H1560	378	H17E0
219	HDF0	259	H1070	299	H12F0	339	H1570	379	H17F0
220	HE00	260	H1080	300	H1300	340	H1580	380	H1800
221	HE10	261	H1090	301	H1310	341	H1590	381	H1810
222	HE20	262	H10A0	302	H1320	342	H15A0	382	H1820
223	HE30	263	H10B0	303	H1330	343	H15B0	383	H1830
224	HE40	264	H10C0	304	H1340	344	H15C0	384	H1840
225	HE50	265	H10D0	305	H1350	345	H15D0	385	H1850
226	HE60	266	H10E0	306	H1360	346	H15E0	386	H1860
227	HE70	267	H10F0	307	H1370	347	H15F0	387	H1870
228	HE80	268	H1100	308	H1380	348	H1600	388	H1880
229	HE90	269	H1110	309	H1390	349	H1610	389	H1890
230	HEA0	270	H1120	310	H13A0	350	H1620	390	H18A0
231	HEB0	271	H1130	311	H13B0	351	H1630	391	H18B0
232	HEC0	272	H1140	312	H13C0	352	H1640	392	H18C0
233	HED0	273	H1150	313	H13D0	353	H1650	393	H18D0
234	HEE0	274	H1160	314	H13E0	354	H1660	394	H18E0
235	HEF0	275	H1170	315	H13F0	355	H1670	395	H18F0
236	HF00	276	H1180	316	H1400	356	H1680	396	H1900
237	HF10	277	H1190	317	H1410	357	H1690	397	H1910
238	HF20	278	H11A0	318	H1420	358	H16A0	398	H1920
239	HF30	279	H11B0	319	H1430	359	H16B0	399	H1930
240	HF40	280	H11C0	320	H1440	360	H16C0	400	H1940

■ Starting address of position control data sheet (401 - 600)

Data sheet No.	Starting address	Data sheet No.	Starting address	Data sheet No.	Starting address	Data sheet No.	Starting address	Data sheet No.	Starting address
401	H1950	441	H1BD0	481	H1E50	521	H20D0	561	H2350
402	H1960	442	H1BE0	482	H1E60	522	H20E0	562	H2360
403	H1970	443	H1BF0	483	H1E70	523	H20F0	563	H2370
404	H1980	444	H1C00	484	H1E80	524	H2100	564	H2380
405	H1990	445	H1C10	485	H1E90	525	H2110	565	H2390
406	H19A0	446	H1C20	486	H1EA0	526	H2120	566	H23A0
407	H19B0	447	H1C30	487	H1EB0	527	H2130	567	H23B0
408	H19C0	448	H1C40	488	H1EC0	528	H2140	568	H23C0
409	H19D0	449	H1C50	489	H1ED0	529	H2150	569	H23D0
410	H19E0	450	H1C60	490	H1EE0	530	H2160	570	H23E0
411	H19F0	451	H1C70	491	H1EF0	531	H2170	571	H23F0
412	H1A00	452	H1C80	492	H1F00	532	H2180	572	H2400
413	H1A10	453	H1C90	493	H1F10	533	H2190	573	H2410
414	H1A20	454	H1CA0	494	H1F20	534	H21A0	574	H2420
415	H1A30	455	H1CB0	495	H1F30	535	H21B0	575	H2430
416	H1A40	456	H1CC0	496	H1F40	536	H21C0	576	H2440
417	H1A50	457	H1CD0	497	H1F50	537	H21D0	577	H2450
418	H1A60	458	H1CE0	498	H1F60	538	H21E0	578	H2460
419	H1A70	459	H1CF0	499	H1F70	539	H21F0	579	H2470
420	H1A80	460	H1D00	500	H1F80	540	H2200	580	H2480
421	H1A90	461	H1D10	501	H1F90	541	H2210	581	H2490
422	H1AA0	462	H1D20	502	H1FA0	542	H2220	582	H24A0
423	H1AB0	463	H1D30	503	H1FB0	543	H2230	583	H24B0
424	H1AC0	464	H1D40	504	H1FC0	544	H2240	584	H24C0
425	H1AD0	465	H1D50	505	H1FD0	545	H2250	585	H24D0
426	H1AE0	466	H1D60	506	H1FE0	546	H2260	586	H24E0
427	H1AF0	467	H1D70	507	H1FF0	547	H2270	587	H24F0
428	H1B00	468	H1D80	508	H2000	548	H2280	588	H2500
429	H1B10	469	H1D90	509	H2010	549	H2290	589	H2510
430	H1B20	470	H1DA0	510	H2020	550	H22A0	590	H2520
431	H1B30	471	H1DB0	511	H2030	551	H22B0	591	H2530
432	H1B40	472	H1DC0	512	H2040	552	H22C0	592	H2540
433	H1B50	473	H1DD0	513	H2050	553	H22D0	593	H2550
434	H1B60	474	H1DE0	514	H2060	554	H22E0	594	H2560
435	H1B70	475	H1DF0	515	H2070	555	H22F0	595	H2570
436	H1B80	476	H1E00	516	H2080	556	H2300	596	H2580
437	H1B90	477	H1E10	517	H2090	557	H2310	597	H2590
438	H1BA0	478	H1E20	518	H20A0	558	H2320	598	H25A0
439	H1BB0	479	H1E30	519	H20B0	559	H2330	599	H25B0
440	H1BC0	480	H1E40	520	H20C0	560	H2340	600	H25C0

■ Starting address of position control data sheet (extended data sheets 10001 - 10025)

Data sheet No.	Starting address	Data sheet No.	Starting address	Data sheet No.	Starting address	Data sheet No.	Starting address	Data sheet No.	Starting address
10001	H2670	10006	H26C0	10011	H2710	10016	H2760	10021	H27B0
10002	H2680	10007	H26D0	10012	H2720	10017	H2770	10022	H27C0
10003	H2690	10008	H26E0	10013	H2730	10018	H2780	10023	H27D0
10004	H26A0	10009	H26F0	10014	H2740	10019	H2790	10024	H27E0
10005	H26B0	10010	H2700	10015	H2750	10020	H27A0	10025	H27F0

■ Starting address of position control data sheet (extended data sheets 10026-10100)

Data sheet No..	Starting address	Data sheet No.	Starting address	Data sheet No.	Starting address	Data sheet No.	Starting address	Data sheet No.	Starting address
10026	H2800	10041	H28F0	10056	H29E0	10071	H2AD0	10086	H2BC0
10027	H2810	10042	H2900	10057	H29F0	10072	H2AE0	10087	H2BD0
10028	H2820	10043	H2910	10058	H2A00	10073	H2AF0	10088	H2BE0
10029	H2830	10044	H2920	10059	H2A10	10074	H2B00	10089	H2BF0
10030	H2840	10045	H2930	10060	H2A20	10075	H2B10	10090	H2C00
10031	H2850	10046	H2940	10061	H2A30	10076	H2B20	10091	H2C10
10032	H2860	10047	H2950	10062	H2A40	10077	H2B30	10092	H2C20
10033	H2870	1048	H2960	10063	H2A50	10078	H2B40	10093	H2C30
10034	H2880	10049	H2970	10064	H2A60	10079	H2B50	10094	H2C40
10035	H2890	10050	H2980	10065	H2A70	10080	H2B60	10095	H2C50
10036	H28A0	10051	H2990	10066	H2A80	10081	H2B70	10096	H2C60
10037	H28B0	10052	H29A0	10067	H2A90	10082	H2B80	10097	H2C70
10038	H28C0	10053	H29B0	10068	H2AA0	10083	H2B90	10098	H2C80
10039	H28D0	10054	H29C0	10069	H2AB0	10084	H2BA0	10099	H2C90
10040	H28E0	10055	H29D0	10070	H2AC0	10085	H2BB0	10100	H2CA0

(Note 1): Data sheets No.10026--10100 are supported by control units of Motion CPU Ver.1.50 or above.

26.3.5 Synchronization control region (storage region No.4)

■ Universal setting region for synchronization

<table>
<tr><th>Offset Address</th><th>Name</th><th>Initial value</th><th>Contents</th></tr>
<tr><td>H0</td><td>Selection of main station axis of synchronization for each axis</td><td>H0</td><td>sets the main station axis of each axis.
<table>
<tr><td>Setting value</td><td>Main station axis</td></tr>
<tr><td>H0</td><td>No main station axis of synchronization, or the set target axis is the main station axis</td></tr>
<tr><td>H1</td><td>Axis 1</td></tr>
<tr><td>H2</td><td>Axis 2</td></tr>
<tr><td>H3</td><td>Axis 3</td></tr>
<tr><td>H4</td><td>Axis 4</td></tr>
<tr><td>H10</td><td>Virtual axis</td></tr>
<tr><td>H21</td><td>Pulse input 1</td></tr>
<tr><td>H22</td><td>Pulse input 2</td></tr>
<tr><td>H23</td><td>Pulse input 3</td></tr>
<tr><td>H24</td><td>Pulse input 4</td></tr>
</table></td></tr>
<tr><td>H1</td><td>Selection of synchronization output function of each axis</td><td>H0</td><td>saves the status of the synchronous operation function set for the axes.
<table>
<tr><td>bit</td><td>Function</td><td>Setting</td></tr>
<tr><td>0</td><td>Setting electronic gear operation</td><td rowspan="4">0: not used
1: used</td></tr>
<tr><td>1</td><td>Setting clutch operation</td></tr>
<tr><td>2</td><td>Setting electronic cam operation</td></tr>
<tr><td>3</td><td>Setting advance timing correction synchronization</td></tr>
<tr><td>15-4</td><td>System reserved</td><td></td></tr>
</table></td></tr>
<tr><td>H2-HF</td><td>System reserved</td><td>—</td><td>—</td></tr>
</table>

(Note 1): advance timing correction is supported by control units with Motion CPU Ver.1.50 or above.

■ Electronic gear setting region

Offset Address	Name	Initial value	Contents
H10-H11	Gear ratio numerator of each axis	K1	K1-K 2147483647
H12-H13	Gear ratio denominator of each axis	K1	K1-K2147483647
H14	Gear ratio change time of each axis	K1	K1-K10000
H15-H1F	System reserved	—	—

■ Electronic clutch setting region

Offset Address	Name	Initial value	Contents
H20	Types of electronic clutch ON triggers	H0	H0: I/O Y clutch ON request
H21	Clutch ON pulse edge selection	H0	Sets valid conditions for triggering signals H0: Level H1: Rising edge H2: Falling edge
H22-H27	System reserved	—	—
H28	Types of clutch OFF triggers	H00	H00: I/O clutch OFF request H11: I/O＋ "I/O + Clutch Control Post Phase Clutch OFF".
H29	Clutch OFF pulse edge selection	H0	Sets valid conditions for triggering signals H0: Level H1: Rising edge H2: Falling edge
H2A	Clutch OFF phase ratio	H0	When "I/O + Clutch Control Post Phase Clutch OFF" is selected in the Types of Clutch OFF Trigger is selected, the phase for the clutch to be OFF is set proportionally. . [Setting range] 0-99 (%)
H2B-H2F	System reserved		
H30	Clutch ON modes	H0	H0: Direct H1: Slippage
H31	System reserved	—	—
H32	Clutch ON slippage mode	H0	H0: slippage time setting
H33	Clutch ON slippage time	K1	1~10000 ms
H34-H35	System reserved	—	—
H36	Clutch ON slippage curve selection	H0	H0: Linear
H37-H3F	System reserved	—	—
H40	Clutch OFF modes	H0	H0: Direct H1: Slippage
H41	System reserved	—	—
H42	Clutch OFF slippage mode	H0	H0: slippage time setting
H43	Clutch OFF slippage time	K1	1~10000 ms
H44-H45	System reserved	—	—
H46	Clutch OFF slippage curve selection	H0	H0: Linear
H47-H4F	System reserved	—	—

■ Electronic cam setting region

Offset Address	Name	Initial value	Contents
H50-H51	Cam control Cycle of main station axis of synchronization	K1	Settings for cycle of main station axis of synchronization for cam control K1-K 2147483647
H52	System reserved	—	—
H53	No. of cam curve used	K1	No. of cam curve used which is registered 1-(16)
H54-H55	Cam stroke	1	setting for upper limit of movement upon cam control K1-K2147483647
H56-H57	Advance timing benchmark	0	When using the advance timing correction function, the unit sets the correction benchmark to calculate the advance timing correction. [Setting range] -1,073,741,823~1,073,741,823 The unit depends on the unit system of the main station axis. Pulse: -1,073,741,823-1,073,741,823 pulse μm (0.1 μm): -107,374,182.3-107,374,182.3 μm μm (1 μm): -1,073,741,823-1,073,741,823 μm inch (0.00001 inch): -10,737.41823-10,737.41823 inch inch (0.0001 inch): -107,374.1823-107,374.1823 inch degree (0.1 degree): -107,374,182.3-107,374,182.3 degree degree (1 degree): -1,073,741,823-1,073,741,823 degree
H58-H59	Advance timing correction speed	100	When using the advance timing correction function, the unit sets the benchmark speed to calculate the advance timing correction. [Setting range] 1~32,767,000 (designated unit system) The unit depends on the unit system of the main station axis. Pulse: 1-32,767,000 pps μm: 1-32,767,000 μm/s inch: 0.001-32,767.000 inch/s degree: 0.001-32,767.000 rev/s
H5A	Parameter change time for advance timing correction	100	sets the time before the reflected changed value when the relevant parameters of advanced timing correction (benchmark speed and benchmark amount for advance timing correction) has been changed during the operation of the electronic cam. [Setting range] 1 - 10000 ms
H5B-H6F	System reserved	—	—

(Note 1): advance timing correction is supported by control units with Motion CPU Ver.1.50 or above.

26.3.6 Setting region for position control operation change (storage region No. 5)

Offset Address	Name	Initial value	Contents
H0	Position control speed change ratio designation (multiplier)	K100	The region for setting the change ratio (multiplier) of the instruction speed upon position control speed change. It takes effect as long as the set value (ratio) is set without the need for I/O to send the change request. 1-300 (%)
H1	Position control speed change Change mode selection	H0	The region to set the change range upon change in position control speed 0000H: only data sheets in operation 0001H: data sheets in operation-E-point data sheet (till the completion of operation) In cases other than the values above, follow the operation of 0000H (only data sheets in operation).
H2-H3	Position control speed change Change speed	K100	The region to set the changed speed during position control speed change Sets the values after unit conversion. 1-32,767,000 (designated unit system)
H4-H9	System reserved	—	—
HA-HB	Position control movement change Change movement	K0	The setting region for changing movement when changing position control movement Sets the values after unit conversion. K-1,073,741,823 -K1,073,741,823
HC-HF	System reserved	—	—

26.4 System Register List

	No.	Name	Initial value	Sets value range and description
Memory allocation	0	Sequential control program region capacity setting	32	24, 32, 40 k words (note 1)
Hold / Non-hold	4	The differential rising edge execution instruction in MC is detected, hold the previous value	Hold	Hold / non-hold
	5	Counter starting number	1008	0 - 1024
	6	Timer / counter hold region starting number	1008	0 - 1024
	7	Internal relay hold region starting number	504	0 - 512
	8	Data register hold region starting number (Note 2)	11970, 32450, 65218	0-12285 0-32765 0-65533
	10	Link relay for PC (PLC) link W0-0 Hold region starting word number	64	0 - 64
	11	Link relay for PC (PLC) link W0-1 Hold region starting word number	128	64 - 128
	12	Link register for PC (PLC) link W0-0 Hold region starting number	128	0 - 128
	13	Link register for PC (PLC) link W0-1 Hold region starting number	256	128 - 256
	14	Selection of hold / non-hold in the step ladder diagram program	Non-hold	Hold / non-hold
Operate during abnormality	20	Selection of dual output (disable / enable)	Disable	Disable / enable
	23	Selection of operation mode in case of I/O check exception (stop / run)	Stop	Stop / run
	24	Operation stop upon Initial error of the motion part	Stop	Stop / run
	25	Selection of operation mode in case of position control operation error (stop / run)	Run	Run/stop
	26	Selection of operation mode in case of operational error (stop / run)	Stop	Stop / run
	4	Selection of operation mode in case of battery error	Not execute	Not execute: Do not notify the self-diagnostic error when the battery is abnormal, the ERR.LED does not flash. Execute: Do not notify the self-diagnostic error when the battery is abnormal, the ERR.LED flashes.

(Note 1): System register No. 0: can set the sequential control program region capacity only in off-line editing. To set the content effectively, you need to download it to the control unit controller.

(Note 2): System register No. 0: if you change the sequential control program region capacity, the capacity of the data register DT will be changed.

(Note 3): System registers No.4-No.14: The data within the setting range of the register can be kept only when equipped with the optional battery. Use the initial valuesdirectly when the battery is not installed.

	No.	Name	Initial value	Sets value range and description
Time setting	31	Multi-frame processing waiting time	6500.0 ms	10 - 81900 ms (unit: 2.5 ms)
	32	Timeout time for SEND / RECV, RMRD / RMWT instructions	1000.0 ms	10 - 81900 ms (unit: 2.5 ms)
	34	Constant scanning time	Normal scanning	0: normal scanning (unit: 0.5 ms) 0 - 350 ms: scan once at a specified time interval
	36	Expansion unit recognition time	0	0 - 10 seconds (unit: 0.1 second) 0: no waiting time
	37	Task time priority setting (note 1)	Standard	Standard / operation
PC Link W 0 — 0 Setting	40	Usage range of the link relay	0	0 - 64 words
	41	Usage range of the link register	0	0 - 128 words
	42	Starting word number sent by the link relay	0	0 - 63
	43	Link relay sending capacity	0	0 - 64 words
	44	Starting number sent by the link register	0	0 - 127
	45	Link register sending capacity	0	0 - 127 words
	46	PC (PLC) link switching flag	Standard	Normal / reverse
	47	MEWNET-W0 PC (PLC) link maximum station number assignment	16	1 - 16
	48	PLC link communication speed (note 2)	115200 bps	115200bps/230400bps
PC Link W 0 — 1 Setting	50	Usage range of the link relay	0	0 - 64 words
	51	Usage range of the link register	0	0 - 128 words
	52	Starting word number sent by the link relay	64	64 - 127
	53	Link relay sending capacity	0	0 - 64 words
	54	Starting number sent by the link register	128	128 - 255
	55	Link register sending capacity	0	0 - 127 words
	57	MEWNET-W0 PC (PLC) link maximum station number assignment	16	1 - 16

(Note 1): When the system register No. 37 task time is set as "Operation" preferentially, after every scan, the time required for the communication process is reduced to 1 port, the operation processing has priority.

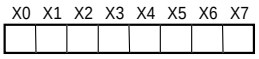
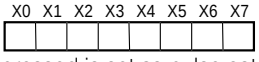
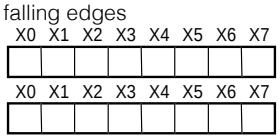
(Note 2): The system register No. 48 PLC link communication speed is set in the same dialog box that the COM0 port and COM1 port setting used.

	No.	Name	Initial value	Sets value range and description
Master input setting 1 (HSC)	400	High-speed counter settings (X0-X3)	CH0: X0 is not set as a high speed counter	X0 is not set as a high speed counter addition input (X0) subtraction input (X0) 2-phase input (X0, X1) separate input (X0, X1) direction identification (X0, X1)
			CH1: X1 is not set as a high speed counter	X1 is not set as a high speed counter addition input (X1) subtraction input (X1)
			CH2: X2 is not set as a high speed counter	X2 is not set as a high speed counter addition input (X2) subtraction input (X2) 2-phase input (X2, X3) separate input (X2, X3) direction identification (X2, X3)
			CH3: X3 is not set as a high speed counter	X3 is not set as a high speed counter addition input (X3) subtraction input (X3)
Master input setting 2 (HSC)	401	High-speed counter settings (X4-X7)	CH4: X4 is not set as a high speed counter	X4 is not set as a high speed counter addition input (X4) subtraction input (X4) 2-phase input (X4, X5) separate input (X4, X5) direction identification (X4, X5)
			CH5: X5 is not set as a high speed counter	X5 is not set as a high speed counter addition input (X5) subtraction input (X5)
			CH6: X6 is not set as a high speed counter	X6 is not set as a high speed counter addition input (X6) subtraction input (X6) 2-phase input (X6, X7) separate input (X6, X7) direction identification (X6, X7) Reset input of the high speed counter CH0
			CH7: X7 is not set as a high speed counter	X7 is not set as a high speed counter addition input (X7) subtraction input (X7) reset input of high-speed counter CH2

(Note 1): When the high-speed counter CH0, CH2, CH4 and CH6 are set to one of 2-phase, alone and direction identification, the setting of CH1, CH3, CH5 and CH7 are invalid.

(Note 2): The high-speed counter hardware reset input can only use CH0 and CH2. X6 and X7 can be allocated for CH0 and CH2 respectively.

(Note 3): When the same input is set to one of high-speed counter, pulse catch and interrupt input, the priority order is high-speed counter → pulse catch → interrupt input.

	No.	Name	Initial value	Sets value range and description
Interruption and pulse catch setting	403	Pulse catch input setting (X0-X7)	General input	Normal input Input pulse  The contact pressed is set as pulse catch input.
	404	Interrupt input setting (X0-X7)	General input	General input Interrupt input  The contact pressed is set as pulse catch input.
Interrupt pulse edge setting	405	Master input interrupt pulse edge setting (X0-X7)	Rising edge	Rising edge Falling edge rising and falling edges  The contact pressed is set as rising edge and falling edge.

(Note 1): When the same input is set to one of high-speed counter, pulse catch and interrupt input, the priority order is high-speed counter → pulse catch → interrupt input.

	No.	Name	Initial value	Sets value range and description
COM0／COM1／COM2／COM3 Port setting	410 411	Unit number	1	1 - 99
	412	Communication mode	Computer link	Computer link universal communication PC (PLC) link MODBUS RTU
		Selection of the modem connection	Not execute	Conduct / not conduct
	413 414	Transmission format	Data length: 8 bit Parity: odd Stop bit: 1 bit	Data length: 7 bit / 8 bit Parity: none / odd / even Stop bit: 1 / 2 End character option: code / time Terminal code: CR / CR＋LF / none Start character: STX no / STX yes
	415	Rate setting	9600 bps	2400 bps, 4800 bps, 9600 bps, 19200 bps 38400 bps, 57600 bps, 115200 bps, 230400 bps
	416	(COM1) general communication receiving buffer starting number	0	0 - 65532
	417	(COM1) general communication receiving buffer capacity	2048	0 - 2048
	418	(COM2) general communication receiving buffer starting number	2048	0 - 65532
	419	(COM2) general communication receiving buffer capacity	2048	0 - 2048
	420	(COM0) general communication receive buffer starting number	4096	0 - 65532
	421	(COM0) general communication receive buffer capacity	2048	0 - 2048
	422	(COM3) general communication receive buffer starting number	6144	0 - 65532
	423	(COM3) general communication receive buffer capacity	2048	0 - 2048
	424	(COM0) Terminal judgment time (×0.01ms)	0	0-100000 or 1-10000 (0.01ms-100ms) When designated to 0, the transmission time is the time needed to transmit 4 bytes.
	425	(COM1) Terminal judgment time (×0.01ms)	0	
	426	(COM2) Terminal judgment time (×0.01ms)	0	
	427	(COM3) Terminal judgment time (×0.01ms)	0	

(Note 1): No. 412: when you select a computer link or MODOBUS RTU in the communication mode, the No. 413 transmission format and No. 415 rate can be set.

(Note 2): No. 412: when selecting only the universal communication in the communication mode, you can set No. 413: transmission format terminal selection, end character and start character. In addition, when selecting the terminal as time only through No. 413, you can select No. 424 - No. 427.

(Note 3): The PC (PLC) link function is only available for COM0 or COM1 port. Data length for transmission format: 8 bits,
Parity: odd, stop bit: fixed to 1. In addition, select the communication speed in PC link W0-0 system register No. 48 item.

(Note 4): The COM4 port only supports MEWTOCOL-COM communication. In addition, the communication parameters (station number, communication format, communication speed) when the power is ON are same as the settings of the COM3 port. After RUN, you can also change the conditions by SYS1 instruction.

	No.	Name	Initial value	Sets value range and description
Constant setting for controller input	430	Master input constant setting 1 X0-X3	No	No 1 ms 2 ms 4 ms 8 ms 16 ms 32 ms 64 ms 128 ms 256 ms
	431	Master input constant setting 1 X4-X7		

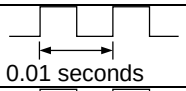
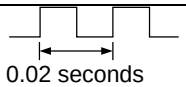
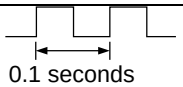
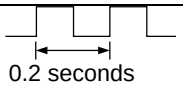
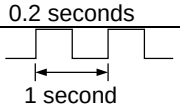
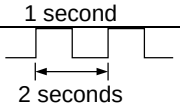
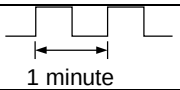
26.5 Special Relay List

WR900 (specified in word)

Relay number	Name	Contents
R9000	Self-diagnostic error flag	When an error flag self-diagnostic error occurs, it is ON. → Self-diagnostic result stored in DT90000.
R9001	Unused	
R9002	Function card I/O error flag	When an abnormality is detected in the input and output card, it is ON.
R9003	Function card exception flag	When an abnormality is detected in the function card, it is ON.
R9004	I/O check error flag	When a I/O check error is detected, it is ON.
R9005	Backup battery error flag (current type)	When a battery error is detected, it turns to ON. Even if you choose not to notify battery error in the system register, it is also ON when the battery runs out.
R9006	Backup battery error flag (hold)	When a battery error is detected, it turns to ON. Even if you choose not to notify battery error in the system register, it is also ON when the battery runs out. When a battery error is detected, it is maintained after the reset. →OFF when the power is cut.
R9007	Operation error flag (hold) (ER flag)	When you start running, it is ON if an error occurs, and it is maintained during operation. →The address where an error occurred stored in DT90017. (Display the operation error occurred initially.)
R9008	Operation error flag (latest) (ER flag)	It is ON whenever an operation error occurs. →The address where an error occurred stored in DT90018. Every time a new error occurs, the content will be updated.
R9009	Carry flag (CY flag)	When the operation result overflows or underflows, or when performing the result of the shift system instruction, the flag resets.
R900A	> Flag	Execute comparison instruction, if the comparison result is large, it is ON.
R900B	= Flag	Execute comparison instruction, if the comparison result is equal, it is ON. Execute operation instruction, if the comparison result is 0, it is ON.
R900C	< Flag	Execute comparison instruction, if the comparison result is small, it is ON.
R900D	Auxiliary timer contact	Execute auxiliary timing instruction (F137 / F138), it turns to ON after a set time. If the execution condition turns to OFF, the flag is OFF.
R900E (R9130)	COM0 port communication error	When using COM0 port, if it detects a communication error, it is ON.
R900F	Constant scan error flag	When performing constant scanning, if the scan time exceeds the value of the set timer (system register No. 34), it is ON. In the system register No. 34, it also turns to ON when 0 is set.

(Note 1): The special internal relay in parentheses is also allocated the same function.

WR901 (specified in words)

Relay number	Name	Contents
R9010	NO relay	Always in the ON state.
R9011	NC relay	Always in the OFF state.
R9012	Scan pulse relay	Each scan cycle repeats ON / OFF action.
R9013	Initial pulse relay (ON)	Only ON at the first scan cycle after the run (RUN), turns to OFF from the second scan cycle.
R9014	Initial pulse relay (OFF)	Only OFF at the first scan cycle after the run (RUN), turns to ON from the second scan cycle.
R9015	Step ladder diagram initial pulse relay (ON)	When performing step ladder diagram control, it is ON only at the first scan cycle after a progress starts.
R9016	Unused	
R9017	Unused	
R9018	0.01 seconds clock pulse relay	The clock pulse with a cycle of 0.01 seconds. 
R9019	0.02 seconds clock pulse relay	The clock pulse with a cycle of 0.02 seconds. 
R901A	0.1 seconds clock pulse relay	The clock pulse with a cycle of 0.1 seconds. 
R901B	0.2 seconds clock pulse relay	The clock pulse with a cycle of 0.2 seconds. 
R901C	1 second clock pulse relay	The clock pulse with a cycle of 1 second. 
R901D	2 seconds clock pulse relay	The clock pulse with a cycle of 2 seconds. 
R901E	1 min clock pulse relay	The clock pulse with a cycle of 1 minute. 
R901F	Unused	

WR902 (specified in word)

Relay number	Name	Contents
R9020	RUN mode flag	If you switch to PROG. mode, it is OFF. If you switch to RUN mode, it is ON.
R9021	Unused	
R9022	Unused	
R9023	Unused	
R9024	Unused	
R9025	Unused	
R9026	There are information sign	If you execute the information display instruction (F149), it is ON.
R9027	Unused	
R9028	Unused	
R9029	Force flag	When performing force ON / OFF for the input / output relay, timer / counter contacts, it is ON.
R902A	Interrupt flag	When an external interrupt is permitted, it is ON.
R902B	Interrupt exception flag	When an interrupt exception occurs, it is ON.
R902C	Sampling point mark	Sample according to instructions: 0, sample at certain interval: 1
R902D	Sampling and tracking completed flag	When the sampling operation stops: 1, starts: 0
R902E	Sample stop trigger flag	When the sample stop trigger starts: 1, stops: 0
R902F	Sampling permission flag	Sampling starts: 1, stops: 0

WR903 (specified in word)

Relay number	Name	Contents
R9030	Unused	
R9031	Unused	
R9032 (R9139)	COM1 port operation mode flag	When using the general communication function, it is ON. When using a function outside of the general communication function, it is OFF.
R9033	Print instruction executing flag	OFF: not executed. ON: executing
R9034	Program editing flag in RUN mode	The special internal relay that is ON only at the first scan cycle after program editing completed in RUN mode.
R9035	Unused	
R9036	Unused	
R9037 (R9138)	COM1 port communication error flag	When performing data communication, if a transmission error occurs, it is ON. When requesting for sending via the F159 (MTRN) instruction, it is OFF.
R9038 (R913A)	Reception completion flag for COM1 port general communication	For general communication, if the end character is received, it is ON.
R9039 (R913B)	Sending completion flag for COM1 port general communication	For general communication, if end the transmission, it is ON. For general communication, if transmitting is required, it is OFF.
R903A	Unused	
R903B	Unused	
R903C	Unused	
R903D	Unused	
R903E (R9132)	Reception completion flag for COM0 port general communication	For general communication, if the end character is received, it is ON.
R903F (R9133)	Sending completion flag for COM0 port general communication	For general communication, if end the transmission, it is ON. For general communication, if transmitting is required, it is OFF.

(Note 1): R9030 - R903F will change even during one scanning cycle. In addition, the special internal relay in parentheses is also allocated the same function.

WR904 (specified in word)

Relay number	Name	Contents
R9040 (R9131)	COM0 port operation mode flag	When using the general communication function, it is ON. When using a function outside of the general communication function, it is OFF.
R9041 (R913E)	COM1 port PC (PLC) link flag	When using the PC (PLC) link function, it is ON.
R9042 (R9141)	COM2 port operation mode flag	When using the general communication function, it is ON. When using a function outside of the general communication function, it is OFF.
R9043	Unused	
R9044 (R913C)	COM1 port SEND / RECV instruction executable flag	Indicates the instruction with respect to the F145 (SEND) or F146 (RECV) instruction of the COM1 port is executable / non-executable. OFF: non-executable (instruction executing) ON: executable
R9045 (R913D)	COM1 port SEND / RECV instruction execution completion flag	Indicates the status with respect to the F145 (SEND) or F146 (RECV) instruction of the COM1 port. OFF: normal completion ON: abnormal completion (a communication error occurs) The error code is stored to DT90124.
R9046	Unused	
R9047 (R9140)	COM2 port communication error flag	When performing data communication, if a transmission error occurs, it is ON. When requesting for sending via the F159 (MTRN) instruction, it is OFF.
R9048 (R9142)	Reception completion flag for COM2 port general communication	For general communication, if the end character is received, it is ON.
R9049 (R9143)	Sending completion flag for COM2 port general communication	For general communication, if end the transmission, it is ON. For general communication, if transmitting is required, it is OFF.
R904A (R9144)	COM2 port SEND / RECV instruction executable flag	Indicates the instruction with respect to the F145 (SEND) or F146 (RECV) instruction of the COM2 port is executable / non-executable. OFF: non-executable (instruction executing) ON: executable
R904B (R9145)	COM2 port SEND / RECV instruction execution completion flag	Indicates the status with respect to the F145 (SEND) or F146 (RECV) instruction of the COM2 port. OFF: normal completion ON: abnormal completion (a communication error occurs) The error code is stored to DT90125.
R904C-R904F	Unused	

(Note 1): R9040 - R904F will change even during a scanning cycle. In addition, the special internal relay in parentheses is also allocated the same function.

WR905 (specified in word)

Relay number	Name	Contents
R9050	MEWNET-W0 PC (PLC) link transmission error flag	When using MEWNET-W0 When a transmission error sent through the PC (PLC) link, it is ON. When the setting of the PC (PLC) link region is abnormal, it is ON.
R9051-R905F	Unused	

WR906 (specified in word)

Relay number	Name		Contents
R9060	MEWNET-W0 PC (PLC) link 0 transmit guarantee relay	Unit No. 1	Unit No.1 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R9061		Unit No. 2	Unit No.2 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R9062		Unit No. 3	Unit No.3 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R9063		Unit No. 4	Unit No.4 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R9064		Unit No. 5	Unit No.5 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R9065		Unit No. 6	Unit No.6 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R9066		Unit No. 7	Unit No.7 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R9067		Unit No. 8	Unit No.8 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R9068		Unit No. 9	Unit No.9 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R9069		Unit No. 10	Unit No.10 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R906A		Unit No. 11	Unit No.11 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R906B		Unit No. 12	Unit No.12 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R906C		Unit No. 13	Unit No.13 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R906D		Unit No. 14	Unit No.14 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R906E		Unit No. 15	Unit No.15 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R906F		Unit No. 16	Unit No.16 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF

WR907 (specified in word)

Relay number	Name		Contents
R9070	MEWNET-W0 PC (PLC) link 0 operation mode relay	Unit No. 1	When the unit No. 1 is in RUN mode: ON. When in PROG mode: OFF.
R9071		Unit No. 2	When the unit No. 2 is in RUN mode: ON. When in PROG mode: OFF.
R9072		Unit No. 3	When the unit No. 3 is in RUN mode: ON. When in PROG mode: OFF.
R9073		Unit No. 4	When the unit No. 4 is in RUN mode: ON. When in PROG mode: OFF.
R9074		Unit No. 5	When the unit No. 5 is in RUN mode: ON. When in PROG mode: OFF.
R9075		Unit No. 6	When the unit No. 6 is in RUN mode: ON. When in PROG mode: OFF.
R9076		Unit No. 7	When the unit No. 7 is in RUN mode: ON. When in PROG mode: OFF.
R9077		Unit No. 8	When the unit No. 8 is in RUN mode: ON. When in PROG mode: OFF.
R9078		Unit No. 9	When the unit No. 9 is in RUN mode: ON. When in PROG mode: OFF.
R9079		Unit No. 10	When the unit No. 10 is in RUN mode: ON. When in PROG mode: OFF.
R907A		Unit No. 11	When the unit No. 11 is in RUN mode: ON. When in PROG mode: OFF.
R907B		Unit No. 12	When the unit No. 12 is in RUN mode: ON. When in PROG mode: OFF.
R907C		Unit No. 13	When the unit No. 13 is in RUN mode: ON. When in PROG mode: OFF.
R907D		Unit No. 14	When the unit No. 14 is in RUN mode: ON. When in PROG mode: OFF.
R907E		Unit No. 15	When the unit No. 15 is in RUN mode: ON. When in PROG mode: OFF.
R907F		Unit No. 16	When the unit No. 16 is in RUN mode: ON. When in PROG mode: OFF.

WR908 (specified in word)

Relay number	Name		Contents
R9080	MEWNET-W0 PC (PLC) link 1 transmit guarantee relay	Unit No. 1	Unit No.1 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R9081		Unit No. 2	Unit No.2 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R9082		Unit No. 3	Unit No.3 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R9083		Unit No. 4	Unit No.4 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R9084		Unit No. 5	Unit No.5 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R9085		Unit No. 6	Unit No.6 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R9086		Unit No. 7	Unit No.7 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R9087		Unit No. 8	Unit No.8 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R9088		Unit No. 9	Unit No.9 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R9089		Unit No. 10	Unit No.10 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R908A		Unit No. 11	Unit No.11 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R908B		Unit No. 12	Unit No.12 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R908C		Unit No. 13	Unit No.13 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R908D		Unit No. 14	Unit No.14 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R908E		Unit No. 15	Unit No.15 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF
R908F		Unit No. 16	Unit No.16 For normal communication in the PC (PLC) link mode: ON When stopping, error occurs or PC (PLC) is not linked: OFF

WR909 (specified in word)

Relay number	Name		Contents
R9090	MEWNET-W0 PC (PLC) link 1 operation mode relay	Unit No. 1	When the unit No. 1 is in RUN mode: ON. When in PROG mode: OFF.
R9091		Unit No. 2	When the unit No. 2 is in RUN mode: ON. When in PROG mode: OFF.
R9092		Unit No. 3	When the unit No. 3 is in RUN mode: ON. When in PROG mode: OFF.
R9093		Unit No. 4	When the unit No. 4 is in RUN mode: ON. When in PROG mode: OFF.
R9094		Unit No. 5	When the unit No. 5 is in RUN mode: ON. When in PROG mode: OFF.
R9095		Unit No. 6	When the unit No. 6 is in RUN mode: ON. When in PROG mode: OFF.
R9096		Unit No. 7	When the unit No. 7 is in RUN mode: ON. When in PROG mode: OFF.
R9097		Unit No. 8	When the unit No. 8 is in RUN mode: ON. When in PROG mode: OFF.
R9098		Unit No. 9	When the unit No. 9 is in RUN mode: ON. When in PROG mode: OFF.
R9099		Unit No. 10	When the unit No. 10 is in RUN mode: ON. When in PROG mode: OFF.
R909A		Unit No. 11	When the unit No. 11 is in RUN mode: ON. When in PROG mode: OFF.
R909B		Unit No. 12	When the unit No. 12 is in RUN mode: ON. When in PROG mode: OFF.
R909C		Unit No. 13	When the unit No. 13 is in RUN mode: ON. When in PROG mode: OFF.
R909D		Unit No. 14	When the unit No. 14 is in RUN mode: ON. When in PROG mode: OFF.
R909E		Unit No. 15	When the unit No. 15 is in RUN mode: ON. When in PROG mode: OFF.
R909F		Unit No. 16	When the unit No. 16 is in RUN mode: ON. When in PROG mode: OFF.

WR910 - WR912 (specified in word)

Relay number	Name		Contents
R9100-R910F	Unused		
R9110	High-speed counter in-control flag	HSC-CH0	When using high-speed counter function, it is ON during the execution of F166 (HC1S) and F167 (HC1R) instructions. It is OFF when the action is completed. (Note 1)
R9111		HSC-CH1	
R9112		HSC-CH2	
R9113		HSC-CH3	
R9114		HSC-CH4	
R9115		HSC-CH5	
R9116		HSC-CH6	
R9117		HSC-CH7	
R9118 -R912F	Unused		

WR913 (specified in word)

Relay number	Name	Contents
R9130 (R900E)	COM0 port communication error flag	When performing data communication, if a transmission error occurs, it is ON. When requesting for sending via the F159 (MTRN) instruction, it is OFF.
R9131 (R9040)	COM0 port operation mode flag	When using the general communication function, it is ON. When using a function outside of the general communication function, it is OFF.
R9132 (R903E)	Reception completion flag for COM0 port general communication	For general communication, if the end character is received, it is ON.
R9133 (R903F)	Sending completion flag for COM0 port general communication	For general communication, if end the transmission, it is ON. For general communication, if transmitting is required, it is OFF.
R9134	COM port SEND / RECV instruction executable flag	Indicates the status with respect to the Executable/Non-executable status of F145 (SEND) or F146 (RECV) instruction of the COM0 port. OFF: non-executable (instruction executing) ON: executable
R9135	COM0 port SEND / RECV instruction execution completion flag	Indicates the status with respect to the execution status of F145 (SEND) or F146 (RECV) instruction of the COM0 port. OFF: normal completion ON: abnormal completion (a communication error occurs) The error code is stored to DT90123.
R9136	COM0 port PC (PLC) link flag	When using the PC (PLC) link function, it is ON.
R9137	Unused	
R9138 (R9037)	COM1 port communication error flag	When performing data communication, if a transmission error occurs, it is ON. When executing via F159 (MTRN) instruction, if transmitting is required, it is OFF.
R9139 (R9032)	COM1 port operation mode flag	When using the general communication function, it is ON. When using a function outside of the general communication function, it is OFF.
R913A (R9038)	Reception completion flag for COM1 port general communication	For general communication, if the end character is received, it is ON.
R913B (R9039)	Sending completion flag for COM1 port general communication	For general communication, if end the transmission, it is ON. For general communication, if transmitting is required, it is OFF.
R913C (R9044)	COM1 port SEND / RECV instruction executable flag	Indicates the status with respect to the Executable/Non-executable status of F145 (SEND) or F146 (RECV) instruction of the COM0 port. OFF: non-executable (instruction executing) ON: executable
R913D (R9045)	COM1 port SEND / RECV instruction execution completion flag	Indicates the status with respect to the execution status of F145 (SEND) or F146 (RECV) instruction of the COM1 port. OFF: normal completion ON: abnormal completion (a communication error occurs) The error code is stored to DT90124.
R913E (R9041)	COM1 port PC (PLC) link flag	When using the PC (PLC) link function, it is ON.
R913F	Unused	

(Note 1): R9130 - R913F will change even during one scanning cycle. In addition, it is compatible with the older model FP-X control unit, the special internal relay in parentheses also can be allocated the same function.

WR914 (specified in word)

Relay number	Name	Contents
R9140 (R9047)	COM2 port communication error flag	When performing data communication, if a transmission error occurs, it is ON. When executing via F159 (MTRN) instruction, if transmitting is required, it is OFF.
R9141 (R9042)	COM2 port operation mode flag	When using the general communication function, it is ON. When using a function outside of the general communication function, it is OFF.
R9142 (R9048)	Reception completion flag for COM2 port general communication	For general communication, if the end character is received, it is ON.
R9143 (R9049)	Sending completion flag for COM2 port general communication	For general communication, if end the transmission, it is ON. For general communication, if transmitting is required, it is OFF.
R9144 (R904A)	COM2 port SEND / RECV instruction executable flag	Indicates the status with respect to the Executable/Non-executable status of F145 (SEND) or F146 (RECV) instruction of the COM0 port. OFF: non-executable (instruction executing) ON: executable
R9145 (R904B)	COM2 port SEND / RECV instruction execution completion flag	Indicates the status with respect to the execution status of F145 (SEND) or F146 (RECV) instruction of the COM2 port. OFF: normal completion ON: abnormal completion (a communication error occurs) The error code is stored to DT90125.
R9146	Unused	
R9147	Unused	
R9148	COM3 port communication error flag	When performing data communication, if a transmission error occurs, it is ON. When executing via F159 (MTRN) instruction, if transmitting is required, it is OFF.
R9149	COM3 port operation mode flag	When using the general communication function, it is ON. When using a function outside of the general communication function, it is OFF.
R914A	Reception completion flag for COM3 port general communication	For general communication, if the end character is received, it is ON.
R914B	Sending completion flag for COM3 port general communication	For general communication, if end the transmission, it is ON. For general communication, if transmitting is required, it is OFF.
R914C	COM3 port SEND / RECV instruction executable flag	Indicates the status with respect to the Executable/Non-executable status of F145 (SEND) or F146 (RECV) instruction of the COM0 port. OFF: non-executable (instruction executing) ON: executable
R914D	COM3 port SEND / RECV instruction execution completion flag	Indicates the status with respect to the execution status of F145 (SEND) or F146 (RECV) instruction of the COM3 port. OFF: normal completion ON: abnormal completion (a communication error occurs) The error code is stored to DT90127.
R914E	Unused	
R914F	Unused	

(Note 1): R9140 - R914F will change even during a scanning cycle. In addition, it is compatible with the older model FP-X control unit, the special internal relay in parentheses also can be allocated the same function.

WR915 (specified in word)

Relay number	Name	Contents
R9150	COM4 port communication error flag	When performing data communication, if a transmission error occurs, it is ON. When requesting for sending via the F159 (MTRN) instruction, it is OFF.
R9151	COM4 port operation mode flag	When using the general communication function, it is ON. When using a function outside of the general communication function, it is OFF.
R9152	Reception completion flag for COM4 port general communication	For general communication, if the end character is received, it is ON.
R9153	Sending completion flag for COM4 port general communication	For general communication, if end the transmission, it is ON. For general communication, if transmitting is required, it is OFF.
R9154	COM4 port SEND / RECV instruction executable flag	Indicates the status with respect to the Executable/Non-executable status of F145 (SEND) or F146 (RECV) instruction of the COM0 port. OFF: non-executable (instruction executing) ON: executable
R9155	COM4 port SEND / RECV instruction execution completion flag	Indicates the status with respect to the execution status of F145 (SEND) or F146 (RECV) instruction of the COM4 port. OFF: normal completion ON: abnormal completion (a communication error occurs) The error code is stored to DT90128.
R9156 -R915F	Unused	

26.6 Special Data Register List

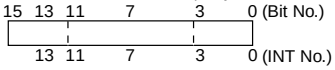
Register Number	Name	Contents	Read	Write
DT90000	Self-diagnostic error code	When a self-diagnostic error occurs, the error code is stored.	○	×
DT90001	Unused		×	×
DT90002	Function card I/O error occurring location	When an error occurs in the function card, the corresponding bit is ON. 15 11 7 3 2 1 0 (Bit No.) 2 1 (Expansion No.) ON(1)：Abnormal OFF(0)：Normal	○	×
DT90003 -DT90005	Unused		×	×
DT90006	Function card error occurring location	When an error occurs in the function card, the corresponding bit is ON. 15 11 7 3 2 1 0 (Bit No.) 2 1 (Expansion No.) ON(1)：Abnormal OFF(0)：Normal	○	×
DT90007	System register error number	When there is mismatch in the setting content of the system register, save the object system register number.	○	×
DT90008	Communication error flag COM4 port	Save error contents when using the COM4 port. ON (1): Error, OFF (0): Normal bit no. 15 8 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 H00 Fixed COM4 Overflow error COM4 Parity error COM4 Framing error COM4 Ultra-limit running error	○	×
DT90009	Communication error flag COM2 port / COM3 port	Save error contents when using the COM2 / COM3 port. ON (1): Error, OFF (0): Normal bit no. 15 8 7 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 COM3 Overflow error COM3 Parity error COM3 Framing error COM3 Ultra-limit running error COM2 Overflow error COM2 Parity error COM2 Framing error COM2 Ultra-limit running error	○	×
DT90010	FP-X expansion I/O check inconsistent unit location	When the FP-X expansion I/O unit installation state turns to power ON, the corresponding bit to the unit number is ON (1). Monitor with BIN display. 15 11 7 6 5 4 3 2 1 0 (Bit No.) 7 6 5 4 3 2 1 0 (Expansion No.) ON(1)：Abnormal OFF(0)：Normal	○	×

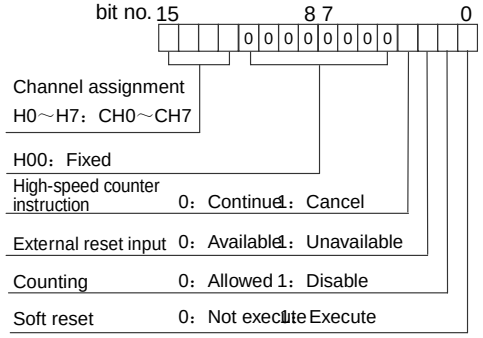
Register Number	Name	Contents	Read	Write
DT90011	Expansion card check inconsistent unit location	When the FP-X expansion card installation state turns to power ON, the corresponding bit to the expansion card number is ON (1). Monitor with BIN display. 15 11 7 3 2 1 0 (Bit No.) 2 1 (Expansion No.) ON(1)：Abnormal OFF(0)：Normal	○	×
DT90012 -DT90013	Unused		×	×
DT90014	Operation auxiliary register of the data shift instruction	After executing the data shift instruction F105 (BSR) or F106 (BSL), the 1 digit data removed out is saved to the bit 0 - 3. Execute F0 (MV) instruction, values can be read and write.	○	○
DT90015	Operation auxiliary register of the division instruction	When executing 16-bit division instruction F32 (%), F52 (B%), the 16 bit of the remainder is saved to DT90015. When executing 32-bit division instruction F33 (D%), F53 (DB%), the 32 bit of the remainder is saved to DT90015-DT90016. Execute F1 (DMV) instruction, values can be read and write.	○	○
DT90016				
DT90017	Operation error address (hold)	After running, the address occurs an operation error first is stored. Please use decimalism display to perform monitoring.	○	×
DT90018	Operation error address (latest)	The address where an error occurred is stored. Update when each time an error occurs. Please use decimalism display to perform monitoring.	○	×
DT90019	2.5 ms RING counter (Note 2)	The stored value is increased by 1 every 2.5 ms. (H0-HFFFF) The difference between 2 points (absolute value) × 2.5 ms = elapsed time between 2 points	○	×
DT90020	10 μs RING counter (note2, 3)	Saved value +1 every 10.00 μs. (H0-HFFFF) The difference between 2 points (absolute value) × 10.00 μs＝(elapsed time between 2 points) note) the correct value is 10.00 μs.	○	×
DT90021	Unused		×	×
DT90022	Scanning time (current value) (note1)	The current value of the scanning time is saved. [Saved value (decimal)] × 0.1 ms (Example) For K50, it indicates within 5 ms.	○	×
DT90023	Scanning time (min) (note 1)	The minimum value of the scanning time is saved. [Saved value (decimal)] × 0.1 ms (Example) For K50, it indicates within 5 ms.	○	×
DT90024	Scanning time (max) (note 1)	The maximum value of the scanning time is saved. [Saved value (decimal)] × 0.1 ms (Example) For K125, it indicates within 12.5 ms.	○	×

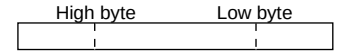
(Note 1): The scanning time and operation cycle time only display in RUN mode. The scanning time of the operation is not displayed in PROG. mode. When the maximum and minimum value are shifted between RUN mode and PROG. mode, they are temporarily cleared.

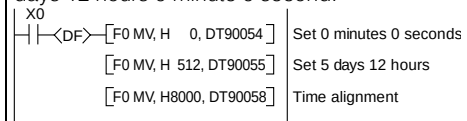
(Note 2): During one scan, it is updated once at the beginning.

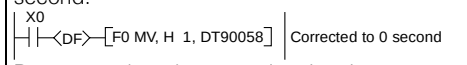
(Note 3): DT90020 is also updated when executing F0 (MV), therefor, it can be used to measure the time interval.

Register Number	Name	Contents	Read	Write
DT90025	Interrupt enable (mask) state (INT0 - 7)	The content set by the ICTL instruction is saved. Monitor with BIN display.  INT0 - INT7: interrupt input X0 - X7 INT0 - INT7: high-speed counter match interrupt CH0 - CH7	○	×
DT90026	Unused		×	×
DT90027	Timer interrupt interval (INT24)	The content set by the ICTL instruction is saved. K0: do not use the timer interrupt. K1-K3000: 0.1 ms-0.35 s or 0.5 ms-1.5 s or 10 ms-30 s	○	×
DT90028	Sampling and tracking interval	K0: changed to sampling performed according to the SMPL instruction. K1 - K3000 (× 10ms): 10 ms - 30 s	○	×
DT90029	Unused		×	×
DT90030	Save characters by F149 MSG instruction	Save contents set through the information display instruction (F149) (character).	○	×
DT90031				
DT90032				
DT90033				
DT90034				
DT90035				
DT90036	Occurring location for FP-X/FP-X0 expansion unit and expansion card status error	Save the corresponding number upon abnormal status. High byte: FP-X / FP-X0 expansion unit Low byte: expansion card (E.g.) The card installation part 2 is abnormal for 0001h.	○	×
DT90037	Job 1 for search instruction	When executing F96 (SRC) instruction, the number that is consistent with the search data is saved.	○	×
DT90038	Job 2 for search instruction	When executing F96 (SRC) instruction, a consistent relative position is saved.	○	×
DT90039	Unused		×	×
DT90040	Potentiometer input	Save potentiometer value (K0 - K4000). Read to the data register by the user program, and it can be used in the analog timer.	○	×
DT90041 -DT90043	Unused		×	×
DT90044	System job	Used in the system.	○	×
DT90045 -DT90051	Unused		×	×

Register Number	Name	Contents	Read	Write
DT90052	High-speed counter control flag	When using high-speed counter function, the high-speed counter reset, count prohibition and instruction execution cancellation are controlled by writing in values with the MV instruction (F0).  	○	○

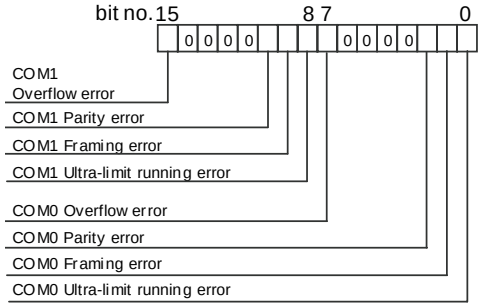
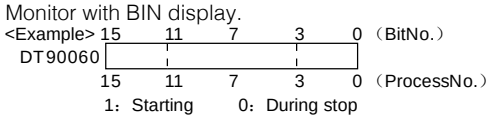
<table>
<tr><th>Register Number</th><th>Name</th><th>Contents</th><th>Read</th><th>Write</th></tr>
<tr><td>DT90053</td><td>Real-time clock monitoring (hour and minute)</td><td>Save the hour and minute data of the real-time clock.
You can only read, can not write.
 
</td><td>○</td><td>×</td></tr>
<tr><td>DT90054</td><td>Real-time clock (minute and second)</td><td rowspan="4">Save the month, day, hour, minute, second, day and week data of the real-time clock. The built-in real time clock is applicable until 2099, also applicable for leap years.
The real-time clock can be set (time adjustment) by using the programming tool or transfer instruction (F0) program to write in values.
 

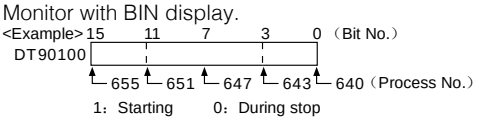
<table><tr><td>DT90054</td><td>Minute data (H00～H59)</td><td>Second data (H00～H59)</td></tr><tr><td>DT90055</td><td>Day data (H01～H31)</td><td>Hour data (H00～H23)</td></tr><tr><td>DT90056</td><td>Year data (H00～H99)</td><td>Month data (H01～H12)</td></tr><tr><td>DT90057</td><td>—</td><td>Week data (H00～H06)</td></tr></table>The week data is not automatically set. Allocate any value within the range of H0 - 6.</td><td rowspan="4">○</td><td rowspan="4">○</td></tr>
<tr><td>DT90055</td><td>Real-time clock (day and hour)</td></tr>
<tr><td>DT90056</td><td>Real-time clock (year and month)</td></tr>
<tr><td>DT90057</td><td>Real-time clock (week)</td></tr>
<tr><td>DT90058</td><td>Real-time clock time setting and 30 seconds correction register</td><td>Time adjustment for real-time clock.
●Use the program to adjust the time
If the highest bit of the DT90058 MSB is set to 1, it turns to the time written into the DT90054 - DT90057 by the instruction F0. After executing time adjustment, the DT90058 is cleared. (You can not execute instructions other than F0.)
<Example> When X0 is ON, adjust the time to 5 days 12 hours 0 minute 0 second.
 

●Correct the error within 30 seconds
If the lowest bit of the DT90058 MSB is set to 1, it will increase or decrease and turn to 0 second. After performing the correction, the DT90058 is cleared.
<Example> When X0 is ON, correct it to 0 second.
 

Decrease when the execution time is 0-29 seconds, increase when it is 30-59 seconds. In the above example, if the time is 5 minutes and 29 seconds, it turns to 5 minutes 0 seconds. If the time is 5 minutes and 35 seconds, it turns to 6 minutes 0 seconds.</td><td>○</td><td>○</td></tr>
</table>

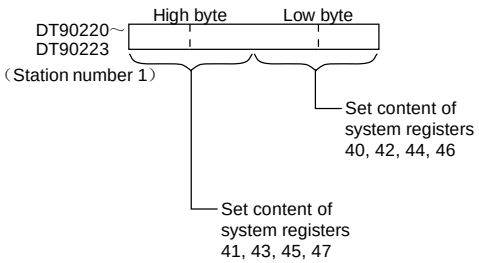
(Note 1): If you use the programming tool to rewrite the value of DT90054 - DT90057, the time is adjusted to the time written at the time of rewriting. Therefore, do not execute DT90058 writing.

Register Number	Name	Contents	Read	Write
DT90059	Communication error code COM0 port / COM1 port	When a communication error occurs, the error code is saved. ON (1): Error, OFF (0): Normal 	○	×
DT90060	Step ladder diagram program process (0 - 15)	It indicates the starting status of the step ladder diagram program process. When the process starts, the bit corresponding to its process number is ON. Monitor with BIN display.  The data can be written using a programming tool.	○	○
DT90061	Step ladder diagram program process (16 - 31)			
DT90062	Step ladder diagram program process (32 - 47)			
DT90063	Step ladder diagram program process (48 - 63)			
DT90064	Step ladder diagram program process (64 - 79)			
DT90065	Step ladder diagram program process (80 - 95)			
DT90066	Step ladder diagram program process (96 - 111)			
DT90067	Step ladder diagram program process (112 - 127)			
DT90068	Step ladder diagram program process (128 - 143)			
DT90069	Step ladder diagram program process (144 - 159)			
DT90070	Step ladder diagram program process (160 - 175)			
DT90071	Step ladder diagram program process (176 - 191)			
DT90072	Step ladder diagram program process (192 - 207)			
DT90073	Step ladder diagram program process (208 - 223)			
DT90074	Step ladder diagram program process (224 - 239)			
DT90075	Step ladder diagram program process (240 - 255)			
DT90076	Step ladder diagram program process (256 - 271)			
DT90077	Step ladder diagram program process (272 - 287)			
DT90078	Step ladder diagram program process (288 - 303)			
DT90079	Step ladder diagram program process (304 - 319)			
DT90080	Step ladder diagram program process (320 - 335)			
DT90081	Step ladder diagram program process (336 - 351)			
DT90082	Step ladder diagram program process (352 - 367)			
DT90083	Step ladder diagram program process (368 - 383)			
DT90084	Step ladder diagram program process (384 - 399)			
DT90085	Step ladder diagram program process (400 - 415)			

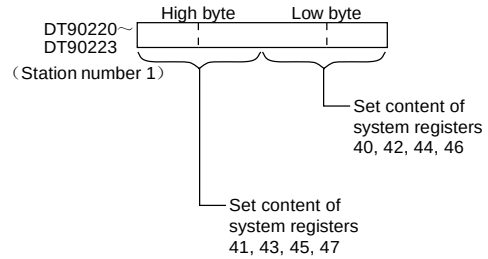
Register Number	Name	Contents	Read	Write
DT90086	Step ladder diagram program process (416 - 431)	It indicates the starting status of the step ladder diagram program process. When the process starts, the bit corresponding to its process number is ON. Monitor with BIN display. <Example>  The data can be written using a programming tool.	○	○
DT90087	Step ladder diagram program process (432 - 447)			
DT90088	Step ladder diagram program process (448 - 463)			
DT90089	Step ladder diagram program process (464 - 479)			
DT90090	Step ladder diagram program process (480 - 495)			
DT90091	Step ladder diagram program process (496 - 511)			
DT90092	Step ladder diagram program process (512 - 527)			
DT90093	Step ladder diagram program process (528 - 543)			
DT90094	Step ladder diagram program process (544 - 559)			
DT90095	Step ladder diagram program process (560 - 575)			
DT90096	Step ladder diagram program process (576 - 591)			
DT90097	Step ladder diagram program process (592 - 607)			
DT90098	Step ladder diagram program process (608 - 623)			
DT90099	Step ladder diagram program process (624 - 639)			
DT90100	Step ladder diagram program process (640 - 655)			
DT90101	Step ladder diagram program process (656 - 671)			
DT90102	Step ladder diagram program process (672 - 687)			
DT90103	Step ladder diagram program process (688 - 703)			
DT90104	Step ladder diagram program process (704 - 719)			
DT90105	Step ladder diagram program process (720 - 735)			
DT90106	Step ladder diagram program process (736 - 751)			
DT90107	Step ladder diagram program process (752 - 767)			
DT90108	Step ladder diagram program process (768 - 783)			
DT90109	Step ladder diagram program process (784 - 799)			
DT90110	Step ladder diagram program process (800 - 815)			
DT90111	Step ladder diagram program process (816 - 831)			
DT90112	Step ladder diagram program process (832 - 847)			
DT90113	Step ladder diagram program process (848 - 863)			
DT90114	Step ladder diagram program process (864 - 879)			
DT90115	Step ladder diagram program process (880 - 895)			
DT90116	Step ladder diagram program process (896 - 911)			
DT90117	Step ladder diagram program process (912 - 927)			
DT90118	Step ladder diagram program process (928 - 943)			
DT90119	Step ladder diagram program process (944 - 959)			
DT90120	Step ladder diagram program process (960 - 975)			
DT90121	Step ladder diagram program process (976 - 991)			
DT90122	Step ladder diagram program process (992 - 999) (high byte not used)			

Register Number	Name	Contents	Read	Write
DT90123	COM0 SEND / RECV end code	If an error occurs when executing SEND / RECV instruction, the error code is saved.	○	×
DT90124	COM1 SEND / RECV end code		○	×
DT90125	COM2 SEND / RECV end code		○	×
DT90126	Forcible input and output in process unit number	Used in the system.	○	×
DT90127	COM3 SEND / RECV end code	If an error occurs when executing SEND / RECV instruction, the error code is saved.	○	×
DT90127	COM4 SEND / RECV end code		○	×
DT90128- DT90139	Unused		×	×

Register Number	Name	Contents	Read	Write
DT90140	MEWNET-W0 PC (PLC) link 0 status	PC (PLC) link 0 reception times	○	×
DT90141		PC (PLC) link 0 reception interval (current value) (×2.5ms)		
DT90142		PC (PLC) link 0 reception interval (minimum value) (×2.5ms)		
DT90143		PC (PLC) link 0 reception interval (maximum value) (×2.5ms)		
DT90144		PC (PLC) link 0 transmission times		
DT90145		PC (PLC) link 0 transmission interval (current value) (x 2.5 ms)		
DT90146		PC (PLC) link 0 transmission interval (minimum value) (x 2.5 ms)		
DT90147		PC (PLC) link 0 transmission interval (maximum value) (x 2.5 ms)		
DT90148	MEWNET-W0 PC (PLC) link 1 status	PC (PLC) link 1 reception times	○	×
DT90149		PC (PLC) link 1 reception interval (current value) (x 2.5 ms)		
DT90150		PC (PLC) link 1 reception interval (minimum value) (x 2.5 ms)		
DT90151		PC (PLC) link 1 reception interval (maximum value) (x 2.5 ms)		
DT90152		PC (PLC) link 1 transmission times		
DT90153		PC (PLC) link 1 transmission interval (current value) (x 2.5 ms)		
DT90154		PC (PLC) link 1 transmission interval (minimum value) (x 2.5 ms)		
DT90155		PC (PLC) link 1 transmission interval (maximum value) (x 2.5 ms)		
DT90156	MEWNET-W0 PC (PLC) link 0 status	PC (PLC) link 0 reception interval measurement job	○	×
DT90157		PC (PLC) link 0 send interval measurement job		
DT90158	MEWNET-W0 PC (PLC) link 1 status	PC (PLC) link 1 reception interval measurement job	○	×
DT90159		PC (PLC) link 1 send interval measurement job		
DT90160	MEWNET-W0 PC (PLC) link 0 unit No.	The PC (PLC) link 0 unit No. is saved.	○	×
DT90161	MEWNET-W0 PC (PLC) link 0 error flag	The error content of PC (PLC) link 0 is saved.	○	×
DT90162-DT90169	Unused		×	×
DT90170	MEWNET-W0 PC (PLC) link 0 status	PC (PLC) link address repeat target	○	×
DT90171		Token missing number		
DT90172		Double tokens number		
DT90173		No signal state number		
DT90174		Undefined instruction reception number		
DT90175		Reception sum check error number		
DT90176		Received data format error number		
DT90177		Transmission error occurrence number		
DT90178		Handler error occurrence number		
DT90179		Master station overlapping occurrence number		
DT90180 -DT90218	Unused		×	×

<table>
<tr><th>Register Number</th><th colspan="2">Name</th><th>Contents</th><th>Read</th><th>Write</th></tr>
<tr><td>DT90219</td><td colspan="2">Station number switch of DT90220 - DT90251</td><td>0: Station number 1-8, 1: Station number 9-16</td><td>○</td><td>×</td></tr>
<tr><td>DT90220</td><td rowspan="4">PC (PLC) link station 1 or 9</td><td>System registers 40 and 41</td><td rowspan="16">The setting contents of the system register related to each station number PC (PLC) link function are saved as following.
＜Example＞
When the DT90219 is 0
 

If the master station system register 46 is standard setting, 46 and 47 on the left will copy the value of the master station.
If the master station system register 46 is set reversely, it indicates the left master station part 40-45 and 47 are set to 50-55 and 57, 46 remain unchanged.
In addition, it indicates the other station part 40-45 are set to values after correcting the received values, while 46 and 47 are set to 46 and 57 of the master station.</td><td rowspan="16">○</td><td rowspan="16">×</td></tr>
<tr><td>DT90221</td><td>System registers 42 and 43</td></tr>
<tr><td>DT90222</td><td>System registers 44 and 45</td></tr>
<tr><td>DT90223</td><td>System registers 46 and 47</td></tr>
<tr><td>DT90224</td><td rowspan="4">PC (PLC) link station 2 or 10</td><td>System registers 40 and 41</td></tr>
<tr><td>DT90225</td><td>System registers 42 and 43</td></tr>
<tr><td>DT90226</td><td>System registers 44 and 45</td></tr>
<tr><td>DT90227</td><td>System registers 46 and 47</td></tr>
<tr><td>DT90228</td><td rowspan="4">PC (PLC) link station 3 or 11</td><td>System registers 40 and 41</td></tr>
<tr><td>DT90229</td><td>System registers 42 and 43</td></tr>
<tr><td>DT90230</td><td>System registers 44 and 45</td></tr>
<tr><td>DT90231</td><td>System registers 46 and 47</td></tr>
<tr><td>DT90232</td><td rowspan="4">PC (PLC) link station 4 or 12</td><td>System registers 40 and 41</td></tr>
<tr><td>DT90233</td><td>System registers 42 and 43</td></tr>
<tr><td>DT90234</td><td>System registers 44 and 45</td></tr>
<tr><td>DT90235</td><td>System registers 46 and 47</td></tr>
</table>

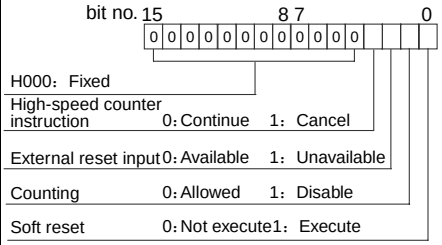
<table>
<tr><th>Register Number</th><th colspan="2">Name</th><th>Contents</th><th>Read</th><th>Write</th></tr>
<tr><td>DT90236</td><td rowspan="4">PC (PLC) link station 5 or 13</td><td>System registers 40 and 41</td><td rowspan="20">The setting contents of the system register related to each station number PC (PLC) link function are saved as following.
＜Example＞
When the DT90219 is 0
 

If the master station system register 46 is standard setting, 46 and 47 on the left will copy the value of the master station.
If the master station system register 46 is set reversely, it indicates the left master station part 40-45 and 47 are set to 50-55 and 57, 46 remain unchanged.
In addition, it indicates the other station part 40-45 are set to values after correcting the received values, while 46 and 47 are set to 46 and 57 of the master station.</td><td rowspan="20">○</td><td rowspan="20">×</td></tr>
<tr><td>DT90237</td><td>System registers 42 and 43</td></tr>
<tr><td>DT90238</td><td>System registers 44 and 45</td></tr>
<tr><td>DT90239</td><td>System registers 46 and 47</td></tr>
<tr><td>DT90240</td><td rowspan="4">PC (PLC) link station 6 or 14</td><td>System registers 40 and 41</td></tr>
<tr><td>DT90241</td><td>System registers 42 and 43</td></tr>
<tr><td>DT90242</td><td>System registers 44 and 45</td></tr>
<tr><td>DT90243</td><td>System registers 46 and 47</td></tr>
<tr><td>DT90244</td><td rowspan="4">PC (PLC) link station 7 or 15</td><td>System registers 40 and 41</td></tr>
<tr><td>DT90245</td><td>System registers 42 and 43</td></tr>
<tr><td>DT90246</td><td>System registers 44 and 45</td></tr>
<tr><td>DT90247</td><td>System registers 46 and 47</td></tr>
<tr><td>DT90248</td><td rowspan="4">PC (PLC) link station 8 or 16</td><td>System registers 40 and 41</td></tr>
<tr><td>DT90249</td><td>System registers 42 and 43</td></tr>
<tr><td>DT90250</td><td>System registers 44 and 45</td></tr>
<tr><td>DT90251</td><td>System registers 46 and 47</td></tr>
<tr><td>DT90252
-DT90299</td><td colspan="2">Unused</td><td></td><td>×</td><td>×</td></tr>
</table>

Register Number	Name			Contents	Read	Write
DT90300	Elapsed value region	Low byte word	HSC-CH0	The counting region of the high-speed counter controller input CH0 (X0) or (X0, X1).	○	○
DT90301		High byte word			○	○
DT90302	Target value region	Low byte word		When executing the F166 (HC1S) and F167 (HC1R) instruction, the target value is saved.	○	○
DT90303		High byte word			○	○
DT90304	Elapsed value region	Low byte word	HSC-CH1	The counting region of the high-speed counter controller input (X1).	○	○
DT90305		High byte word			○	○
DT90306	Target value region	Low byte word		When executing the F166 (HC1S) and F167 (HC1R) instruction, the target value is saved.	○	○
DT90307		High byte word			○	○
DT90308	Elapsed value region	Low byte word	HSC-CH2	The counting region of the high-speed counter controller input (X2) or (X2, X3).	○	○
DT90309		High byte word			○	○
DT90310	Target value region	Low byte word		When executing the F166 (HC1S) and F167 (HC1R) instruction, the target value is saved.	○	○
DT90311		High byte word			○	○
DT90312	Elapsed value region	Low byte word	HSC-CH3	The counting region of the high-speed counter controller input (X3).	○	○
DT90313		High byte word			○	○
DT90314	Target value region	Low byte word		When executing the F166 (HC1S) and F167 (HC1R) instruction, the target value is saved.	○	○
DT90315		High byte word			○	○
DT90316	Elapsed value region	Low byte word	HSC-CH4	The counting region of the high-speed counter controller input (X4) or (X4, X5).	○	○
DT90317		High byte word			○	○
DT90318	Target value region	Low byte word		When executing the F166 (HC1S) and F167 (HC1R) instruction, the target value is saved.	○	○
DT90319		High byte word			○	○
DT90320	Elapsed value region	Low byte word	HSC-CH5	The counting region of the high-speed counter controller input (X5).	○	○
DT90321		High byte word			○	○
DT90322	Target value region	Low byte word		When executing the F166 (HC1S) and F167 (HC1R) instruction, the target value is saved.	○	○
DT90323		High byte word			○	○
DT90324	Elapsed value region	Low byte word	HSC-CH6	The counting region of the high-speed counter controller input (X6) or (X6, X7).	○	○
DT90325		High byte word			○	○
DT90326	Target value region	Low byte word		When executing the F166 (HC1S) and F167 (HC1R) instruction, the target value is saved.	○	○
DT90327		High byte word			○	○
DT90328	Elapsed value region	Low byte word	HSC-CH7	The counting region of the high-speed counter controller input (X7).	○	○
DT90329		High byte word			○	○
DT90330	Target value region	Low byte word		When executing the F166 (HC1S) and F167 (HC1R) instruction, the target value is saved.	○	○
DT90331		High byte word			○	○
DT90332 -DT90379	Unused				×	×

(Note 1): Only F1 (DMV) instruction can perform the reading and writing of process value region.

(Note 2): When executing the high-speed counter target value consistent instruction F166 (HC1S) or F167 (HC1R) instruction, the target value region is set. It can not be written by the user program.

Register Number	Name		Contents	Read	Write
DT90380	High-speed counter function control flag monitoring region	HSC-CH0	When using the high-speed counter function, the contents set into the system register DT90052 by F0 (MV) instruction are saved to each channel.  	○	×
DT90381		HSC-CH1		○	×
DT90382		HSC-CH2		○	×
DT90383		HSC-CH3		○	×
DT90384		HSC-CH4		○	×
DT90385		HSC-CH5		○	×
DT90386		HSC-CH6		○	×
DT90387		HSC-CH7		○	×
DT90388 -DT90411	Unused			×	×

26.7 Error Code List

26.7.1 Syntax Check Error List

Error Codes 1-8

Code	Name	Run	Error content and handling method
E1	Syntax error	Stop	● A sequencer with syntax errors has been written in. ● Switch to PROG. mode and correct the error.
E2	Reuse (definition) error (note 1)	Stop	● The same relay was used repeatedly in the output instruction and hold instruction. It also happens when using the same timer / counter number. ● Please switch to PROG. mode and modify the program to ensure that 1 relay is only outputted once in 1program. Or, select to allow dual output by the system register No. 20. However, even in the choice of running dual output, a timer / counter instruction reuse definition error is still detected.
E3	Match not established error	Stop	● Executing of the instruction used by matching (JP and LBL etc.) is not possible due to one is missing or there is a wrong positioning relation. ● Please switch to PROG. mode and enter the 2 instructions for matching into the correct position.
E4	Parameter mismatch error	Stop	● An instruction word inconsistent with the system register settings was written in. The range setting of the timer / counter is inconsistent with the number assignment in the program. ● Switch to PROG. mode to confirm the contents of the system register, and reconcile the setting and instruction word.
E5	Instruction position error (note 1)	Stop	● The instruction to determine executable region (main program region, deputy program region) is written into a position outside of the region (the subroutine SUB - RET etc. were recorded before the ED instruction). ● Switch to PROG. mode, and enter the instruction into the specified region.
E6	The compiler memory is full	Stop	● Unable to compile all programs. ● Switch to PROG. mode to reduce the total number of steps of the program.
E7	Application instructions combination error	Stop	● The executing for each scan type and differential execution type are mixed in multiple application instructions that perform continuous writing. ● Concentrate the executing for each scan type and differential execution type and add individual execution condition.
E8	Application instructions operand combinations error	Stop	● The combination instruction is determined by multiple operands (unify types etc.), and the combination is wrong. ● Please log in to the operands with the correct combination.

(Note 1): The E2 and E5 error codes mean errors than can be detected even it is required to correct a syntax in the RUN mode. In this case, the control unit does not write anything and continues to run.

26.7.2 Self-diagnostic Error List

Code	Name	Run	Error content and handling method
E20	Watchdog timer timeout	Stop	● The watchdog timer is started, but the running stops. A hardware error or operation stagnation has occurred. ● Please check if there is a infinite loop in the control instructions (JP, LOOP, etc.) used to change the program handling process. If the program itself is OK, it may be due to a hardware error.
E21	Motion part startup error	Stop	● It may be due to a hardware error. Please contact our company.
E22	Hardware error	Stop	● It may be due to a hardware error. Please contact our company.
E25	Inconsistent main memory models	Stop	● The main memory models are inconsistent. Use a main memory created by the same model.
E26	User ROM error	Stop	● When installing the main memory card, the main memory may be corrupted. ● Remove the main memory card to check for errors. If there is no error, the contents of the main memory may be corrupted. ● Use it after rewriting the main memory. If the error can not be cleared, please contact our company.
E27	Unit installation is restricted.	Stop	● The unit installation number exceeds the limits. ● Please turn off the power to confirm whether the combination unit is within the limit range.
E29	Configuration parameter error	Stop	● It may be due to a hardware error. Please contact our company.
E34	Abnormal I/O status	Stop	● An abnormal unit is installed. ● Confirm the slot number by DT90036, replace the abnormal unit with a normal one.
E40	I/O error	Select	● The function card may be abnormal. Confirm its location through the data register DT90002 and repair it. ● You can use the tool software to confirm it by the [I/O Error] button in the status display dialog box.
E41	Special unit collapse	Select	● It may be due to abnormal high function unit. Confirm its location through the special data register DT90006 and repair it. ● You can use the tool software to confirm it by the [Special Error] button in the status display dialog box.
E42	I/O check error	Select	● The connection status of the input and output unit (expansion unit) is different from that when the power is turned on. ● Verify the input and output unit whose connection status changed through the special data registers DT90010 and DT90011. Or, verify the chimerism of the expansion connector. ● You can use the tool software to confirm it by the [Check Error] button in the status display dialog box.
E43	Initial error of the motion part	Select	● It may be due to a hardware error. Please contact our company.

Code	Name	Run	Error content and handling method
E44	A position control operation error occurred	Select	● Parameter settings may be incorrect, or there was a limit error. ● Check if the parameters are within the range that can be specified. ● You can use the tool software and click the [Position Control Error] button in the status display dialog box to confirm the channel with position control operation error and the content.
E45	Operation error occurred	Select	● An operation error can not be performed occurred. ● The operation error address can be confirmed by one of the special register DT90017 and DT90018. You can use the tool software to confirm it by the [Operation Error] button in the status display dialog box.
E48	Abnormal system register setting	Stop running	● The settings of the system register are abnormal. Check the settings again. Example) If the data register and internal relay ranges set by the system register No. 0 and No. 1 are not matched with the setting of the system register No. 7 and No. 8 hold / non-hold region and the setting of the system register No. 416-No. 423 universal communication buffer region, an error will occur. ● Verify the number of the system register through the special register DT90007.
E49	Abnormal expansion power sequence	Stop running	● The power of the expansion Unit is turned on later than the control unit. Make sure it is powered on before the control unit or at the same time.
E50	Abnormal battery (battery fall off or voltage reduced)	continues operation	● The backup battery voltage is lower than the specified voltage, or the control unit is not connected to the battery. Verify the backup battery, pay attention to the replacement and connection work. ● You can set whether to notify the self-diagnostic error through the system register No. 4.
E100-E199	Self-diagnosis error set by F148	Stop	● An error set by the application instruction F148 occurred. ● Handle it according to the detection conditions set.
E200-E299		Operation continues	

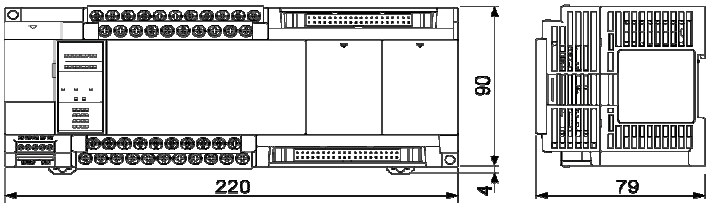
26.7.3 MEWTOCOL-COM Communication Error Code List

Code	Name	Error Contents
! 26	Unit number setting error	An instruction can not be used in the global region (station number FF) is received.
! 40	BCC error	A transmission error occurs in the received data.
! 41	Wrong format	An instruction inconsistent with the format is received.
! 42	NOT support error	An unsupported instruction is received.
! 43	Multiple frames procedure error	In the multi-frame processing, another instruction is received.
! 60	Parameter error	The specified parameter content does not exist or can not be used.
! 61	Data error	There is an error in the contact, data region, data number assignment, size assignment, range and format assignment.
! 62	Login overrun error	Exceeds login times or operate without logging in.
! 63	PC mode error	An instruction can not be processed was executed in RUN mode.
! 64	Bad external recording error	Bad hardware. The built-in ROM (F-ROM) / main memory may be abnormal. Designated content exceeds the stipulated capacity during ROM transmission. A read / write error occurred.
! 65	Protection error	A write operation of the program or system register was performed under the protection status (password setting) or with the main memory card installed.
! 66	Address error	There is an error in the code format of the address data. In addition, there is an error in the range assignment when it is exceeded or insufficient.
! 67	No program error ／no data error	It is not possible to read due to the program region has no program or abnormal memory contents. Or you want to read an unregistered data.
! 68	Can not rewrite in RUN error	Edit instructions can not be rewritten in RUN (ED, SUB, RET, INT, IRET, SSTP, STPE). Nothing has written into the control unit.
! 71	Exclusive control error	Execution of the instruction can not be processed simultaneously with the instructions in process.

26.8 Dimensions

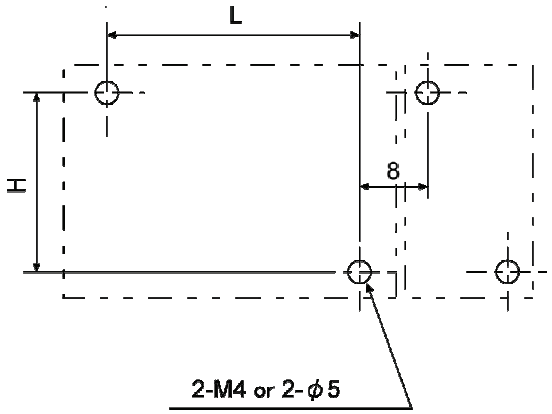
26.8.1 Dimensions

■ FP-XH M4 control unit



Unit: mm

26.8.2 Installation Dimensions



Model	L	H
M4	212	82

Unit: mm

Revision History

The manual No. is recorded beneath the cover.

Issue Date	Manual No.	Revision Contents
April 2015	WUMC-FPXHM4-01	First Edition
June 2015	WUMC-FPXHM4-02	Second Edition ● Errors corrected
November 2015	WUMC-FPXHM4-03	Third Edition ● Models added Linear driver output type FP-XH M4L16T ● Relevant functions of synchronous control added (Chapter 12) ● Errors corrected

About Warranty

The products and specifications listed in this document are subject to change without prior notice as occasioned by the improvements that we introduce into our products. Therefore, when you consider the use of the product and place orders for the product, you may contact our customer service representatives and check that the details listed in this document are commensurate with the most up-to-date information.

We spare no efforts to give the utmost care and attention to the quality of this product. However, to ensure optimal performance, we recommend that:

1) When our product is used beyond the range of the specifications, environment or conditions listed herein, or it is used in any environment or conditions not listed herein, or when you are considering the use of product in any condition or environment that is not specified herein, or when you are considering the use of our product for particular purposes for which high reliability is required such as safety environment and control systems used for the railroad, aviation or medical care industries, you should contact our customer service representatives and obtain proper specification sheets.
2) Consult with us for the specifications of your own products, end users, environment and conditions of use, installation locations, etc. to prevent accidents caused by the items not listed herein.
3) Take safety measures (such as double interlock, etc.) to the external circuit of the product to ensure the safety of the whole system in case of abnormalities caused by product failure or external factors. Also, please use this product within its limits and capacity mentioned in this document.
4) For the product you have purchased from us or with the product delivered to your premises, promptly perform an acceptance inspection; for handling of our product both before and during the acceptance inspection, give full attention to the control and preservation of our product.

Warranty period

- The warranty period of this product is 3 years from either the date of purchase or the date on which the product is delivered to the location specified by the Buyer.
  However, the warranty period (the so-called “3 years”) shall be valid only until 42 months from the date of manufacture which includes a maximum of 6-month distribution period.

Warranty scope

- In the event of any failure or obvious defect in the product due to the reasons solely attributable to Panasonic Electric Works, Panasonic Electric Works shall remedy such malfunctioning or defective product at its own cost in one of the following ways: i) repair such product;
  ii) replace such product; iii) supply of replacement parts.
  However, the warranty shall not cover the failures or defects arising from any of the following reasons.
  1. Specifications, standards and handling procedures specified by the Buyer;
  2. Modifications to the structure, performance or specifications performed by a party other than the Seller after the date of purchase or the date on which the product is delivered;
  3. Phenomena that could not been foreseen with the technology that has been put into practical use after purchase or at the time of signing;
  4. Cases that the range of conditions, circumstances or environment described in the manual or specification sheet are exceeded;
  5. Damages that could be avoided if Buyer’s product provides the function and structure generally accepted in the industry when this product is incorporated into Buyer’s product;
  6. Natural disasters or force majeure;
  7. Consumable goods such as battery and relay or optional accessories such as cables.

  In addition, the warranty described herein shall only cover the single unit purchased or delivered by Panasonic Electric Works. Damages arising from failures or defects of this product are excluded from this warranty.

●Please contact us

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